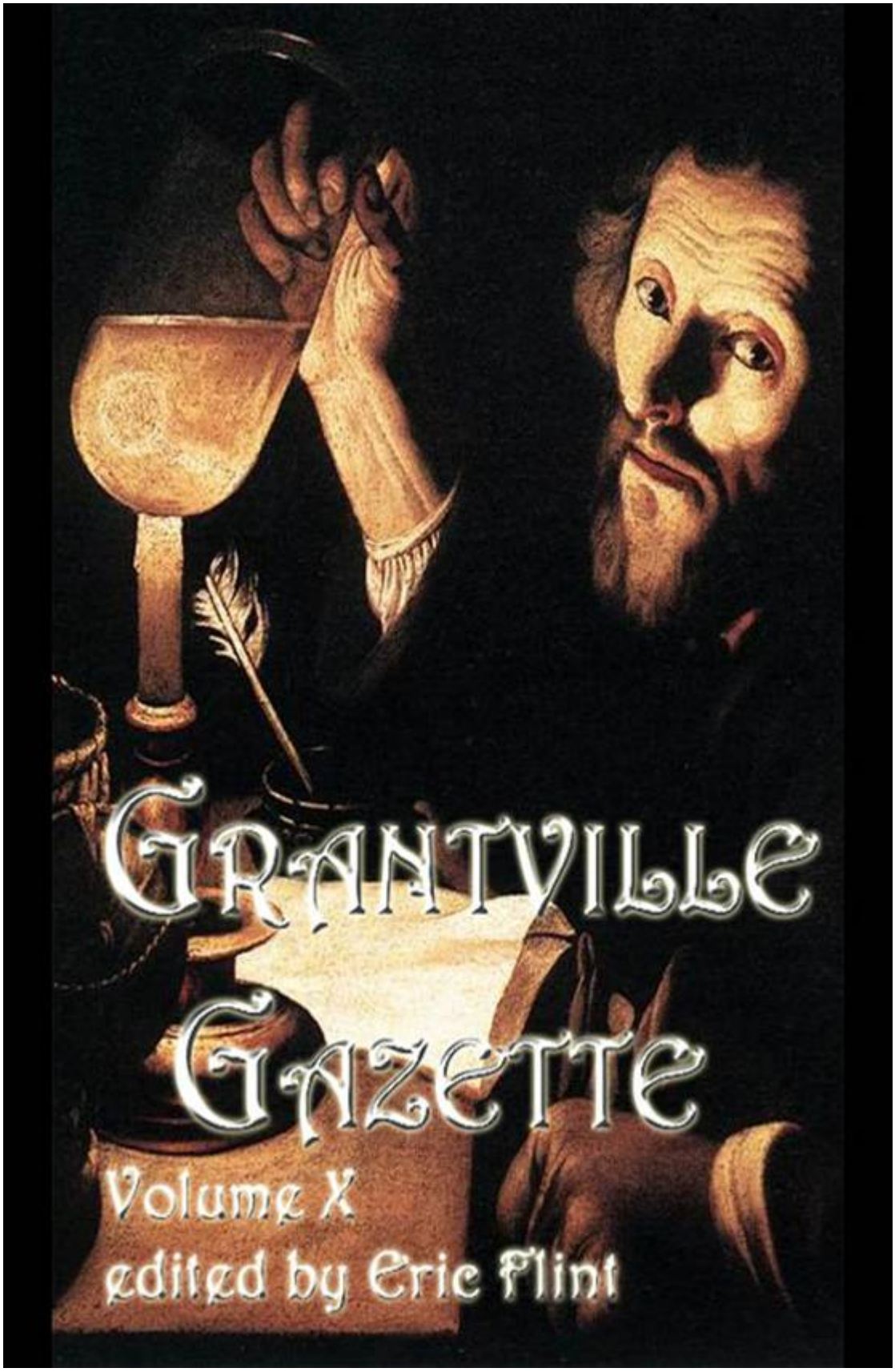

Grantville Gazette

Volume X

Off we go again. Grantville Gazette Volume 10 is, as always, stuffed full of good stories, facts, figures, events, wants and wishes.

Volume 10 moves fromParis toBern ,Magdeburg to Aschersleben, Grantville toJena ,Venice to the Brenner Pass . . . and all the way toMoscow . From the mine to the police forces, biolabs to the sewer system, new drivers to musicians, from corrupt bishops to famous—and not-so-famous—people. There's everything from new developments in antibiotics to new music, how to fix the roads—or build new ones, stage plays to solo performances in the market square.

C'mon and jump in.

First printing, January 2007

Distributed by Simon & Schuster

A Baen Books Original

Baen publishing Enterprises

Electronic version by WebWrights

Grantville Gazette

Volume X

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Preface

Wow! Who knew? Way back in 1999, when people started writing fan fiction for 1632, who'd have thought it would grow like this? This is our tenth volume—and the fifth in 2006. And there's no lack of material for the next volume, either.

Volume 10 includes our first "pro" submission, from Bradley H. Sinor, "On the Matter of D'Artagnan." It's not your grampa's Three Musketeers, that's for sure. Aamund Breivik entertains us with a little, ah, dirty problem in "A Filthy Story," while Virginia DeMarce is rewriting the musicalOklahoma ! in her story "Franconia!" A young English lord and a not-yet-famous philosopher are touringEurope in Iver P. Cooper's "Grand Tour," while our Dr. Phil gets a new visitor—or three—in "Dr. Phil's Family" from Kerryn Offord.

Non-fiction for this volume includes Vincent Coljee's "Herd Immunity," along with Kim Mackey's "Crude Penicillin: Potential and Limitations," as well as Iver P. Cooper's "All Roads Lead. . . ." and Anette Pedersen's "The Feast." We have more fiction from Terry Howard, who has written "Star Crossed," and Jose J. Clavell tied "NCIS: Lies, Truth and Consequences" into that situation . . . with an, ah, interesting ending. Richard Evans wonders what's going on inBern with "The Launcher," while Russ Rittgers gives us the rundown on some illicit activity in "Fiddling Stranger."

Speaking of illicit activity, "None So Blind" from David Carrico shows what happens when the good guys win, while "Little Angel" by Kerryn Offord shows us what happens when they don't. If you don't have the medications down-time that you have up-time, what do you do? "The Prepared Mind" by Kim Mackey gives us one possiblity. Part three of the continuing series "Butterflies in the Kremlin" by Gorg Huff and me continues our take on what's going on inRussia , while "The Salon" introduces a Grantviller no one has heard from before.

Mark Huston's "Twenty-eight Men" brings Grantville tragedy along with hope, and helps us understand some of the many, many things that can go wrong. And things will go wrong, as we all know. But the continuing hope for our relocated Americans is that they'll prevail in the end. Will they? Well, you just never know.

We hope you enjoy the stories

Paula Goodlett

And

The Grantville Gazette

Editorial Board

FICTION:

On The Matter of D'Artagnan

By Bradley H. Sinor

"Charlton Heston or Tim Curry?" mused Cardinal Richelieu.

Since there was no one else in the room, the chief minister to His Majesty Louis XIII ofFrance was speaking for his own benefit.

Richelieusat in a large chair behind the huge desk that dominated the room serving as his office. Two candelabra provided more than enough light for him to work. He brought out a pair of small boxes from one of the desk drawers, and put them next to a glass of wine he had poured earlier.

He found himself having to squint slightly to study the boxes. His eyes were good, for a man his age, but not as good as they had been more than a decade before, when Armund Jean du Plessis had first been created a cardinal-prince of the Roman Catholic Church.

The printing on the boxes was in English, a language he had only a smattering of, but it was the pictures on them that really interested him. They were not paintings, but rather what were called photographs, just another in a seemingly unending stream of new terms he had learned since the Americans and the town ofGrantville had appeared on the scene.

Richelieuhad long been an admirer of art; photographs, however, were far different than any paintings that he had ever seen. They showed what really was, not an artists interpretation.

The photographs were scenes from "movies." As best he understood them, movies were like plays, only they could be watched over and over again—not repeat performances, but the same one, with no differences.

These two movies were of special interest toRichelieu . They were the same basic story, entitled "The Three Musketeers," but each used different performers, and had been made several decades apart. Viewing them was an impossibility, since he had neither the machine to do it—or the power to run it if he had the machine. So, his agents in Grantville had also supplied very detailed summaries of the plots.

True, the movies did exaggerate events—not to mention playing rather fast and loose with actual facts; ashad the book, by someone named Dumas**.**They even included a supposed relationship between Queen Anne and the English duke of Buckingham.

Richelieu, himself, was a character in the story. It certainly didn't hurt his ego to know that he would be remembered nearly four hundred years in the future, not just in the history books but apparently as part of popular culture.

That he found himself portrayed as a villain and schemer didn't bother him one bit. A fact of life he had learned a long time ago was that whether or not someone came off as a villain or a hero depended on who was telling the story.

Something about the picture of Curry remindedRichelieu of himself, back when he had first come to the

church. It was, perhaps, the gleam in the man's eye, which gave an almost predatory, animal look to the man's face. On the other hand, the older man, Heston, with his hands steepled in front of him, projected the quiet dignified look thatRichelieu fancied for himself.

"Yes, I think Heston is more me."

"Excuse me, Your Eminence."Richelieu looked toward the door where one of his secretaries, Monsignor Henri Ryan, had appeared. The young man held several thick folios under one arm.

"Yes, Henri?"

"I have just received word that the Italian delegation will be here within the hour." Henri placed the documents he carried in front ofRichelieu . "These are the reports on the things they want to discuss with you."

The younger priest stared for a moment at the two movie boxes lying on the desk. His distaste for them was rather obvious.Richelieu made a mental note to have a long talk with Henri about learning to conceal his feelings on some subjects, whether it was the Americans or the Spanish or whatever. That was one of a wide variety of skills Henri needed to develop.

"Very well, let me refresh my memories of these matters, and then bring them in when they arrive."

"Of course, sir." Henri started to leave, but stopped a few steps from the door and turned back toward the desk. "Also, that man, Montaine, arrived, a short time ago, saying he needed to see you."

Richelieucocked his head slightly. Montaine was not due to report for at least a week. His unexpected appearance suggested that he came bearing news.

Of course, the Italian matter was also pressing.

"Very well. Have him wait in the smaller library. If he is hungry, have the kitchen prepare something. I shouldn't be more than an hour or two at the most. Did he say what he needed to speak to me about?"

"Yes, Your Eminence. He said it was on the matter of D'Artagnan."

* * *

Charles D'Artagnan stared out the window. It was an hour after sunrise and the narrow street below was already filled with people; there were food vendors, merchants, barbers, craftsman and their customers. A woman screaming at a man in a greasy apron, who was selling meat pies of some kind, caught his attention.

The exchange continued for a few minutes, with invectives flying between the two. The verbal combat only stopped when the woman handed several coins across and the vendor passed her back several of the meat pies. The two parted with smiles and wishes for the best of the day.

D'Artagnan felt something small and furry rub against the side of his hand. He looked down to the window ledge and found himself confronting a tiger-striped kitten who was very vehemently demanding attention.

He reached down and gently picked up the animal. The kitten was not happy with this idea, preferring to

be petted rather than held, and struggled to escape his grip even as he began to stroke the animal's temples and then under its chin. The response came quickly, and the kitten stretched out, offering its neck for more attention, showing its approval with some very loud purring.

"Like that do you, little one?"

"I must say, you certainly have a way with animals, my dear Charles." A dark-haired woman clothed only in a sheet stretched out on the bed that filled much of the room. She had raised herself up on one elbow and leaned across the impression in the mattress that, until several minutes before, D'Artagnan had filled.

"I have had a bit of experience with the wilder creatures of the world." He smiled.

"Do you think you can bring out the animal in me?" Charlotte Blackson laughed.

"I'll do what I can," he said, walking back to the bed.

He set the kitten down on a side table, much to the chagrin of the animal. The cat reached out to try to drag his hand back, but D'Artagnan ignored the protests, intent on a different goal now.

He reached over and gently ran his finger along the edge ofCharlotte 's chin. The gesture brought a purr to her lips and a very inviting smile.

Charlotte Blackson was a beautiful woman. Her husband, a Musketeer, had been killed in the war. While not rich, he had left her well off.Charlotte had, in turn, taken her inheritance and shrewdly parleyed it into much, much more. Now, six years later, she was the proprietor of a dozen businesses and a partner in several more. She had even begun to move into some of the minor social circles ofParis . D'Artagnan had met her a few months before when he had stopped a thief intent on making off with her purse. In spite of the fact that she was more than a decade older than he, D'Artagnan soon found himself enamored of her.

"Yes, you do have a way with animals."Charlotte reached up and wrapped her arms around him. The sheet fell away, its edge dropping over the end table and trapping the kitten for a few moments.

"I try," he said as she plastered her lips against his.

* * *

"So what do you have for me, Montaine?" askedRichelieu .

Montaine was a small man, dressed in shades of brown, with a face that, other than having an immaculate pencil thin moustache, was not unique in any way whatsoever. Two minutes after they had seen him, few people could describe the man; most failed to even notice his presence, which had often proved a major advantage.

He stopped a half dozen steps in front of the cardinal's desk. Montaine never approached any closer than that; it was as if there was a line on the floor that he could not, or perhaps would not, cross.

Richelieu had employed Montaine for nearly four years, but actually knew very little about the man, other than the fact that he was loyal to France, i.e.Richelieu , and he had been remarkably effective in the various tasks that were set for him.

"I have located the man you are seeking. His name is actually Charles de Gatz-Casthenese. His mother's family was named D'Artagnan. He is from Lupiac, but he was raised inGascony and came toParis just over a year ago. He has been calling himself simply Charles D'Artagnan. He has not made a secret of who he is, but has not gone out of the way to make it known either."

"Indeed,"Richelieu prompted.

Montaine nodded. "He attempted to get into the Musketeers, but was turned down, I believe because of his lack of military experience. However, he was able to secure an appointment with the Royal Guard."

"Continue."

"From the reports I have seen he has proved to be quite the gifted swordsman. He also turns out to not only to be good with his sword, but also knows when to fight and when to walk away. I suspect his superiors have an eye on him for eventual promotion."

"What of the other three men I asked you to find?"

"Oh, yes. I'm afraid I have bad news in that area. I could find no trace of anyone by the name of Athos, Porthos or Aramis currently serving in the Musketeers. From the way they were described in that book you gave me, I should have been able to find them, or at least someone who had heard of them. It's really a pity; the story makes them seem the sort of fellows I would have liked. However, I have found some very young men, barely in their teens. Issac de Porteau, Henri d' Aramitz and Armund de Sillegue d'Athos d'A'Autevielle. I suspect they may have been the ones that this Dumas fellow modeled his characters on. They are all relatives, to one degree or another, of the commander of the musketeers, Monsieur de Tourvelle. So I did not inquire too extensively. I can, should you require more information on them."

"Unnecessary." De Tourvelle was a man thatRichelieu knew of, quite well. He bore watching and could be either friend or foe to the cardinal, depending on the needs of the moment.

Perhaps it was true that the Athos, Porthos and Aramis of the movies and the book might not exist. It was entirely possible that those three were indeed simply characters who had been invented for the purposes of these entertainments. However, that did not mean they might not eventually still be of use to him.

"Have you actually met this D'Artagnan?"

"No, Your Eminence. I didn't feel that wise at this time. I have learned enough about him to know that this young Gascon is someone that you might do well to be wary of. He would not be easy to control and could end up being very much of a loose cannon."

Richelieuhad come to trust Montaine's opinions. But he had also learned that there were times when you wanted someone who was not easily controlled, so this young man might suit him quite well. "Very well. Bring him to me, but do it quietly. I do not want the world to know of my interest in this man. Not quite yet."

"That might prove difficult. If it were a formal summons he would come, of that I have no doubt. However, D'Artagnan seems to have an agenda of his own and I do not see it allying with others, even you, sir," said Montaine.

Richelieu meditated for a few moments on the man's words, then took a single sheet of paper and began to write on it, adding a large daub of hot sealing wax to the bottom of the page into which he placed not only his official church seal but that of the chief minister ofFrance .

"You must wait until the chance offers itself and bring him to me. If he is indeed as stubborn as you suggest you may have to*persuade* him."Richelieu passed the paper to Montaine. "This may be of assistance. I will trust in your discretion about when and how to use it."

* * *

D'Artagnan stood quietly in the doorway of an abandoned storefront. This was not the best part of town. From the look of the grime on the windows and the rust on the shutters, this place could have been shut up for decades.*That* suited D'Artagnan's needs perfectly.

From here he had a clear view of the Flying Pig, a tavern just down the block, and few would be able to see him, even if they were standing directly in front of him. A covered lantern sat at his feet.To add to his camouflage, D'Artagnan had left his uniform in the wardrobe atCharlotte 's home. Tonight was not a night to be known as a Royal Guardsman.

No, tonight was a night for personal matters.

The Flying Pig was a low dive at its best. At its worst, it was a dump. The clientele asked no questions and only demanded to be left alone to muddle their dark thoughts in cheap wine and nearly tasteless ale.

D'Artagnan had gone into the Flying Pig twice, two times more than he would have wished. The smell inside the building reminded him of a charnel house or a battlefield long after the fighting was over, when the crows held forth. It was not a place that, even in the darkest of moods, he would willingly seek out.

Yet the Flying Pig fit the man he was seeking like a glove

D'Artagnan had watched his quarry enter, small forms that seemed to be fleeing from the moonlight that filled the street.At just past ten o'clock the tavern door opened and two men emerged. Both were short and round, their clothes the color of sand stained dark after a rainstorm. Neither man was steady on his feet. It seemed a miracle that they both didn't end up face down in the mud.

They stopped, for a moment, almost directly in front of his hiding place, then moved on. One of them began to sing, very badly.

D'Artagnan came up behind them in a few steps, grabbed both and slammed them hard against each other. Then he dragged them backwards, kicking the door of the abandoned shop open and pulling them inside. By the time the door had swung shut he had both of his prisoners on the floor.

The whole incident hadn't taken even thirty seconds.

Hand on the hilt of his sword, D'Artagnan waited to see if the attack had caught anyone's attention. One minute, then a second, passed and there were no cries of alarm.

He recovered his lantern and opened it to look down at them. One was barely breathing, and would not be waking up anytime soon. But the other, the one that D'Artagnan wanted, surprised him. The man had actually begun to snore. This wasn't what he had expected, though the man fairly reeked of cheap wine

and ale, which explained it.

D'Artagnan grabbed him by the lapels of his threadbare coat and shook him hard. "Wake up, you scum-sucking piece of filth."

There was no response at first. "If its money you're wanting," the man said finally, "then you're too late. What few coins I had have been sent to keep company with their cousins in the tavern keeper's cashbox."

D'Artagnan snorted. "I sincerely doubt that you have ever had enough money enough to interest me."

"What do you want from me, then?"

"I want your memory." D'Artagnan shook him again, then, while the man was still rattled, dropped him and held the lantern up close to his face. "I know who you are, Andre Marro. I know that you were once seneschal to the family LeVlanc, as your father and grandfather had been before you. It is for that reason that I've come looking for you, that I want your memory."

At the mention of his name Marro's eye's shot open. If it were possible, his face went paler than it had been.

"I . . . I . . . I . . ."

"Don't deny it. That will only make things worse. I know all about what happened to the LeVlancs and why it happened. You do as well, since you were there. I've tracked down the other servants who survived the purge. They didn't know the name of the man that the LeVlancs trusted to organize the whole thing, but they all agreed on one point.*You* knew who it was."

Marro groaned. D'Artagnan slapped him twice. Finally he muttered a name, a name that D'Artagnan recognized.

"If you have lied to me, I will find you, no matter where you run or hide."

Marro curled into a ball and tried to shrink into the floor. D'Artagnan walked away and slammed the door.

* * *

D'Artagnan came awake with a start and pulled himself up almost completely out of bed before he was fully aware. He struggled for each breath, every one coming as a hard won victory while cold, clammy beads of sweat rolled down his face.

Images cascaded though his mind: blood, the edges of swords, screams, the smell of burnt gunpowder, all rolling over and over and over. Intermixed with them was a single face, one that brought him a feeling of warmth, yet cut into the very fiber of his being.

"Charles, what is the matter?"Charlotte 's voice was a distant sound for him.

"I'll be all right," he gasped. "Everything is all right."

"Right. You have nightmares like this all the time."Charlotte pulled the covers up around his shoulders to

warm him, her arms wrapped tightly to hold it in place.

"This will pass." He knew the reason for the dream; the reason had followed him for more than twenty years. "It is not the first time I have had to face demons in my dreams."

"I don't understand."

D'Artagnan drew the blanket tighter around himself but let his arm slide out to put aroundCharlotte . "It's complicated," he said, finally. "I must face someone, someone I have been searching for a long time. I know where he is, but I have never been able to find him alone."

"Who is this person?"

When he told her,Charlotte 's reaction was not what D'Artagnan expected.

"I think I might be able to help, my dearest," she said with the hint of a smile.

* * *

"Please, Monsieur, is this the act of a gentleman?"Charlotte giggled.

"I hardly think a gentleman is what you want right now." The man who had been nuzzling her neck for the last few minutes laughed.

They were standing in a garden to one side of the Hotel Transylvania, where a ball had been going on for many hours. Charlotte wasn't even certain who was throwing this ball; she had the feeling that a great many of the guests felt the same way though most would sooner die than admit it.

Manuel Zarubin had been standing near one of the windows whenCharlotte spotted him. He was not openly circulating among the guests, but remained in one place, letting others come to him. It had taken nearly an hour forCharlotte to gain his attention and finally lead him into the darkness of the garden.

"It would all depend on what the gentleman in question might be offering. So what are you offering, my good sir?"Charlotte drew her words out so each one was a breathy echo.

Zarubin was fully twenty years her senior, but still muscled like a soldier. His neatly trimmed beard was streaked with grey, but in a manner that made him seem exotic rather than ancient. A few streaks of graying hair had snaked out from beneath the perfectly coiffed wig he wore.

"Perhaps I can show you." He pushed her back into the shadowed area between two large trees. His hands moved quickly into the opening presented by her cleavage; the staves of her corset screamed as they were pushed out of shape.

"Sir, I beg you, do not do that. I am, after all, a lady."Charlotte tried to pull back. Her action threw her up against the fork in a tree just behind them, lodging her where she could not move.

"You are no lady, tart," Zarubin said, pushing his hand further down.

"My good sir, I believe that lady said she was not interested in what you had in mind." D'Artagnan moved toward the couple from behind a gazebo, where he had been waiting.

Zarubin twisted his head, his face showing surprise and anger at being interrupted. "Begone, sir! This is none of your affair."

"On that matter—" D'Artagnan laughed. "—I would say that you are definitely wrong. This is mostly definitely my affair."

He grabbed Zarubin and yanked him away fromCharlotte . That the man managed to stay on his feet was a surprise, though his wig did go flying off onto the ground.

"You are a dead man, assassin." The Spaniard's voice was quiet and cold.

"We all die, sometime. Perhaps it is my time, perhaps not. Personally, I would put money on my walking away from here alive."

Zarubin pulled a rather fancily decorated sword from the sheath at his side. "Then you would lose your money, just as you are going to lose your life. I suggest, instead of boasting, that you put steel into your hand."

"My name is D'Artagnan," he said, and brought his own weapon free. "Prepare to die."

Zarubin made the first blow with a driving lunge meant to end the fight immediately. D'Artagnan parried the thrust and responded with several of his own.

"Enjoy this, dearCharlotte ." Zarubin didn't take his eyes off his opponent. "You obviously know this young upstart. I hope you had a chance to say goodbye to him. Once I am finished with him, we can resume our little tête-à-tête."

D'Artagnan said nothing. He struck for Zarubin's chest with three quick jabs, which the man parried with ease, his battle hardened reflexes obvious with every move. As he parried Zarubin's counter strikes, D'Artagnan stepped to one side, his foot hit an uneven patch of ground and he went down, his sword slipping out of his grasp and out of reach.

"Now you are mine." Zarubin closed the distance, looming over his foe, intent on finishing the fight as quickly as possible.

D'Artagnan's dagger came into his hand as he rolled to one side. Striking blindly, D'Artagnan drove the blade hard into Zarubin's heart. The man trembled for a heartbeat and then he fell, the light fading from his eyes.

"Fight, don't talk," D'Artagnan muttered.

"Monsieur, do not move, or we will be forced to shoot!"

The command came from two men in Musketeer's uniforms with pistols in their hands. They had come from the direction of the hotel. Others were coming behind them to find the source of the disturbance.

"Charles, would you please settle this whole matter," said someone from behind D'Artagnan.

Startled, he turned to see a small man, dressed in brown, who was stroking his thin moustache as he spoke, walk forward from behind a statue of the Greek god Prometheus.

"I must say, it is rather cold out here and I think that Mademoiselle Blackson would definitely like us to escort her home," said the stranger.

The small man stood looming over D'Artagnan for a moment, just staring at him, before he offered him his hand. Once D'Artagnan was back on his feet, the newcomer's small fingers slid into the pocket on the right side of D'Artagnan's vest; producing a small folded sheet of paper, one that D'Artagnan knew for certain had not been there earlier.

"There are times, my old friend, when you get so centered on your task I suspect that you would lose your way in your own home." The little man turned to the Musketeers and offered the paper. "I believe that you will find that my friend had a full and proper warrant for what he did this evening."

* * *

"The bearer has done what he has done by my order and for the good of the state," intoned D'Artagnan as he stared at Cardinal Richelieu.

The cleric said nothing, just cocked his head slightly and waited. D'Artagnan wasn't sure just what he had expected to happen. From the moment his blade had plunged into Manuel Zarubin, he had expected to wind up in the Bastille, not standing in front of the king's chief minister.

"I know what is on that warrant, young man, since I wrote it,"Richelieu said finally.

Once the Musketeers had read the warrant, D'Artagnan and his companions had been released. After escortingCharlotte home, the small man, who refused to even give his name, led him toRichelieu .

That the cardinal had been awake and working in his office fit his reputation for having a hand in everything that happened in Paris and France every minute of the day and night.

"Then I suppose I have you to thank for my freedom, Your Eminence?"

"Indeed, you do,"Richelieu agreed. "And how do you propose to repay me for that favor?"

"What would you call fair payment? You seem to have some interest in me. This fellow," he gestured toward Montaine, "obviously works for you, and, I would guess has been following me for some time."

"That he does, Charles de Gatz-Casthenese."Richelieu smiled. "Don't look so surprised, I know who you are. The question is what I do with you. You have obviously been planning the death of Senor Zarubin for some time. So let me ask you the next question. Why?"

D'Artagnan didn't know whether to smile or be worried at this latest turn of events. "Justice, Your Eminence, justice."

"I thought the king and I were the dispensers of justice in the realm."

"You are, but sometimes that task falls into the hands of others. In the case of Zarubin, it fell to me. I had no choice in the matter. If you will recall, the year before he was murdered, our current king's father, Henry IV, was the victim of another assassination attempt.

"Most of the conspirators were captured and executed, as they should have been, but not the man who organized it. My father was killed while still searching for him, although it took a long time. My mother

was convinced that he must have gotten too close to the ring leader and was murdered for it. I have searched for most of my life to find out who that was. Three weeks ago I found out that it was Zarubin."

"You were duty bound to avenge the attack on his late majesty?"Richelieu steepled his fingers.

"Duty bound, yes, but not for that reason. If you will recall, the king was unhurt. My father, however . . . I have known all my life that for my father's soul to rest there must be justice. It was a matter of the honor of my family."

Richelieuwas silent for some time. "There will be consequences for his death, political problems that I really did not need at this time."

"I regret nothing that I have done. I am prepared to accept whatever penalty I have earned for my action."

Richelieupulled a folded sheet of paper out of his desk. It bore both his personal seal and the seal of his office. It had obviously been prepared some time ago. He passed it to D'Artagnan.

He could feel his jaw hanging open as he read the document. "I do not understand, Your Eminence."

"What is there to understand? That is a commission as a lieutenant in my personal guard. If you accept this, know that while your loyalty must always be to myself—and that means to France—I will, from time to time, call on you, for shall we say, special duties."

The man in brown chuckled. "Do you think Dumas would approve, Your Eminence?"

"Dumas?" asked D'Artagnan, butRichelieu waved the question away. "What of the consequences for the death of Zarubin?" he continued. "If I recall your statement not minutes ago, you said that you didn't need the political problems that might come from it."

"True, but there are ways to turn them to the advantage ofFrance ."Richelieu 's smile was cold. "That is where a statesman can be as deadly as a swordsman. As for you, Charles D'Artagnan, I feel that*your* skills can be of use to me, and in turn toFrance , in these most unsettled times."

"How did you know of me?" asked D'Artagnan.

Richelieuhesitated for a moment and then smiled. "Let us say that you came to my attention because of a man named Charlton Heston."

D'Artagnan shook his head. "I have never heard of this person."

"It is highly unlikely and completely unnecessary that you have. Perhaps one day I may explain who he is."Richelieu took a bag of coins and tossed them toward D'Artagnan. "Consider this an enlistment bonus."

"Why do I have a feeling that my life has just become quite interesting?"

"Because it has," said Montaine. "Personally, I think that a celebration is in order." D'Artagnan had almost forgotten the little man's presence.

"It is late, gentlemen and I am tired. I will leave the celebrations to you young men."Richelieu turned and

left the room.

"I, for one, could use a drink," said the small man to D'Artagnan**.**"I also know an excellent tavern not a stone's throw from here."

"Lead on. I think I am going to need several drinks," said D'Artagnan. "By the way, it occurs to me that you still have not told me your name. I have no idea who you are."

He grinned and flamboyantly traced the line of his moustache. "I have many names. Why don't you call me Aramis?"

A Filthy Story

By Aamund Breivik

Daniel Pedersson cursed, and swung the entrenching tool again. It went*splat* instead of*crack* , again, and he cursed some more. Not that swearing helped; he was already covered in filthy sewage slush beyond all imagination. The supply depot's jury-rigged sewer system had worked fine all summer, but now the outlet had frozen solid and the sewage had backed up all the way to the officers' latrines. Removing the blockage was a horribly filthy job, but this was the Swedish army. There was always someone who could do with some "disciplinary measures." Ah well. Daniel had been punished before, and he probably would be again.

Not that he was entirely innocent of this current mess either, but he couldn't help feeling that it ought to be procurement officer Paal Nilsson-Loo down here clearing it up instead of him. They weren't even supposed to have a supply depot here, never mind sewers. So what if he'd helped construct this dodgy plumbing in the first place? Or that he and some other enlisted men had been a little too enthusiastic when they found the sewage was blocked, and the enlisted men's latrines were*upstream* of the officers'?

Nilsson-Loo had been ordered to set up a small Swedish army procurement office for the Grantville area. The Swedes were buying so many goods and services from the booming industry there that they needed someone to sign contracts and inspect the goods, to ensure the crown always got its money's worth. He made a decent living, more than decent in fact, by skimming what he saw as his rightful share off every single deal. A bit more than what the crown might think he was entitled to, but he kept the witnesses quiet by sharing some of his questionable income with his subordinates.

Like when he decided he liked the up-time-style indoor plumbing so much that he had his men lay pipes from their fancy new latrines out to a nearby drainage ditch. Not just his own shiny porcelain throne, but the men's too, since he didn't want to smell their waste if he could help it. Now it had all gone wrong, and the Grantville authorities had gotten wind of their unauthorized plumbing. They'd declared it all to be the Swedish army's problem, after repeatedly using the phrase "code violation." Along with other, less polite English words and phrases which Daniel could now add to his vocabulary. Other new additions were "septic tank" and "leach field." Nilsson-Loo had therefore declared it must be Daniel's problem, for not doing the job right in the first place. So while Daniel was down here in an overflowing ditch, Nilsson-Loo was probably off spending his "skimmings" on women. Or on something else Daniel didn't want to know about; there were rumors, and he worried that his boss might stain the army's reputation one day.

Before he could employ his new skills in language and septic engineering, he had to remove all the effluent from the drainage ditch and deposit it in a more permanent location so it couldn't run off

downstream to pollute the waterways. This was backbreaking, boring, seemingly endless work and he'd been at it alone all day. There had been some commotion earlier, but nobody had bothered to tell him what was going on and he couldn't leave his work to find out.

He'd just about finished hacking the frozen sewage into slush and dirty ice cubes, when a sour-looking military policeman arrived escorting a surprisingly cheery person who was carrying a number of buckets. Surprising, that is, for someone about to wade waist-deep in raw sewage with frozen crusty bits on top. Vague recognition kicked in.

"Hey, aren't you one of those ski-troop heroes? What are you doing here on punishment detail?"

The man answered something unintelligible:*"Eig e skilaupar, jau, meinn neigu noukon hjelte"* it sounded like. "Say again?"

"Sorry," the man answered. "I'll speak German instead. I've gotten used to my Swedish friends understanding me, but they've had some time to learn. My name is Torjer Lien, and I'm a skier but no hero. I'm here for offending a supply officer." He grinned.

"Why? And what's so funny about it?"

"Well, the reason isn't funny." Torjer's face darkened, all merriness gone. "It started when the ski troops were asked to test a new piece of equipment, a 'sleeping bag' made to an up-time pattern and with up-time-style zippers." Torjer spoke while he worked, filling two buckets with filth and handing two more to Daniel. "The 'prototype' we were shown looked good, and when we let a recruit use it for a week it didn't rip or break or anything. That's how we test new equipment—if it's recruit-proof then it's probably strong enough for general issue. We told them it was a great idea, if they would only make them big enough that we could actually use them while wearing all our winter clothes and equipment. The prototype was a bit tight when you put your rifle and everything inside, like we sometimes do to thaw out frozen locks and water bottles."

They carried the buckets over to a hand cart for transport uphill to a large pit. It was going to be some punishment, as there must surely be a hundred more bucketfuls to scoop up and remove.

"Our boss, Captain Virenius, ordered a full platoon set of sleeping bags just like the prototype except a bit wider. What we got—what the supply officer gave our captain—was bags the same too-small size as the prototype and with a thinner, finer-looking type of zipper. The supply officer claimed these were newer, better zippers than the one on the prototype".

The two men continued filling and emptying buckets of unimaginable filth. "We didn't know the zippers were bad—he'd charged the army for a larger version with deluxe extra-strong zippers, and only bought the standard size with cheaper zippers. Zippers designed for ladies' dresses!" Torjer shook his head, and continued to work.

"So out we went, on an exercise to test our new tactics and equipment against friendly 'enemy' units who'd be looking for us, and if we were spotted they'd fire blanks at us. All pretty harmless, but nobody wants to lose a battle even if it isn't for real. So we decided to be serious about it, you know, moving quickly and making cold camp. Just the sort of job for up-time-style sleeping bags, if only the bloody zippers had worked." Torjer spat and cursed for a few minutes in unintelligible Norwegian, apparently without repeating himself.

"The first few nights were great. I had a good, thick reindeer pelt underneath my warm, cozy sleeping

bag and I slept like a baby. Except for when that clumsy son-of-a-taxman Ante stumbled in the alarm line and woke me half an hour before it was my turn on stag. The fifth night, however, we were pretty close to the 'enemy' and everyone was a bit on edge. So when our mess kits began to rattle during dog watch, we all burst from our sleeping bags and ran to our defensive positions. I don't think anyone noticed at the time, but nearly all of us tore those lady-fashion zippers open without using the little pull tab thingy. Nobody had told us that would destroy the zippers."

Daniel felt confused. "Back up a little. Mess kits? What made them rattle?"

"We use them for an alarm system," Torjer explained. "You tie a long piece of string to a bunch of tin pots or whatever will make noise, like a couple of mess kits tied together. Run the string out to the sentry post, and he can alert those in the tent without leaving his post. But that's not the point.

"There was a terrific noise, with the alarm string being jerked so hard it nearly took the whole tent down. We thought all hell was breaking loose, and stormed out into the darkness. Some fool opened fire, and the others followed suit. Including me, no less a fool than anyone. But at least I only reloaded once before I realized that we were shooting at shadows."

They were making progress on removing the slushy, near-frozen waste, but somehow that only made it worse. The effluent was now running in fits and starts, bringing fresh and rather more odorous waste their way. They had forgotten about all the sewage standing under pressure in the blocked pipes, and with the blockage removed there was something like a volcanic eruption. At least the fresh stuff wasn't freezing.

"It turned out that the sentry hadn't pulled the alarm string, and neither had any other man. It was a deer—a stupid, insomniac deer that went a-walking right between the sentry and the tent. It tripped in the string, and scared the crap out of us."

Daniel couldn't quite bring himself to laugh in his present circumstances, but he was still curious. "And what did the deer have to do with your offending the supply officer?" he asked.

"Nothing much, but the zippers did. They would have failed sooner or later, so it didn't matter if the alarm was raised for a deer or for the whole Danish army. We had opened fire, announcing our presence to the whole county, so we had to leave. Fast."

Torjer shook his head. "Breaking camp quickly in near pitch darkness and running like the devil himself was after us. That's a recipe for disaster, even in the best of times. And then the weather changed, it turned first wet and then cold. Our skis were soon caked with ice, which isn't nearly as slippery on snow as you might expect. Not when the snow is wet and sticky. Our uniforms were soaked with icy water, which then froze like a suit of ice armor. After a few hours I noticed young Nils Larsson was getting even more clumsy on skis than usual, but when I asked him he claimed to be fine."

Torjer slipped on something unmentionable, landed in something worse, and after an exceptionally long bout of swearing he seemed to have forgotten the story.

"And was he? Fine, that is?" probed Daniel.

"Huh? Oh, him. No, he bloody wasn't. The damned fool had taken his boots off in the tent. Well, you're supposed to do that, but you're also supposed to remember where you put your woolly socks. When that whole deer incident went down he was in too much of a hurry to find both socks, so when we set off skiing he only wore one. Frostbite on three toes, he had. He also had hypothermia, which is why he didn't notice the frostbite. Did you go to that lecture on hypothermia and frostbite, when the up-timers

held first aid instruction?"

Daniel nodded. "Yeah, they told us the extremi-somethings get cold first and then when the brain begins to cool you get stupid."

"The 'extremities' you mean," Torjer corrected. "That's your fingers and toes, and other things that stick out. Like your privates. Remember what else they said?"

Daniel gulped, wide-eyed: "If you get bad frostbite, they have to cut it off. Really, the . . . ?"

Torjer nodded sagely. "Yes, that part too if it's really bad."

* * *

Some time later, the two men were about to haul the last cart over to the pit when Torjer's hand slipped and he fell face first on the frozen ground. The sudden additional load made Daniel lose his grip, too, and the cart went backwards into the ditch.

"There's even shit on the drawbars," Torjer muttered.

They eventually finished up and walked towards the warm showers, a wonderful invention even if it wasn't quite as social as a communal tub. Waddled to the showers, rather, trying to move without touching their filth-soaked and half-frozen clothes.

Warming up, Torjer picked up the story again. "Now, if someone gets hypothermia near civilization you simply throw him in a hot tub and thaw him out. But when you're in the middle of nowhere and all your gear is wet, you stick him in a sleeping bag and crawl in with him to share some body warmth. Personal privacy be damned."

"Yes, I remember," said Daniel. "That's what they told us at that lecture."

"And that's what mountain men like me have always known," replied Torjer, "only we've always used furs and blankets instead of sleeping bags. Problem was our no-good, stinking sleeping bags were too small even for one man, and the bedeviled zippers didn't work so we couldn't put two bags together to make a large one. In the end we put poor frozen-toes into the only bag that still had a functional zipper. Which saved his life, but meant I had to sleep in a bag that couldn't be closed properly." More profanity followed.

"Look, he had to amputate a toe but he'll be fine otherwise. No longer fit for winter duty, but he'll live. Me, on the other hand, I nearly froze my balls off. The zipper would sort of close, but every time I fell asleep it would open again. Right over my privates, dammit. And me out of my pants, as they were soaking wet and I had to get warm somehow and maybe I wasn't thinking too clearly myself, being cold and all. Remember what I said about extremities? I came*this* close to freezing my manhood off! Because of a bleeding lady-fashion zipper and that filching, cost-cutting supply officer!"

Torjer was clearly working up a temper, and Daniel had to concentrate on not laughing. It might be bad for his health to annoy Torjer, he decided. "So you set out for revenge. I guess I can understand that"

"I sure did," Torjer continued. "Or I tried to as soon as I learned it was this Nilsson-Loo fellow's fault. I skied all the way here in anger, not even stopping for a change of clothes. I took my axe and ran to his office, thinking I'd chop a couple of his toes off or something. Or maybe an ear. I'm not choosy." His

mood seemed to brighten. "But while we'd been on patrol, this shit had been happening to the sewers and nobody had thought to tell me.

"This guy's an officer, right? And the officers' latrines had backed up, spilling right over and running onto his office floor. So there I come, charging in unprepared, and I slip on the filth and lose my axe. Right at his crotch, it went! He'll have to wee sitting down from now on, and it was an accident! A genuine, beautiful, honest-to-god accident with plenty of witnesses. I'd have been hanged if I'd neutered him on purpose, but they can't punish me for an accident!"

When they were done laughing, Daniel remembered. "Then why are you here, if they can't punish you?"

"For laughing! Insolence, they call it!"

So they laughed some more.

Star Crossed

By Terry Howard

"Yoo hoo! Manuel!"

When Emmanuel Onofrio heard Verlinda Fritz yoohooing down the hall, his mind yelled, "Run!" He was looking forward to a quiet, restful lunch in the teacher's lounge. Keeping the rowdy kids in line so the others could learn seemed to get harder year by year and week by week. He gritted his teeth. "Santo Luigi Gonzaga protect me from pestilence."

She used the same shrill yoohoo to demand attention as she had used on the playground fifty years before. Since Verlinda was without a brain in her head and three grades younger, he'd ignored her then as he tried to now.

"Manuel!"

Any hope she might be stalking game other than her favorite Onofrio ended. Emmanuel disliked being called Manuel almost as much as he disliked being called Manny, since one sounded like it should be followed by the word "labor" in a bad accent. The second sounded like either nanny or mammy.

"Manuel!"

There was nothing to do but face the charging cow. He knew from experience if you out ran it, she would just keep coming. "Yes, Mrs. Fritz?"

She put her hands on her hips. "Well! Emmanuel Onofrio! Just what are you getting all uppity about?"

Emmanuel hid the flinch. "What can I do for you, Verlinda?" He still he hoped to cut his losses.

"Oh, Mann! We've know each other for a coon's age. When did I stop being Linda?"

Oddly enough, Emmanuel didn't mind being called Mann. He didn't speak, so she continued. "Do you know enough Italian to translate engineering texts?"

Emmanuel shook his head. "No."

"Who would?"

"Well, the Renato kids still use it at home." The Renatos were a large extended family of emigrants who left the Grisons of northernItaly for Grantville, where the word heretic was an insult not a legal accusation.

She frowned. "I really need to find one of us. Half the time someone has to translate for the translator because they don't really know English."

Emmanuel sighed. He knew what she meant. A great many books assumed a vocabulary now uncommon. In time, perhaps, that vocabulary would be common again, but it wasn't yet. Still, he found her separation of the world into "us" and "them" troubling. "I am sorry, Verlinda. I can't think of a single up-timer who would be of any use to you." Several possibilities came to mind, if they had the time, but he didn't feel like getting into it.

"Well, think of someone!"

"Why?"

"Because it's our job! I have a young man in the library. He spent the whole morning with a book on architecture and a dictionary and barely turned a page. He's a nice boy. He needs help. He's Italian, Carlo Rainyday, or something like that."

"Carlo Rainaldi?" Emmanuel forgot about lunch. Mrs. Fritz called for him to slow down. He ignored her.

When he pushed through the library doors, it was clear who Verlinda was referring to. Emmanuel addressed him in Latin, hoping it might be enough like his dialect to be of some use. The young man responded in excellent Latin. Emmanuel smiled. He knew several men with Latin. For a Rainaldi, they would make time. Then his smile became a smirk. He knew who would have the time.

Verlinda caught up with him in the library where she needed to be quiet. It didn't stop her. "Emmanuel Onofrio, how dare you run off and leave me?"

Emmanuel remembered those exact words from the playground fifty plus years ago.

"Shhh! Come here." He went to the encyclopedias, shoved a volume into her hands, pointed at an article and walked off. She followed him reading as she walked.

"Rainaldi Carlo, 1611–91, Italian architect of the high baroque. He followed in the steps of—"

"Come, my friend. Let us go find lunch." Switching to English, Emmanuel said, "Mrs. Fritz, please inform the office they need a sub for my afternoon classes. Then call Joseph Jenkins and ask him to come to the library."

That startled her. "Old Joe! That dumb hillbilly? Why?"

"He's the only one who knows Latin and has the time."

"When did Joe Jenkins everlearn Latin?"

Emmanuel enjoyed Verlinda's consternation. "He taught himself Latin a year ago."

"Then how good could his Latin be?"

"As good as mine." Emmanuel was exaggerating a bit. He was sure he could write better Latin than Joseph. He was also sure Joseph was a better Latin conversationalist than he was, which really did puzzle him.

Emmanuel smirked. "One dumb hillbilly, isn't he?"

* * *

Joseph Jenkins spent almost every waking hour, six days a week, tutoring and translating for the young architect. Carlo impressed Joe with his aptitude for study. The boy obsessed on two things. His every thought was in service of one or the other. He loved buildings and wanted to build. He loved a girl and wanted to marry. If forced to choose, he would truly regret not marrying.

Carlo inspected all of Grantville, from half of a log cabin perched on a cliff, to post and beam barns, which he found ordinary. Stud-built houses covered in vinyl revealed little. Carlo found cinder blocks briefly interesting, but they were only lighter blocks or larger bricks, after all. Brick was brick and Carlo thought he knew what there was to know about brick. Pole barns, a steel framed structure, and even a Quonset hut had their day.

Prefabs, modulars and trailers fascinated him. He crawled under every trailer he could get permission to crawl under. Sometimes he would call questions out to Joe who resolutely refused to get under there with him.

When he dusted himself off it was always the same. His face beamed, dust and cobwebs flew, "Joseph, what you people did with steel and wood is incredible. The quality of the plywood is amazing. You do not worry about it coming apart even if it is dropped on its end or gets wet. Why can't you still make plywood?" He would shake his head. "And chip board, turning scrap into material better than planks, genius, pure genius. What my father could do if he knew the weight-to-span ratios I have at my fingertips boggles my mind!"

Carlo talked of nothing but buildings. Every attempt to talk of other things, such as religion or politics, was met with a polite but uninterested response, except for the topic of love. When anything related was brought up, Carlo would sigh like a desert wind, shake his head gently as if trying to shake an idea out of his thoughts while being very careful not to succeed. He would end the sigh with the drawn out word, "Angelina." Then he would say nothing else.

He stayed in Grantville until he had been through every book on building and any related engineering text in the library at least once. Along the way, he interrogated anyone of interest Joe could track down. He examined every bridge within the Ring of Fire. The new covered bridge enthralled him. That a light weight wooden lattice could handle any vehicle in Grantville amazed him. He spent a morning watching traffic from the bank and the afternoon watching the bridge from underneath.

After three months, the well was plumbed to its depth. "Joseph, I'm going back toMagdeburg ," Carlo said. "Come with me."

"Thanks for the invite. But the only way to get these old bones down there is by river boat and I don't do

boats."

"But, Joseph," Carlo wheedled, "I need you."

"Hog wash. You want me there in lieu of your father but you don't need me."

A few weeks later inMagdeburg

The merchant/shipper Amadi was back with more colored glass for the windows and letters of credit for the project manager, Carlo, and a few others.

Thomas, the muleskinner, had a letter fromBologna . "Hey, Carlo." Thomas yelled and waved.

Carlo looked up.

"Hey, Carlo. You got the money you owe me?"

"What money?"

"The money for bringing a letter fromBologna . You only paid me to deliver one. Now I need to be paid for bringing one back." Thomas decided not to mention that he had been paid inBologna .

"Give me the letter!" Carlo shouted.

Thomas held it up out of his reach. "Say the words I want to hear."

"Please, please, please?"

"Not those words."

"I'll pay, I'll pay!"

Thomas grinned and handed Carlo the folded and sealed paper.

Carlo broke the seal and read as fast as he could. He let out a whoop of joy. "She is on her way. Thomas, celebrate with me. She is coming toMagdeburg . We can go to Grantville and get married. My father and her father will have nothing to say about it."

Carlo insisted on buying a drink for anyone he knew while he told them his news. Every time he bought a drink for someone else, he also bought one for Thomas. Thomas moved with Carlo like a shadow.

After a bit, they leaned against the bar. Carlo jabbered away with an Americani whose interest centered on getting Carlo to sign on for a tour of duty. The admiral would pay a signing bonus.

The solitary drinker on Thomas' right ranted in German. Thomas eavesdropped out of boredom and habit.

The man muttered away to the wall or the world. "Damned Papists. This is a Lutheran city. What God damned right have they got telling a German Lutheran he hasn't got a job so they can give it to an Italian

Cath-o-lick?"

The speaker was a stone cutter. Thomas learned he'd been working on the new cathedral until a few hours ago. Three stone cutters, carrying a sizable letter of donation, had arrived in late morning. Preferment went to Catholic workers, so his services were no longer needed. They gave him a full day's pay, with complete assurances that his work was fully acceptable.

The cutter was a large man, a head above average and as broad as an ox through the shoulders as well as between the ears. Thomas listened to the man snarl.

"The stinking animals! They pray to statues and think they can buy their way into heaven. Their priests are perverts. Half the cardinals inRome have mistresses and the rest like boys. A man should have a wife! Luther said so."

Thomas heard the whole tirade. Bored, he addressed the man. "So a man should have a wife?" Thomas waited for the drunk to focus. "Is it wrong to have two or three?"

"Of course it is."

Thomas happily provoked a fight. The cutter was a big man. Thomas didn't mind. Big men are slow. He liked the solid thud a big man made when he hit the floor. "Then you think Luther was wrong**."**

"What are you talking about?"

Thomas knew he had the man completely puzzled."Luther approved of polygamy."

"Poly gamy? What's that got to do with anything? Is it some kind of bird?"

"It's having more than one wife at a time," Thomas said, "and Luther said it was all right."

The cutter roared. "You lying piece of Italian shit." He leaned over the bar, grabbed a wine bottle and made a round house swing.

Thomas, expecting it, ducked.

Carlo turned at the commotion. The wine bottle connected solidly across his nose. The impact threw him back even as the bottle broke, slicing his cheek to the bone, leaving a large flap of skin hanging and teeth showing. His eye collapsed like an empty wine skin. He hit the floor with a sharp crack.

The city guards arrived shortly. They demanded the stone cutter cease fighting in the name of peace. He charged. They clubbed him into submission and dragged him off.

Carlo lay on the floor, face bleeding into the filth, still as a statue.

The Americani bent over him. "He's still breathing." The up-timer looked at the wound. He let out a string of words Thomas didn't know and covered the wound with a handkerchief. "Help me get him to the infirmary."

Thomas grabbed Carlo's knees, the Americani took his armpits. They headed for the naval yard as quickly as they could. Admiral Simpson was coming out the gate as they arrived, and when he heard the name Rainaldi he turned about and followed them to the sick bay.

* * *

The corpsman pulled the handkerchief away.

"What are you doing?" Thomas demanded when Carlo started screaming.

"I've got to treat the wound. Now get your ass out of here. You, too, Admiral."

"Keep me posted," was all the admiral said as he left. The order went unacknowledged.

Dorrman turned to a corpsman. "Get the ether and a surgical kit."

* * *

Dorrman went to the headquarters building fully cognizant that he had just rudely thrown his boss, an admiral, out of the infirmary without even acknowledging an order. "Senior Chief Petty Officer Dorrman reporting as ordered, Admiral." Dorrman came to attention in front of the admiral's desk.

"At ease."

Relief swept over Dorrman. The admiral was not going to stand on technicalities.

"What is the prognosis?"

"Admiral, it doesn't look good. He's lost an eye and will be horribly scarred at the very least. I've done all I can. If we had penicillin I'd be a lot happier. I've cleaned the wound and treated it with chroralphenicol. It's good, but. . . . Sir, he'll live if it doesn't get infected or if he can throw it off. Even up-time in a hospital, losing him to an infection that close to the brain would be a real worry.

"He's still out from the ether. When he comes to, he'll be in a lot of pain. I'll have to break out some of the opiates." Opium was imported at some expense and Carlo was not in the military. Chief Dorrman had to account for the clinic's budget.

The admiral nodded. "Carlo went to work for the yard as of this morning. Log his care as a civilian employee.

Chief Doorman was taken aback a bit. He wondered if Carlo really had signed on but, he couldn't see Admiral Simpson bending the rules. "Aye, aye, sir. If there is anyone he needs to see, send for them. Tomorrow he could be out of his head."

"I don't know of anyone," the admiral said. "I'm sure you'll do everything you can. See to it that I'm kept abreast of his progress."

"Aye, aye, sir."

* * *

Carlo's wound festered. Dorrman and his staff kept the wound drained, the patient warm and hydrated and the pain under control. Then they waited.

For days he tossed and turned and drifted in and out of fever dreams. Often, when he was out of it, he asked for Angelina. No one knew who Angelina was. This went on for a week and a half. Dorrman shook his head over Carlo's condition at least twice a day.

The admiral stopped in daily for an update. The news went from bad to worse. "I think his kidneys are shutting down," Dorrman reported. "When he's alert he's complaining about numbness in his legs and feet. He may have hurt his spine when he fell. That could cause the kidney failure. The infection could do it, too. If the kidney's are failing, that is. I've never seen it but the symptoms match what we were told to look for. There's nothing I can do for it anyway."

* * *

Angelina went straight to the building site. From there she was delivered with all practical haste to the front gate of the shipyard.

A young American guard barred her way. "Whoa there, little lady! You can't just come bargin' in here."

Angelina didn't understand him. Her escort from the building site didn't either. In a loud, demanding voice he started explaining just who it was the guard was holding up. At the same time Angelina, in Italian, at full volume, using very un-ladylike vocabulary, making threats and promises she had no way of keeping, demanded immediate entrance.

The guard picked up on just one word. He put two fingers in his mouth and let out a three-tone "I want a taxi" whistle. Angelina and her escort were startled into silence. Tom, the guard, filled it with a bellow of his own. "Angelina's here! I need some help!"

No one needed to ask "Angelina who?" Someone walked her to the infirmary. Someone else took the news to the main office. Without preamble, he announced "Angelina's here . . . and, boy, is she pregnant."

A staff member interrupted a conference. "Admiral Simpson, sir, Angelina has arrived."

"Gentlemen, you have just been reprieved. Get your numbers straightened out and be back here at nine o'clock tomorrow morning. Dismissed."

* * *

Carlo was fading fast. Angelina wept quietly, tears running down her face while she kept holding his hand. From time to time she kissed his dry, hot cheek.

The Catholic and Lutheran chaplains were talking quietly in a corner of the room when the admiral entered. "Have you married them yet?" he demanded.

"No," the Catholic answered.

"Why not?"

The chaplain visibly flinched at the tone of the admiral's voice. "I can't."

The admiral's tone, against all odds, somehow became colder and harder. "Why not?"

"The banns—"

A normally polite man who conscientiously got all the information before he spoke cut the priest off. "Waive them!"

The chaplain cringed. "I can't." When Admiral Simpson glared at him, the man bucked up and explained. "She is not a member of this parish. I do not have the right to waive the banns for anyone who is not of my parish.I can perform the rite, Admiral, but the church is unlikely to recognize the marriage."

Simpson turned to the Lutheran chaplain. "Will you marry these two?"

"He's right," the chaplain said, nodding at the Catholic chaplain, "and they're Catholic. I don't think the Lutheran church will recognize . . ."

"This is bull shit!" Everyone in the room was shocked. Admiral Simpson never used foul language. "How old is she?"

"Nineteen."

The admiral turned to the assistant corpsman. "Go to the recruiting office and get an enlistment form on the double." He addressed another corpsman. "Go get the notary."

The men answered, "Aye, aye, Admiral," and left at a run.

The admiral stood and stared at the chaplains. The only sound was Angelina's soft sobbing. No one dared move. The four and a half minutes it took the first corpsman to return were the longest minutes of the chaplains' lives.

The assistant handed the paper to the admiral. "Angelina, I need you to sign this." She looked up at her name but did not respond.

The Catholic chaplain explained. "She doesn't know German."

"Well, try Latin. Or Italian, if you know it. Whatever. Just get her signature on this form. Now!" Simpson barked.

The chaplain took the form and spoke softly to the girl. Dorrman dipped a brass-nibbed pen and handed it to her. She looked at him. He pointed to the right line.She signed it with a shaky hand, then the chaplain handed the form to the Admiral.

"She is now a recruit in the USE—" he looked down at the form "—Marine Corps?" He glanced at the assistant corpsman. The man turned beet red. "That makes her a legal resident. If she is a legal resident then she is a member of this parish. Carlo has been here long enough to establish residency." No one was going to dispute the point with the admiral. He turned to the Catholic chaplain. "Marry them!"

The chaplain smiled at a beautifully split hair. It established instant residency. True, it broke recruitment guidelines, but an admiral can do that.

The chaplain spoke so loudly the corpsmen later swore they heard echoes. "Carlo, Carlo?" The lad's eye left his lover and focused on the voice. "Do you, Carlo, take this woman to be your lawfully wedded wife?"

Carlo whispered something inaudible to anyone but Angelina.

"He said yes." Tears ran down her face. "He said yes."

"Do you, Angelina, take this man to be your lawfully wedded husband?"

"The banns?"

The priest glared. "Answer the question, child."

"Ye-yes."

"Having given themselves to each other by the joining of hands and the exchange of vows, I pronounce them husband and wife. What God has joined together, let not man put asunder."

Angelina whispered. "Is this legal?"

The chaplain nodded at the admiral. "If he says it's legal, it's legal."

Angelina turned to the admiral. Her eyes pleading as the tears doubled in strength. "Can you do this?" The chaplain translated the question.

The admiral told the chaplain, "As soon as we've drawn up a writ of marriage and you've signed it as the officiating clergyman along with two witnesses—" he looked at the Lutheran chaplain "—you and me, then it's legal. Tell her that. Then help her fill out the enlistment form. I'll sign to cover the irregularities. The marriage will hold up inWest Virginia . They'll see things our way here inMagdeburg , too."

He handed the form back to Angelina.

* * *

"What is this?" she asked.

"An enlistment application, my child. For the American military."

Baffled, Angelina asked, "I am in the army?"

The amused priest replied, "No. This is a Marine Corps application. And, no, you are not a Marine. Not yet. You must first finish boot camp. For now, you are a boot."

"And if I don't want to be a piece of footwear?"

"Then you are not a resident of the base, the banns are not waived and you are not married."

Angelina scrambled to fill out the paper work.

Before the writ was dry, Carlo quit breathing. Angelina cut loose with a wail that was loud enough to frighten a banshee. She was startled by the reaction brought on by her anguished cry. The men in the corner began to pray; the priest had given her lover, no, her husband, the last rites earlier. The physician stuck something in both his ears and put the other end on the breast of her beloved. Then he barked one

harsh guttural word and started pounding on Carlo's chest. Why was he beating the dead? He left off and went to kissing and then back to the beating. Carlo's dead body gasped and then went back to breathing. Carlo was alive. Angelina almost swooned; she had often read of miracles but . . . to see one was something else again.

* * *

When he stepped back from a quietly-breathing patient, Dorrman found himself wondering why he was doing CPR. The man was done for. Five seconds later, Angelina let out a shriek of pain and fear far different from any previous weeping.

Dorrman looked at her. "Damn. Her water just broke. If she's seven months along, I'm the pope." He turned to the assistant corpsman. "Go get my wife!"

His assistant was completely baffled. "What?"

"She's a midwife. I need her."

The assistant corpsman took off at a run yet again and almost collided with a man who had walked in the door. The man was carrying a red chest with a white lid. On the top were three lines. The first was three words long "RUSH NAVAL YARD." The second line held two, "Carlo Rainaldi." The third said, "Open Immediately." There was no return address.

Dorrman recognized the picnic cooler before it was through the door. "What have you got there, sailor?"

"Sir, this arrived with the mail. The bargeman who brought it told me it was waiting at the post office in Grantville when they opened up. There was enough money to cover postage left with it, so here it is."

"What is it?" Dorrman asked.

"Mail. It's heavy and it sloshes is all I can tell you."

"Well, set it down."

Dorrman opened it with a dozen curious eyes peering over his shoulder. The cooler was full of melting ice. It held one tin box which read, "For Veterinary uses only." Inside were six little bottle-shaped holes formed in thin plastic. Three held little glass bottles. The other three were empty, but the box held a syringe. He shuddered at the thought of using a dirty needle, then looked at the date on the penicillin. Someone had been hoarding it on the very edge of freezing. He found himself praying. It should have been thrown out long ago.

Up-time he could and should go to jail for what he was about to do.

NCIS:

Lies, Truths and Consequences

By Jose J. Clavell

"You shall know the truth, and the truth shall make you free."

John 8:32

Naval Headquarters
MagdeburgNavy Yard
Magdeburg, USE 0900 Hours Local

In the charming vernacular of his time, the admiral was ready to have kittens. The tension in his office was thick enough to cut with a dagger and if I'd had my druthers, I wouldn't be here in spite of my supposedly princely salary. But then, I suspect that neither would any of the rest of the people in the office. Most especially, the quietly sobbing young woman sitting in front of his desk.

My name is Gunther Schlosser and as the up-timers put it . . . I'm a cop.

Actually, I'm the Senior-Agent-in-Charge,Magdeburg as well as the Director, Naval Criminal Investigative Service. And although the titles sound impressive, the reality is that I have less than fifty men and women under my command . . . and most of them are involved in bodyguard and security work through the USE. Still, that makes me the navy's top law enforcer and Admiral John Calhoun Simpson my boss. Like the bard says, the policeman's lot isn't a happy one and this was a case in point. The sobbing, pretty, young woman was Marine Private Angelina Rainaldi, a recruit with a seriously ill husband, a new baby and too much baggage, physical and otherwise. Her baby was the reason that we were meeting this morning.

Rather, the failed kidnapping attempt of said baby right out of her mother's quarters in the barracks, was the reason for the meeting. The attempt led to the murder of the floor duty firewatcher, radio-operator Edwina Haas, and to NCIS official attention. Luckily for all concerned, the perpetrator had met his just reward and the child was rescued unharmed, thanks to the quick actions of an off-duty military policewoman, Annalise Schuhmacher. I'd met her three months earlier during another murder investigation, our first. At that time, she had provided me with the critical clue that led to solving the murder. I'd decided that I was going to keep close tabs on her and her partner, Hans Leiss' careers. NCIS is always looking for good people and, as her actions demonstrated, my interest in Schuhmacher hadn't been misplaced.

But that still left us with two dead bodies and one of them was ours. Those of us in the navy take a dim view of those who harm our people. So, Rainaldi had been summoned to the admiral's office to answer some very pointed questions. She hadn't come alone. Lieutenant Colonel Friedrich Von Brockenholz, her battalion commander, escorted her. Some up-timers had compared him with an Archibald Henderson, whoever he was. His top kick, Charles 'Duke'Hudson , another up-timer, stood at her back.

I think there are a lot of children inMagdeburg —and not a few Marine privates—who go to bed early under the threat of a midnight visit from Sergeant Major Hudson. Truthfully, he is one of the good guys and the top architect and founder of the new Marine Corps. However, he's not what you could call Rainaldi's number one admirer. But then, the way she became a Marine was one for the books.

I can surely say, without it being an understatement, that the pucker factor was decisively high that day.

Young Angelina was sworn-in as a recruit in the United States Marine Corps—not the navy, as everyone expected—and immediately thereafter married to a barely resuscitated groom. At the last

possible moment, a supply of a powerful up-time drug had been secured, and Carlo's life saved, although he lost an eye in the process. Angelina delivered a healthy and beautiful baby daughter shortly after the wedding. A storybook ending, right? Well . . . not quite.

It didn't take long for our community's little old ladies—of both sexes—to start to count backwards in their fingers and, possibly, toes. It became painfully obvious that unless Carlo had some hitherto unknown magical power that allowed him to be with his beloved at the right time—or that Angelina suffered from a case of immaculate conception—the baby girl was probably not his. Nevertheless, Carlo, still recovering at the infirmary, stepped forward to do the right thing and accepted her as his own. That won him a lot of extra brownie points with the whole naval community and lost her just as many. The subject was still very touchy for the Corps, especially the servicewomen.

Like the rest of the females from Grantville, servicewomen have had to contend with my century's ideas of the place of women in society; ideas that are sometimes at great odds with what up-timers understand or implement. In the eyes of many servicewomen, Angelina's actions were not helping their case. So the poor woman found herself increasingly isolated and shut out. Don't get me wrong. She was treated correctly and assisted as much as possible with child care and such. But, unlike most new recruits, she was not welcomed into the comradeship of the Corps. In hindsight, that was a mistake that cost us the life of one of our own.

* * *

Despite the admiral's inclination for kitten-bearing, he had maintained a remarkably even temper so far. For those of us who knew him well, this was not considered a particularly good sign. In addition to three Marines, a yeoman, my partner and me, the navy Judge Advocate General was also present. Commander Tomas de Kratman, a former professor fromLouvain in the Spanish Netherlands, came toMagdeburg to study how the navy implemented the American Uniform Code of Military Justice. How he ended up in uniform could be attributed to the admiral's uncanny ability to cultivate and recruit capable individuals. Hudson, an earlier victim like me, once told me that it was akin to selling refrigerators to Eskimos. So Professor Kratman found himself with the unique opportunity to both see the code in action and be responsible for its implementation. Prior to Angelina and her escort's arrival, he had solemnly informed the admiral that, in his considered legal opinion, she couldn't be held liable for Haas murder under the U.C.M.J.

That was fine with me and my partner, Brunhilde Spitzer, who was sitting calmly beside where I stood against the wall of the crowded office. It had also moved the investigation from the realm of criminal activity back to the one of force protection, another of NCIS' core responsibilities. That still left some very important questions in our minds. Simply put, who was the intruder, who sent him here and would that person send more? The answers to all those questions required Angelina's willing cooperation.

That cooperation was not forthcoming.

By my calculations, Angelina was one wrong answer away from having Spitzer read her rights under Article 31 as the first step in the process that would see her drummed out of the Marines. Everyone in the room was aware of this, most especially her, which explained the waterworks as she faced the admiral. I felt sorry for the girl, in some ways. There was not much sympathy for her in the room.

Spitzer, as the only other woman present, might have been presumed to be at least an understanding listener. But she had known and liked Haas, and I could read her determination to bring those behind the killer to justice. If Angelina stood in her way, she was going to suffer the consequences. That was scary in so many ways. Of the two of us, Spitzer is the cool, analytic one who complements my tendency for

more direct and aggressive action.

My partner's current inclination for bloodthirstiness and "no quarter" attitude was, in part, my own fault.

Spitzer is not only my colleague, but also my wife. Three months earlier, she announced that we were pregnant. Of course, I was delighted, but as a man born in my time, the idea of my pregnant wife doing the kind of work we do at NCIS appalled me. And when she informed me that she didn't have any plans to quit, I objected for all I was worth.

She had other ideas. There was a reason she took the name of a Valkyrie warrior maid out of the old sagas after heeding Gretchen Higgins' message. You quickly learn to not stand in her way, and even with my well-deserved reputation for ruthlessness, I do know when to back off. My dear mother didn't raise a fool. Although I suspect that she's having a good laugh at my expense, up there in heaven. SoBrunei stayed on the job and I was introduced to the wonderful world of morning sickness and hormones. She isn't getting too much sleep; neither am I.

It's a good thing that I love her with all my heart.

Meanwhile on this case, I have to do without her usual cool head and use my own in its place. That's a great departure for me, as I'm . . . a bit notorious for my preference to knock heads together instead. So, as I looked at Angelina's anguish-stricken face, I decided that she needed someone in her corner. One, we were not getting anywhere with her. Two, we needed her wholehearted support. And finally, her silence wasn't making any sense at all. Suddenly, an idea about the why of it sprung forward, as well as a plan. But I needed help to go with it, and looked around the room. I confirmed that there was not a sympathetic face in this bunch. Of course, that never stopped me before.

"Admiral, can we take a break? I think Private Rainaldi could use the time to pull herself together."

Simpson was caught by surprise at my request, but he recovered quickly, looked at her and then back at me. "Okay. Everyone take twenty and be back here on the hour. I need to use the head anyway."

We all stood and waited until he left the room before attempting to make our own escapes. NotBrunei . She stationed herself at my side with a puzzled expression. Angelina didn't try to leave, but sat heavily back on her chair, looking like she had the weight of the world on her shoulders. I motioned toBrunei and left the room with her in close pursuit.

She waited until we were out of the room and Angelina's hearing before tearing into me. "Gunther Ignatius Schlosser, what are you and that devious mind of yours thinking?"

I smiled and looked down at her, which isn't difficult. I've got at a head and half height advantage on her. "Spitzer . . . my love, I need to find a sympathetic ear, preferably another woman, for that poor girl in there to talk to. And today . . . you're not it. And I doubt our local version of the inquisition is going to make her talk."

I swear there were sparks in her blue eyes. She snarled, "Good. You can be the good cop and I can be the bad cop this time." Then she turned to march back into the room.

As I said before, I'm taller than her. As tall as most of the up-time males and rather well muscled, characteristics that came handy on my prior line of work as a thug and enforcer. My face isn't that of a great beauty, either, after one too many bar fights only my mother—or a certain pissed-off blue-eyed lovely—could love it. You can see why I'm more accustomed to frightening people. I can't do cuddly too

well—much less sympathetic "good cop." So, I grabbedBrunei by the elbow before she went too far and used my greater physical strength to lead her in search of the aforementioned "good cop."

I needed to find a sympathetic female ear, preferably of the Marine variety, in the next twenty minutes. Luckily for me, I remembered that I'd seen someone who could fill the bill when I came to work this morning. However, I needed a phone because I doubted that I could convince my companion to take a romantic stroll just now. Dietrich Schwanhausser, the admiral's chief yeoman, head clerk and administrator, looked up from his work with some amusement at my better half's efforts to get rid of me by sinking her nails into my forearm.

"Senior Chief, would you be kind enough to call the gate and ask Lance Corporal Schuhmacher to report to me immediately."Brunei stopped struggling and looked at me in surprise. I gave her a toothy grin while hiding my discomfort—she has long nails.

"Sure thing, Herr Director." To his credit, Schwanhausser kept any comments to himself but then he's a husband and father, too. The look he gave me clearly said, "oh, you poor bastard."*What the heck* , I thought. *I can do six more months of this standing on my head . . . I hope.*

We spent the time waiting for Schuhmacher in thoughtful silence. Brunei knows about my hunches and is smart enough—now that she was out of Angelina's aggravating presence and somewhat relaxed—to start wondering what I saw in the situation that she failed to see. My own version of the same process pulled several curious factors in the back of my mind together, and I was finding that they were forming a very interesting mosaic.

Angelina was a rather well-educated woman and I was betting that it was not as your typical well-brought up merchant's daughter, a factor that got lost at the beginning because her mastery of English and German was so awful. But she had picked them up fast and now spoke them better than Carlo, who had been around these parts close to two years. Kratman once told me that her Latin was nothing to sneeze at either, and he suspected that it was better that his, which was really interesting. There was also the fact that she arrived inMagdeburg with enough resources of her own to hire a nurse to watch baby and another to watch over Carlo while she was doing her Marine training. Finally, like I mentioned before, her silence made absolutely no sense if her main interest was to protect her family. My conclusions were all of an unsavory nature, but went together with one last thing that everyone seemed to forget in the middle of all the commotion. Carlo was as reticent about discussing that past as she was.

Schuhmacher, warily, popped her head into the office, looked around and when she saw us, smiled and walked forward, confidently ignoring the senior chief's stare at the impudent jarhead who was impinging on his domain. The light sweat and the flush on her face told me that she had run all the way from the gate. It was strange to see her without her usual partner, Hans Leiss, but he was now on paternity leave, getting acquainted with his new son and helping his wife around the house with his other two kids. Oh yes, paternity leave was one of those twentieth-century concepts that the women of my time intuitively understood and quickly adopted. One I expected to come to understand intimately—enthusiastically or not—in six months, more or less, together with the one about the honey-do-list. At least I hope so. *Seriously, cross my heart, etc.*

Schuhmacher popped herself to a stiff parade rest on arrival; as civilians neitherBrunei nor I qualify for the more formal "attention." The wet-behind-the-ears Marine who came to my notice three months ago had gained poise and confidence in the meantime and was no longer the farm girl I was certain was going to lose her dinner at our first crime scene. Her parents could be very proud of the woman that she's growing into, although I suspect that Herr and Frau Schuhmacher were not thinking about the Corps or law enforcement when they sent their daughter toMagdeburg to seek service as a maid. "Lance Corporal

Schuhmacher reporting as ordered."

"At ease, Marine. I need your help."

"I'm at the Herr Director's service." She probably thought that whatever I had in mind would be more interesting than gate traffic control and ignoring the stares of those who have never seen a woman MP before.

"Good. We need your help. Angelina Rainaldi is in the boss' office digging herself into a dishonorable discharge. We would appreciate it if you'd go in there and talk to her and make her see that is to her advantage to be candid with us." I watched her face. The smile was gone and she was giving me that expressionless cop face that seems to be issued to us with our badges. I didn't need a sign about her head to understand that she was not a card-carrying member of the Angelina Admirers Club. "Herr Director, is there someone else that you could ask?"

I gave her one of my best looks. "If she's thrown out of the corps, there isn't going to be anyone between her baby and the next fiend who's sent to steal her, is there? Has she ever done anything that would warrant that her baby girl deserves such a fate?"

I was counting on her basic sense of fairness. You couldn't be in our profession without one. Still, I was on pins and needles while she thought it over.

"Herr Director, as far as I know, she's never done anything that would bring disgrace to the Corps. I could talk to her, but what can I say that would get her to cooperate?"

Before I could open my mouth, Brunhilde beat me to the punch. "Annalise, just be truthful. The security of her child needs to be foremost over any sense of guilt or modesty."

Schuhmacher looked at her for a second before nodding her head and then walking toward the admiral's office. I watched her go in and close the door before turning towards Spitzer. My surprise at the change in her attitude must have been written all over my face.

"Oh, Gunther, stop looking at me like that. You're not as enigmatic as you like to think you are. By the way, how's the arm? I'm sorry, but you do make me crazy at times."

"Never fear, my love. It was just like a kitten's caress." I lied, smiling and wondered if the senior chief had a first aid kit in his desk, or at least some alcohol nearby.

Brunhilde snorted, recognizing BS when she saw it but didn't say anything else as I went looking for the supplies.

* * *

I was dabbing disinfectant on my arm when the admiral, Kratman, Von Brockenholz and Hudson returned, coffee mugs in hand. The vile stuff seems to oil the inner workings of the naval establishment and I'd have killed for a mug, too. But I was abstaining in support of my bride, who was forbidden to touch the stuff. Sighing mournfully, I stopped them and explained the situation.

Admiral Simpson didn't seem too pleased about the loss of his private office but gracefully acquiesced and went to look out of the window. The rest of us, with nothing much to do, started to talk shop; talk that sometimes seems to get more stuff done in this man's navy than all the memos and regulation in the

whole outfit. So, when the door opened ten minutes later, everyone looked in surprise at a suddenly paralyzed Schuhmacher. The poor girl was doing a great impression of a mouse that found itself as the main guest at a cat's party as she looked at all the senior people present in the outer office.

Hudsonfinally took pity on her and broke the silence. "Can we help you, Lance Corporal?"

Schuhmacher snapped to attention and barked a "No, Sergeant Major," that would have made her DI proud. Then she continued in a normal tone. "I need to see Special Agent Spitzer."

I was surprised and, like the rest, turned to stare atBrunei , who, in her usual casual manner, put the tea mug down and walked toward the office. The door closed behind the two women and everyone else looked at me, perhaps expecting me to have a clue about what just transpired. I stared back, shrugged my shoulders and shook my head to dissuade them of that notion. So, we went back to what we were doing.

After a short while I started to wonder if I could sneak out and grab some coffee beforeBrunei returned, but the door opened again and Schuhmacher made another appearance. This time, she went straight to the senior chief and murmured something in a surprised Schwanhausser's ear.

He picked up the phone and before we could ask her what was going on, she went back in. All of us looked at Schwanhausser.

"I just called the health clinic. They want to see the midwife."

An ugly idea popped into my mind but I kept it to myself, trying to avoid jumping to conclusions.

Faster that I'd have thought possible, Susan Dorrman arrived and was directed to the admiral's office. She was a Grantville-trained nurse with a specialty in obstetrics. For a moment I feared forBrunei and our baby, but put it aside. If there were any problems, I'm sure that I wouldn't be standing in the wrong side of that door. Then I remembered that Frau Dorrman had another specialty. One for which my time doesn't have an equivalent. Admiral Simpson looked at me and I realized that he also knew about it.

Intuitively, I knew that NCIS was next.

I was finishing with my usual plea for funds to hire more agents to cover our new bases and the admiral's usual response about money not growing on trees when the door opened again. Frau Dorrman and Schuhmacher escorted Angelina out without stopping for explanations. Kratman tried to object but both gave him such a look of naked rage that I fought the impulse to cross my legs and protect myself. The commander, no doubt availing himself of his superior education—and a fine sense of self-preservation—stopped in mid-sentence. After the ladies left, Simpson led us back into his office.

We foundBrunei staring out the window, arms crossed under her breasts and ignoring our presence. I felt an icy lump in the pit of my stomach and instinctively knew that it was going to be bad. I called her name but she remained deep in whatever sort of hell she was peering into. This was what I feared.Brunei 's past life as a camp follower and prostitute hadn't been at all voluntarily. If what I thought was correct, she could relate first hand to Angelina's experience and still had the occasional nightmare to prove it.

Fearing the worst, I went to her and stood quietly at her side, waiting for her to acknowledge me. When she turned and fell into my arms, it caught me by surprise and almost off balance.Brunei isn't known for personal displays of emotion while we were on duty. After a while, I heard the admiral clear his throat. She stepped away from my embrace, wiping her eyes. I looked into her eyes and knew that she was

going to be all right. "Excuse me, sir. I needed a moment to get myself together."

"There isn't anything to excuse,Brunei . Why you don't sit down, please? It would probably be easier for all of us," he said with that innate courtesy that many would never suspect him of possessing.

Bruneisat on the chair vacated by Angelina. The rest of us found seating around them. As she started talking,Brunei went into the automatic reporting mode that we drill into our agents, putting emotions aside and just stating the facts. We soon discovered that those were harsh enough.

* * *

Angelina came from a noble Genovese family that could trace their lineage all the way back to theRoman Empire . That was impressive, but with two members of our audience born four hundred years in the future, it wasn't exactly a show-stopper. That came soon enough. The family, like many in this world, fell on hard times until they discovered that service in the Catholic church was a good way to retain and improve their fortunes. That was one of the reasons Martin Luther disobeyed the anti-poster and littering regulations when he defaced his church doors. Angelina's uncle and guardian—her parents died when she was very young—was a bishop in the city ofBologna and dean of the law school there. An ambitious man, her uncle was bucking for the red cap of a cardinal, using influence he gained through the graduates of his law school, many of whom now served throughout theVatican bureaucracy.

His Grace had met Carlo when he hired Girolamo Rainaldi, Carlo's father, as architect for his proposed grand cathedral. Sadly, his desires outstripped his purse, as poor Girolamo discovered whenever he sought payment. While working with his father, Carlo met and fell in love with Angelina. For his temerity, and because Carlo was an unsuitable candidate for her hand, the uncle banished Carlo from the city and saw to it that he couldn't find work anywhere else in Italy. That would have been enough to add him to the top of my blacklist butBrunei was just getting started.

The bishop's adherence to holy vows had been rather elastic. At last count, he was known to maintain two mistresses and had a roving eye for young and comely girls. You couldn't blame Angelina for starting to make preparations to run away and join her beloved Carlo here. A detailed planner, Angelina had started to slowly sell her jewelry and convert the proceeds to traveling funds and letters of credit when the incident that started the chain of events that got us here this morning happened. During a drunken revelry, a new maid attracted her uncle's eye. The girl, recently arrived from the countryside and with a strong religious upbringing, hadn't expected that her duties in the bishop's household were to include more than housecleaning. So, she failed to submit meekly to his advances and her shouts for help attracted Angelina's attention. No one living in that household would have blamed her if she had suddenly discovered an urgent need to be elsewhere, and no one would have been the wiser, either. Instead, she charged into the bedroom to the rescue.

AsBrunei spoke, I saw the admiral, the colonel and Hudson nodding. Personal courage was one of the traits highly sought by the military and defending the weak is part of the unwritten warrior code. In their eyes, Angelina's unselfish actions had erased their doubts about her worth to the service. I looked at Kratman and he looked back at me, both of us sharing the same grim expression. Those of us who are entrusted with enforcing the law tend to have a more cynical view of the world and the commander and I were already seeing where all this was going.

Bruneipaused for a moment. I knew we were going to get just the bare facts version but her haunted expression told me that she had heard all the sordid details. Angelina's intervention was successful and she diverted her uncle's attention from the maid. Unhappily, that attention was then focused on her. I suspect that the old goat probably had desires for her for a while . . . but I digress. If the girl had stayed

and helped, what happened next could have been avoided, but she ran away and as far as she could. As far as Angelina knew, she didn't stop running until she was out of the city.

Rape was not that unusual, not even up-time. I was glad that we had Susan Dorrman, the lone rape counselor in the whole navy—and only one of two in the whole world—with us in Magdeburg. Still, I felt sick at heart, a feeling shared by everyone in the room.

The next morning, her uncle attempted to bribe Angelina with a combination of carrot and stick. The carrot included more jewelry and clothing; the stick was a permanent stay in a convent cloister. She wisely chose the goods and those were later used to add to her travel funds. I gave her extra points for keeping her head under the circumstances. She was also lucky. Her uncle was called toRome shortly afterwards in support of the Spanish-instigated disturbances there, and there was not an opportunity for a repeat encounter.

Unfortunately, as many people have learned to their surprise, it only takes one time. Angelina had always had an irregular menses, so it took her a while to realize that she was pregnant. She concealed this from her uncle when he returned toBologna , justifiably afraid that if he found out about it, her only travel would be to the convent or worse.

Finally, with all the preparations at the ready, she escaped the city under the guise of visiting a family friend inGenoa . After a harrowing trip, she'd managed to make it toMagdeburg barely in time for the birth.

* * *

WhenBrunei finished her report, there was a long silent pause where everyone was busy with their thoughts. Kratman was the first to verbalize those. "Admiral, we don't have a case. All the evidence is hearsay, although I tend toward believing that poor girl. The only person that could have confirmed this individual's involvement was killed during the kidnapping attempt. At best, we could issue an imperial warrant for questioning but I doubt that the bastard—with his connections to Cardinal Borja—has any plans to visit the USE."

Well, I'm not a lawyer, but I'd figured that one out already. The admiral looked at Hudson and Von Brockenholz, prompting the later to speak. "The Corps doesn't have any resources to bring to bear at this time, Admiral. Maybe later, when the RECON platoon gets up to speed, we can attempt to put something together, but that will take a while. We don't have any Horse Marine detachments inBologna , and I doubt that the Ministry of State would allow us to compromise their diplomatic status anyway. There isn't a thing that we can do."

Total silence followed his words. There was an unmistakable air of despair in the air at our inability to bring the bastard to justice and avenge our own.

Admiral Simpson looked at each of us. "Agent Spitzer, gentlemen, is your consensus that there is nothing we can do to bring this man to justice?" The silence in the room was deafening as he continued to stare at each of us. He let us steam for a while before continuing. "I tend to agree. However, is there anything else we could do to prevent another attack?"

We looked at each other and slowly shook our heads, all of us except forBrunei . She looked at the admiral with a cold feral smile. "Sir, I think that we can all agree that we're out of legal options." I thought that was a strange way to state the problem, until I realized that she was looking directly at me, the same way that the admiral and the rest were.

I hate when they do that.

Base Chapel
MagdeburgNavy yard
Magdeburg, USE 1000 Hours Local

A month later

I ignored the restrictive feeling of my new clothes and plastered a smile on my face as ordered.Brunei , having decided that my position required clothing that reflected our professional image, had dragged me to the tailor and ordered them. Truth be told, I like my new garments very much, as they were cut in the simple and subdued style popularized by Prime Minister Stearns.Brunei herself looked really nice in her new business dress with the now notorious skort. It did a good job of covering her growing tummy—at least for the present. Now that her morning sickness had subsided, the atmosphere had improved in Casa Schlosser and I was glad.

Glad enough that I consented to be dragged to the wedding and I'm not even popish . . . err . . . Catholic. In fact, the Catholics present were outnumbered by those who were not. But women consider such ceremonies important and tend to support each other in these endeavors. At least, I could commiserate with fellow sufferers: Dorrman, Schwanhausser and Hudson, who, like other male guests sat stoically through the ceremony while the more numerous female guests beamed teary smiles at the happy couple, the bridal party and the chaplain. Thanks to her condition,Brunei sat in the front row, after being entrusted with the safekeeping of the youngest Rainaldi. I had already ascertained that she had the proper number of fingers and toes, together with the cutest toothless smile on this side of the river, so my interest had waned somewhat. Of course, I expect our littlest Schlosser would have her beat, but this was her and her parents' day; ours would come soon enough.

Carlo made a striking figure in his navy officer's uniform, the newest ensign on the Naval Corps of Engineers. Although recovered, his body was still gaunt due to his ordeal and his eye patch gave him a decidedly piratical look. Alas, I have also been ordered to stop suggesting that he needs to acquire a parrot to complete the image. Angelina was doing much better now that her own ordeal was no longer a secret. She and Susan had made great progress and I was told that she would like to do the same for other women. There's an iron core behind that pretty face.

Meanwhile, basic training finished, she's been assigned to Commander Kratman's office as a legal clerk. He has already confirmed his suspicions about her language abilities and also discovered that she was more advanced in the study of the law than anyone suspected. So, there are plans afoot for her to continue to read law. We need more JAG officers, and what better than to grow our own? Angelina also has a good eye for finances and has been investing some of the funds that she brought out ofBologna . Not all of them, of course, but enough that she and Carlo have moved to their own home in the growing naval housing area. Since that is patrolled by our own guards and not the city watch, it simplified our security problem immensely.

Warrants were issued for her uncle. A paper exercise, more or less, given the current circumstances inItaly , although copies had been sent to our embassies, the temporary Holy See, and the cardinal-protector's office. I have made arrangements for her uncle's personal copy to be delivered, together with a message.

The form of that message had taken a while to formulate. Regardless of the naval leadership's faith in my abilities, I couldn't pull an idea out of my hat that fast even if my life was at stake. The answer finally came to me one evening when I escortedBrunei to movie night at the Eagle, Globe and Anchor. We had a standing date—you know, to keep the romance going. Of course, she accuses me of using the opportunity to expand my up-time slang. I'd say we're both right.

Anyway, they were showing a classic crime drama with an Italian connection and I couldn't resist it. Still, it took a while to make the proper arrangements.

Meanwhile, the copy of the letter sent to the cardinal-protector's office had some unintended consequences in the form of our newest chaplain, Father Jose Manuel de Alvarado, SJ. The admiral made a request for another Catholic chaplain a long time ago. No one expected a Jesuit Spaniard who, as a young man, had served as an officer in the Spanish*Tercio de la Infantería de Marina* and seen heavy action against pirates, Moors and others on theMediterranean . We all assume that was the cardinal-protector's way of keeping an eye on us, although Father Jose is definitely the kind of clergyman that our organization could use.

But I wonder what the good chaplain is going to think when he finds out about the message and warning I arranged to be delivered directly to His Grace's bedroom. I don't think Father Jose will make much fuss. He was a soldier and a Spanishhidalgo , after all. And it isn't like Haas' murderer has any other use for his head, pickled or not.

I like to think that Don Corleone would be proud of me.

Twenty-eight Men

by Mark Huston

January, 1635

The cold wind cut through to the very core of the men as they walked to the entrance of the mine. It was dark, well before dawn, in the dead time of the night. The cold was complete, a January cold, dry, harsh and sharp. Soon they would be down in the dark and warmth of the mine. Deitrich, the shift foreman, still smiled at the incongruity of the whole thing. They were going into a mine that had been started over three hundred years in the future, and abandoned because it wasn't profitable enough. Abandoned with a large amount of the equipment in place. The power, phones, ventilation equipment, even some of the low electric carts were still there. It was almost if they were placed there for the men to pick up and start the operation again. Of course, many things were missing, or so the up-timers said. But there was much that they could use. So they did.

The mine was a dangerous place, but Deitrich always felt safe there. Even after the up-timer training about the dangers, it seemed a much safer place than the front of a tercio. There he could take a musket ball or a pike at almost any time, and it was far beyond his control. "No," he often said, "the mine is a much safer place." There he had some control over what happened. There were procedures for safety and rescue techniques, and equipment that was designed to provide them with the ability to survive in the worst of conditions. He spent ten days in a special mine safety school before he was even allowed to be on the jobsite. Deitrich often said that his job under the ground was a warm and safe place to be. It was secure. Snug somehow. That confidence, many said, had made him a natural foreman in the mine. Some said that he was too confident.

Twenty-eight men went down in the mine that late January night.

As part of their training, the new miners had visited a local park and the "Memorial." The memorial was an imposing black granite pillar, twenty feet high, and was inscribed with the names of seventy-eight men who had died in the "Consolidated Coal Number Nine Mine Disaster." The incident had happened back up-time. The trainees were brought to the natural glen that nestled in a small valley, a short distance out of town. There were many carefully planted trees in a small meadow that was now groomed by a flock of sheep. The monument itself was imposing, almost frightening from some angles. From others, it was gentle, stepping back in two places as it reached for the sky. It was most gentle at the top, where there was a cross carved into the face, in a style that looked strange to most down-timer eyes. The clean outlines and the perfectly formed hole in the center of the cross drew their eyes skyward to the top of the monument, away from the seventy-eight names carved into the face. The hole represented loss, a black hole, aching to be filled by those no longer there. Along with the names carved into the front face, there were words calling the ground beneath their feet a cemetery. It was considered hallowed ground.

The miner who trained them spoke of unity and brotherhood. He sounded like a priest as far as Deitrich was concerned. They were told that many famous up-time leaders had been to this place to pay homage, and that it was still used even today as a memorial by families who had lost a father or a grandfather in the explosion. The down-timers brought there became hushed, picking up on the somber mood of their usually jovial up-time partners. This was a holy place for the up-timers, and the rare display of public and universal piety surprised many of the old-hand down-timers. It had struck Deitrich as an unusual mood for the up-timers, especially in public.

It was shift change at the mine, and Deitrich met briefly with his counterpart, the afternoon shift foreman, Johan Gruber. The previous shift had noticed slightly elevated levels of methane near the working face. It was well below the danger level but Johann had duly noted it on his safety report. This wasn't unusual. The Ring of Fire had lifted a three-mile sphere of twentieth-centuryWest Virginia back in time, and its active geology of coal and gas along with it. Methane is common, and there were clear procedures for dealing with it. As well, on a night when the weather was cold and the atmospheric pressure was low, methane tended to outgas at a higher rate.

"Not something to worry about," thought Deitrich. "We have training to deal with an increase in elevated methane. Simply clear the area and wait for the ventilation system to do its job."

The ventilation system was a giant fan. Deitrich had seen it as part of his training. An up-timer and several down-timers were assigned to keep it running day and night. Without the fan operating, the methane would seep out of the surrounding coal and rock and could build up to dangerous levels and cause an explosion. The fan drew fresh air into the mine through the same shaft where the lift moved men and equipment in and out. It was expelled at another shaft, where the coal was hoisted out. The fan was driven by an electric motor that was five hundred horsepower. Deitrich had seen five hundred live horses at once before. When the fan was turned on, he believed that every one of them had been somehow harnessed in the large metal housing. That fan pulled air through the mine with a tremendous amount of volume and pressure, turning the passageways into large pathways for the air. Concrete block barriers were installed through the mine to guide the air to the areas where men were working and along escape routes. Behind the barriers didn't matter, since nobody was working there. As long as those barriers were in good condition and the fan kept running, the methane wasn't something to seriously worry about.

This mine had started as a "room and pillar" mine, Deitrich recalled. That style of mining was practiced back up-time, with up-time technology. Over the past two years the up-time equipment had begun to fail, and old techniques had to be rediscovered. Instead of a conveyer belt, they now used mining carts pulled

by mules. Instead of the roof bolts that had supported the up-time mine roof, they now used timber for support, and carpenters and timber men to put in the supports. It was a hybrid operation, but always it was tested so that it would be safe, always safe.

As Deitrich was turning away, Johann called to him. "One more thing, Deitrich. Do you know where your crew is working tonight?"

Deitrich looked at Johann and shrugged. "Of course I do. I inspected it yesterday."

Johann smiled. "You are near the old mine, the one with the monument we visited. Some of the bodies of the men are still in it. Also, it's near the Ring of Fire border. This will be the last shift working in that section. We don't want to get too close to either of those things. The seams and roof are unstable, the engineer tells us, and the old mine may be flooded."

Deitrich shrugged again. "How close are we supposed to be to the other mine? Wasn't that mine massive and went on for miles?"

Johann counted off the hazards on his fingers. "Yeah. Watch out for methane, unstable ribs and roof, and be on the lookout for ghosts under the ground. There were bodies left in that mine up-time, don't forget. They just sealed it up." He was holding up three fingers.

Deitrich also held up three fingers. "I always watch the roof and the ribs—" He dropped one finger, leaving two. "I always watch for methane—" He dropped the second finger, leaving the middle one extended to Johann. "And that's what I think of your ghosts!" Both men grinned, and moved away with a wave, one going home, and the other to work underground.

* * *

Their up-time hard hats were now fitted with the old-time carbide acetylene flame lamps. The warm light shone off of the black walls. They were in thePittsburgh seam, a ten-foot thick layer of coal. That seam had been mined back up-time for a hundred years, and the up-timers had developed amazing ways of bringing it out of the ground, in quantities that were astounding to Deitrich. With the mining machines, conveyors, and the automated processes, the up-time miners could move more coal in a day than Deitrich and his crews could move in a week.

As he walked, Deitrich kept scanning the ceiling, what the miners called the "roof," and the walls, which they called the "ribs." In the older, up-time part of the mine, he didn't worry about the ceiling coming down. They used technology to drive long bolts into the rock to hold it together above their heads. The bolts worked well. When he got to the part of the mine that had been worked since 1631, he always paid more attention. There the roof and, occasionally, the ribs were supported by wood beams and planks, the same way a down-time mine would be, with wooden beams and supports overhead. It had worked for them well in the last couple of years, and they had only lost three men to falls of the roof.

He was always listening to the mine. Deitrich joked that he could almost hear her talking to him. As their mining activity expanded, they eventually reached the edge of the Ring of Fire. The closer to the edge of the ring, the more unstable the rock became. They could hear the rock above them "working" more and more the closer to the border they mined.

The men soon reached the point where they were to part for their different tasks.

"Ernst. Take your crew to the end wall at the far east end. Pay attention to your methane monitor. Get

the machinery up and running. I'll be back to check on you when I'm done with these guys. You know where you are going?"

"Ya. West face, cuts twenty-two and twenty-three. Build stopping, remove tracks, secure equipment, get ready to stop operations. Close to Ring Wall. Test for the methane and make sure the ventilation is good. Okay." Ernst nodded and smiled. He was nearly fifty, one of the oldest men on the crew, but strong and steady. He had been one of Deitrich's men when they were with Wallenstein back in '31. He knew Ernst, and knew that he understood.

"The rest of you guys are with me. Ernst, give me your carpenters, you won't need 'em for a while."

"Okay, Deitrich. See you later."

The men began to move to their assigned areas. By the time they started to work, they would be more than a mile apart. Deitrich's crew was mostly apprentices. Young electricians, carpenters, general maintenance men ,and miners who still wore the red hard hat that signified that they had been in the mine for less than six months. They began their short hike to the east side of the mine. The west side of the mine, where Ernst and his crew would be working, had initially been mined before it was abandoned back up-time. The east side had not been developed as much. As mining activity ended at the edge of the Ring of Fire, they were stopping mining in that direction, and turning the mine around to the east. Deitrich and his crew were going to begin preliminary work to prepare the area: pull power lines, prepare the floors to accept the relocated rail lines, and general preparation and safety inspections. Good work for the apprentices to learn, and he could check nearly everything they did before it would be put into critical service. Ernst and his crew were shutting own the mining operation at the west end, and preparing to relocate the operations to the east side. There would be no actual mining this shift, only maintenance and prepratory work.

As Dietrich and his crew headed to the east side of the mine, they passed a large device with cables coming in and out of it in the mine passage.

"Hey, Zing!" One of the red hats with the carbide lamp turned to him. Zing was a little guy, only on his second trip out of the classroom and into the mine. His real name was Zingerle, but the up-time instructor had called him Zing. His nickname also reflected his attitude, as he occasionally overcompensated for his small height with excess bravado. Deitrich knew this. Knew that it could be good to be brave, but bad to be foolhardy. "What is in that big box with the wires? You electricians keep quiet; he should know the answer."

Zing nodded. "That's easy. It's a suction breaker." Several men laughed, most of them electricians. "What? That's what it is," he said defiantly, turning to his fellow classmates. "It's a switch for the high voltage electricity that's used on the machines and battery chargers. It's called a suction breaker. It needs that because of the high voltage can jump, so it uses suction to open and close."

The group laughed, but abruptly stopped when Deitrich asked the next question. Deitrich's tone wasn't conducive to humor.

"Metzinger. What is that thing? Zing is close, but not right"

The apprentice electrician smiled. "It's a vacuum breaker. Almost everything he said is sort of right. Sort of. But it does disconnect power inby from here. Normally in an up-time mine there are more of them, but we have what we have."

Deitrich aimed the light from his carbide cap light on to Metzinger's lean face. "Good. But you're an electrician, you should know." He raised his voice to make his point. "What Metzinger does with that box is life or death for our little Zing." He shone his light on Zing. "Isn't that right, Zing?" Deitrich asked the question in the voice that he had used as a soldier. It was a voice than held men in place in the face of a musket volley or a pike charge. Unlike most, Zing straightened instead of cowered and answered in a brave, if somewhat tense, voice.

"Yes, sir."

Deitrich glowered. "What is inby?" Several cap lights now illuminated Zing's face, as more heads turned to watch the exchange. There were a few suppressed snickers. Deitrich's eyes hardened.

"We learned that our first day . . . ummm . . . inby is toward the working face—where the actual mining is done."

"And outby?"

"Just the opposite."

"So if we're walking toward our new work area, are we inby or outby?"

Zing took a deep breath. More cap lights turned his way. "We're outby." The answer didn't come with a high degree of certainly. He then brightened. "But we're walking inby, toward the east work face."

The cap lights went to Deitrich. He smiled. "Good answer, Zing. Now what is that thing?" He pointed down a passageway that intersected their path at a right angle. Cap lights illuminated it as the passing group glanced down the intersecting passageway. They saw what looked like a concrete block wall.

Zing looked at him in shock.

Deitrich growled. "This keeps you alive too. You should know what it's. Everyone halt!" The knot of men stopped cold with the command. Deitrich walked down the short passageway. "This passage is called a . . ." he looked to Zing to finish the statement.

"Umm. It's a concrete block wall that seals off the passageway?"

"No and no! I asked you what the passageway is called."

"Uhhh. I think it's a crosscut. Sir." The sir was added after the fact, with a measurable degree of hope.

"You think?" Deitrich's voice boomed and echoed off into the darkness. "You can't 'think' down here. You've got to know, Zing. Know! Our lives—my life—yours, all of us—depend on one another down here. We cannot have you taking the time to think. Do you know what you are, Zing? You are an unconscious incompetent!" His booming voice went off into the darkness, as confusion over the up-timer phrase bubbled through the little group.

The bellowing continued after a brief pause. "First word. Unconscious. Asleep, unknowing, unaware. Next word. Incompetent. Don't know what you're doing, not adept, inexperienced. In other words, gentlemen, you are all so wet behind the ears that you don't even know enough to ask the right questions to keep from getting killed. What is that wall called, Zing?"

Deitrich watched as Zing clenched his jaw, straightened to his full diminutive height, and looked him in the eye. "That's a seal, sometimes called a 'stopping,' sir. It secures the area against flowing or escaping gas. It's there as a barrier to isolate working parts of the mine from non-working parts of the mine. It also guides the ventilation."

Deitrich suppressed a smile. Zing was doing well. "And if it's made of wood and cloth, and it's temporary, what is it called?"

Zing stood up a little straighter, if that were possible. "A brattice, sir!"

Deitrich looked up at the group, satisfied. He felt a little bit bad about picking on Zing. Zing always reminded him of a terrier with his quick movements, and the way he was small and seemingly fearless. Deitrich had never liked terriers. "By the end of this month, I want to elevate all of you conscious incompetents. I want you all to wake up and*know* you*don't know anything* , and that almost anything down here could kill you. I want you all to know when you are being safe and to recognize when you are not, before it kills you. Or me, God forbid. If you kill me, I'll come back to haunt you for the rest of your life, so be extra careful. Learn your procedures, learn your safety gear, and take care of your fellow miners. Take care of this mine, and she will take care of you." As he finished, his voice once again echoed off into the surrounding darkness.

"Let's go to work." Deitrich began walking, and the rest followed him, subdued.

* * *

Peter was very tired. He was driving one of the old Grantville public works dump trucks, full of sand that had been hand-shoveled out of a dried up bend of the river. It had been two days of backbreaking, cold, hard labor. Much of the sand in the old riverbed was frozen, and breaking it loose with shovels and picks was difficult. He would arrive at the Grantville public works department soon, park the truck, and head home to bed. The sand would be used on the steep roads around Grantville to maintain traction. He was going to make sure next year that they had enough sand so they wouldn't have to dig it in the winter. It was much easier to remove from the riverbank when it wasn't frozen.

Stuffed into the cab with him were the three men who had helped him with the task. They were asleep, but crammed into the cab of the truck this way, they were at least warm. He looked at the dark road ahead of him through the dusty headlights. He knew that the road conditions could change fast, so he tried to drive no faster than his headlights could see ahead. The frozen dirt roads had been easy and not slippery. but the blacktop roads could be treacherous in icy conditions.

Peter had struggled to stay awake most of the way back to town, but now, near the turnoff for the mine, he began to relax. He shifted in his seat, and stretched to relieve the cramps in his back and shoulder. The downhill road was in good shape, with only spots of snow and ice left in the shaded areas where the afternoon sun didn't reach.

As he was stretching, the truck hit a small patch of ice. It caught him unaware, and because he was tired, cramped, and half asleep, he overcompensated when the truck started sliding. The result was that the back end of the truck caught the ice and then lurched toward the shoulder. The whole thing happened in slow motion.

As he violently jerked the wheel back to counter the developing skid, a joint in the steering assembly broke, causing the left side wheel to part from the steering gear. The massive wheel now moved in whatever direction it wanted, and it was generally not in the direction that Peter wanted it to go.

He saw a slope off to the side of the road that led to the river below. All he could see with the headlights was the blackness of the drop-off. He jammed on the brakes and the truck lurched off the side of the road, halted for a brief moment, its nose down the slope and the back wheels still on the shoulder. It then began to slide down the icy slope.

He kept trying to make it go nose first, but there was no real control. He realized he was now only a passenger, with nothing to do but wait until it was over. He yelled at his co-workers to hang on. He was afraid that the truck might roll over, but it stayed upright, going straight down the embankment. The slope wasn't steep and the transition to the frozen creek wasn't as severe as it could have been.

The truck gained speed and hit the bottom of the ditch nose first. The front bounced up, and then slammed down and through the ice in the shallow creek bottom. There was enough momentum still left to carry the truck out the far side of the creek bed and bounce up the other side. The truck began to slow in what appeared to be someone's side yard. Peter had a brief thought that they were going to make it without any major damage when he spotted the power pole dead ahead.

* * *

Ernst wasn't happy. "Willie. Get your head out of your ass." He liked many of the up-timer sayings, and that one was his favorite. It wasn't quite as crisp in German as it was in English, but Willie got the idea. Willie was twenty, and the newest member of the crew, having only just recently finished his safety training. He, too, was wearing the red hat of a new miner. He was daydreaming, gazing into the darkness. His coworkers smiled. Willie was newly married, and his wife kept him up very late. It was unusual for down-timers to get married so young, and Ernst didn't approve of this break with custom. He blamed it on the bad influence of the up-timers.

"Willie. Do you hear me?" Remove your head from your ass. Pay attention."

Finally Willie looked at Ernst and blinked. Ernst was standing on top of one of the battery-powered carts, which had a coal scoop on the front. When the coal was blasted away from the mine face, the cart acted as a small bulldozer, quickly scooping the coal into the waiting cars, which would be pulled to the exit by mules. It was the typical incongruity of the new and the old, the familiar and the unfamiliar, that his men had become accustomed to.

Ernst was finishing his start-of-shift methane reading. It was less than one half of one percent, well within safety limits. He eased himself off of the heavy battery compartment to the ground. Since methane was lighter than air, he tested it at the roof of the tunnel, where he could smell the fresh cut pine boards that formed parts of the roof of the mine.

"Time to get to work, gentlemen. Let's go. Willie, get the pneumatic hammer drills and the twenty-foot bits, and start to load everything into the coal cars. Next shift will haul it out.

"Schmidt and Fredric, pick up the undercutting equipment on the other face." Those two men grabbed the heavy pneumatic jackhammer that was mounted on a cart horizontally, right at the floor. Normally, they would cut along the floor into the face as far as the highly-modified tool would reach. When they blasted the coal out of the face, the undercut would make it easier to control the blast and to recover the broken coal. But tonight they were disassembling it and all of the support equipment that went with the tool, such as the pneumatic lines, braces, and wedges.

"Hans. You are the loader driver tonight; you passed your certification. Back it outby and put it in the

next crosscut. I want it out of the way." He turned to the rest of the men. "When that machine finally breaks down, we go back to shoveling coal into the carts by hand, so we're all very careful of it, aren't we, gentlemen?" He smiled, and the rest of the crew responded with a friendly and half-satirical, "Yes, Herr Ernst."

"Very good. Now get to work" The work area erupted with activity. Hans backed the noisy battery-powered hydraulic loader away from the coal face. The noise of the loader could be deafening and only hand motions and signals with their headlamps could be used. They could communicate basic signals by facing their partner and nodding their head in such a way that the light formed a pattern. Ernst found himself once answering a man in the Gardens by using these headlamp signals. It was so natural that the other man immediately understood.

Ernst watched Hans closely and walked with him as he backed the loader down the tunnel. At the crosscut, Hans backed the loader around the corner. He did it rather fast, and looked to be accelerating instead of slowing down.. There was silence for a moment as the loader was put into an emergency shut down, but not soon enough. Ernst could hear the heavy impact of splintering wood as the loader began hitting something.

"*Scheiss*," is what Ernst heard from Hans.

* * *

Peter's truck hit the wooden power transmission pole squarely in the center of the hulking front bumper. The truck pushed the pole to the ground as if it were a sapling, and drove the top of it into the ground with a hammer blow. Darkness turned abruptly and prematurely to day as the wires hit the ground and the transformer mounted on the pole exploded. The truck continued to slide toward the transformer and its associated fireworks until it finally eased to a halt. It stopped just inches from the transformer. Peter re-fired the truck engine and put it into reverse to back away from the transformer fire. He stopped when there was no more traction; the back wheels now deep in the frozen creek bed.

Peter's three passengers were awake now. Wide-awake. They shielded their eyes from the bright blue light of the burning transformer and saw the sparks from the downed power lines. They all sat transfixed by the display. Peter saw that the transformer and the top of the pole had landed on a piping assembly that he knew to be a natural gas wellhead. This one appeared to have been abandoned, as there wasn't anything connected to it on the surface. Once they began to understand they were uninjured, they began to smile at each other, and then laugh the giddy laugh of surviving a close call.

One of the men opened the passenger door and started to step out. Peter shouted to stay in the truck, but it was too late, and the down-time laborer jumped out and onto the ground. Peter thought for sure the man would be killed with that much voltage flowing around them in the snow and ice. But he soon realized that the wellhead was acting as a grounding rod, pulling all of the high voltage current away from them. They were safe.

* * *

Ernst frowned. The small amount of electric lighting they had in the work area had gone out. "Double *Scheiss* ," he thought. At least the air compressor, service power, and the large fan ran off of the emergency generator, so they could continue working for a couple of hours when the generator came on.

It grew very quiet.

Ernst wasn't pleased. it was a matter of honor that Ernst's shift was the most productive, and this wasn't shaping up to be a very productive day. He adjusted his carbide light up higher, and strode toward the crosscut where the loader had disappeared.

* * *

Stacks Shackelton had bad knees, the kind that hurt just because the weather changed. The kind of knees that had more than one large scar from surgery, and he was always pulling up his pant leg to show them off. Those knees were really hurting tonight. He sat in the control room topside, monitoring the large fan that supplied fresh air to the mine, watching the lift, and manning the emergency phone. His feet were up on the desk, and he was beginning to get comfortable, when the lights went out.

"Awwwww, crap." He grabbed his radio and stood up, then winced as his knees straightened out. Dawn was beginning to break over the hills. "Hey, Fred and Fred. You copy?"

The radio popped and crackled in his hand for a moment, and he listened to the unusual quiet around him. Without the noise of machinery and the hum of the transformers it was eerily quiet. He chewed on his lip as he waited for the response. Fred and Fred—or, more properly, Fredric and Fredric—were the day shift maintenance electricians. Their job was to pull the manual switches that allowed them to start the massive backup generator and feed power to critical systems. It was something that would happen automatically back up-time, with lots of complex equipment kicking in during a power failure. But they didn't have the complex equipment. They had Fred and Fred.

The radio came alive. "We're on it, Stacks. Gen should start in a minute. Are you ready to accept load?"

While Fred—or was it Fred?—was talking, Stacks began throwing switches in the control room to shut down non-critical equipment and lessen the load on the generator. They were not totally comfortable with the mine operating this way, so the procedure was usually to contact the power plant and see how long they thought they might be down. Usually he got a call if there was a trip at the main plant, so Stacks figured that it might be a downed line. He would call when the generator started, and then call for more maintenance help to start the mine back up when the power came back on.

Stacks smiled. "All set there, Freddy, my boy. You can hit the go button whenever you want to, over"

"We're starting the generator now, hope it starts in this cold. Damn, it's cold out here. Are you warm in your chair, Stacks, you lazy up-timer?"

"Don't you two boys worry 'bout me none. I'm nice and warm in here. You get the generator goin' and you can cuddle up to the big ol' exhaust and warm up just fine." Stacks looked over at the Franklin stove that kept him relatively comfortable and rubbed his left knee. It was really acting up today.

* * *

Ernst surveyed the damage. The loader was still in good shape, but the mine rib and support beams for the roof were knocked askew. Hans was apologizing profusely and was nervous as hell. It seemed he got the brake and the accelerator confused; the other unit he had trained on was slightly different. Ernst took advantage of the nervousness and proceeded to ream Hans up one side and down the other for his carelessness, all the while surveying the damage to the mine ribs and roof support structure.*Dammit,* Ernst thought,*Deitrich grabbed my carpenters. We'll have to fix this next shift.*

The small scooploader weighed close to seven tons, and was driven from a low seat near the middle. It

was a low, solid steel, box-shaped piece of machinery with a scoop on the front. Huge batteries powered it and it could load coal at a tremendous rate when handled by an experienced operator. Ernst knew that Hans had just passed his operator test the day before. As the consequences of his rookie error, he would go back to shoveling coal by hand or get to wield one of the vacuum cleaners that sucked up the coal dust. It was a toss up which was the worst job. Ernst finished his colorful lecture, then began looking at the damage. The loader had snapped a brace that held up the roof and torn boards off the ribs of the mine.

The crosscut showed evidence of the rock "working," or moving around and possibly coming loose, so the carpenters had placed planks on the ribs and the roof for safety. Behind them, the concrete block "stopping" wall that separated the non-working—and possibly methane-filled—side of the mine from the ventilated and working side of the mine looked relatively intact. He looked the damage over and decided that it would be good enough for now.

Four or five miners came around the corner of the crosscut to see what was going on and began to walk toward the loader. Ernst heard the noises from the roof first and his heart jumped into his throat. The rock was "working" above them. His hand went up to try to stop the miners coming down the crosscut. Before he could shout a warning, it was too late. The support gave way, and a twenty-foot long single piece of rock fell out of the roof. The shifting pressures caused the damaged rib to burst, and it added its own two tons of rock, crushing and trapping the men from above and the side. There were no screams when the rock stopped falling. It was silent, and black with dust.

Ernst and Hans had been beyond the fall, past the rib failure, and were helpless to do anything except dive to the floor next to the loader for protection. They helped each other to their feet. The black dust was so thick they couldn't see more than a couple of feet in front of them. Behind them was the block wall; in front of them was the half-filled passageway with their fellow miners buried beneath the heavy rocks. They could hear the shouts of the other miners who had stayed on station.

Ernst answered them. "How many are under there? Who is trapped?" He began a fit of coughing and stopped shouting. He saw some faint light, probably reflections from the other miner's helmets, above the pile of rubble. At least he and Hans were not trapped.

Willy, the youngest miner, answered, "We think there are four or five under there. We're starting to dig."

Ernst stopped coughing and caught his breath. The dust was beginning to settle. He noticed the there was some movement of air and assumed that the ventilation system had finally come back on. That was good. "Get to a phone. Tell them topside we got a fall and we have men trapped under the fall. Run to a phone. Now! The rest of you start digging." He began coughing again. Hans thumped him on the back until he finally stopped.

"Look." Hans pointed. "I think we can crawl over the top. There's room there; we can get over it. Before there's another fall." Ernst nodded and pushed Hans ahead of him. The younger man scrambled over the top of the pile, paused to listen to the rock, and quickly squeezed through the opening above. Ernst could see the hands of his co-workers helping him from the other side.

Ernst started up the pile. The breeze was blowing stronger as he neared the top. His dusty eyes narrowed.*Something isn't right,* he thought.*This isn't blowing in the right direction. It should be blowing in my face, not from behind me. If there's airflow, then the wall must be . . .* Once he was near the top of the pile, he turned to look. The concrete block wall that separated the abandoned and methane-rich part of the mine was damaged in the fall. It was nearly gone; only the two bottom rows of blocks were left. The breeze he felt was pressure from the abandoned side of the mine rushing into the

occupied side of the mine, where his fellow miners now stood.*Scheiss. The ventilation system is still down!* He pulled his methane meter out of his pocket and turned it on.

* * *

"Hey, Fred and Fred. Come in, Fred and Fred. C'mon you two sparkies, answer me. Is your radio working or did you two freeze your asses off out there? Where'n hell's my generator?" Shackelton stared at the radio for a moment. "C'mon, you guys. I need that generator soon," he mumbled. He absentmindedly rubbed his knee again, and began to pace slowly. Finally, the radio crackled to life.

"Stacks, we got a problem. This generator lost the heater, and the thing won't start."

"What do you mean, it lost a heater? The thing is a diesel engine, what does it need a heater for?" Stacks looked at his radio again, and held it up to eye level. "Just get that thing running or we'll lose the whole shift and it will take us another shift to re-ventilate the mine once we get it running. C'mon, guys. We're depending on you."

"A fuse blew for the heaters for the fuel and the oil. The whole thing is as cold as ice. Don't you know anything about a diesel? These don't like to start when the fuel turns to jelly. It don't flow too well. We got the circuit back up, but it's going to take a while to heat up. Why don't you send a couple maintenance guys over with a torch set? We can at least warm up the crankcase faster that way."

Stacks smiled and pushed the transmit button. "Okay. That's one I owe you. Hey, maintenance. Did you copy the request from the sparkies?"

"Ahyep," came the reply. "We was already goin' when we heard there was no power, Boss. You think we're a buncha dummies over here?"

Shackelton made a face at the radio. "Ten-Four" didn't seem like the right thing to say.

* * *

Ernst looked at the meter and his heart raced. The meter read five percent. He reached up and snuffed his cap light, plunging the area into darkness. Then he began to scramble over the top of the rock fall, shouting to the men on the other side. "*Scheiss*. Men. Run. Run as fast as you can. Out of the mine. Run!"

"What did you say?"

"What is it, Ernst? We'll come for you. Are you hurt?"

Ernst tried to answer them but the dust choked him. He began coughing, the dust in his lungs burning and making his eyes water, but still he kept scrambling to the other side, hacking out the cry to run away, leave me, run. He was thinking it as loud as he could, trying to make his voice answer to his command, all the while battering, bruising and cutting himself as he scrambled up to the remaining few feet of the opening.*Just a couple more feet* .

He could see the reflections of the flames from the carbide lights through the opening and realized that those lamps might ignite the methane and air mixture that was flowing into the work area. The readings on the meter indicated the percentages were correct. Now four men with flames burning in their cap lights were scrambling up the other side of the pile of rubble, trying to save him. He had no voice to tell them to

go back, to snuff the flames of their lamps, or even to pray.

The last face he saw was that of Marcus Schoenfeld. The light from Marcus's carbide lamp reflected off Ernst's own face, softly illuminating Marcus. Ernst remembered how he had helped Marcus at a meaningless skirmish when they were with Wallenstein; he had a scar across his forehead, another on his cheek, and no teeth. Even without teeth, Ernst could tell that Marcus was smiling at him, encouraging him to crawl forward. In his mind, he saw the day of their last battle together; it seemed like only yesterday.

The last thing either of them saw was Ernst reaching for Marcus's cap light, trying to extinguish it to prevent the explosion.

* * *

Willy ran toward the phone. It was over three hundred meters away, in a crosscut. He knew the procedures: tell the command shack who you were, where you were and what happened. Don't tell them what was needed; they would decide that. Topside would decide what was needed.

He was running that mantra through his head when he was hit from behind by a full-body blow, with an additional three or four sharp impacts in his back and legs. He was tossed forward violently, like a rag doll. He hit the floor hard and got caught in the in the tracks that the mules used to pull the coal cars. His shoulder and ribcage were burning with pain and he could smell horseshit. His hardhat was knocked off and the carbide extinguished. He was dazed, momentarily trying to figure out if he had tripped or been pushed. There was no light. Whatever happened, he had to get to the phone system and tell them topside. When he tried to stand, his ribs moved in ways that they were not supposed to and he fell to his knees. There was something wrong with his fingers.

Willy tried to walk, and then to trot. He fell again, this time smacking his face against the ribs of the mine. The air tasted like dusty coal mixed with his blood. He gathered himself up and tried again, going slowly, feeling his way ahead. He touched something hanging from the wall. A cable for electric power had been strung along the wall. He followed that, using it as a guide, crying from the pain in his shoulder, ribs and face. He realized that he couldn't hear, and could only perceive a loud ringing sound in his ears. He needed to get to a phone. Who, where, and what . . .

* * *

Deitrich had his men spread out doing several different tasks. Some were preparing temporary electric power, some were moving supplies into position, and others were readying the temporary barriers that would divert important airflows from the main passages to the work areas.

He noticed that the power had gone out but wasn't overly worried. The area they were in had no permanent power anyway, and they had prepared to work with only cap and hand lights. Later, as the cleanup on the other end was finished, they would begin to move all of the tracks, equipment, and materials to this end and resume mining as before. But he checked his methane meter every couple of minutes. This end of the mine wasn't as active as the other end and he wasn't worried about airflow. The plan said that it was up to him to pull his men out if he thought it was necessary.

Most of the time the power would come back on in a few minutes. This time it had been at least a half hour, and there was still no power. Surely the generator must be started by now. He stared back at the main passageway, looking outby toward the center of the mine and the lift stations, when he felt the air move around him. The movement was odd, not like the fans had restarted, but as if all of the air in the mine had moved at the same time. The air moved forward, and then back. It was unusual.

He felt his ears pop and shook his head. He looked around at the other men. Guys were shaking their heads and blowing their noses, trying to equalize the pressures in their sinuses and looking confused. Deitrich was confused, too.

"What the hell was that, boss?"

"I got no idea, Metzinger. I never felt that before."

Metzinger made a face. "Wonderful. If you never felt it before, what are we supposed to—"

It was then they felt the bump pulsing through the earth, and it raised some dust from the floor of the mine. The dust stayed in suspension as there was no airflow to sweep it away, and it hung in the air, lowering their visibility. All of the men stopped working and looked at Deitrich. He stared down the passageway and tossed the problem back in forth in his mind. There was a lot of work to do; maybe the bump had something to do with the power outage.

He turned to his men. "Keep working, you guys. I'll tell you when to stop." He paused, turned to Metzinger, and spoke quietly. "The phones have not been strung all the way down here yet. You know where the nearest one is, don't you?"

Metzinger nodded. "Almost all the way back to the lift. It will take me a few minutes. You want me to see if they know anything in the command shack?"

Deitrich nodded back. "I want you back here quick. This better not be a leisurely stroll to the phone. Walk from here slow. I don't want to panic any of the new guys. Go."

Metzinger strolled toward the telephone, but when he rounded the corner, Deitrich heard his footfalls increase their pace. He looked at his pocket watch. *Should know something in fifteen or twenty minutes.*

* * *

"Hey, Fred and Fred, come back on the radio. Did you guys hear that bump?"

"Negative, Stacks. Didn't hear anything except this generator trying to start. What did you hear?"

"I heard a . . . felt a . . . like a bump. Like someone dropped somethin' heavy, y'all know what I mean?"

"Control, this is April on the phone shed. You copy?"

"Sure do, sweetheart. C'mon back to me."

"I felt it over here in the phone shed. And stop calling me sweetheart or I'm gonna tell your wife, and what she'll do to you is far worse than anything I could do." There was a pause. "Sweetie."

Stacks looked at his radio and scowled. This wasn't shaping up to be a good day. "Thanks, April. Anyone else? How bout the lift? CC, you copy there, buddy?"

"Yup, I heard it too, barely. Like a truck driving by. Hey, Stacks, you heard anything from the power plant about when we're gonna get some juice?"

"They don't know. Said they think a line is down and they're checking it. If we don't get this generator working within the next half hour, we're gonna have to pull those guys out of there. A half hour is all I got left for time in the safety plan. Can't go beyond the time, no matter what. So how are you doin', Fred and Fred? Are you boys getting close? I*reeely* needs to know soon. Else there are gonna be a lot of pissed off miners having to climb all the way up and out of the mine."

"Sorry, Stacks. It's gonna be another half hour before we can even try it. I got about eight tons of engine block to heat up, or we're gonna destroy the starter motor. Can we get another torch?"

"You bet. Whatever you need. Maintenance, get over there with another torch, anything you got to help. My phone is starting to ring off of the hook. We must not have been the only ones who heard that bump. Just don't blow yourselves up over there."

Stacks swiveled his chair around and picked up the first line that was ringing. "Control Shack, Stacks. . . . No, we don't know what it was either. . . . I have no idea. . . . Yes, calling the police might be a good idea. . . . Ma'am, I need to keep this line clear for emergencies. No, no. There's no emergency here. I need to keep this line clear. Ma'am, yes ma'am. No, ma'am. Please, I need to go. Goodbye!" He banged the phone down, and it rang immediately. All three lines were lit.

"Shit, this isn't going to be a good day at all. Control shack . . ."

* * *

Willy stumbled in pain and darkness, blinking his eyes and trying to see. He knew that a working phone had a green indicator light on the base of the box. He kept looking for the green light, concentrating, wiping the sweat from his eyes, and focusing on taking another step.

He tried to ignore his growing pain, push it to the back of his mind, but his eyes had nothing to focus on, so his mind went to his injuries and the pain increased. He tried to maintain focus, and gulped some of the dense air around him. He coughed, and his broken ribs tortured him. He fell to his knees, and then struggled to get up.

He pushed off of the rib of the mine, clawing up the side with his good left hand. As he rose, he hit his head on something hard and metallic and he bit his tongue. More blood. He felt the object with his hand and found a telephone box. There was no green light. No light at all. The phone was dead, damaged by the blast.

He found the cable that served the phone and began to follow it. One foot in front of the other, keeping the cable in his had. It helped to hold the phone cable, as it became his eyes and gave him more to focus on than the pain.

* * *

When Metzinger reached the phone, he was walking at a brisk pace and noticed nothing unusual. His crew was less than a quarter-mile behind him and the other work crew more than a mile away, through a labyrinth of tunnels. There were no signs of anything unusual. He picked up the phone and waited for April to answer. He liked talking to April when he had the chance, but it was unusual to do it over the phone.

"Phone shack. Who's this?"

"Hi, April. Wilhelm here. You know Wilhelm Metzinger. Second-year electrician apprentice? I'm at east section one at crosscut six."

"Hello there, Wilhelm. Is Deitrich with you?"

Metzinger frowned. Always Deitrich. The girls just seemed to like him more. He sighed. "*Nein*, he stayed with the others. He sent me to see what was going on. We heard and felt something, and our ears popped. He thought I could handle it on my own."

"That's nice, Wilhelm. I just talked to Stacks and he doesn't know anything either. But he did say that you guys were goin' to have to come out soon 'cause we don't have power. You probably didn't even notice it down there, but the phones have a battery backup so we can still stay in production. They're trying to get the generator working. Apparently it's too cold or something."

"Should we keep working, or should we come out?"

"Give me a minute, Wilhelm. I want to talk to Stacks. He's not answering his phone, so I need to go see him. Just hold on; I'll be back in two shakes."

Wilhelm looked at the phone. How long was two shakes, he wondered. He passed the time looking around in the darkness, adjusting his cap lantern, and finally scraping patterns in the dusty floor, when he heard an unusual noise over the phone line. There was scratching and line static, and then it sounded like labored breathing. Metzinger listened intently. He finally heard a scratchy voice.

"Help . . . this is Willy. Men trapped, west cuts twenty-two, crosscut, roof fall, trapped . . . this is Willy, men trapped, west cuts twenty-two, crosscut, roof fall, trapped.

Metzinger was stunned. "Willy? This is Wilhelm. What is going on? Willy, do you hear me?"

"Wilhelm? Men trapped, west cuts twenty-two, crosscut, roof fall . . ." His voice was getting weaker.

"Stay on the line, Willy. April will be right back. I need to tell Deitrich. Do you hear me? Stay on the line. April will be right back. Willy. You must stay on the line." Metzinger left the phone off of the hook and began to sprint back to Deitrich.

* * *

April was beginning to get frustrated as she banged on the door of the control shed. "Goddammit, Stacks, it's cold as hell out here. Open the damn door. Why the hell aren't you answering your phone or radio? You hear me? Open up!"

"Sorry, sweeth—uhh, April. I got three phone lines going at once here." She could hear him reach the door, and begin to open it. "Damn thing's froze shut. Gimme a second here, let me—" The door flew inward and April felt the rush of warm air from the shack. It felt very good. She jumped through the door and he closed it behind her.

"Goddammit, Stacks. You need to answer your radio and phone. I talked to Metzinger and he didn't know what was up with the noise. Wants to know if we should pull them out or leave them in."

"How the hell should I know, April? We need to ask Fred and Fred. You answer the phones for a

minute, let me get to them on the radio."

She planted her hands on her hips and glared. "Listen, you dummy. I ain't supposed to leave my phones unattended. And you are not a goddam answering service for anyone calling this place from the outside. Let them ring. Find out about the generator and let me know what to do with those guys." She tugged open the door and stomped out into the cold light of morning.

April trotted back to the phone shack. When she got to her post, she was surprised to discover Metzinger was no longer on the line, but she could tell that the phone was off the hook. She called to him several times over the open line and got no answer. She then noticed a background noise that wasn't there before. The signal to noise ratio sounded—well, it didn't sound right. She scratched her head and looked up at the old phone relay board.

"That's odd." She leaned back in her chair, and stared at the panel. "This thing acts like I got more than one phone open here." She pulled her electronic test meter out of the desk drawer. One last check for Wilhelm first.

"Wilhelm, are you out there? Can you hear me? Wilhelm? Dammit, answer me." She put the phone down and began to check resistance readings through the switch circuits.

* * *

Deitrich was growing impatient waiting for Wilhelm to return. It had been over twenty minutes since he left and it was taking far too long. He should have been back by now. He pulled his pocket watch out for the third time in five minutes, and then stuffed it back in his pants. Something just felt wrong. The power had gone out before, and the mine never behaved in this way.

Maybe it was all of the new guys that were making him jittery. There. He'd said it. Well, thought it. He was jittery. That thought made him angry. When Metzinger got back he was going to tear him a new asshole for being slow and lazy. Deitrich heard the returning footfalls and took a breath, ready to verbally rip strips of flesh from his hide. Then he saw Metzinger's face and lost all thought of abusing him.

Metzinger gulped for air and leaned on Deitrich for support. He must have run all the way back. Metzinger gasped. "Willy—Ernst, roof fall by the west coalface. That must have been what we heard. Needs help. Men are trapped. We need to get over there."

"Are you sure?"

Metzinger sat down on the floor and nodded, still gasping for air. "Yah. I heard it from Willy. I was on the phone with April, and he picked up. His voice was very faint." By now some of the other miners had come over to listen to the conversation. A canteen of water was pushed in his hand and he drank deeply.

"What's up, Deitrich?" asked one of the apprentices. Several others chimed in. "What's going on? A roof fall? Where was it? What did he say . . ."

Deitrich growled at the group. "Quiet. Give us some room. You talked to Willy, right? Metzinger nodded. "When you were on the phone with April, right? Metzinger nodded again. "Where was Willy; did he say what phone he was calling from?"

"West face." Metzinger struggled to his feet. "We gotta help them, boss. Willy sounded bad."

"Okay." Deitrich thought for a moment then straightened. "Everyone. Listen up. We have a situation. From what we know, there has been a roof fall at the other end of the mine. We're going to see what we can do. Grab any tool and first aid kits you see along the way. We're gonna double-time it over there and see what we can do to help. Everyone. Let's go. Now."

The guys working further away had trickled to the group and as Deitrich began to turn away, they fell in behind him. Metzinger stood to follow and Deitrich hesitated. "Good job, Wilhelm. Rest for a moment, then catch up to us when you can."

Metzinger looked relieved. "Okay, boss. I'm getting a hell of a cramp in my legs. Thanks."

Deitrich turned and began to jog. His old rally cry from the battlefield came to mind. "To me, men!" he half growled and half shouted. "To me!"

* * *

"This is damn odd." April scratched her nose and looked at the chart. The chart gave resistance readings for the phone wires. Generally, it was accurate. The more wire in a certain direction, the higher the number. The less wire, the lower the number. Her readings indicated that the phone where she talked to Metzinger was off the hook and was at the end of the line for that circuit. That made sense from what she knew. But on the west circuit, according to her chart, there weren't enough phones. One of them was off the hook, and it was like the wire ended at that phone. She knew there were more, at least three beyond that. She scratched her nose again.

The radio on her bench cracked to life. "Hey, April. This is control. You still got Metzinger on the line?" She ignored it for a moment, deep in concentration, and it cracked again. "April, you copy? C'mon, you're not still mad at me are you?"

She snatched the radio off of the bench. "Stand by, Stacks. I think I got a problem here. Can you give me a couple seconds?"

"Sure can, sweetheart."

She didn't even notice that he called her sweetheart again.

* * *

Deitrich and his men had run beyond the telephone that Wilhelm had left hanging and past the main lift station. There was a steady rhythm of men breathing hard, and the cap lights flickering. Each light made a bouncing and fluttering U-shape in the darkness. Occasionally, a light would go to the roof, sometimes to the ribs, sometimes to other miners. They ran in silence, an oddly illuminated chain of lights, panting and passing through the passages.

Darkness was briefly pushed out of their path as they ran and then slipped in behind them as they passed. The deeper they went, the darker it seemed to get. There was more dust in the air at this end of the mine, so their dim cap lights pushed less and less of the darkness away. Deitrich was focused on getting there as fast as possible, and he didn't notice it until one of the new men called out.

"Deitrich! Do you smell smoke?"

He slowed and looked hard at the roof of the mine, looking for a visible trace of the smoke. Without the

ventilation, it would cling to the roof, instead of mixing like it normally would. It smelled like burning wood. Why would there be a smell of burning wood for a roof fall? He slowed to a walk for a moment. *Maybe something else is going on* ? Ahead he saw one of the green lights for the telephone on the wall, and decided to stop there.

It was there they found Willy. He was alive, but in bad shape and unconscious. Deitrich told two of his guys to get him on a stretcher and back to the lift station.

Deitrich stared at the phone for a moment. Something was odd. It was off the hook. He picked up the receiver and held it to his ear. He heard clicking sounds, and a sound like someone moving around a room. He hung it up and re-signaled the phone room.

"Phone shack. Who's this?"

"April, this is Deitrich"

"Deitrich? What the hell is going on down there? I was talking to Metzinger and he just took off and left the phone off the hook back on the west end. This phone was off the hook, now you're on it, and it doesn't appear that there's any phones active inby from you. And did you guys hear that bump down there?"

"One thing at a time. I have an injured miner, and a possible roof fall over by where Ernst is working. It sounds like you don't know about Willy?"

"Willy? No, I don't. What's up with Willy?"

"He's injured. Badly. I'm sending him topside with two men. We found him at the phone. Did you not talk to him? It would have been right after you talked to—wait, April. I need to think." Deitrich pushed his hard hat back on his sweaty forehead and tried to think clearly. He shook his head and made a decision.

"April. I don't know what the hell is going on down here. All I have is that Metzinger said that he heard Willy on the phone and there was a roof fall down there. And now I smell smoke. And we got no goddamn power down here. I'm going to take this crew and head down to the old working face and see if there's something we can do. You let Stacks know what we're up to, and I'll call as soon as I know something."

"Okay, Deitrich. But I know that they were talking about pulling you guys out until we got some power back."

"I'm wasting time talking to you. We're going to help Ernst. I'll let you know if everyone is okay." He hung up the phone and ignored it when it started to ring. He didn't have time to argue with April. Deitrich turned on his heel and began to walk down the passage toward the working face, where he knew that something was wrong. The smell of smoke grew stronger.

After another two hundred meters, they began to notice unusual damage. The seals had been damaged in the cross cuts. The further they went, the more damage they saw, until they were stepping over blocks and brick that had been blown out into the main passageway. Their pace slowed. The mine was now wide open on this end; all of the careful seals and brattices had been knocked down.

Deitrich began to think that what they were dealing with might be a methane explosion. Or maybe what

was referred to as an "ignition," when gas would be coming out of the rock in a particular area and could form a standing flame, like the gas stove in the cafeteria. He had never seen one, but there were films. Normally an explosion would destroy an entire mine, or sector of a mine. But Willy didn't look burned. Willy had said a rock fall. Something wasn't making sense. They were still a ways from the working face when the smoke and dust started to become a visibility problem. Several men were coughing.

Deitrich looked back. "Guys, go ahead and put on your self-rescuers. They should have gone over that in class. If there's excessive carbon monoxide, this little thing—" He held up the belt mounted canister. "—changes the bad air to good." There was a rustling as the men put them on and tested them.

From the back, Zing spoke up. "Deitrich, we're not allowed to use these to fight fires; these are only for rescue, for us. If there's a fire, we're supposed to . . ."

Deitrich turned to him viciously. "Don't quote me rules, goddammit. Put it on and let's move. And keep an eye out for the injured."

* * *

Metzinger was limping badly from the cramp in his legs when he met the two men carrying Willy. Willy had been patched up when they found him, but hastily.

"Put him down, guys. Let me take a look." One of the men handed him a small first aid kit. "*Scheiss*, we need some light." He looked around. "Let's take him to the tool crib over there."

The tool crib was built into one of the cross cuts, and was generally locked. But there were extra carbide lights stored there, along with concrete blocks, mortar, plastic and cloth sheeting for brattices, and spares of all kinds. Even a microwave oven for heating lunches. It took them almost no time to open the gate and set Willy down on a workbench. Metzinger looked around at all the stuff in the tool crib, including the very valuable compressed air hoses for the tools.

He turned his attention to Willy. "I can handle it from here, guys. I think we just need to stop this bleeding and he should be okay. At least I hope so. He was bleeding through the old bandages." He lifted up Willy's shirt and pulled back the soaked bandages, exposing the gash in his chest that ran along the ribs. They could actually see one of the ribs. The two younger men stepped back. Metzinger pulled clean bandages from the kit and began to apply pressure, gently, to the area. Willy stirred and moaned.

"Now that's a good sign. It still hurts. If you guys want to go back and help Deitrich, I can handle this. It will take me an hour to get there at this rate. I think he needs you more than we do. Go on. I got this covered. If we move him any more, we could kill him."

The two apprentices looked at each other and headed after Deitrich. Neither of them looked like they could stand the sight of blood.

Must not be from around here, thought Metzinger.

* * *

"I need that goddamn gen-set now. We got a man injured down there and maybe a rock fall. We need the lift and the goddamn fan. We need it ten minutes ago. Do you guys copy?"

"Stacks, we'll give it a try. We've bypassed the safety controls on the generator and we're using a torch

on the outside of the fuel line to try and make it flow. There isn't much more we can do that won't blow this—and us—sky-fucking-high." There was a pause. "Do you copy, Stacks?"

Stacks could clearly hear the implied "asshole" at the end of the last transmission. He didn't care. It comforted him. He knew that whatever those guys could do to get power flowing from the generator, they were doing. At their own risk, all for the guys in the mine. He responded. "Ten-four. But don't you guys get hurt. Do what you can, but. . . . Well, just do what you can, we're standing by."

Stacks opened the plant safety manual, and reviewed the procedures for an injury. Apply first aid and remove from plant. Call ambulance. If possible, continue production. That was the gist of it. Well, at least the phones had cleared up since that first bump, whatever that was. He dialed the fire department.

An operator with a pronounced German accent picked up. "Emergency services. What is the nature of your emergency?"

"This is Stacks at the mine. I got at least one injured miner down there and we're trying to evacuate him now. We're not sure of the extent of his injuries, but the information I have is that he's hurt pretty bad. We're trying to bring him out now."

"He's still in the mine?"

"Yeah, still down there. We have no power, so it will be a while before we can get him out."

"Do you know the extent of his injuries?"

"No, ma'am."

"Do you know when he will be on the surface?"

"Ummm. Not exactly, no, ma'am. But we're hoping pretty quick. Maybe an hour before we get him out, maybe less." He looked at the radio, hoping it would give him good news.

"Hang on, Stacks, give us a minute."

Stacks sighed as he heard the dispatcher cover the receiver on her end, and ask a muffled question. He looked at his watch. It was only nine in the morning. It seemed that this shift had already been on for twelve hours.

"Stacks, sorry, I'm back. We already have one ambulance out. Can you give us another call when you get closer to bringing him up? We don't want one just sitting there because if something else comes up, we won't be able to handle it."

"Okay. Let me log the call, and you do the same. There's always a safety review after one of these things." Stacks hung up the phone. Sometimes, doing this job, he still felt like he was up-time and everything was normal. It was a comfortable feeling. But he knew it was false. At times like this he realized how deeply in trouble they all were, and how very precarious things could be. He grabbed the radio.

"How 'boutcha, Fred and Fred. Are you gonna flow some electrons pretty quick, or am I gonna have to do it for you?" As soon as he took his finger off of the transmit button, he heard a large bang from the direction of the generator, followed by another, and then quickly followed by two more. The generator

caught, stumbled, stumbled again, and started. He heard it stumble again, and imagined the guys scrambling to control it, working the throttle, nursing it until it flattened out into a steady roar. Finally, something was going right. The radio came to life as he sat down, suddenly very tired.

"There's your goddamn electrons. Give us a minute for this thing to stabilize, and we can start putting loads on it. What do you want first?"

"Give me the lift first, then service power, then the fan, and air compressors last. Let me know when you hit the transfer switches, so I know what's coming"

* * *

Deitrich and his men had to slow to a walk, sometimes feeling their way inby. The smoke and dust were so thick that visibility wasn't much more than five or six feet. He kept chattering confidently to the men behind him, and they obeyed his orders. Deitrich was a leader, and he knew what he could expect of these kids. And he was asking them for a lot. So far, they had . . .

"Deitrich! Here is someone. Over here! I have found someone." There was a knot of men forming around a shape on the floor of one of the damaged crosscuts. It was one of Ernst's men; Deitrich recognized him, but couldn't remember his name. He wasn't breathing, but he had one of the "rescuers" in his mouth. And he was burned. Deitrich touched him and knew the man was dead. He clenched his jaw, and stood.

"There's nothing we can do for him now. Leave him."

Zing spoke up. "Boss, they tell us in class that we need to let them know topside ASAP when someone is—well, injured. Shouldn't we call for reinforcements from upstairs? They need to know what is happening, don't they?"

Deitrich turned on the young miner. "I'm in command here. I'll do the thinking." As Deitrich turned, he remembered the dead man's name. And his woman. And their son's names. He felt sick to his stomach. He hated indecision. Hated it in him and in others. He looked forward into the smoke, and back toward the safety of the center of the mine and the lift. Then back to the smoke and the dark. Indecision was over.

"If we go out now, there will be no chance for anyone up there to survive. By going in now and searching, there may be a chance we can rescue someone. We're going all the way to the working face, and look for survivors." He looked at the group. "Any questions?" The cap lights shook back and forth and it was quiet.

Deitrich spoke in the lowest voice he could. But the power was unmistakable. "To me, men. To me. Let's go."

* * *

"We're closing power to the lift breakers now. I don't want to lose the gen-set, so go easy. Run the cage down slow."

"Thanks. Okay, CC. It's on you, buddy. Send the cage down and see how many get on it, then start hoisting. We need to get these guys out of there and figure out what's going on"

"Stacks, the cage is going down. It will be 'bout three minutes before it gets to the bottom. When they pick up the phone and tell me, I'll haul them up."

"Thanks, CC. Fred, as soon as you can, and the gen-set is stable, give me service power so they can have some light down there."

"Ten-four, Stacks. You'll have it in a couple of minutes."

Stacks picked up the landline again, this time to call his boss, Larry Masaniello. It was Larry's day off, but he would be upset if someone was hauled away in an ambulance and he wasn't notified.

* * *

Deitrich was more and more worried that they wouldn't find any survivors. The closer they got to the working face, the worse the damage. Now they picked their way over debris piles, pieces of timbers, and finally . . . bodies. Whatever happened, some of the guys started to get away. Some of them had their shoes and miners belts blown off, and hard hats were scattered about. There was no doubt that there had been a methane ignition of some sort, and it had been powerful. They finally reached crosscut twenty-two, where Willy had said the roof fall had occurred. A large rock had fallen. He was afraid that all they were going to find was bodies.

"Check by the face, you three guys. See if there was anyone up there. Shout out for survivors, but don't forget to listen. If we don't find anyone alive, we'll head back." As he said that, some of the explosion proof lighting fixtures winked on. "Looks like we're getting power back. That's good. Hopefully, we'll get some ventilation going and clear this dust. . . ."

Deitrich paused.

He saw the layout of the mine in his head. The fan shafts where the air was pulled in and pushed out and all of the carefully-built stopping that had been blown out from the explosion. The fact that the fan was off had kept it from mixing any further, and probably limited the explosion. But if they started the fan now, all that mixing would happen again, on a much larger scale. There were still small fires burning and smoldering all around them.

The dread hit him like a ton of bricks. He swallowed and looked around.*All these kids* . He was going to try to get them out. It was the least he could do.

"Let's go! Everyone! Let's go! Out of the mine! Now! Fast as you can!" He took two steps backward and stumbled over some debris. "Let's go! Run, goddammit, run!" He caught his balance and ran inby, shooing the ones he had told to go to the face in front of him. "Move it! Let's go!" The group began to stumble away from the epicenter and began to run faster as their panic grew. Deitrich recognized it and let the panic have its head. It could only help.

They tripped, fell, cut themselves, got up again and kept running as fast as they could. All the while the panic gripped them, and they ran faster. They picked their way through the debris, trying to go as fast as possible, sometimes stumbling, sometimes falling flat. As one cap light fell, another would help it up and rejoin the other cap lights, bouncing and weaving down the passage. They were grunting and breathing hard, some making noises like children running from a nightmare, as if they were being chased by some terrible monster. There was no speaking, no conversation, only animal noises.

As they ran, the darkness once again closed silently and inevitably behind them.

* * *

"Okay, Stacks. Fan breakers are closed. Go ahead and start it"

"Good job, you guys. Here goes. I got a green light, the fan is starting up. How's the generator?"

"We're stable. Go ahead and put the compressors on and we'll be back in business."

"Compressor start . . . and I show a green light for them, too."

"You owe us a beer. You know that, don't you?"

Stacks looked at his radio, sat down and smiled. "Roger that. Beer is on me." He smiled again and called the fire department dispatcher.

* * *

The cold light of the January sun had barely begun to light the old Pence house. Marylyn Pence, a widow, had been renting rooms in her home. It was a way she could make ends meet. She was at the stove, boiling water, preparing to make breakfast. She felt the blast first through her feet. From there it traveled through the house, where glassware rattled, and then echoed off of the hills surrounding the valley. She froze as the echoes died away. She'd become a widow when she heard that sound, many years ago.

A baby cried upstairs. Marylyn sat at the kitchen table, pale and shaking. Her boarder—or rather, her boarder's wife—went to quiet the baby. She heard the footsteps upstairs. Soon the baby was quiet. A moment later, mother and child came downstairs. She was beautiful, Marylyn decided. As radiant as the sun that peeked through the window. Marylyn always liked the kitchen and the way the sunlight bathed it at breakfast. She gathered herself. Before she could speak, the German girl greeted her.

"Good morning Mrs. Pence. It will be a lovely, sunny day today. A little bit cold,*ja* ?"

"Yes, a bit cold"

"What was that noise that woke the baby? It sounded like a cannon shot!"

Marylyn took a deep breath. "Maria, is your husband in the mine today?"

* * *

Peter felt the rumble beneath the ground. They were all out of the truck, standing in the field. They had used the phone at the house to call the police and request the rest of the equipment to pull the truck out of the frozen mess. The sparking had continued, but the transformer had burned itself out.

The rumble grew and the wellhead erupted in a new flame, the hot yellow flame of natural gas. It was hot enough that they raised their hands to protect their faces. The muted colors of the frost-covered creek bottom, where the low winter sun wouldn't reach for hours, were turned into the harsh light of day. The flame shot above the trees, stayed for a moment, and then receded to a height of ten feet or so, and stayed there. The ground shook even more. The cab of the truck was scorched and the heavy vehicle swayed when the ground shook.

Peter looked at his companions. "What in the hell was that?"

* * *

Shackelton was knocked out of his chair by the force of the blast. Several windows shattered, letting in the cold air that slapped him in the face. He heard breaking glass and things shifting and falling in the shed. He jumped up, momentarily forgetting his knees, then winced. "What in the God damn Sam Hill was that?"

The booming noise diminished to an eerie quiet. Then, within seconds, all three of his outside lines lit up. He looked at the phones, started to answer one of them, and stopped. He turned away and triggered the master alarm then looked at the phones, and paused again. What the hell could he tell anyone? He didn't know any more than anyone else.

He grabbed his radio. "I want information. What the hell was that? April? Do you have any communication? April? Answer me, goddammit . . ."

* * *

The Reverend Doctor Al Green was in the shower when he felt the earth shift and rumble. He had soap all over his face and stood in place, knowing what it was, already seeing the events that would probably transpire over the next few days flash in his mind. He turned, slowly and deliberately, and rinsed off. He took his time. He prayed a little. This was going to be the last solitude that he would have for some time. He prayed for strength, prayed that it wouldn't be what he was certain that it was.

His wife stuck her head into the bathroom. "You hear that?"

Al paused before he answered. "Yes"

"Was that . . . ?"

He sensed that she didn't want to say it any more than he did. As if by not saying it out loud, she would somehow make it not true.

"Yes."

"Shall I start making calls?" She was asking if she should call out the troops of church ladies, who would be the support for the next several day's events. His church, no matter what the religion of the miners, had always been the center for families awaiting news. It would be no different this time. A mining accident wasn't just another industrial accident. In a town where almost everyone was related to someone else, it becomes a far-reaching family tragedy.

"Yes. Please. And give me just a minute, would you?"

He heard her close the door, softly, and move away. The calls would probably begin on their own. He warmed the shower water a bit and stood with his face in the stream, letting the warm water wash his tears away.

* * *

The exact location of the point of ignition was never determined. It was probably near the first explosion, but the damage was too severe to tell. When the air and methane mixture was correct, it ignited explosively and began to propagate a shock wave before it, seeking release. This wave picked up the coal dust that was distributed by the first explosion, and it too became fuel. The flame front followed the shock wave.

The wave front caught Deitrich and his crew, still far from any refuge, in the main passage. They barely realized the beast had overtaken them before they were all dead. The flames followed, but they were of no consequence to those men.

Metzinger and Willy were more fortunate. The heavy workbenches protected them somewhat from the massive damage that the others suffered.

As the explosion progressed, its energy began to dissipate. By the time it got to the lift, the majority of the destructive forces had gone. The flame front had stopped well before the lift. Now came the smoke, lots of smoke, from the multiple fires the flame front had started. Those fires consumed fuel and oxygen, leaving carbon monoxide. So as the echoes of the shock wave were reverberating off the hills, the smoke began to flow through the mine, stealing air from wherever it went. The air in the mine was unbreathable in a matter of moments.

* * *

The battered pickup truck raced down the blacktop road on the way out of town. The sun was peeking over the ridgeline now, and Larry Masaniello was trying to get to the mine—his mine—as quickly as possible. He could see a plume of black smoke rising behind the ridge. His coal mine. He was the manager.

His heart was pumping much harder than it had in a long time and he felt physically sick. He was afraid that he would throw up if he didn't keep focus. He had always considered himself a coal miner first, and the mine manager second. The idea of a major mine accident on his watch had kept him awake nights ever since he had taken over for Quentin Underwood. His hands were shaking.

He had to be careful. People were on the road, a lot of them, hurrying to get to the mine. He saw miners and their families. Miners carrying gear and women carrying children shuffled out of his way. He kept honking his horn.

He heard the ambulances coming from town behind him, and the fire department. He could tell the sirens apart by sound alone. He kept the window up, even though he wanted to open it wide to let in the cold air. He couldn't look at anyone in the eye and he felt the stares of those who got out of his way. He swallowed hard once again, and took a deep breath.

Finally, the mine was in view. The tall transfer tower for the coal was the first thing he spotted, before the other buildings came in sight. The mine sat at the very bottom of the valley, and the blacktop road was above it, about a third of the way up the ridge.

Originally, the coal had been removed from the mine on conveyors on the other side of the ridge, and came back to this side for processing. Those conveyors had been sliced off by the Ring of Fire, and the coal now came up a different shaft on this side of the ridge. That was where most of the smoke was escaping. The main shaft, which held the elevator, was smoky, but the smoke was not as thick. He felt a little relieved. If that was gone, then the men, and the mine, might be lost entirely. For now, there was hope that some men had escaped the blast.

When the mine was first constructed, it was surrounded by a large cyclone fence topped with barbed wire, but not now. That resource had long since been redirected.

He wished the fence were still here, as there was a knot of people around the mine control shed already. Things would get out of control real soon if somebody didn't take charge. He could see hand-waving and arguing going on as he approached. He swallowed hard again.

He dropped the pickup truck down into second gear and let the engine slow him down. With the busted up exhaust system, the V-8 made an ominous rumbling sound as he rolled up to the small, but rapidly growing, knot of people. It had the effect he desired, as they all turned and looked at him.

He hopped out of the cab and began to give orders. He looked for the biggest men there. "You four men, I need some crowd control now. Keep everyone back from this shed. If they're cold, have them go into the locker rooms or the old guard trailer. You two, keep everyone away from the lift. I don't want anybody trying to do something stupid. Nobody goes into the lift until rescue is here. You women, get inside before you freeze to death. Go to the locker rooms or the trailer." He didn't stop to see if his orders were followed, but strode to the control shed.

Shackelton met him at the door. "I'm damn glad you're here, Boss."

As he closed the door behind him, Larry felt himself shrink, as the bravado of his entrance wore off. He rested his back against the closed door. Shackelton, along with a much older retired miner whose name he couldn't quite remember looked a little surprised.

Larry took a breath. "What do we know, for sure?"

"For sure? Not too damn much. The mine phones quit working right after that big ass boom."

"Who's on the phones today?

"April Lafferty. I heard from the guys before, and there was a roof fall of some sort. Deitrich somehow heard about it and he was headed for the workface when we powered everything up. Then there was just that big boom."

"Have you heard from anybody since the explosion?"

"No, sir" Stacks looked at the ground.

"Could anyone have survived? I mean, the goddamn furniture moved in my house, and I'm over two miles from here."

"Anything's possible, Boss"

Larry needed good news. He hung on to the hope that some men had survived the blast. It gave him a focus. He straightened and noticed the other man. Skinny to the point of bony, bald, with a wisp of gray hair on the sides. He looked vaguely familiar, probably from a union meeting somewhere. He wore a work coat of brown canvas, boots, and work pants. "How did you get here so fast?" Larry asked.

The old man smiled a toothless smile. "I only lives 'bout a quarter mile up the blacktop." He waved up the road, beyond the mine. "I was up'n'bout when she went. Took me only coupla minutes or so."

Larry nodded. "Thanks, old timer."

"My pleasure, son. What c'n I do?" Once again he flashed Larry the gummy smile.

"How well do you remember the lift system?"

"I 'magine I kin help. Y'all wan' me to take a look?"

"Yes, sir. I think I'd like that. Who's on the phone system today?"

Shackelton looked a Larry a little funny. "I told ya'. April Lafferty."

Larry's stomach took another flop. "Yeah. You did tell me."

The old man looked at Larry. "You can do it, Boss. Hell, after all of the assholes I seen run mines over the years, you got it all covered. Y'all will be jus' fine." He looked Larry in the eyes, shuffled to the door, and was gone. Larry saw that more people had gathered outside. He turned to Shackelton. "Did you call the cops?"

The sixty-plus good ol' boy fromKentucky , who would be down there with the men except for his bad knees, simply nodded. "We're gonna need more crowd control." Larry stopped. He could still feel that sick feeling in his stomach. He fought it back. He heard the first ambulance roll up, followed by the fire trucks. He stood up straight once again. "Emergency Response Team?"

Stacks nodded again.

Larry sighed. "Has anyone called Reverend Green? We should get a couple of busses running between here and the church. This may be a while."

* * *

"Prime Minister Sterns?" The lieutenant interrupted the meeting in the Prime Minister's office, causing all of the heads to turn toward him. This was the weekly morning briefing, and everyone who was there was supposed to have all the pertinent information they needed before the meeting started. If it was important enough to interrupt, it was going to be a surprise. And the men in the room didn't like surprises.

"What is it?" Mike's voice was level, his look clear and relaxed.

"Thought you should know, sir. Telegraph report from Grantville says that a very large explosion has occurred."

All of the heads in the room swiveled and focused on Mike Stearns. A dark cloud seemed to come over his face.

There was a pause.

To the men in the room who knew and understood Mike Stearns, his pause spoke volumes. The lieutenant knew that the pause, the—dare he think it—the hesitation, meant the Prime Minister was caught up in thoughts about Grantville for a moment.

"Do we know a how big? What kind? Where in the town was it located?" The questions came hard and fast, a little harder and faster than normal.

The lieutenant swallowed. "We don't have any of that information at this time, sir. The telegraph operator was an up-timer. He said he thought it might be the mine, but he wanted to be clear that this was unconfirmed, and more information would be coming as soon as he had it. I thought you would like to know sir."

"Lieutenant. This information . . ." Mike cut off his statement, then started again. "Thank you for bringing this to our attention. We can deal with this in a few minutes."

Warner Barnes, an up-timer sitting alongside Duke Hermann of Hessen-Rotenberg, the Secretary of State, cleared his voice. "Umm, Mike. This is Grantville. Why don't we take a few moments and . . ."

"Thank you, Warner. Right now there are more pressing things. More pressing places. Places and people that need our full attention." Mike paused and took a breath, and looked around the room. There was a mix of government leaders, mostly down-timers, and the handful of up-timers supporting them with whatever education and experience they had. The Prime Minister's face grew grave. The lieutenant started to close the door, when Stearns looked at him. "Wait. You need to hear this too." He stood.

"Some of you are not going to like what I have to say, so I'll say it and be blunt. Right now, Grantville isn't all that important."

All of the down-timer's faces showed surprise.

"It's not that important, not compared to what is going to happen in the spring. Because if what happens this spring fails, and we get our asses kicked, then Grantville is irrelevant. There's a lot that's more important than what might be happening in our—" He motioned to the down-timers. "—old home town. And if there's one thing this group has to do—we must understand what's important."

Mike paused and straightened. "When it comes to what we're doing now, it's simply not that important. If any of us are thinking about only Grantville, or for that matter, onlySweden —" He looked at Tortenssen. "—or only Hessen-Rotenberg—" He set his gaze on the duke. "—then you don't understand what we're doing here."

Mike placed his hands flat on the table and leaned forward to gaze at everyone. "Thank you, Lieutenant. That will be all for now. Please prepare a report when you have some facts."

The lieutenant stood at the door for a moment, and then quietly closed it.

* * *

Reverend Green stood in front of the open door of his church, looking out onto the street. The cold morning air stung his face. It felt good. He breathed deeply and surveyed the block. The church was an old one, built in the Grantville's heyday, near the turn of the twentieth century. The massive red brick structure sat next to the rectory. The first of the busses from the mine would be along soon. He stood on the steps of the church, in front of the door, watching and waiting.

The church ladies had already set up the meeting hall in the back of the church with food and more was arriving. He could smell some of it all the way up here. Hot casseroles and rolls, pies, dried fruit, someone had heated a ham and brought it. Plenty of water, maybe even some tea and coffee. The smell

of coffee in the church made him think back to the time that it wasn't unusual to have coffee. Now it was almost a special occasion. He looked at the ground.

"Some occasion," he thought, "we could live without more of these . . ."

He didn't have to wait long. The first bus was full of down-timers, some he knew and some he had never seen before. It was escorted by a Grantville police car, the officers bundled up against the cold. As people left the bus, he began to welcome them. It was mostly women and children, a few old men. They came to him with vacant stares, glazed and shocked eyes, red with tears and worry.

He silently prayed for more strength and ushered them through the front doors, to the meeting room. Most had not been in his church and stared in amazement at the high ceiling, the organ, and the serene color of the walls. It was warm inside and soon the place would be warm and humid, like too many people in a house at Thanksgiving, when the windows would fog over on the inside. Warm and safe.

"Welcome, welcome, please come in, welcome, go all the way to the back, there's food and drink, welcome, welcome, you'll be safe here, this is for families of all faiths, welcome, there's food in the back . . ."

There were at least forty people. Reverend Green turned to the police officers. "How many are we to expect? How many are in the mine?"

The smaller policeman spoke first. "Father, there are at least three more busloads of people at the mine. Some won't leave, but you should expect at least another one hundred twenty or more. We're making it clear that we're only allowing families of the miners on the busses."

"How many were in the mine? Do we know?"

The second officer answered. "They think twenty-eight. They're putting together the rescue team now; they should go later in the afternoon."

Reverend Green sighed and bowed his head. "Are you going to stay here?"

"Yes, Father," replied the smaller one.

"Good." He looked up at the man. "We're not Catholic here, so please don't call me Father. I'm a Reverend. We're Baptists here."

"Okay, Reverend. You got it." The policeman tossed a small salute his way, and smiled.

Reverend Green went back inside and headed toward the meeting room. They were going to overflow, so he approached one of the senior church ladies. "We'll need more blankets, and we'll need to open up the sanctuary for people. There will be more. How are we set for food?"

"Could use more," said the woman. "We'll do what we can."

"Talk to my wife. She knows who to call at the other churches. We all need to get involved in this one. Twenty-eight is what they say are in the mine. I pray to God some of them make it out." He looked at the clock on the wall. Eleven thirty in the morning and the first rescue team had not yet gone in for a search. This was going to be a long, long day. He prayed a little, looked up, and then purposefully stepped into the throng of people, arms outstretched, comforting and welcoming.

Soon another bus arrived, then a second, and then a third. The building was nearly to capacity and the food was running low. Within an hour, a group of Catholic ladies, all of them down-timers, a mixed group of Methodists, and a down-timer group of Lutherans had arrived to help out. There were up-timers in the mix, but most of the crowd were down-timers.

It wasn't too much longer before the reporters started to arrive. There were five or six of them out in the street, kept there by the police officers' watchful eyes. One of them managed to talk his way in, but was soon discovered and tossed out unceremoniously by two very large and angry Methodist women, with support from a pair of Catholic church ladies. Pastors, preachers and priests showed up to comfort the waiting families. Social services were there. The place was filled to capacity. All they could do now was wait.

So that's what they did.

Every half hour, Reverend Green would walk around the church, stopping to talk, to tell someone where to get help, how to notify someone who wasn't there, offer support to the visiting clerics, and check in the back to see how all of the church ladies were getting along. He didn't have a lot to worry about. The groups of women were self-organizing. They agreed on shifts to support the Baptist core group, with relief coming from all other quarters. He stuck his head in the back rooms, and observed them for a moment. It was more diverse than it had ever been back up-time. The Protestant denominations were well represented, as well as support from both of the synagogues in town. There was even a fledgling humanist society represented, and those three people were in the back, working hard.

He leaned against the doorframe and took a moment to watch this miracle. This group of people had become a community, far more disparate than anyWest Virginia town could ever be, and yet it still functioned almost the same way. Good people looking out for good people. He smiled inwardly. After all, isn't that what a community is supposed to be? Come together in times of need, despite differences. Answer to the common threat, defend the common good? Here in the back room of his Baptist church, were people from different times and faiths, together. Side by side at the sinks and the ovens. Hauling out the garbage, cleaning the countertops.

His inward smile turned quietly outward, as he realized that even in the darkest tragedy, there was good.

From that, he took strength.

* * *

The leader of the mine rescue team was a coal miner named Hank Jones. He had been part of a rescue team back up-time. In his mid-fifties, he was still in good shape and was still an active coal miner. Experience had taught him that he should expect something like this someday, and knew that he would have to have a team to back him up.

The typical rescue team is five men. Hank had been training with a group of down-timers he personally selected. He'd hoped to be able to give one of the men a team of his own and expand the training, so that there would be a backup. But there hadn't been time to do so. Never enough time.

Hank and the team were ready to go in. Stacks and Larry had wanted to shut down the fans, shut down everything before they went it. Hank knew better, and there was a heated argument about what to do. It was critical to keep the situation underground stable, to not change the conditions and potentially create new hazards. It was a basic rescue team procedure. Hank's job as a team leader—*the*team leader—was

to take charge.

He had to assert himself. When the rescue team is called, they*own* the mine and everyone else works for them. Mine owners, maintenance, management, everyone. There were some Swedes from the army, a couple guys that tried to take charge with a national defense posture that Hank also had to squelch. He was in charge. That's what happens when you call out a team.

Normally he wouldn't assert himself that way. He would hang back, learn who everyone was, take opinions, and collaborate. But this one was personal, for him and everyone at the jobsite. Larry Masaniello was taking it particularly hard and it could be affecting his judgment, Hank decided. But Hank didn't call Larry on it in public. He asked for a meeting off to the side, and focused Larry on supporting Hank. And the families.

"Keep these guys off my back, Larry. Let my team do our job down there. Keep the army out of this; that's the last thing we need. We brought them into the disaster planning as a courtesy more than anything else. Help me with those assholes. Focus on them and focus on the families. Have you delegated anyone to speak to the families over at the church?"

Larry shook his head. "No. That has to be me." His eyes began to cloud with tears. Hank could see him struggle, and then smile. "Funny, we never picked anyone for that position in the event of an emergency. Sorta like we didn't think it would happen."

Hank grabbed Larry's shoulder. "You know it's bad. I know it's bad. But at least be honest and open with them. Don't give them a lot of hope, but—well you'll know what to do. Just be the man that you are. It's all you can do."

The five-man team was ready for the job. They had trained and practiced, sometimes on their own time, sometimes by being paid overtime for the long hours extra they put in. They had the best equipment, including the extra-bright battery cap lights and flashlights. But for four of the men, it was their first real rescue mission.

As they approached the lift with the thin wisps of smoke streaming out, Hank spoke. "All right, you guys. Are you ready for this?" He looked each of them in the eye as he looked around the huddle. Each man met his eyes and nodded. Hank looked for uncertainty and saw none. They were going to have to depend on one another to a degree that they had trained for but never actually experienced. Satisfied with their silent answers, he proceeded.

"Step one is to re-establish communications. Since we don't have any more phone wire, we'll have to trace and repair what we find. We have practiced that in our SCBAs. We should be able to splice the wires within two minutes even with the tank and air mask of the SCBAs. That's what we'll do. We think most, if not all, of the men were at the west face. It's the deepest part of the mine and the furthest away. Since we don't have the ability to put down a full borehole, we're having the well-digging truck try to hit that part of the mine. They will be able, maybe, eventually, to get an air sample. If the improvised bits work, and if it digs a straight hole and doesn't miss. We'll take readings for carbon monoxide and methane every one hundred feet of travel, and stay within sight of each other at all times. Nobody gets out of sight, not unless we plan for it, and all members are aware.

"After we get the phones working and after we understand the mine atmosphere, then we can start looking for survivors." Hank realized he swallowed that last word. Survivors. Based on what he saw and what he knew from the past, it was unlikely that there would be any survivors. But the first team in was always a rescue team, seldom a recovery team. And he intended to keep it that way, until he was

absolutely sure.

They stepped onto the lift and gave the signal to the operator. They went down slow, taking air quality readings as they descended, not using their SCBAs. It was smoky, but breathable.

The next hours would be painstakingly slow, as they repaired the phones, established communication, and began the advance down the main tunnel.

* * *

It was three in the afternoon when Larry pulled his pickup truck in front of theBaptistChurch . It was a busy place. He looked over the notes in his hand and steeled himself. With the short days of winter, the daylight was already taking on dusk-like appearance, and it gave an unreal diffused glow to the imposing church. What he was about to do was going to be the hardest thing he had ever done in his life, and he wasn't sure he was up for it. He hoped his wife had made it here. He was going to need support for this.

He had nearly made it to the front doors when he was recognized by the reporters, who shouted out his name, and began to fire questions. "Larry . . . Larry . . . Can you tell us how many might have died? . . . what's the body count? They said that there would be no announcements at the mine, and that everything would be announced here. Is that correct? Did anyone survive? Is the search still going on? We're on a deadline here. People have a right to know . . ."

It was the "right to know" that made Larry turn on them. He had told himself he would ignore the press, but that got to him in a way that surprised even him. He turned to the reporters and a small group of curious onlookers. He exploded. "I'm here for the families of the men who are in that mine! Nobody else. They're what's important right now. You wait your turn, you God damn vultures."

There was one reporter in the front who knew his trade and saw an opportunity when it presented itself. He slipped past one of the barricades that had been erected and started in on Larry. "So there are fatalities. How many? What did they die of? Are you confirming that there are fatalities?"

Larry started to go for him but couldn't move. Reverend Green had opened the doors and five or six pairs of arms were restraining him. He struggled for a moment until he realized he was being restrained and then relaxed.

Reverend Green leaned toward him. "Priorities, Larry. Remember what's important."

Larry looked at Reverend Green. He didn't know the man all that well. Knew who he was, but didn't really know him. His respect for the Baptist minister went way up that afternoon. He nodded. "He's only doing his job, and it seems he's a better at it than his cohorts. Come inside. I've saved a little coffee for you, if you want it. There are a lot of people who have been waiting for you."

Larry wasn't prepared for what he saw when he stepped into the sanctuary of the church. He froze. There were more than three hundred people crammed into a place that was designed for only two hundred. An image from a horror movie, Alfred Hitchcock's*The Birds* came into his head. The scene where Tippi Hedren was in the attic, and the killer birds were packed into every nook and cranny, all quiet, staring, and ominous.

He tried to swallow but his mouth was dry. There was a pathway being made to the pulpit. He saw his wife Erica there. She was looking at him too, but in admiration. He locked eyes with her, and moved through the crowd. He could do this. Just maybe, he could do this.

After some introductions, and with a chalkboard relocated from the one of the Sunday school rooms, Larry began. The tension in the room was brutal. "First of all," he began, "I want to thank Reverend Green for his hospitality in accommodating all of this. But I understand that there are people supporting this church from all directions and faiths. Every part of this community, old and new, is here. For that, I thank you all. As I go through this, I'm going to stick to the facts, and what I know for sure. But . . ." He paused, trying to find the right words. "I'm not going to pull any punches—I'm going to tell you like it is as we see it. I'll tell you everything I know. But no matter how bad it gets, don't give up hope. We have hope."

He stepped to the chalkboard and drew a line to show the surface, a vertical tunnel, and then a horizontal tunnel near the bottom of the board. "We know that something happened. We think it was here." He drew an X at the end of the bottom tunnel. "We don't know what. When it happened, there were men working there . . ." He drew a circle around the X. "And over here." From the vertical shaft, he drew another horizontal line in the opposite direction from the first, only much shorter. "And we had men working here." He drew another circle at the end of that tunnel.

"We had men working on tasks at different ends of the mine. The distance from this X to this X, is about one and a half miles. When something happened early this morning here . . ." He pointed to the first X. ". . . the men from here went to help." He pointed to the second X in the smaller tunnel. "The men in this longer tunnel were the more experienced miners. Those in the other end were mostly apprentices with our most senior man.

"Since the explosion we felt, we have not heard from any of them. There was contact shortly before that explosion, but none after. All of the communication in the mine is down due to damage, so we needed to send men inside to see. There are men in there now, and they're setting up communications and trying to move forward. The further they go, the more damage they're seeing, indicating that whatever happened this morning—the explosion, also happened at this end of the mine." He drew a circle around the end of the longer tunnel. "That's where we think everyone was."

He stopped at that point and looked at the audience. There was a range of reactions, all of them subdued, some of them delayed as translations were made. Several sniffles. But these were a pragmatic lot of people, and the reactions were more stoic than he expected.

"The further we move into the mine, the worse the smoke. The air quality—the survivability of the air that they can breath—is diminishing. The rescue team is now wearing what we call SCBAs, or 'self-contained breathing apparatus' because the air in the mine won't sustain life." He paused, letting the statement sink in. There were several sobs as the understanding grew. It was if nobody wanted to cry out first. Eyes went back to him.

He let the room settle a moment. "That does*not* mean that they're all dead. It just means that we can't breath the air on the way in. We're attempting to drill a hole from here . . ." He put an X on the surface above where the miners were. ". . . to pump in air to this area." He drew a line from the surface down to the end of the long tunnel. "That will take us most of the night, if it works. There's a lot that can go wrong in drilling this hole. We're using equipment that's not designed for this, and it's slow going.

"We're also moving down the tunnel from the elevator to the area where the men may be trapped and unable to communicate. This is being done by the rescue team.

"So far, we have found no one, alive or dead. It will be after sunrise tomorrow that we think we'll have the hole drilled, or the men down to the end of the tunnel." He paused for a moment. "This is hard, I

know." He stepped from behind the pulpit, so there wasn't anything between him and the audience. "Members of my family have sat in those pews the same as you, waiting for words, alive or dead. It will take time, and even when we find the dead, it may take time to identify them. We won't announce anything until we're positive. It may be several days. I can take questions for as long as you like and I'll be staying here through the night with you."

The questions went on for many hours, and Larry answered them all. Honestly and to the best of his ability.

He met every person in every family.

He was right. It was the hardest thing he had ever done, or ever would do.

* * *

Hank was tired. His men were tired. They were nearing the limits of their endurance and were very close to giving up when they got the news from topside.

The air sample that had been pulled at the far end of the mine, where the well-drilling rig had managed to break in, had shown very high levels of carbon monoxide. Levels that couldn't sustain life even for a little while. Miners had self-rescuers, and additional ones were scattered through the mine and on equipment, so the possibility existed that someone could have been swapping them out over the last thirteen hours, but. . . . But, if the guy had that kind of energy and wherewithal, he would have gotten out by now.

Hank sat by the phone, took off his mask for a moment to grab a slug of water and quickly put it back on. He sat with his back to the ribs, and his hard hat off to cool his head. He motioned at the guys to gather around him. He looked at his watch. They had broken every rule about how long a rescue team should be in a mine. But he had no choice. Dawn of the second day had broken above them, and they had found no bodies, no survivors, and massive destruction. The explosion had blown all of the seals down, along with most of the lighting, vacuum breakers, mining carts. Even all of the mules were dead, over thirty of them in their stalls. The loss was just about total.

Hank was trying to decide if this was a rescue mission or a recovery mission. Recovery meant that they had to leave now, rest, re-equip, and come back to fight the remaining fires and remove the bodies. "One more crosscut, guys, and that's it. We don't want anyone to have to look for us and drag our butts out of here in a body bag. One more crosscut, and we terminate the mission. The far end of the mine does not have a sustainable atmosphere, and we're way past the time when someone could use the self-rescuers to survive. They only last for an hour when new, and all the ones in the mine are a couple of years old." He held out his arm, and one of the team members helped him to his feet. "One more crosscut, and we call it."

The other members of the team looked at each other, and nodded quietly. They fanned out across the tunnel and went deeper into the mine.

* * *

The onlookers at the mine scanned the sky when they heard the buzzing sound of an aircraft in flight. They searched the clear and cold morning sky. The direction of the sound couldn't be pinpointed. Most people turned to the north, the rest turned in multiple directions. The aircraft came into view from the northeast and the gathered crowd turned to watch it. The aircraft began a long slow turn around the rising column of smoke. It circled only one time, and then turned toward the landing strip.

A murmur began, wondering who was on the craft. Rumors flew. Guesses were made. Most of the down-timers had no idea who it would be. It was certainly not important, at least for them.

* * *

Mike Stearns stared at the column of black smoke rising from the metal structure that made up the entrance of the mine. From his perspective in the Belle, eight hundred feet above the ground, it looked bad. Very bad. He leaned his forehead against the cold glass canopy as the airplane made the wide turn over the mine. He was aware of the upturned faces pointed in his direction and just as aware when they turned back after identifying the plane, focusing on the reality in front of them. Whoever was flying above them wasn't important, not today. He looked at the smoke again. His breath began to cloud the glass in front of him. He let it obscure his vision. Is this how a mine owner feels when something like this happens in his mine, under his direction, he wondered. He had always hoped so, in the past. But he was never sure.

* * *

Larry was nudged awake gently by Reverend Green. "Telephone, Larry. They want to talk to you. The mine. It's Stacks."

Larry eased to a standing position and every eye that was awake followed him. When they saw he was moving toward the phone in Reverend Green's office, the people who were already awake woke the others. Larry let his wife stay asleep, closed the office door behind him, and picked up the phone.

"Masaniello."

"Larry, Stacks. The drill got in, we pulled a sample, and it was only eight percent O two. There's no way . . . they took a couple of samples just to be sure. They've been down there too long. We think we need to call it. I have been in touch with Hank and he's going to do one more crosscut, then we'll transition into a recovery mission. But he and his team need to come out, no matter what." Stacks' voice was flat, almost emotionless. It was as if he let any emotion into his voice, he wouldn't be able to control it."

"Thanks, Stacks. You did what you could." Larry hung up the phone and turned to Reverend Green. He simply shook his head.

"You did what you could too, you know."

Larry scoffed. "Did I? I don't think so. There's always something else I could have done, or should have done. Some procedure, some rule about safety. I don't know . . . *something*. I'm responsible for their deaths. Nobody else. My mine, my responsibility."

There was a soft knock on the door and Erica poked her head into the room. "Someone here to see you." She opened the door and Mike Stearns walked in. The look in his eyes mirrored the one in Larry's. Grief and pain. Mike and Erica came in, and closed the door behind them.

Larry looked directly at Stearns. "They're calling it, Mike. They're all dead." Erica came to him and gave him a gentle embrace. Mike just nodded.

Larry looked at the ceiling, tears welling in his eyes. "Mike, I'm a coal miner from a little town inWest

Virginia . I got no business runnin' a mine. Crew of guys, yeah, maybe, but a whole fucking mine? What was I thinking? Hell, what were you thinking? I wasn't the right guy for this at all. No wonder Quentin Underwood is such a prick all the time. Who could live this way?"

Erica pulled herself closer to him. Reverend Green looked at Mike, and his eyebrows went up, as if to say "Well . . .?"

Mike took a step forward. "Would it help you to know that I have been anticipating this for over a year?"

They all looked at him with surprise. "What we're doing here isn't trying to make a buck off of the backs of our brother miners, Larry. That's how Quentin thinks. That's all he thinks about. That's how he can do what he can do. He has skills, but no, I dunno—no*humanity* , I guess. He's perfect for this shit, precisely because it doesn't bother him." Mike leaned back against the door. "But you and me, we're different. We're not trying to make a buck. Do you know*what* we're doing, Larry?

Larry was confused and angry. "We're digging a hole in the ground and killing people for coal."

There was a brief flash of anger in Mike's eyes. "That's right, Larry. But why do we have to do that? Think about it. Why?"

Larry hung his head, and stared at the floor for a moment. He then looked up at Mike, then his wife, and finally Reverend Green. He pointed to the door, and the people gathered outside the office. "I need to talk to them."

Mike nodded, slowly at first, then empathically in a final nod. His wife—"*thank you Lord, for Erica* "—just hugged him.

Reverend Green spoke next. "We'll follow your lead, Larry. You take the pulpit and we'll be behind you. We'll be there."

Larry took a deep breath and let it out. He straightened and headed for the door. When the phone rang, he was caught off guard, and actually jumped a little. Larry stopped as Green answered, "First Baptist." There was a pause. "He's right here." He handed the phone to Larry.

"Masaniello."

"Larry, Stacks." The tone of Stacks' voice wasn't anything like the last call. The emotion was overflowing, and he was close to tears. "We found two guys! We found them alive!" Larry could hear a background of cheers and celebration. "I just got the word from Hank. We're sending down two spare SCBAs and a stretcher team. One of them is pretty bad, but Hank thinks he'll make it! You won't believe it! Metzinger, that clever SOB, was living off of compressed air. He was in the tool crib—and you know that air is piped in there for testing the pneumatic tools—so he set up a compressed air line, a valve, and they got under some plastic sheeting. They've been there for over sixteen hours! They're fucking alive!"

"Thanks, Stacks. What are the names?"

"Wilhelm Metzinger and Willy Huenefelder."

Larry wrote the names on a pad of paper from the desk. "What does Hank say about the rest of them?"

The tone of Stacks voice changed again. "He—Hank, uhh." Stacks volume lowered on the phone, somewhat conspiratorially. "Larry, I don't know that I agree. Now that we've found these guys, I think we should keep this a rescue mission, not a recovery. Hank is saying that it should be a recovery from here on out. I don't know, and some of us think that—"

"Stacks, if Hank says it goes to recovery, it goes to recovery. That's his call. That's what he does for us. Does the compressed air go any further than the crib?"

"No. Metzinger had to rig up something because it was damaged downstream from the tool crib."

"Then there's really no hope, is there, Stacks?"

"No." He heard Stacks half sigh and half sob into the phone.

"Thanks, Stacks. And, Stacks . . . good job."

"Thanks, boss."

Larry placed the phone back in its cradle, and double checked the two names on his paper. He turned to the others in the office. "They found two of them alive. Metzinger and Huenefelder."

Smiles broke out across the room. Then Mike very quietly asked a question. "And the mission changing to recovery?"

Larry nodded. "Hank called it. One miracle is all we can expect per day, I suppose. This actually makes it harder for the twenty-six other families, doesn't it? And it won't be easy for the other two, either."

Larry straightened with as much resolve as he could muster, rubbed his face with both hands to clear his eyes, picked up the paper, and strode to the doorway. The others filed out behind him.

* * *

It took almost a month of working around the clock to get the mine back in operation. Things were tight for energy supplies over the last part of the winter, but by spring, production had resumed. In the meadow, where the monument stood for the up-time miners who had been killed in the Number 9 Mine disaster, the bodies of twenty-six down-timers were buried. A stone was erected for them, with names and other words carved into the face, in English and German.

They have not died in vain.

These men fought the battle under the ground, just as others fought it above the ground, on the sea and in the air.

These men fought for the community and the nation, and through their sacrifice, helped to bond them together.

We are all in their debt.

The Salon

By Paula Goodlett

and Gorg Huff

"Ah . . ."

The sound of a throat clearing drew Heather's attention away from the paperwork on her desk at Trommler Records. "Hey, Jacob. What's up?"

"It is Thursday, Heather. I wanted to leave about three so I can attend the salon."

"Salon?"

"The salon at Rachel Hill's house. Surely you've heard of it? People come from all over to attend them."

Heather had to search her memory. "Hill. Hill. I know an Ashley Hill; she's on the geology survey team. But I don't remember a Rachel."

Jacob shook his head. "You amaze me, you up-timers. There's a treasure in your midst and you don't realize it. You should come with me, meet her. See the electric car."

"Oh. Her. I remember seeing the car. But I never met her. Grantville isn't that small and I was a kid back then." Heather wondered if he meant to ask her on a date. She liked Jacob, although his taste in music was horrible. On the other hand, his taste in music was one of the reasons Trommler Records had made such a splash. The oldies she preferred sounded like horrible screeching, at least that's what Jacob said.

"You should come."

"Sure. But I want to break for lunch now, then I'll come back and we'll go." Once Jacob nodded and left, Heather headed for the one place she knew she could get the low-down on anyone in town, the City Hall Coffee Shop. Cora would know all about Rachel Hill. Cora always knew everything about everybody.

* * *

"Come on, Jacob." Heather grinned over at Jacob, who didn't get nearly enough exercise, apparently. "It isn't that far and the road isn't all that tough to walk."

"We could have waited for the bus," Jacob grumbled. "Or a cart. Or a wagon."

"Silly. Not that many vehicles come out this way. Now, let's hurry a bit. This was your idea, after all. It's your own fault."

The gravel road wound a bit, but not as much as some in Grantville. It was also quiet, very much so. Heather looked around, enjoying the fall color and the peace. These days, Grantville was much busier than it had been in her childhood. More people came in every day, it seemed.

People from everywhere, just about. One of the truly big surprises to many of the residents was just how much—well, tourism—there was in the seventeenth century. Young men went on grand tours all overEurope . Young women came in for the economic opportunities that abounded in the area—not to

mention the right to vote.

But this road was quiet, which was a welcome relief.

"There's the little bridge." Jacob pointed. "And that's what used to be the garage, but the Mehlers made it into a nice little cottage. We go left when we get there."

"Ah."

Jacob grinned. "I always feel that way when I see Rachel's house. Once you get here, you feel like there isn't another person within a thousand miles."

They stopped to admire the view. It did feel like there couldn't be another person anywhere near. The hills reached up and blocked any view of the town, and there wasn't another house near. It was perfect. Today was a bit misty, the fall colors were at their best; and the deep red house was in a perfect setting. Across the graveled road, a tiny waterfall trickled down the rocks.

These days, since the Mehler's arrival, what had been lawn was mostly garden. Herr Mehler had become seriously interested in what one of Rachel's many books called "French intensive gardening," so he had deeply dug three-foot wide beds with paths between them.

"It still seems strange that so few people in the town knew about Rachel," Jacob said. "Now that her salon's are so well attended."

"She kept to herself, mostly." Heather hesitated. "After the accident, when she couldn't get around very well, she got to be pretty reclusive. In a way, the Ring of Fire did her a favor, I guess. That's what Cora said. I mean, people sort of knew who she was, since she grew up here. But she went off to college and didn't make a real big splash when she came back."

* * *

The house was laid out in a typical farmhouse pattern, with four rooms on the ground floor. Considering the number of bodies in the living room, Heather was glad the ceiling fan was turned on. Jacob introduced Heather to Rachel with what seemed a proprietary air. What Heather couldn't figure out was what he was being proprietary about, Rachel and her salon or Heather. He seemed to be showing off the cultural jewel of the salon to Heather and Heather to the gathered group. It was quite a group, at that.

There were eleven people in the living room. Jacob introduced Heather to them all. Father Gus from Saint Mary's was there, along with Father Nick Smithson. There was also a Spaniard who introduced himself as Don Diego Valdez y Mendoza. He immediately wanted her to confirm that up-timers really did believe in astrology. After all, they published horoscopes in the newspapers up-time. It was immediately apparent that this was a conversation that was repeated with each new up-timer to join the group. Apparently he wouldn't, or couldn't, give up on his pet notion.

A Frenchman with the name of Pierre de Cancavi claimed "I'm going to build an airplane as soon as I can put together the money."

He was arguing with an Italian named Gasparo Berti, who insisted, "Waste of money. Lighter-than-air craft are the real future of aviation. It was no more than an accident of history that that prevented the up-timers from properly exploiting the advantages of dirigibles. Granted, they were—and are—militarily useless but who cares about that?"

"The military?" Magdalena Van de Passe, one of the few people Heather knew, suggested. Heather hid a giggle.

Gasparo Berti paused and looked atMagdalena severely for a moment. Then gave a half smile and a hands-in-the-air Italian shrug. "Dirigibles are elegant. Stately even. Besides, they carry more."

Heather let herself be carried by the flow of the group. She saw Vladimir Yaroslavich and looked around for Brandy Bates. Seeing Prince Vladimir without Brandy was a surprise these days. "We were caught in the middle of changing the structure of our armed forces." He was talking to a Polish gentleman named Jan Brozek. "Don't make too much of it, Jan. We won the next one after all."

"But that was after the great freedom had turned into license," Jan Brozek insisted. "That won't happen this time."

"Neither did the Smolensk War," Prince Vladimir countered "At least not yet. Don't count too much on it going the same way. It did in that other time line, but too much has changed. Guatavus Adolphus is still very much alive—busy with the league, but alive and well with his army intact."

"Why the change from Important Speeches to Frivolous Music?" Heather could hear the capitals in Herr Gulden's voice. She learned later that he was in Grantville fromAustria . Meanwhile she shot Jacob a look and he cringed.

"Yes, why?" Herr de Groot actually seemed interested rather then calling her to task. She later learned he was fromHolland .

"Because people like music," Heather said to the nice one. "They don't, as a general rule, like speeches—at least not to listen to everyday . . ."

Then she got into a discussion about the difference between seventeenth-century and twentieth-century ballet. The French guy was back, insisting that for the most part the down-time French version was better—though there were no doubt a few points they could pick up and had she seen the Christmas show inMagdeburg ?

It was starting to get a bit much for Heather. It wasn't that the people here were dumb, quite the contrary. But she was rapidly coming to the conclusion that no one could foul up like a smart person. They would say something really insightful, then finish the sentence with something totally off the wall.

Rachel caught her eye and indicated a door with her eyes. Heather retreated and found herself, eventually, in the kitchen with Rachel and Frau Mehler, a stout German woman.

"Did the air heads drive you out?" Frau Mehler looked cross. She was washing up a stack of the trays that refreshments had been served on.

Rachel grinned. "Be nice, Helen." Then she looked at Heather. "I call it 'candy store syndrome.'"

Heather gave her a questioning look.

"Believe it or not, that room—" Rachel pointed at the living room. "—has some of the brightest minds inEurope in it. Seven out of ten of those people made it into the history books as great thinkers of their time. It's not requirement to get invited; I don't work that way. Still, it's true. The reason they seem a

little . . . ah . . . vague sometimes is that they are the ones who got to Grantville and jumped into the ocean of knowledge we brought with us without bothering with a life preserver. Some of them haven't come up for more than the occasional breath in the last three years. They're like kids in a candy store, nibbling on this piece of knowledge, then getting distracted by that one. No time to digest what they have already learned. There is always another chocolate covered truffle of information to try to swallow whole."

"I've seen the effect." Heather laughed.

* * *

By the end of the evening, Heather's head was spinning. She was full of the snacks that had been served, as well as the beer and wine. Perhaps a bit too full, since the spinning head might not be just from all the conversation. She had stayed with Jacob, mostly. He moved from group to group, sometimes listening, sometimes conversing. That had helped, since it kept Heather from feeling that she was in over her head.

She took a deep breath of the misty air. "Wow. Who knew?"

"Well, I did," Jacob said. "Perhaps it is just because everyone is always so busy. You up-timers, at any rate. Always working, day and night, so many of you. Always doing."

"I suppose."*Right now* , Heather thought,*what I'd really like is for you to take my arm again.* The thought surprised her a bit. Then she realized that with Judy and the other girls gone toMagdeburg , she was simply lonely, without the companionship she'd come to rely on. Which was another surprise, that she relied on anyone.

He didn't take her arm again, though. Or try to kiss her good night at the door. Or any of the other stuff a guy who was interested in you tried to do. It was kind of disappointing.

* * *

Jacob didn't try to kiss her that night. He didn't have the nerve. Trying to kiss a young, pretty girl who is much richer than you are—and an up-timer to boot—took nerve. At least for Jacob it did. It took several more visits to Rachel Hill's gatherings before he worked up the nerve. Plus some not-that-gentle prodding by Rachel. It was the covetous looks that Pierre de Cancavi was casting Heather's way that finally pushed Jacob to boldness.Pierre really wanted someone to fund his airplane and Jacob was afraid that he would try to seduce the money out of Heather. Well, at least that's how he justified it to himself.

The Launcher

By Richard Evans

Bern, Swiss Confederacy, Early Spring, 1634

"Will this spot work?"

"Looks high enough." A few steps toward the edge of the cliff let Peter gaze down toward the ever—but slowly—growing lake below. The lake, cut out of the fast-flowing River Aare, had been intended to slow the river down as it passed the city and allow for new dockyards to be built, as well as to give the city

access to the river rock needed for its explosive growth.Bern was trying its best to be the center of technology and science in the Swiss Confederacy.

Technology, dribbling in from the city called Grantville, was making its way toBern andLucerne . The other cities of the confederacy, exceptingBasel , were waiting to see which way the winds blew.

Karl and Karl were surprised when Peter, a journeyman clock-worker and newly-named master machinist, had offered them a deal to develop an aerial launcher overlooking the new shipyard. He never really told them what it was for, but he needed their help and was paying for their expertise.

"Come spring the pamphlets will go out. By summer we are to expect many competitors to arrive. You've seen the latest posters, have you not? Should more arrive, we'll stretch out the competition. The visitors will spend all summer perfecting their machines and I will be enriched by the monies they spend. It's my shops they will rent to perfect their designs to make the parts they need!

"Imagine every mountain top having its own catapult and a messenger craft to fly out mail, or warnings, and even to take the rich for rides in the sky! We'll be rich," Peter exclaimed. "Rich indeed! We pay the winning designer a small prize, just a percentage of the entrance fees. And then we'll own the rights to develop the craft, too!"

"And all we have to do is build this launcher?" The shorter Karl, Karl Hoffman, crooked an eyebrow and peered over the edge. He was a carpenter by trade, but had recently been trained in machining aimed towards making better roads and tracks for the new mountain rails.

Due to their rich patron, Peter Gerber, he and Karl the Tall had work for the next year at least. And it was a council-approved job that would also count towards their new guild's training requirements.

All they had to do was design a proper horizontal catapult to give any craft placed on the tracks enough impetus to clear the thick trees below and—hopefully—reach the new lake . . . or perhaps even beyond. Any craft, be they packages using something called "parachutes" or man-powered gliders or even aircraft powered by pedals and gears or engines. Karl had seen his first engine last winter. It just powered a small toy boat, but ran on nearly pure alcohol, naphtha and lamp oil. But he could imagine larger versions of such engines.

Peter didn't care which craft was tried. He just had to prove that this launcher could and would be able to move a load across the mountains and do so faster than the best runners or riders could do it on the roads. If it also worked for aircraft, even better. That'd mean more money and more visitors toBern .

Karl the Tall lowered himself over the side of the cliff, swinging over the drop and holding onto one of the ropes wrapped around what would become one of the anchor trees for their catapult. He swung back fearlessly, grabbed a branch, and pulled himself onto the solid rock of the cliff. "We can drive our shafts here and over there and build the deck and extend it out over the edge . . . ten, twelve feet easily."

"What about the tracking? What are we going to use for track?" Karl the Short asked.

"I acquired some of the older iron-capped wooden rail that they've replaced with good steel rail down at the mines. Don't you mind how I got it. Just know we got enough for a thirty-foot stretch on each side," Peter said smugly. "I know someone who knows someone who didn't want something embarrassing exposed."

"Wish the magazines you bought us had more pictures, Herr Gerber. I'm not so sure about the rope and

pulley catapult system Herr Ramsdell came up with. Sure, his father's father was a shipbuilder and kept very good logs and drawings, but it's going to be a pain to raise the weights each time we try for a launch. And I don't trust any Englishman, even if he's thirty years dead and buried. And Herr Ramsdell is only a clock-worker himself. What's he know of mathematics and leverages?"

"The Technology and Science group at the new University is paying for most of the research. So the posters say," Peter offered. There was no such group inBern , yet, though he was trying his best to make it so.

The closest thing there was to such a group was the new Library of Science and Technology that consisted of books copied from Grantville, available for anyone who could pay the proper fees. As well, articles and copies were sent south with every mail carrier and merchant heading through the Confederacy.

"You all saw the prize money we're offering for a proven flyer." Peter laid out the launcher's design drawings and began to pace off the space that would be needed. "If enough flyers show up, this project will pay for itself many times over and let me try out all of my other ideas."

The others muttered their agreement and started to work. There were a lot of trees that would have to be cut and cleared to make the runway and ramp for the catapult. If they were lucky, this competition would run every year, possibly becoming a tradition. One day there would be a winner, but by that time . . .

"Karl, I still think that water looks awfully hard and unforgiving from up here," Karl the Short whispered.

"Well, just be careful, Shorty. Pretend we're only building a dock here. Just mind that first step."

Three months later

Launcher One, overlooking the River Aare and theBern Dock works

"Stand by for test firing of the aerial package load! Engage the safety locks once the weights are up! And be careful that the lines are even and not tangled this time! The last dummy load nearly took out the right pylon!"

Peter waved his red flag, and waited until the men manning the small coal gas engine that raised the counterweights acknowledged him.

"I'm going to check the tracks one more time and make sure the decking is solid. It's rained the last two days. I don't want any warped boards to ruin our dry runs!" He didn't move onto the tracks until he saw the two men manning the locks wave back with their own red flags

Peter inspected every board and inch of the track and, after securing himself in a harness, slid over the side of the ramp and swung down to check below. Huge stone-filled counterweights hung to either side of him. The drop to the lake was a good four hundred seventy feet or more on this side of the valley.

He took out his spyglass and scanned for the marked sight lines his boatmen were dropping, then noted the way the flags were marking the projected paths the test aircraft would eventually take. It all looked perfect.

Today, they'd test site-to-site package delivery. Soon the real spenders, the flyers, would be coming in droves. Peter could feel it in his bones.

Gliders and self powered aircraft were the future. He was sure someone would win the prize, eventually. TheAlps would no longer be obstacles cut through with bad roads, but something to enjoy from high above.

The inventors who came would be risking their lives for the honor and for the money. Peter had a small trophy made to pass out to all those who took the risk. He chuckled. The lake below would make a fine burial spot for most of them.

By the next week at the latest, posters would be going up all overEurope , inviting aspiring flyers and inventors to bring their flying machines to this location for the competition. The initial copies had gone out before winter had set in full.

He clambered back up, wiped the sweat out of his eyes, stomped his foot to test the carpentry work once again, and smiled. The breeze felt great. He wiped the sweat out of his eyes again. Soon science and technology would take a great leap here inBern . Once the citizens below saw man flying, there was no way they could deny the truths of the world.

"Technology is coming, get on board or get knocked aside. Man will fly and the skies will be ours!"

* * *

"Peter's waving the green flag, Hans!" Karl the Tall exclaimed.

"Are you sure?" Karl the Short asked.

"Look for yourself!"

"But we don't have a test-load in place. And I haven't checked the hawsers yet!"

"You going to argue with the boss? He waves the green flag, we pull these levers."

"There he goes. He stomped his foot and is waving the green flag. Firing!"

* * *

"Well, Karl, at least we know the catapult works like Peter said it would." Karl the Short held his hat to his chest.

"Not our fault. He waived the ready flag. You saw it, I saw it. Heck, it's still on the deck over there."

"Yeah, he did at that. Think the investigators will believe us?"

"Probably. Heard he had a nice young wife, too." They exchanged glances.

"He did want to fly at least once in his lifetime, didn't he?" Karl the Tall offered.

"Yeah, he did. Went pretty far, too. Some of him farther than the rest of him, I think."

"Third and fourth marker out past the lake, at least."

"Do we record this as a new record for unassisted flight?"

"Dunno if the widow will buy it."

"Dibs on comforting her."

Every man has his priorities.

Fiddling Stranger

By Russ Rittgers

August 1633

Dolf was the first in his farming village to notice the stranger. Not that strangers walking or riding past on their way to or from Aschersleben were unusual. He was ten, old enough to have finished his formal schooling, or so his father said. "Got your letters and your ciphering, lad. That's all any farmer needs. Knowing more won't help till the fields or harvest the crops."

It was taking forever to get the growth Mama kept saying was coming and the top of his head still only came up to the middle of Papa's chest. Like Mama, he was dark-haired and stocky. Like Papa, he had a broad nose. They both agreed he'd be strong as an ox someday. His little sister teased him, saying his mind was already like an ox. Dolf held himself aloof from such comments made by his trivial sibling. Mostly.

Dolf spent some of his time playing with his friends in the village or the city and still helped his mother regularly in the garden and with the laundry. But most of the time he helped his father in the fields or herding the village's livestock. He was years away from considering that being ten years old and not having to go to school the next year was the best age—too young and small to be considered strong enough to work in the fields regularly and too old to be watched.

Last spring the family had gone to the city to sell their garden produce. Gretchen Richter had been speaking in the town square and he'd never seen a woman speak so powerfully. Men, even his father, paid attention. On the way home his father told him, "Wonderful to listen to, lad. But silver in the hand weighs heavier than words in the ear. Remember that."

Two months later, again entering the city, two men wearing blue sashes stopped them. "Name and village?" the man holding the open book asked.

"It's five pfennigs to sell in the market," the second man explained. "By order of the city council, the Aschersleben Committee of Correspondence now provides services and maintains order there. Pay now or pay after you sell your goods. Leave without paying and you won't be allowed back in without paying double."

Dolf looked up and saw Papa clench his jaw. "That's almost twice what it was the last time we were here. What ever happened to the regular city watchmen collecting the fee?"

The CoC watchman gave a smirking smile. "Some of us watched what was going on when they collected the money. Most of it stayed in their pockets. Several backs were bloodied after a rigorous questioning, and only the Committee watchmen are authorized to collect market fees. The city council certainly doesn't mind receiving far more than they used to."

Dolf thought for a moment Papa would refuse to pay the higher fee, but he relaxed and shook his head, his mouth still tight. They paid the fee and set up their small stall in the central marketplace.

"Don't know why the city council thinks they have to have watchmen at all to maintain order in the market," his father grumbled as they set out their produce. "Never had an incident before, not even when Tilly was staying here a couple years ago. Well, except for the occasional scuffle, but that's never anything."

"I don't know," Mama answered. "But what we saw of the city coming in did look neater."

Later the family looked around the market. In one stall was a young woman with a pleasant smile and several unfamiliar items lying in front of her. "What are these?" Mama asked, bending down to touch a rectangular object.

"Hi. I'm Gertrude Fischel and that is a Laughing Laundress washboard. The one with the rollers is called a wringer. Let me demonstrate what each can do for you." The blonde woman drew a linen shirt from the wash bucket and began scrubbing it on the washboard.

When Mama felt the freshly washed and nearly dry linen shirt only moments later, her mouth hung open. "The time I've spent . . . How much for just the wringer?" The dickering began with Mama occasionally looking up at Papa. He finally shook his head. No deal.

* * *

Aschersleben was only two miles away, so Dolf and his friends from the village frequently ran to the city when not needed in the fields or by their parents. It was a familiar place, since they'd gone to school there. And, sometimes, they snuck away when they were needed. But not often. Their fathers had given them reason enough to know the difference.

That particular day, Dolf tired after only an hour of playing kickball. It was too far to go home so he found a far corner of an empty tavern whose door had been left open. He was almost asleep when four men wearing blue sashes walked in.

The jolly-looking bar owner came out of the back room. He took a quick glance at the empty tables and welcomed the men with a warm and cheerful smile. "How much, Hans?"

"Forty pfennigs that's on the books. Two*Groschen* ." The young man with a scanty mustache spilled the contents of his leather bag on a table. "How about you guys?"

The other three called out their numbers. The bar owner gave a slow, satisfied look as he totaled the count of the fees that had been written onto their books. Next he deliberately separated the coins into two piles, one with over twice the number of the other. He shook his head as if in sadness and gave a slow sigh. "You would think that such a busy market would bring in more money. Only one hundred eighty-five pfennigs on the books. Shameful. Perhaps they slipped by our diligent CoC sentries both coming and going." Dolf didn't understand why he gave a rough laugh and the other four joined in.

The owner scraped the larger pile into a leather bag. "Richard, you take this bag to our highly esteemed leader along with my tally. After sending on the city council's portion, I'm certain he will use the rest for the benefit of the entire city, especially the poor, oppressed proletarian masses." From the remaining pile he made five separate piles of coins, one significantly larger than the others. He pushed that one into his pouch.

"Hey, how come you get a larger pile, Heinrich?" Hans demanded.

Heinrich gave Hans a glance and without warning, backhanded the smaller man, knocking him down. A moment later, the point of Heinrich's knife was scant inches from Hans' eye. "Because I'm bigger, badder and meaner than any two of you." He then stood up straight, lifted his eyebrows and gave a knowing smile. "Besides, it was my idea to investigate the old city watchmen. I convinced Jan Wagner and he convinced the city council. Any questions?" He gazed around at the others. No questions.

No longer looking jolly to Dolf, the large man slipped his knife back into its sheath. "All right then. Each of you take a pile. Richard, you get that bag to Jan Wagner. Don't think about taking out so much as a pfennig. You saw me count out how much was written on your books and I put it all in there. I'll check with him. After all . . ." Heinrich put his hands together as if in prayer and lifted his eyes towards the ceiling. ". . . the money we collect is for the good of the people."

After they left and Heinrich had gone into the storage room, Dolf crept out of the tavern. He wasn't sleepy any more.

Heinrich scared Dolf down to his bones. He'd never seen such casual, possibly murderous, violence coming from someone who looked so friendly. He didn't dare mention it to his father for at least two reasons. First, Papa might be angry with him going to town when work could be done and then for going into a tavern to sleep. Second, Papa might become very angry and denounce Heinrich and his sentries to the other farmers. Anyone who was that ready to use a knife, well, Dolf thought that would be a bad idea.

Likewise, Dolf didn't want to go directly to the Aschersleben CoC leader. He didn't know who he was and might mention something to a friend of Heinrich's by mistake. In fact, he knew only one member by sight—Gertrude, the woman selling the wash boards, who'd mentioned she was a member. She looked too nice to fight against Heinrich. Besides, why would they take the word of someone his age seriously? He didn't know what to do.

A week later he came across a torn pamphlet lying in an alley. Dolf had trouble with the meaning of the words Spartacus had written, but he finally understood. It was like hearing Gretchen Richter again. But different, very different. Where Gretchen denounced the tyranny of the powerful and their subjugation of the people, Spartacus seemed to apply reason. Why tyranny always fails in the long run and that the people are the ones who ultimately decide what kind of leadership they should have.

Dolf noticed that the pamphlet was printed inMagdeburg , not that far from Aschersleben. Now he knew who to tell about Heinrich. Spartacus wouldn't know how old he was. He wrote a letter describing what he had seen and sent it off.

* * *

The horse was tired. Dolf could tell that by the way it shambled along the road in the heat of a late-August day. Its rider, now walking beside it, seemed to be equally weary.

He was using a long walking stick and turned off the main road towards Dolf's village. He seemed old to Dolf, somewhere about twenty. The only unusual thing about the tall stranger was that he wore narrow-legged boots that came to mid-calf. "That Aschersleben?"

"Yes, sir."

The man gave a relieved sigh. He took off his hat, wiping his brow with his sleeve. "Some water for my horse, please."

"Slowly, there, boy," he said a short while later as the horse dipped its muzzle into the bucket Dolf was holding. After a couple of huge gulps, the man motioned Dolf to pull the bucket away from the unwilling horse. He roughly stroked its neck. "Give yourself a bellyache if you gulp it all down at once. Can I put him up here for the night? I can pay."

"I'll have to ask Papa but I suppose so."

The man was brushing down his horse when Dolf returned with Papa who carried a small pitcher of beer. "Hello. I'm Daniel Bauers. This is my son Adolphus. We call him Dolf."

"Carl Johantgens." He shook Daniel's hand and then took the filled mug from Dolf. After draining it in three quick gulps, Carl gave a contented sigh. He resumed brushing his horse. "Could I leave my horse here in the village? I don't want to pay city rates and I won't need him for a few days."

Papa nodded. "Don't see why not. What brings you here?"

The man gave a wry smile. "Several wrong turns." He pointed towards a long, vaguely triangular box covered with leather by his saddle. "Actually, I'm a fiddler, going from city to city trying to make a living." He grimaced. "Sometimes I find myself working in villages during harvest."

"We don't have much but you can join us for a bite of supper if you'd like," Papa offered.

"Thank you, but Dolf's a growing boy. I can wait until I go into the city tomorrow."

"Nonsense." The conversation went on a bit longer. Dolf finally realized that Carl must have seen a good many hungry farmers as he traveled between towns. But his village really did have enough, having been able to squirrel away seed inside a house in the city when the imperials were besiegingMagdeburg and later when the Swedes came through.

That evening, Carl tucked his fiddle below his collarbone and played several tunes. The village families who crowded into Dolf's home watched and joined in on familiar songs. When Carl took a break he was plied with questions about what was happening inMagdeburg and around the country.

* * *

Carl was about to leave his horse's stall the next morning when his shirt caught on a splinter, tearing a huge three-cornered hole. He was wearing a severe frown when Dolf came into the barn a second later. "Who's a tailor in town?"

Dolf shrugged. "Mama does all our sewing."

Carl shook his head. "No, I'm sure your mother is too busy. A tailor, in town?"

"There's Herr Oehlschlegel." He looked up at Carl, his eyes dancing. "A market woman, you'd really like her, Gertrude, um, I forget her last name, says he's good. He gave her wringer his, uh, recommendation," he blurted, remembering the long word.

Carl gave him a jaundiced eye and cocked his head. "So what's the matter with her? Cross-eyed? Wide as a wine tun?"

"Oh, no, no, no! Just a nice lady. She's a member of the Aschersleben Committee. Sells the Laughing Laundress wringers and wash boards."

"Huh. Aren't you a little young to be making matches?" Carl grinned and tousled Dolf's hair. "Met too many CoC women already. Even Gretchen Richter." He gave a shiver. "The stories I've heard about her."

"What stories?"

"Never mind." He pointed to the south. "I need to head for Aschersleben."

"I'll take you."

"I don't think your mother, or father, would appreciate your taking off this early in the morning. In fact, as I recall, it's the best time to weed a garden."

Dolf winced. It was the best time because weeds could be pulled from the dew-softened soil. A few minutes later he watched Carl head towards the city, his straight hiking stick in one hand and his fiddle box over a shoulder.

* * *

Dolf ran into town as soon as his morning chores were done. He recognized Carl as he entered a shop on a side street. He got to the door just before it closed and entered the shop.

Carl glanced back at the noise of the door bell. "Oh, hello, Dolf."

The proprietor, a short, heavy-set middle-aged man with a small mustache, emerged from the rear of the shop. "*Ja, mein Herr*? I am Adam Oehlschlegel. How may I serve you?"

The younger man gave a rueful smile. "My name is Carl Johantgens. I had a slight accident this morning." He pulled back the right side of his jacket, displaying the large tear in his shirt.

"Ach. Would you like it mended? My wife is an expert seamstress. Or perhaps a new shirt to replace it?"

"I'd like to say a new shirt but my purse says I'd better get it mended."

"What is this?" the tailor's wife, Maria Prost, asked a short while later. She lifted the shirt to expose its interior sewing. The stitching connecting the front and back of the seams puzzled her. "How did they ever make these stitches?" Dolf looked and noted the stitching. Much neater and closer than Mama ever did.

Carl shrugged. "I purchased the shirt inJena . The tailor had a sewing machine from Grantville."

"A sewing machine?" Adam was indignant. "Taking away the livelihood of honest tailors."

Carl lifted a diffident hand. "The real tailoring, the cloth cutting and the fitting remains the same. It's the drudgery of stitching that's been removed. That's how it seems to me, anyway."

Adam glared at him and Dolf giggled. Maria spoke up. "Well, I for one, will not be unhappy to be relieved of the drudgery, Herr Johantgens. The seams still have to be sewn and I sincerely doubt that stitching such as this to repair your shirt will ever disappear." She began picking up the linen threads of his shirt with her needle at one corner of the tear and began stitching.

The bell on the door began to ring again. Two men wearing blue sashes walked in. "Herr Oehlschlegel? We're here to collect our weekly fee," said the young one Dolf recognized as Hans. The rough-looking other man leaned against the wall by the door with his arms crossed.

"I still don't see why I have to pay." The older man was gruff. "I've never had a problem with any ruffians."

"It's not just ruffians, Herr Oehlschlegel." The young man raised his hands to placate the tailor. "The Committee not only maintains order in the market and repairs the stalls but it also provides a low-cost laundry, health education and other services."

"Well, I certainly still don't see why. I've supported my own son, paying for him to attend Latin school until he went off to the university. Why should I have to support anyone else? I give to the church, not to mention the taxes that I pay to the city. Laundry and the other facilities, I provide for my own. Why should I provide for anyone else?"

Clearly Hans had been through this argument before. "Herr Oehlschlegel, we understand your argument. Unfortunately, if we don't collect from you, we have to make up the difference from other merchants. Now that wouldn't be fair, would it?"

"What's fair is to make those who are not paying city taxes pay your fee," the tailor grumbled.

Suddenly the other man angrily strode forward. "Look, old man, you pay the fee or bad things could happen to your shop."

Adam's face flushed with anger. He moved to inches away from the man's face, his hands clenched into fists but not raised. "Bad things, eh? Now you're threatening me? Perhaps the city council should be advised of your tactics," he growled. "Anything happens to me or here and, well, I was a member of the city militia for years. You think you can scare me, who was here for Wallenstein, Tilly, the Swedes and the plague before them? Any threats you can make are pathetic by comparison."

The man drew back his fist but before he could use it, Carl smoothly inserted himself between the two men. Dolf noticed that Carl still had his walking stick in his hand.

"Easy there, both of you." Carl's easy smile did not extend to his eyes. "How much is the fee for this week?" His free left hand dropped to open his pouch.

Hans mumbled, "Ten pfennigs."

"And that's what you were going to charge me for mending my shirt, wasn't it, Herr Oehlschlegel?" Carl turned his head toward the glowering tailor who made no gesture. Carl pulled a Saxon*Groschen* from his pouch. "I want proper change."

The faces of both watchmen were taut while Hans counted out the coins.

The quiet after their departure was quickly broken when, Adam, his face reddened and his fists still clenched, rounded on Carl. "Who do you think you are? I don't need any protection from the likes of them! I've been in fights before! Plenty of times! I can handle myself!"

"Adam Oehlschlegel!" Marie's voice screeched as she waved Carl's shirt. "You're not a scruffy apprentice any more. Do you want to lose all your dignity, behaving like some penniless hooligan? Is that the proper conduct for the father of a man who has a degree in philosophy?"

"Woman!" The tailor's voice was tight in restraint. "We . . . have . . . a . . . customer." He'd apparently forgotten he'd started the argument. Dolf was about to laugh when Carl put a finger over his lips.

"I apologize. Excuse my indecorum. At one time I . . . never mind. You have my thanks."

Carl gave a slight shrug. "In my profession, fighting's hard on the fingers and can endanger my fiddle. So I try to keep fights from happening." He sat and pulled the sides of his jacket over his bare chest.

"A good thing, too." Maria nodded. "Thank God, our son is not pugnacious."

"You mentioned he has a philosophy degree?"

"Oh, yes." Her face beamed with pride before she bent her head again to look at the tear she was mending. "Our son Adam originally went to theUniversityofLeipzig to study theology. He changed colleges, received his degree over five years ago and later became part of the faculty. Have you been inLeipzig ? He is, or was, the deputy headmaster at the Nicolai gymnasium inLeipzig . But he wrote recently to tell us he'd entered the service of Duke Friedrich of Schleswig-Holstein. He's to be the secretary to a diplomat and arrange their missions. Initially they were going toPersia and theRussias but he writes now that things have changed."

Carl chuckled, his blonde mustache spreading wide. "I've been toLeipzig and even visited the university but that was probably well after he left. I don't know if any of my audience was from the gymnasium faculty. My audiences are usually, ahem, somewhat less distinguished." He gestured towards his fiddle case.

Dolf listened as Carl chatted with the tailor and his wife about performing in city markets and taverns. Why, he'd even been to the Grantville Gertrude Fischel talked about!

"There." Maria turned Carl's shirt right-side out. "Not quite good as new but no worse than many shirts in town. As I have cause to know."

"Thank you. How much do I owe?"

"Owe? After paying off those men? For not letting my husband get into a fight? Forget it."

Leaving the tailor shop, Carl squinted in the bright sun. "Where's the public bath? I stink."

Half an hour later, Carl emerged from the bath, his short hair still wet under his hat. Dolf rose from the shade of a doorway. "What are you going to do next?"

Carl cocked his head. "Go to the market and put out my hat. I had to pay five pfennigs to enter town, I paid ten at Herr Oehlschlegel's shop and I'll have to pay your village for stabling my horse."

"But you've got more! I saw them."

"Sure. And if I want to eat tomorrow, I'll have to make more today. Come on, I'm already late starting."

Carl walked through the market, talking with the occasional seller. He approached a shaded stall with a smile. "Hello,*mein Herr* . How goes business today?"

The elderly man with a dozen or so imperfect onions set out before him, stared back. Dolf's parents would never have taken such onions to market. They would rather have used them for meals.

"What's it to you?" the old man rasped.

Carl swung his fiddle case down into his hand. "I'm a fiddler. Let me use the shade of your spot and I'll guarantee more visitors to your stall. I'll buy an onion to eat if I can get it roasted somewhere."

The man jerked his head backward towards the street closest to them. "Woman three houses down bakes bread every morning. Oven may still be hot."

Ten minutes later, all the man's onions were cooking in a closed empty pot in the woman's oven. "Never thought to sell roasted onions," he admitted. "Not too old to learn, I guess."

Carl gave a lazy smile and tucked his fiddle under his collar bone after tuning it. He drew outward-curved bow drawn across the strings. "Do you have a tune I might already know?"

The man was totally unmusical, Dolf thought, listening to him mutter a tune. But Carl must have already known it because he began playing slowly along with the man. "And the words?" Carl began playing again, listening intently to the man and then nodded at the refrain.

People hear a fiddle over most other noises, Dolf noticed as Carl began to draw the bow across the strings more strongly. The fiddle responded and Carl speeded up the tempo. Soon a small crowd gathered to listen.

After five tunes, Carl took a break to retune. One of the audience grumbled in Dolf's hearing as they walked away. "We've got fiddlers who sing better and even better fiddle players here in town." Dolf was surprised by his remark and reported it to Carl.

"I don't doubt it for a minute. The first time I played in public was only a year and a half ago." He smiled again and gestured towards the market. "The thing to remember is that I'm here and they're not. So while I'm not being paid in silver, I am making money. The other fiddlers all have to work because, frankly, fiddling doesn't pay all that well unless you have a patron. But I'm free to move and travel as I like; they're not. It's the freedom to sleep under the bridge but it suits me."

While Carl got ready to play again, Gertrude came up to them. "Good morning. My name is Gertrude Fischel and I'm with the Ascherleben CoC. Do you know any progressive tunes?" The blonde woman wore an expectant smile.

"Can't help but know them if you travel around. Old tunes with new words and sometimes new tunes." He began to sing and play, "There was a Committee maid, whose hair was bright and gay . . ." The song went on for several minutes, ending with how she'd never be afraid and would only marry a good CoC man.

When he finished, some of his audience, like Gertrude, applauded loudly. Others just stood with their arms crossed on their chests waiting for the next tune. Given the uneven response, Dolf doubted that Carl would be playing many tunes of that nature today.

After the crowd drifted away following the end of his set, Carl emptied several small coins from his hat and bent slightly so only Dolf could hear. "Never let the audience think you're making much money. But always leave a coin or two, just to let them know that others have appreciated you and how much to contribute."

"But why do you keep stopping?" Dolf was puzzled, looking upwards to Carl.

"Right now, because I know those onions should be ready. Second, I have to retune. Third, my arms are tired. Finally, this lets my audience continue their shopping. Never bite the hand that helps feed you, in this case the people who are selling the goods that first drew them to the market."

Dolf and Carl each ate a cooked onion. The old man paid the woman who roasted the onions and then doubled his price. He sold out almost immediately. "I should have tripled the price."

Carl shook his head, his eyebrows raised as if in pity. "What and have other vendors roast their onions as well? Then where would you be?" The old man growled but gave a grim smile before walking away.

A few more sets of tunes and then Carl put his fiddle away. "Getting too hot. You can see how the market is emptying." His bag over one shoulder, the fiddle case over the other and his thin walking stick in his right hand, he was about to leave the area when Gertrude stopped him.

"Herr Johantgens, where will you be playing tonight?"

"Thought I'd check the local taverns. At least one of them won't have a fiddler."

"How about trying the Golden Lion? The Aschersleben Committee meets there and I'm certain you'll get a lot more applause when you sing their tunes."

With both Dolf and Gertrude at his side, Carl entered the dim tavern. Dolf recognized Heinrich behind the bar and took half a step back. "To what do I owe this pleasure, Gertrude?" The tavern keeper beamed.

"I have an entertainer for you, Herr Grueber." Dolf was somehow reassured that she was not on a first name basis with the man. "This is Carl Johantgens who arrived in the city today. Did you hear him playing in the market?"

"No, but that's not unusual. How do you do, Herr Johantgens?"

"Well enough if I can make a few coins tonight and sleep under a roof,*mein Herr* . Fraulein Fischel tells me that the people who come to this tavern are receptive to progressive tunes. Not that they're all I'd be playing."

"No, indeed. I like all sorts of music myself. Come, sit down at the table. Let's discuss this over a mug of beer." Gertrude excused herself while Heinrich drew two mugs of regular beer and a small beer for Dolf.

"Good." Heinrich smacked his lips after his first sip and gave Carl a broad smile. "Now, on to business . . ."

Dolf watched the two men negotiate using very different styles. Heinrich was jovial but aggressive, laughing frequently. The much younger Carl was mild and almost diffident. He turned aside what might be considered slights with a soft smile but often revisited issues where there'd been no agreement. It seemed to Dolf that Carl might even be getting the better deal, including the right to sleep in the back room after closing. On the other hand, Carl promised that at least half of his tunes would be common or drinking songs people could sing with and that CoC tunes would not be over a quarter of those played. The most surprising part to Dolf was watching Carl write down their agreement and copy it. Each man signed both copies. "My father was, is, a merchant and ingrained in me early that written agreements save a lot of arguing later."

When they emerged from the tavern, it was late afternoon. Dolf was curious. "Did you get the better deal?"

Carl gave a shrug and a weary smile. "Who knows? We both got what we really wanted. You'd better get home, Dolf. I'm certain your parents are wondering what you've been doing. I'm going to wander around town."

At supper Dolf related everything he had seen and heard.

"You remember the Aesop fable about the ant and the grasshopper?" his father asked, his brown eyes serious. He took another spoonful of soup. "Farmers like us are the ants and your friend is the grasshopper. It gets very cold under the bridge in the winter."

True, Dolf thought. Then remembered that Carl would be sleeping in the back room of the Golden Lion tonight, not under a bridge.

* * *

The next morning Dolf found Carl leaning against a wall near a doorway, chatting with Gertrude and an older laundress.

"Ah, here's my would-be match maker." Carl teased Dolf with a slight smile, his light tan face crinkling. "It's all your fault, Gertrude. Leading him astray with all that progressive talk. Right, Dolf?"

Dolf blushed. He was warmed by Carl's easy companionship but he didn't know the laundress at all and Gertude Fischel hardly any better.

"Don't tease him, Carl," Gertrude said. "It's your fault anyway, talking about walking up and down the countryside when he should appreciate that a good farmer stays with the land he knows best. Oh, by the way, Dolf," she said, bending over and looking into his eyes, "Listen carefully. I plan to marry a stable, dependable man, not a wanderer. And one, ahem, more mature."

"Huh!" Carl mimed being shot in the chest by an arrow and fell back against the wall. A moment later his twisted smile and raised eyebrow showed his skepticism. "So how's that new-fangled machine that

Gertrude tricked you into buying a few weeks ago working, Elina?"

"It works fine except for being a little hard to turn when I first start," the older woman replied. She took a few steps backward into the doorway and turned the wringer handle. It screeched loudly in the small room.

"Put some grease on it!" Dolf yelled, holding his ears.

Gertrude was clearly unhappy. "He's right. Unless it's greased regularly, that's what happens. Sorry if I didn't make that plain."

An older man wearing a black leather apron walked up to the small group. Dolf guessed he was a printer. "Herr Johantgens? In answer to your question yesterday, I didn't receive your lucky Saxon *Groschen* . Our guards must have used it to make change."

Carl made a sour face and lifted his hands in regret. "I hadn't realized which coin it was when I gave it to them, Herr Wagner. It's really my fault."

"Call me Jan. Several people mentioned that you gave an excellent performance at the Golden Lion last night."

"Thank you, Jan. You can call me Carl. Always nice to receive compliments. It's even better when accompanied by coins, preferably silver." He grinned, turning towards Gertrude. "And best when it's from a sweet fraulein like Gertrude." She gave him a dismissive sniff.

Dolf watched the byplay and looked at the older man. So this was Jan Wagner, the Aschersleben CoC leader Heinrich had mentioned. Jan was similar to Papa but with a heavy mustache and a goatee. He didn't look any more forgiving than Dolf's own father.

The older man turned abruptly and strode away. Dolf had the feeling that he'd expected more of a response from Carl. As he was thinking that, Carl left Gertrude and Elina, heading towards the market.

Dolf hurried to catch up. "Carl, why did you not talk longer with Herr Wagner?"

Carl stopped and gave a sigh. "How many Committee members would you say there are in this city? One in five? One in ten? One in fifteen?"

Dolf shrugged.

"If this is like most cities, one in twenty or fewer." Carl's voice was full of resignation. "Many more will know about them but with a greater or lesser knowledge of their convictions. If I'm known as a friend of Herr Wagner this early in my stay, I become identified with the CoC. Because I'm an outsider, many people would think I'm an agitator, someone who's ready to upset the current situation. Understand?"

"Yes, I think so."

"Remember how I make my living? People give me money for playing music. If they don't like my politics or for any number of other reasons, how much do you think they would put into my hat? Besides, last night at the Golden Lion, I made five times the money singing drinking songs as I did playing the others. Sure, most of the crowd enjoyed hearing them, but for some reason they thought that I should play them to display my solidarity with the working masses, not for money."

He resumed walking. "In the market where we're heading, people will give money more quickly to someone who makes them feel good, not thoughtful. They want to hear light music. Not dancing music, not drinking songs."

"But you played that tune about the woman who ran away with her lover."

"Uh huh. For which she was punished, you might say. He was also punished for the murder." Carl gave a grunt of laughter. "That sort of song is popular with parents whose daughters might be less than obedient. A morality tale, you see."

Carl didn't walk directly to where he'd played the day before. Instead he talked again to the vendors, introducing himself to some, calling others by name, asking how sales were going today. He bargained for an apple from one vendor and a stoppered jug of fresh cider with a mug from another.

"Good morning, Carl." Georg welcomed him to his stall. "I'm having two dozen onions roasted. Hanna set aside some small rolls, too. We'll slice the rolls open and pop in a hot cooked onion. Delicious and you won't burn your fingers." He paused a moment. "So how many should I save for you?"

Carl looked at him with a soft smile as he lifted amused eyebrows. "That's as smooth as I've ever heard it done. Put me down for two—one for me and one for Dolf."

He lifted his fiddle from its case and began tuning it. "Any tunes you want to hear today, Georg?"

"How about that one you played yesterday called*Frenchman's Retreat* ?"

"Not until my fingers are really loose. How about*Du bist mein Sonnenschein* ?"

The old man frowned, the wrinkled skin of his face moving into deep folds. "Don't know it."

"That's right. I only played it at the tavern. It's easy to remember and anyone can sing it." Carl began playing the simple tune and singing along with it. Before long both Georg and Dolf were joining in and several market visitors walked over to listen.

Later Carl and Dolf were sitting on the ground in the shade with their backs to the building. Carl poured cider into a mug for both of them. "So what have you learned today, Dolf?"

After taking a sip, Dolf looked up at Carl. "What do you mean?"

"You watched everyone and saw everything that happened. I played about a dozen songs. Which tunes gathered the best response? Which ones received the worst?"

The boy frowned. "I hate to say it, but the two CoC tunes got the worst response."

"Uh huh. But in other towns those same ones are some of the most popular, especially where there is an active Committee chapter. So what does that tell you?"

"That it isn't very popular?"

"Right. Not popular and it's an organization which is supposed to be by and for the working class, women, the poor and younger tradesmen. The type of people who frequent the market. I suspect that

what we saw in Herr Oehlschlegel's tailor shop was only one example. That said, having talked with Jan Wagner last night and seen the obvious improvements, the organization as a whole is doing a lot of good."

Dolf was torn. He wanted to blurt out what he'd written to Spartacus, but didn't want this man who'd befriended him to get into trouble. He might look strong, but Heinrich had at least four other men he could call on. So he drank his cider.

Carl stood, brushed off the back of his trousers and began tuning the fiddle.

"Will you be playing in the tavern again tonight?"

"Yes, but it'll be my last night. I'll be leaving the area mid-afternoon tomorrow, as soon as the market crowd dissipates. I should be inHalle before nightfall. So don't let my horse go out with the other horses in the morning."

"You're leaving? So soon?" Dolf couldn't believe his new friend would leave.

"Uh huh. Always leave your audience wanting more. Tomorrow's Saturday, always a good day for tips. But Sunday? Best to be in a new town. Besides, some of the other fiddlers here in town might decide to give me some competition next week which would cut down on my income." He stepped forward and played a dramatic downstroke on the violin strings, quickly vibrating the bow back and forth.

Then he gave a bright smile. "Good morning, everyone. Before I play, I suggest that you purchase Georg's roasted onions for your noontime meal. Good for your health and placed inside a freshly baked roll, so you won't burn your fingers. I also recommend Maria Deitz's cider. Do any of you have any tunes you'd like to hear?"

"How about*Mein Freiin* ?" Gertrude's voice was clear in the distance.

"As you wish, esteemed Fraulein," Carl answered with a bow of his head. He played a few opening bars and then began to sing her request, a romantic song about his search for the love of his life and how she'd fulfilled him.

Dolf couldn't help but notice that while the coins weren't plentiful, this song brought in more than the progressive songs. After four more melodies, while Carl retuned, he mentioned that Gertrude Fischel not only sold laundry hardware but also MaidenFresh blue bleaching powder which made linens whiter than lying out all day in the sun.

When the set was complete, another small jug of fresh cider was sitting next to Dolf as he munched on his roasted onion.

"No charge." Georg had winked to Dolf when he handed him the onions.

"How did you know I had MaidenFresh bleaching powder?" Gertrude asked later, glowering with her hands on her hips. "I sold out all that I had brought today while you were still playing."

Carl swallowed his bite of onion and took another swig of cider. "There's no MaidenFresh laundry in town and you have Laughing Laundress goods. Pretty obvious connection to me. If you didn't have it, you should. Besides, I recognized the barrel."

She eyed him with suspicion, her dark blond eyebrows lowered. "You're not quite as stupid as you sometimes seem." She changed the subject. "I admit your song is very romantic but who's the*Freiin* ?"

"All traveling singers, fiddlers too, are issued a*Freiin* , whether noble or not, to serve as an inspiration. A muse, you might say. Besides, it comes in handy if he's invited to play for nobility."

"I never heard the song before today," Dolf grouched, almost disapproving.

Carl burst out with a laugh and shook the boy's shoulder with one hand. "It's a song my parents knew before I was born. Surprisingly enough, it's lasted for a good many years. I even heard an English version of it in Grantville."

Adam Oehlschlegel walked over. "Herr Johantgens, my wife Maria was in the market a short while ago and heard you suggesting that your audience purchase certain goods. She also saw what happened at those stalls even before your break." He paused a moment. "Could I prevail upon you to mention my shop? Maria says that we will have a shirt ready for you tomorrow if you mention us in each of your, sets."

Dolf saw Carl consider the offer, then shake his head. "Much as I would like to, it would be unfair for me to take a shirt for what will only be two or three more sets today. But I'll mention your shop anyway."

The older man laughed and gripped Carl's hand with both of his, shaking it up and down. When it came away, Dolf saw a gleam of silver in Carl's palm.

No, this grasshopper wouldn't be wondering where his next meal would be coming from during the winter.

* * *

Dolf figured that by early afternoon Carl had received goods or money from half of the market vendors he mentioned. He described Herr Oehlschlegel's tailor shop in glowing terms in each of his sets. After Gertrude had sent word that she'd restocked, he resumed mentioning her bleaching powder.

"Is she your girlfriend already?" Dolf teased Carl. "I mean, she hasn't sent any money over or volunteered to wash your clothes."

Carl grinned. "Nope. But I have my reasons which have nothing to do with her."

Dolf was mystified.

"Isn't it time you went home and did some chores?"

"No. Uh, Papa told me last night that they would be harvesting next week and that I could stay with you as long as I wasn't in your way. By the way, uh, when will you be coming back to Aschersleben?"

"Not for a long time. I've got a number of places to visit and once the fall rains start, I want to be inThuringia . I know quite a few people there."

"Is that where your*Freiin* is?"

Carl burst out with a laugh. "Not exactly. She lives inSaxony . AfterHalle , I'm going toLeipzig and I'll

visit her."

Jan Wagner walked up to them. "Herr Johantgens, Carl. My niece Gertrude tells me that you're responsible for her selling out her bleaching powder twice today. I thank you."

Carl grinned and showed an uplifted palm. "I can only make suggestions. I can't make anyone buy."

"Tell me, is there anything you've noticed here that is different from other towns?"

Carl twisted his mouth and then sighed. "Your watchmen seem to be more . . . vigorous about getting funds from people marketing goods than any other town I've seen. Personally, I think it's bad policy. But that's just my opinion."

"I'll talk it over with Heinrich Grueber. He's the head of the watchmen." A quick wave and Jan was gone.

Dolf just had to say something. "Carl? Herr Grueber is . . . dishonest. I mean, he doesn't send all the money they collect over to Herr Wagner." He dropped his head as if ashamed. "I, uh, overheard them once. I didn't mean to."

Carl gave Dolf's shoulders a rough paternal rub. "I figured that out when Herr Wagner hadn't seen my lucky Saxon*Groschen* . But I like having you confirm it to me." He didn't speak for a moment. "It's good to have people like you who can report things that are important to the right people."

Carl looked around and squatted to look straight into Dolf's eyes. He almost whispered, "Don't tell anybody but I gave that watchman an ordinary Saxon*Groschen* I happened to have in my pouch. I just wanted to see if it would be sent on to Herr Wagner."

Realization burst into Dolf's eyes. "Are you Spartacus?"

Carl put his finger to his lips. "Oh, no. But he told me to come here to see if your report was correct. Other people had complained but your letter was the first to indicate some money wasn't going where it should. What Jan and the rest of the organization do with what they receive is still impressive."

"Do you work for the Magdeburg Committee?"

Carl gave a shake of his head. "Not exactly. I happened to be inMagdeburg and Spartacus is a friend of mine. So when I said I was headed south toHalle , he asked if I'd make a detour."

"Is that how you, no, well, what do you do?"

"I play my fiddle to make money. As you've figured out, I have connections and sometimes I do things for them."

"When I grow up, could I become a member?"

"Sure. By the time you're my age, the CoCs will be very different. They'll transform into political parties, still pushing for the same social reforms and improvements but in political assemblies such as the city council,*Landestags* and even a national assembly."

"But I'll be a farmer! I'll be in a farming village."

"Nothing says a farmer can't be a politician. In fact, my, well . . . never mind. Down inFranconia , right now, farmers are some of those pushing hardest for change. Aschersleben might be officially in theMagdeburg bishopric but that'll never last, not under the Swedes and the new Confederated Principalities."

* * *

Dolf flew down the road home that evening brimming with excitement. First, just the idea that Spartacus . . . *Spartacus* . . . had read something written by him, thrilled him more than anything he could imagine.

Second, Spartacus had sent Carl, a grown man, to Aschersleben, just to find out if what he said was true. Spartacus was so great that he didn't dismiss what a ten year-old boy wrote to him!

Mama noticed something had definitely changed but didn't say anything, just continued to prepare the evening meal. Papa walked into the house and washed his face and hands before sitting at the table. Katya sat quietly in her chair.

Papa rarely talked after giving grace until he'd finished his bowl of soup. Today, though, after having a few spoonfuls, he turned his head and looked at Dolf. "So what's the news in the city?"

Dolf was already bouncing in his seat. "I, I wrote a letter to Spartacus. He's a man who works with Gretchen Richter. For the CoCs. About Heinrich at the Golden Lion. I read a brochure he wrote. Spartacus, not Heinrich. I saw how Heinrich split out and kept some of the money that he collected for the Committee. So he sent Carl to find out. Carl works with the Magdeburg Committee but he's, you know, different from them. Carl says I can become a member. Says that it was good that I wrote to Spartacus about what I saw. But he's leaving tomorrow."

Papa watched Dolf talk, nodding regularly but looking serious until his son stopped. He nodded twice more. "Good. That's good, son. I think we ought to leave early tomorrow to get a good stall to sell our produce. That way we can sell it and listen to Carl." Papa paused. "Perhaps he'll even mention our goods."

Dolf couldn't help himself. He laughed so hard he fell off his chair. Everyone else was so laughing loudly that he got on his chair again and this time deliberately repeated the fall. Which made everyone laugh again. Then Katya fell off her chair and everyone laughed. Mama and Papa let them fall off their chairs one more time before they said it was time for bed.

* * *

Dolf rushed about his morning routine, remembering not to let out Carl's horse. By the time he returned home, Mama, Papa and Katya had already harvested two large baskets of vegetables to take to the market.

It was fortunate that they got there early because it seemed like every village for miles around sent at least two or three farmers to sell their goods. Dolf smiled, thinking about how very soon Heinrich was going to hate giving up so much money. Spartacus was going to take care of that.

There had already been a lot of buying by the time Carl came into the market. As usual before going to Georg's stall, he talked to several vendors, including Dolf's parents. "Hello, Daniel, Anna." He stopped,

then grinned at Katya. "How's Katya today?" Embarrassed and hiding a smile, Katya ducked behind her mother.

Carl squatted and looked at the stacks of carrots, onions, cabbage and celery on display. "They look good. I don't think you're going to have to take any home today. Not with as many people as are here."

"Saturdays are always good," Papa said with a trace of a smile. "Nobody will be selling tomorrow so people have to buy for today and tomorrow. You should know that."

Carl grinned. "I do but after three days here, I almost forgot the difference." He rose. "Time to move on."

By the time Carl arrived at Georg's stall, Gertrude was talking with Dolf. "I was telling Dolf I made arrangements with Elina that if I get low on bleaching powder, she'll go get more so I won't be embarrassed at having none when customers arrive."

Carl looked at her, a teasing smile on his lips and his eyes wide in innocence. "Dolf, do you think I should mention her powder? After all, as you mentioned yesterday, she hasn't even offered to wash my clothes."

Dolf knew he was only teasing but Gertrude's fair face flamed. "Do whatever you want!" She stalked away.

"Should I tell her you were only teasing?"

Carl chuckled and gave a brisk shake of his head. "She knows. She just didn't have a response ready. Or didn't want to make any concessions." He opened his fiddle case and drew out his instrument. "People can be funny that way. Especially women. You'll learn all about that someday." He looked as if he was going to comment further but stopped.

As he tuned his fiddle people began to gather, requesting favorite songs. "*Backe, backe Kuchen*?" he asked, looking down at Dolf. "Who wanted that song?"

"Hanna Weber, the baker who makes the rolls for Georg's onions."

A quick opening back and forth of the bow on the strings opened the set. "Good morning, everyone. So nice to see people in a good mood today. Georg in the stall next to me will be selling onions roasted with herbs in a little while. They'll be in freshly baked rolls for a delightful snack. Speaking of bakers, Hanna Weber, down the street from here made the rolls. She not only bakes delicious rolls but also other breads and mouth-watering pastries. Speaking of baking and for the children, here's a song you know. I want all of you to join in." He drew his bow across the strings again. "*Backe, backe Kuchen, der Bäcker hat gerufen . . .*"

After singing the song through, Carl began to play around the melody line before coming back to the original line and singing it again with the children. "Now here's another song both children and adults can sing.*Du bist mein Sonnenschein, mein einzig Sonnenschein . . .*"

Dolf laughed, seeing the initial confusion on some adults who thought they should know the words. The younger set just picked up the happy words as they went. By the time Carl began the chorus a second time, they were singing it as if their parents had sung them the tune as a lullaby.

Carl played several more tunes, ending with a quick jig. "If you're looking for vegetables for today or tomorrow's meals, I looked over the selection Daniel Bauers and Anna Klein set out. I don't think you'll find better in the market today. I'm going to take a break right now to retune but don't go far. I'll be playing again in a few minutes."

Dolf noticed that before the last two tunes, Carl had managed to mention Herr Oehlslegel and Gertrude Fischel's businesses. "Why did you mention her again after she got so angry with you?"

Carl cocked his head and gave a slight smile. "I told you I had my reasons. I happen to have met the people who make all the products she sells. That she's selling them and is a member of the local Committee is no coincidence. It's that way in all the towns. So I encourage their sales."

"Oh." Dolf had never considered that the two activities went so well together. He thought for a moment. "I guess it's, well, like being a Christian and doing good works. If you're doing one, you should be doing the other."

Carl sighed. "Now you're going theological on me. Next thing I know, you'll be headed off to theUniversityofLeipzig like Maria Prost's son did."

The idea was so completely absurd to Dolf that he laughed. Carl joined in but it wasn't his usual warm chuckle. Had he really meant it?

The morning passed and they ate a meal, this time supplied by one of the nearby taverns in return for a mention. They had just finished another set when Dolf saw three men ride in from the north. Riders dressed like ordinary workmen, but why would they be riding horses? The leader of the three men had a broken nose and pale blue eyes that pierced, even from a distance.

Carl caught the direction Dolf was looking and made a grim frown. "Dolf, in my town we used to make jokes such as, 'You know you're going to have a bad day when the sun rises in the west.'"

Dolf wrinkled his brow. "But it rises in the east. Everybody knows that."

"Uh huh. And if it rises in the west?"

Dolf giggled. "You're really going to have a bad day."

"Right. Here's another. You know you're going to have a bad day when Gunther Schlosser comes to visit."

"Was that him? What's funny about that?"

"Not a thing. If you're the person he came to see." Carl gave a heavy sigh. "Gunther happens to be Spartacus' head of security. Like Heinrich's supposed to be. Only Gunther hates to leaveMagdeburg and when he does it's because he's going to do something. 'Direct action' is what the CoCs call it. You really, really don't want to be the object of his attentions."

Carl played several tunes and bantered with his audience while Dolf pondered why Guenther would have come to this city. Surely he wasn't going to do anything that bad to Heinrich. What could have been important enough to bring him here?

Dolf emptied Carl's hat for the final time and was surprised when Carl handed him back several

pfennigs. "Today's been good." He packed up his fiddle and handed it to Dolf. "You carry it. I'm going over to the Golden Lion to pick up my bag, my walking stick and the money Heinrich's supposed to pay me for the two nights I've played. Sometimes a tavern owner tries to avoid payment, figuring I won't take the time or money to sue him in court. He's right on that but wrong that I won't do anything."

"You mean you'll fight him?"

Carl gave a twisted smile and shook his head. "You must have me confused with someone adventurous. I try to avoid trouble. It's safer. I just get the head of the town's CoC security or its chairman or someone else to return with me. But just in case Heinrich decides to get nasty, if I say the word 'scoot,' I mean for you to get out of there, right away. Which is also why I gave you my fiddle. To keep you and it safe. Understand?"

Dolf's heart was thumping wildly as Carl picked up his bag and absurdly straight walking stick from a hidden corner in the storage room. "Two down, one to go." Carl smiled but with a trace of unease.

"Just how stupid do you think I am, Carl?" Heinrich snarled a few moments later. He was standing before them in the main aisle with the front door behind them. Dolf heard the bar to the entrance door go down shortly before two CoC watchmen moved to flank Carl's movements. "Think I don't know who you are? You're one of Spartacus' college friends, all sweetness and talk. You think you can just move on after you've stabbed me in the back. Oh, and if you think he's going to come here in response to your letter two days ago . . ." Heinrich wore a nasty smile as he held up the neatly folded paper addressed to Joachim Thierbach.

Carl slipped his bag to the floor and kicked it under a table. Looking directly at Heinrich and gripping his walking stick firmly, he said, "Scoot."

It took a moment for Dolf to realize who he was talking to. In a flash he was at the door and threw off the bar before either of the watchmen could stop him. He ran straight into the street, narrowly missing a cart and heard the bar slam down on the other side of the Golden Lion's door.

Dolf stopped for a moment then ran to the market. His parents were talking to a vendor at a different stall. "Papa! Heinrich and two watchmen have Carl trapped inside the Golden Lion!"

Papa turned to the next stall. "Where's your uncle, Gertrude?"

"He should be in his print shop but it's late right now and besides, I think he's talking with those men who rode in."

"Gunther Schlosser?" Dolf asked.

"Is that who that mean-looking man is?" She pursed her lips. "Yes, it would have to be. There they are!" She pointed at a group of several determined-looking men moving rapidly in their direction.

Papa ran over to them. "Heinrich has Carl trapped at the Golden Lion."

Gunther Schlosser narrowed his eyes. "If Carl doesn't come out of there in good health, your butcher's going to have to be careful about what meat he buys."

Dolf shivered at his cold words.

"We'll go in the back door," Jan Wagner announced.

* * *

The two watchmen were on the floor unconscious, blood streaming from their broken faces. Carl held his walking stick at the ready, on the other side of a table from Heinrich, watching the knives in his hands.

"That stick's a lot sturdier than it looks." Heinrich moved to Carl's right towards the end of the table. "You're also a lot better with it than I ever would have imagined."

"It's almost the symbol of authority for Jena Committee watchmen. I practice with them when I'm in town."

"Yes, aUniversityofJena student. I don't know Latin so I couldn't tell exactly what you wrote. But I read my name and know who Joachim Thierbach is." Heinrich made a sudden move around the table and rushed at Carl.

The younger man thrust his staff towards Heinrich and then rounded the far end of the table. "I thought you'd be smarter than this, Heinrich. Haven't you ever heard that pigs get fat and hogs get butchered? You weren't just dipping your bucket into the cash stream. You were diverting a good part of it. Did you think no one would notice?"

"Oh, two people did get too nosy." Heinrich sneered. He grabbed the end of the table, shoving it against the wall. He rounded the table again, now on the same side as Carl. He feinted with his left hand and then lunged with his right. Before Carl brought down his stick on that side, Heinrich had withdrawn again.

Carl took another step back.

"They disappeared before they told anyone. Just like you will. I waited so your disappearance would be about the same time as you said you were going to leave. It won't be noticed." Heinrich feinted with his right this time. When Carl didn't react, he lunged again with his right. Carl brought down his stick too late to hurt Heinrich. He moved to his right and tripped over one of the fallen watchmen, losing his balance. He dropped to the floor, his stick falling away from him.

The older man immediately charged and Carl dove under the table. He knocked over three chairs as he rolled quickly to his feet on the other side. A moment later he moved to a different table so as not to be trapped again. As Heinrich came between the tables, Carl shoved the one in front of him at Heinrich, slamming it into his hip. A moment later, Heinrich freed himself and limped forward.

"Little more exercise than you're used to, isn't it, Heinie?" Carl taunted the older man. Both men had sweat running down their faces but Heinrich was also red-faced and puffing. "Don't forget, you're going to have to come up with an explanation of how the two guys on the floor over there got their faces ripped open.

"One more thing. You should be crapping your pants right now. Gunther Schlosser rode into town today. Five will get you ten that the only reason he's not here right now is that he's questioning your other watchmen with Jan Wagner watching. You see, when Joachim didn't receive my letter, he probably sent Gunther to find out why. You really ought to riding out of town rather than chasing after me with knives."

"A little too late for that now," a deeper voice came from the backroom side of the bar. Jan Wagner was there with Gunther, two watchmen looking a little worse for the wear and Daniel Bauers.

* * *

Dolf watched the excitement from a distance, but was close enough to understand Carl's humor. You were going to have a bad day when Gunther Schlosser came to see you. Herr Schlosser was . . . scary.

While he watched the action with Gunther, Heinrich and Jan Wagner, he lost track of Carl and Papa. When he next noticed them, they were standing together talking. Carl was giving Papa a double-handed handshake like Herr Oehlschlegel had yesterday. Then both of them turned to look at him with grim smiles. Dolf knew it meant trouble for him.*May as well get it over with.*

Head down, he trudged over to them. Heinrich had been taken away and men were checking out the tavern's cellar floor. Dolf lifted his head as a thought came to him. In all the excitement, Carl never received his fee for playing at the Golden Lion. He was about to mention it when Adam Oehlschlegel and his wife joined the small group.

"Herr Johantgens, we hear you're leaving today," Maria Prost began. "In the two days that you've mentioned us, it seems like the door bell was always ringing. Adam got several orders. So I, and Adam, decided that you should have the shirt anyway." Carl started to protest. "No, no, you deserve it."

Carl flushed. "Well, thank you. I'll think of you two every time I wear it."

Adam spoke up. "Herr Johantgens, if in your travels you come across our son, you can tell him who made this shirt."

Carl nodded with a slightly vacant stare and looked at the shirt he was holding. "Right. Adam Oehlschlegel. Parents made this shirt."

"No, not Oehlschlegel. He latinized his name. He calls himself Adam Olearius now."

"Olearius?" A line appeared between Carl's eyebrows. "Like Johann Olearius, the late pastor at St. Mary's inHalle ? I never met him but I spent some time with his son when I was in Wittenburg."

"Pastor Olearius was a distant cousin of mine and sponsored Adam's application to theUniversity ofLeipzig 'sSchoolofTheology ."

Carl shook his head and then laughed. "I don't plan on heading north but if I ever meet your son, I'll be happy to tell him that I got a shirt from you." He gave a deep, mischievous grin. "And how his tough old sire almost got into a fist fight right in front of me."

* * *

"Papa? What were you and Carl talking about before Herr Oehlschlegel walked up to us?"

Papa cocked his head and looked down at Dolf as they walked back to the village with Mama and Katya. "Nothing much. Carl really did appreciate your going for help. I agreed with him that a lad with your spirit and intelligence really ought to stay longer in school. Maybe even go on to Latin school."

"Latin school?" Latin school was where you went if you wanted to get into a university. Dolf suddenly realized that Carl might not have been joking when he talked about Dolf doing what Herr Oehlschlegel's son had done.

"Uh huh. Jan Wagner mentioned earlier that I should be proud to have a son like you, who's not afraid to write to Spartacus. Or to get help when someone's in trouble. I told him I was and always had been." Papa laid his hand on Dolf's shoulder. "Not that I'm going to stop letting you know when you're in the wrong."

"Uh, Papa, did you go to school with Herr Wagner? I mean, when you were talking with him this afternoon, you acted like you were good friends."

Papa gave a warm chuckle and tousled Dolf's hair with work-thickened fingers. "Didn't your friend Carl mention that farmers could be members of a CoC?"

Papa was in the CoC?!!!

GRAND TOUR

By Iver P. Cooper

My name is Mister Thomas Hobbes. If you are one of the Americans from the future, you know me as a political philosopher, the praised and reviled author of*Leviathan* . If you are a fellow down-timer, in this Year of Our Lord 1633, then you probably don't know me yet at all. Unless you have read my translation of*Thucydides* .

I was, until recently, the governor of young William Cavendish, the Earl of Devonshire. That means that I watched over him during his travels abroad, and tutored him as needed. Just as I did for his father, some score of years before.

The rude name for governor is "bearleader." People fancy that our charges are so unruly that they are like dancing bears, whom we must lead on a leash. But William wasn't like that. Usually.

We leftEngland in the spring of 1632. Christian, the dowager countess of Devonshire, had been uncertain that her son would benefit from a grand tour ofEurope which began when he was not even fifteen. I assured her that "the only time of learning is from nine to sixteen; after that, Cupid begins to tyrannize."

Calais

Spring, 1632

We crossed the Channel and made landfall inCalais . There, I had the luxury of a room to myself, and I decided to take advantage of it. No, not to enjoy the questionable charms of some scullery maid. I closed the door, and started singing: "Phyllis! Why should we delay?"

You don't know it? It's one of Edmund Waller's poems, set to music by Henry Lawes.

"Can we (which we never can)

Stretch our lives beyond their span,
Beauty like a shadow flies,
And our youth before us dies.
Or, would youth and beauty stay,
Love has wings, and will away."

It's my belief that singing is good for the lungs.

"Love has swifter wings than Time;
Change in love to heaven doth climb.
Gods, that never change their state,
Vary oft their love and hate."

Someone was banging on the wall for some reason. I hoped he would go away.

Paris
Mid-1632

Our next destination was the great city ofParis , of course. At the iron gates, the customs officials searched everything. Young men pled to serve as William's valet, and thrust their letters of reference through the windows of our carriage. Fortunately, we did not need their dubious services, as William had brought his own servants.

Geoffrey Watson was an under-butler, and also served as William's valet. He had some letters, so Lady Cavendish had given him charge of her library and study. Geoffrey was to make sure William did his lessons if I was off on other business. He was always polite to me. Sometimes I thought him a shade too polite.

Samuel Brown was our coachman, but he had spent more years riding the deck of a ship than the driver's seat of a coach. He had sailed theMediterranean with the Levant Company, and he was, what's your American term, "our muscle." Samuel certainly had plenty of those. He was quick to make friends wherever we traveled. Except that one could never be sure what he would say to a Catholic priest.

Then there was Patrick McDonnell. You may be surprised that we would have an Irishman among us. Clearly, you are not aware that the Irish make excellent running footmen. Patrick was of a wiry build, and his calves were considered first-rate. Unfortunately, he had come into a growth spurt, and hence was no longer of a height with his fellows. Otherwise I am not sure that Her Ladyship would have parted with him. He could run ahead of our coach, or ride postilion, as needed.

While I could tutor William in the academic subjects, there were some he would learn better from others. Fencing, horsemanship, and dancing, to name a few. Hence, I enrolled him in a French academy. It was held in the basement of a French palace, the Louvre.

This gave me some leisure time, and leisure, as you know, is the mother of philosophy. I attended many soirees, and heard much praise of the ancient Greek and Roman philosophers. This did not surprise me,

as intellectuals find it easier to reverence the dead than to applaud their living competitors.

Parisis a great city, which would achieve perfection if only one were to do away with the Parisians. If something foreign arrives inParis , they either think that they invented it or that it has always been there.

French cookery was forced upon us by necessity, as we had not thought to bring a British chef with us. We were almost poisoned by what the French presume to call food. If only the French had some interest in the culinary arts a stay inFrance would be much more pleasant. Unfortunately, the French innkeepers are as pleased to see their dishes go untouched as their English counterparts are displeased if the food is disliked. The French don't hesitate to serve stale mackerel, or raddled eggs, or beef roast to a crisp.

At least the French wine is passable.

TheRiviera , between Marseille andGenoa

November, 1632

In November, 1632, we boarded a Provencal*felucca* , which would take us from Marseille toGenoa . We had suffered several delays on the road south fromParis , thanks to outbreaks of contagion and banditry, and had arrived too late in the season to obtain passage on a larger vessel At least, too late to do so without enduring further delays.

We were only four days into our voyage when William twitched his nose and said, "I smell smoke, Mister Hobbes."

I wasn't especially worried, at that point. The sailors were well aware of the danger of fire at sea. There was no hubbub, yet, to alarm me. But it was still conceivable that William's nose was just keener than theirs.

"Coming from someplace on board?" I asked.

"No . . . I don't think so. Look, on the shore! There's a fire!"

Before we could say anything further, each of us was gripped, painfully, by a meaty and indelicate hand. "Shut your mouths, both of you," the sailor behind us whispered urgently. "Barbarypirates raiding yonder village." He let go of our shoulders, and we turned to look at him. "Sound carries far too well over water. If they hear us, snick. . . ." He drew his finger cross his throat. "Or if you are spared, the exciting life of a galley slave."

Poor William shuddered. He had turned fifteen only the month before, and had led a rather sheltered life in centralEngland . Still, he had recently been exposed to certain harsh realities. In Marseille, he and I had toured one of the French navy's war galleys—it was Marseille's principal tourist attraction. He had seen the conditions under which the galley slaves labored, little dreaming that he might be in danger of being forced into such a life himself.

Nonetheless, he was a nobleman, a member ofBritain 's warrior aristocracy. "Can't we do something?"

I was pleased that he asked, although I would not encourage any reckless conduct.

Of course, the captain wouldn't consider any martial exploit. "This isn't a warship," he said. "Count yourself lucky it's night."

The sailor who had confronted us, and the other common seaman, were rowing now. Feluccas mostly travel under sail, but they carry oars for emergency use.

"Why don't you raise your sail?" William asked the captain. "You could take advantage of the land breeze to move you away from shore."

The captain shook his head. "The sail is white. If it were a moonless light, we might chance it, but we are better off moving slowly and remaining hard to see."

He smirked. "That reminds me. I have something better for you to do than ask questions. Get your servants on deck; I can use three more oarsmen. For that matter, you look healthy enough to pull an oar yourself." I protested his highhandedness, but William assured me that he had no objection, and I was thus quelled.

Genoa

November, 1632

"Your*bolletino di sanita* , signore."

I presented the health certificates I had received from the French authorities, hoping for fair treatment.

Hoping in vain. "*La buona mancia per il signor ufficiale*," the inspector suggested, holding out his hand.

"He wants something to eat?" asked William.

"He wants a bribe," I whispered. I decided to just ignore the suggestion, and hope the man wouldn't press the issue. "Our papers are in order."

The official didn't back down. "The ink here is smudged, I am not sure these papers are genuine."

It was just too much. "We were just in a small boat for eight days. Of course the ink is a little smudged!"

"I will have to put you in quarantine."

I bowed to the inevitable, and met his demand. Some pirates have no need for warships.

* * *

We dined that night with Lewes Roberts, one of the English merchants resident inGenoa . I let William tell him about our close encounter with the pirates.

Roberts didn't seem surprised. "The corsairs aren't really under the sultan's control, anymore; the pasha inAlgiers does whatever he damn pleases. The French only have ten galleys on patrol in the summer, and six or eight in the winter. As toEngland , we simply encourage our privateers to harass the Moors in turn.

Which, in my opinion, has made matters worse, not better."

Roberts was avid for news from home, which we gave to him. Naturally, we asked him about the war inGermany .

"The Swedish king marches from victory to victory," he told us. "Aided now, I understand, by people from a strange place called Grantville."

That was the very topic I was hoping he would bring up. "Grantville?" says I, widening my eyes in feigned surprise.

"Supposedly it is a town of the far future, transported by God's will from someplace called 'West Virginia,' in theAmericas , intoThuringia in 1631."

"Remarkable," I said. "Why would anyone believe such an absurd story? Next, they will speak of Prester John." I had heard of Grantville already, from my friend Doctor William Harvey, the king's physician.Harvey had confirmed that Grantville existed, and that its residents were masters of the mechanical arts. Moreover, that they had knowledge of the future, through history books and not by witchcraft.

You understand that, as a youngster, William had only inherited his father's title, not his property. I was employed by William's mother, Christian. She managed the Cavendish estates with a wise and firm hand. Which they needed, William's father having been a spendthrift.

After I told her ofHarvey 's confidences—which he seemed, after the fact, to have regretted making—I had been instructed to go to Grantville and determine what those history books had to say about the Cavendish family, our country, and the countries in which the family had investments.

Perhaps you know this already, but the Cavendishes are one of the wealthiest families in the kingdom. Thanks, in large part, to Christian's Scottish canniness. They own perhaps one hundred thousand acres, almost all of them in Derbyshire. And they hold significant interests in many merchant ventures, including the East India Company and the Muscovy Company.

Christian directed me to conceal the family's interest in the time travelers. She thought it might be imprudent to show too particular an interest in Grantville. But it was customary for the sprigs of the English nobility, some even younger than William, to tourFrance ,Italy and, if conditions permitted,Germany . So William was my excuse to be on the Continent.

Christian hadn't intended him to go on his grand tour until he was two years older. But he must needs go, that the devil drives.

Even William didn't know of our secret mission to Grantville. It was all in keeping with the Cavendish family motto:*Cavendo tutus* , "safe by being cautious." The motto, as I hope you noticed, is a play on the family name.

Anyway, Roberts had more to say about Grantville.

"TheWest Virginians are real, all right. Real enough to smash six Spanish tercios. Real enough for their townspeople to chew up several squadrons of Croat cavalry." William looked fascinated. Typical teenage boy. His academy got the young gentlemen interested in art by having them sketch fortifications.

"I understand that Grantville is now the center of some sort of confederation. They control much of Thuringia andFranconia , under Swedish protection of course."

"What has been the effect on trade? Are the Germanies safer now?" I meant safer for Protestants, of course.

"The trade throughMilan , over theSaint GotthardPass , has picked up." This ancient trade route led throughLucerne andZurich , to theRhine .

"What about theBrenner Pass ?" That connected northeasternItaly to Tyrolia andBavaria .

"I couldn't say. You will have to ask about that inVenice ."

I decided it was time to steer the conversation away from the Germanies. I asked aboutVenice , and was told that the new doge, this past November, had proclaimedVenice free of contagion. Then we spoke about doings inRome , and so forth.

* * *

The next day, it was time to head on, to theport ofLeghorn , and, ultimately, toFlorence . There was no reason to linger inGenoa ; it does not have the antiquities ofRome , the natural wonders ofNaples , or the bustle ofVenice .

Florence

December, 1632

When we were inParis , we visited Mersenne, the French mathematician, with whom William's Uncle Charles corresponded regularly. Mersenne, in turn, gave us a letter of introduction to Galileo. After checking into our hotel inFlorence , I sent Samuel and the precious letter on to Galileo's villa in Arcetri, with a request for an audience.

Uncle Charles had agreed with Christian that I should go toGermany by way ofFrance andItaly . "You should visit Galileo at the earliest opportunity," Charles told me. "He is, what, sixty-eight, now? Who knows how much longer he will live? Or, for that matter, how long the Inquisition will permit him to receive foreign visitors."

While we waited to hear from the great man, we toured the city, beginning with the cathedral of Santa Maria del Fiore. Upon arrival, we paid for the privilege of climbing to the cathedral's octagonal cupola, perched on the famous Duomo of Brunelleschi, the largest dome in the world.

We went back down, then strolled back toward our lodgings, stopping in whichever shops caught our fancy. Mostly bookstores, I must admit. Often, we heard English, asFlorence was a popular stop on the English*Giro d'Italia* .

We were in a bookstore, browsing, when we heard the bookseller addressed in English. Naturally, we looked up. The new arrival held a journal of some kind in his hand.

"Yes, what may I show you?" said the eager storekeeper.

"What are the favorite herbs of the sheep of this country?" the Englishman read aloud. There was a silence.

"I am sorry, signore," said the Florentine. "I don't know the answer."

This didn't faze his visitor. "In your market, what are the values of whales of different sizes?"

"Signore, we are far from the sea. May I show you a book on whales and other marvelous fish?"

William leaned closer to me. "Why is he asking these questions?"

It was then the custom for parents to insist that their children, touring the continent, keep detailed journals. William, indeed, had one. This fellow obviously had created a questionnaire for use in every city he visited.

The whale fancier didn't take the bookseller's hint that he should start looking at books. "Are there many instances of people having been bitten by mad animals?"

The Italian smacked his forehead. "Signore, I am so pleased that I can tell you where to find out the answer. Turn left as you leave my humble store. When you reach the fountain, turn right. Take your sixth left, and then go to the building which has a sign of a bleeding arm. The good doctor there is an expert on the subject in question. But you must hurry, because he will soon close his office for the day."

They parted with many expressions of good wishes. Out went the earnest questioner, and the bookseller watched him walk off.

Turning back into the store, he caught sight of us, and looked at us quizzically. No doubt he wondered what particular Anglic madness*we* were afflicted with.

"Whales!" I gasped, and started laughing. The others quickly joined in.

"So tell me, my good man, does the 'good doctor' exist?"

"No, sir."

"Aren't you worried that fellow will come back, and complain?"

"No, sir. The fountain is many blocks away. When he reaches it, he must decide which right to make, because there are several. Once he turns, he must decide what counts as a left. Only a true street, or does an alley signify? He will wander harmlessly through the streets ofFlorence . Perhaps he will even find a whale market."

* * *

At the inn that night, William had a bit of a surprise. You will understand, after I tell you about the incident, that I did not observe it, nor did I hear about it from William directly.

William had gone up the stairs, guided by the chambermaid. He had left his own journal—free of any notes on whales, may I add—at the table, and I sent Geoffrey up with it, to return it to him.

When Geoffrey was nearly at his room, he distinctly heard the chambermaid tell William, "I can give you a kiss, to help you sleep better."

Instead of interrupting this tête-à-tête, as would have been proper, Geoffrey stopped in his tracks to eavesdrop.

The wench continued, "Or I can give you something more, so you don't sleep much at all."

William fled back to the common room, and I can vouch for the fact that there was plenty of color in his cheeks. When I asked him about it, he just mumbled.

An hour later, I personally escorted William up to his bedchamber, still wondering what exactly had happened. The room was empty by then, that I know.

I pried the story out of Geoffrey, eventually, but decided not to castigate William about it since, after all, no harm was done.

* * *

Thevillage ofArcetri lay less than half an hour's walk from the walls ofFlorence . Of course, it would have been beneath William's dignity as an English peer to arrive at Galileo's doors with Tuscan mud on his shoes. So we rode over.

Galileo's villa was known locally as*Il Gioiello* , "the jewel." The scientist's housekeeper, La Piera, met us at the door and explained that Galileo was napping. She offered to give us a tour of the property; we gladly accepted. Thehigh point was when we stood in the garden to the south of the house. We admired Galileo's fruit trees, and the views of the Tuscan hills in the distance, but all too soon the fierce *tramontana* , the north wind, forced us indoors. I tipped La Piera, and she went off to look for her master.

By this point Galileo was up and about, and we were ushered into his bedroom-cum-study. Galileo was seated at his desk. On his right, there was an armillary sphere, and his bed. Two maps hung on the wall. His desk faced the window, whose shutters were open to allow the winter sun to warm the room as best it could. To the left of the window was a bust of Cosimo the Second, and below it, on a stand, one of his famous telescopes.

Galileo looked up. "I write small, to avoid wasting paper, and then I have trouble reading my own notes. My eyesight seems to be getting worse and worse as the years go on." He picked up a letter.

"You are Mister Hobbes? I read here that you are acquainted with the Reverend Father Marin Marsenne, of the Order of the Minims."

"Yes," I said. "Dottore, may I present to you William Cavendish, the Earl of Devonshire, my pupil." William inclined his head. "Perhaps you know his uncle, Sir Charles Cavendish, the mathematician." It was Galileo's turn to nod.

"Please, be seated, both of you. You are too tall to remain standing, Mister Hobbes. It strains my neck for me to look up at you." I am about six feet tall.

"So, Mister Hobbes, what is your interest in my work?" Galileo asked.

"A philosophical interest, in your theories of motion. I believe that if nothing is added to an entity, and nothing is taken, it remains in the same state. Hence, all change is the result of motion, of the effect of some agent upon the subject."

"Indeed," said Galileo. "And once an object is in motion, it will tend to remain in motion, until halted by some other agent. Thus, objects tend to resist a change in motion."

Galileo turned to William. "Young man, have you studied natural philosophy?"

"Most illustrious sir, I have studied Latin, Italian, French, history, rhetoric, logic, astronomy and geometry with Mister Hobbes."

"Astronomy, you say? Well, when the wind settles down, we can go out in the courtyard and see what we can spy with my telescope. Would that appeal to you, young lord?" William thanked him profusely.

"Is Mister Hobbes your only teacher?"

"InParis I attended an Academy in the basement of the Louvre. I took lessons in riding, fencing, dancing, singing, drawing, tennis, and playing the lute."

"The lute!" exclaimed Galileo. "That is my instrument, too." He raised his voice. "Giuseppe, fetch my lute. And Michelangelo's old one." This was a reference to Michelangelo Galilei, Galileo's brother.

"What about you, Mister Hobbes, are you a musician?"

"I play viol and flute, Dottore. But only for my own amusement."

"I am sorry I cannot provide those instruments." Galileo spread his hands in apology.

The servant boy appeared a few minutes later, with two lutes. "Thank you, Geppo. That will be all." Galileo handed one lute to William. Following Galileo's example, William tuned his instrument.

Galileo invited him to play first. William played an English tune, one popular at court. Galileo complimented him. "Now it is my turn."

It was clear from the first few bars that Galileo was a skilled musician, although his fingers were slowed by age. After he finished the piece, he set the lute down, and sighed.

"That was my baby brother Michelangelo's 'Toccata.' He composed it for the Archduke Maximilian. Michelangelo died in 1631, of the plague. May his soul rest in peace."

"Amen," we replied.

Galileo rose, and took William's arm. I picked up the telescope, and we all went out onto the veranda.

It was, of course, still daylight. With Galileo's guidance, we set up the telescope in such a manner that it would project an image on a white board. "In this way," Galileo said, "I can observe the sun even when it is too bright to look upon—which is most of the time."

After pointing the telescope in the correct direction, William held the board behind the eyepiece.

"About a foot away is best. Mind you don't tilt the board away from the axis of the scope—the image should be circular. Yes, that's it." We could see the projected disk of the sun. Magnificent!

"Now, look for sunspots." We had no trouble finding them.

"How wonderful!" William said. "Is this system of projection another of your inventions?"

"Oh, no. This was conceived by my beloved pupil, Benedetto Castelli."

I thought it best to demonstrate that I was not ignorant of Galileo's writings on this subject. "I have read of this device in your*History and Demonstrations Concerning Sunspots and their Phenomena* ."

"Then you know that its importance is not just that it protects my eyesight, but also that it allows me to record, on this very paper, the exact locations of the spots. And I can make such records every day that the clouds permit me to see the sun.

"It was in this way that I determined that it took the sunspots a little more than fourteen days to traverse the entire solar disk. It follows that the sun revolves, and that the sunspots are on its surface."

We then turned the telescope toward terrestrial targets; the Convent of San Matteo where Galileo's daughter was a nun; the River Arno, and the great city ofFlorence . All too soon, it was time to retire inside.

"So, Mister Hobbes, we didn't really finish our discussion of motion. How do you intend to develop your thesis?"

"First, to show that sensation is the result of motion. The clapper has no sound in it, just motion, and it makes motion in the bell. The air has motion, but not sound. And the air causes motion in the brain, and it is that motion which we call hearing.

"In like manner, I will explain sight, and touch, and the feeling of the heat of a fire."

"Interesting," Galileo said. "You will, of course, want to devise experiments to prove your point."

Experiments, bah. But one must be polite, so I didn't pick a fight. "Ultimately, my goal is to extend the theory of motion to the actions of men upon each other, that which we call politics."

"Ah, politics. I have gotten into enough trouble discussing religion, I cannot afford to talk about politics as well."

At that point, La Piera came into the salon. "Dottore, why aren't you in bed?"

"I feel fine."

"Have you forgotten? The duke's physicians are supposed to be here within the hour. So that they can examine you, and attest that you are too sick to travel toRome to appear before the Inquisition."

Galileo winced. "Excuse me, gentlemen, I must bury myself under the covers, and you had best be going. The duke is on my side, but appearances must be maintained." Galileo disappeared into his bedchamber, and let off a trial moan or two.

As we filed out the door, we could hear Galileo calling, "Where is my hot water bottle?"

* * *

We rode back toFlorence , and decided to have our supper out on the veranda.

"So, Mister Hobbes, are you going to do those experiments? Can I help?"

"William, William," I said. "There is more than one path to knowledge. Experimentation is a last resort, to be adopted when one cannot reach a conclusion by pure reason. It is better to proceed, wherever possible, by geometrical constructions.

"Have I told you about poor Francis Bacon?"

"No, Mister Hobbes."

"I was his private secretary before I joined the Cavendish household. I took dictation, helped him translate his vernacular writings into Latin, and so forth. Besides being Chancellor, he was a great experimenter.

"Well, in 1626, I think it was in March, he was riding in a coach, and suddenly he decided that it was a good time, the weather being so cold, to test his theory that cold would delay the decomposition of flesh. 'Stop the coach,' cried he, when it entered one of the market squares. Out he hopped, and bought a chicken. Then, still a-shiver, he cut it open and stuffed it with snow. And do you know what happened?"

I didn't wait for William to answer. "He developed a bad cough, took to his bed, and died."

William sat in silence for a moment. "Whether Bacon had died or not, his experiment still settled the issue, didn't it? And would Galileo have discovered the moons of Jupiter, or the phases of Venus, by pure reason?" He looked at me expectantly.

"And look where Galileo is now—hiding under his covers, in the hope that the Inquisition will relent and leave him in peace," I replied.

"Would you like some more chicken?"

* * *

William went up to his room to do his lessons, and Geoffrey sat down beside me.

"English fellow was talking to us. Us servants, I mean."

"Are you sure he was English?"

"Spoke like a native, sir."

"And what did we want to know?"

"Who the young lord was, and why was he inFlorence , and where else was he going. And 'may I buy you fine lads a drink?'"

It was customary for the British consuls in foreign cities to keep tabs on the movements of English nobleman. Not as much as it had been in the days of Queen Elizabeth, but not unheard of even today. And I had reason to think that King Charles might have sent instructions to step up such surveillance.

"And what did you fine lads tell him?"

"Oh, it's just a sightseeing trip, entertainment for the idle rich, under the guise of education."

"And that was all?"

"No. When we said that we were going toGermany , he asked if we had ever heard of a place called Grantville. InThuringia . No, I said, we were going toGermany , all right, but just to visit a few towns and then come home by way ofHamburg ."

"And do you think he believed you?"

"Well, I did let on that I thought that you, begging your pardon, Mister Hobbes, had a sweetie in Nürnberg, and that we were swinging through the Germanies so that you could have a rendezvous at your employer's expense."

"Is that so?" I didn't know whether to be aghast at his presumption or delighted by his ingenuity.

"I kinda thought that if they were looking for a baser motive than education, it was best to volunteer one that wasn't, uh, political. There's all sorts of talk about Grantville, y'know."

"All sorts. Thank you, Geoffrey." And I tipped him heavily, of course.

Papal Statesborder post

January, 1633

Although the marriage of King Charles to the Catholic Henrietta Maria in 1625 had considerably eased relations betweenEngland and theVatican , the inquisitors were still capricious in their examination of Englishmen.

Consequently, I gave William and the servants a severe lecture before we saddled up for the ride toRome . "Don't argue about religion; in particular, do not defend the Church of England, the Lutherans, or the Calvinists."

As I said this, I kept my eye on Samuel. Back home, he was always railing about papist this and papist that. Right on cue, he protested my instruction.

"But sir, it is one thing not to start an argument about religion, but must I feign allegiance to the Harlot of Rome?"

I put him in his place, of course. "I expect you to protect the interests of your master, the earl. Don't pretend to be a Roman Catholic unless it is absolutely necessary to avoid arrest, but don't say anything in favor of the Anglican Church. Or any other faith.

"Oh, and don't give scandal in their churches. If you cannot bear the idolatry, remain outside."

Of course, it was easy for me to give such advice. My views of God and religion would give offense to everyone.

* * *

Despite my little precaution, I couldn't help but be nervous when, at the border, we were summoned before the local office of the Inquisition. After all, we were Protestants in the heartland of Catholicism.

"Next!" said the sergeant.

The Dominican friar, the representative of the Inquisition at this border post, closely examined us. Dressed in black, he looked like a large crow. One with a case of dyspepsia.

"What is your country?"

I answered for the entire party. "England."

"What are the names and stations of all of the members of your party?"

"This is William Cavendish, Earl of Devonshire and Baron of Hardwicke." Always good to let the inquisitors know that they are dealing with someone of high rank. "I am his tutor, Mister Thomas Hobbes, a graduate ofOxford . We are accompanied by his servants, Patrick McDonnell, Samuel Brown, and Geoffrey Watson."

"Are you all Christians?"

"Yes."

"Are you all Catholics?"

"Yes." It was an honest answer, since we Anglicans considered ourselves to be the*true* Catholics. I had warned our little company to expect this question, and my stock reply. I warned Samuel twice.

"What is your business inRome ?"

"To see the sights."

"Where are you going after you are finished inRome ?"

"Naples, to seeMount Vesuvius ."

"Are you carrying any books which are on the*Index Librorum Prohibitorum* ?"

"No, Holy Father."

The inquisitor conferred with the sergeant. "You are free to go."

Rome

February, 1633

William lunged, delivering the coup de grace to a phantom opponent.

I shook my head. "Lord Devonshire. Have you been keeping your journal up-to-date?"

William shook his head like a man trying to rouse himself from sleep. "My journal?"

"You heard me, Milord. Your lady mother expects to see proof that you have been observant. As I have told you before, you must record the history, geography, climate, wildlife, trade, agriculture, minerals, food, clothing, customs, art, laws, politics, and fortifications of each land we pass through."

William gave me a sheepish look. "Not since we leftFlorence ."

"I have to go out and run some errands. This would be a good time to set down in your journal a description of what you have seen inRome so far. You may go outside once you are done, but don't go alone."

* * *

I returned to our apartment and found classical bric-a-brac all over the place. Vases, bronzes, tablets, and busts galore. There was barely room to walk without tripping over an ancient Roman or two.

"Look what I bought!" William chortled.

"I am looking."

"I went off to the old Forum. It's market day there, and as I was walking about, I ran into this Englishman. We got to talking, I told him who I was, and he said that he had been a friend of my father, God rest his soul.

"Well, it turned out that his guide, this Italian fellow, was from this old family, that could trace its descent all the way back to old Julius Caesar, and they had all this old Roman stuff that had been in their family for generations. And because I was a fellow Englishman, and because he knew my father, they were willing to let me in on the chance to buy it!"

"How extraordinarily generous of them," I said. I wondered whether any of the sculptures were more than a year old; they had been somewhat indifferently "aged."

"Patrick, Geoffrey, you were supposed to keep his lordship out of trouble."

"There was no trouble, sir, no trouble at all. Lord's expected to shop when he's in foreign parts."

"What's wrong?" William said.

"Lord Devonshire, how many splinters of the True Cross are there?"

William blinked. "I don't know. A hundred?"

"Judging from the number which have been sold, enough for a thousand crosses!" I shook my head. "Lord Devonshire, you have great wealth and people will try to take advantage of you. Here inRome , they have been manufacturing fakes for over a thousand years."

"So these aren't real?" William's lips quivered.

I took pity on him. A little bit. "Well, some may be good copies of the real thing. I would have to look at them more closely."

"But I was going to ship them home, as presents."

"You can still do that. Just give them to relatives you detest."

William directed the servants to start putting the classical menagerie in some kind of order. By the time he was done, I had remembered the question I had meant to ask him. "What progress did you make on your journal entries?"

William proudly presented his work. "The River Tiber runs through the town," I read. And, a bit later, "Here, also is the great amphitheater, which they call the Coliseum because of its size." Clearly, William was not destined for a literary career.

Naples

March, 1633

For our excursion toNaples , I hired a*vetturino* . The man had been recommended to me by the Tuscan ambassador toRome , Francesco Niccolini. I paid him a fee, in return for which he arranged the coach, our lodging, and one meal a day, for a fifteen-day round trip.

"Not all*vetturini* are as honest as this fellow," I warned William. "You will expect a private room and then find other guests in the same chamber, or even the same bed. Complain to the innkeeper, and he says that it was all that the*vetturin* o had contracted for. Complain to the*vetturino* and he insists that the innkeeper is responsible, and you must take the matter up with him. Round and round you go, and are never satisfied."

We went inside the coach; the other servants had to ride on the outside. Our fellow passengers looked up and then ignored us.

To pass the time, I told William a bit about what we expected to cover inNaples : Virgil's Tomb, the House of Cicero, and the many volcanic sites. The latter included the Phlegraean Fields, whose fumaroles led many a visitor to think of Hell; the Grotto of the Dog, whose vapors brought death; and of courseMount Vesuvius itself.

After a while, I urged William to poke his head out the window. The road here was paved with smooth stone, and, in the distance, it gleamed like a thread of silver. "The Queen of Roads, the Via Appia," I explained. "This is where six thousand of Spartacus' followers were crucified by Marcus Licinius Crassus."

William noticed that there were many crosses alongside the road, and asked me about them. "Surely

those aren't the ones erected by the legionaires?"

"No, those are modern. Each cross marks the place where a traveler was murdered," I explained.

"Now, look there." I pointed to a skull on a post. "That marks where a bandit was executed."

William thought about this. "The crosses greatly outnumber the skulls."

* * *

The most important of our Neapolitan excursions was toMount Vesuvius . We intended, like many tourists before us, to climb to the rim of the great crater, but this was not without risk. Only a little more than a year before, Vesuvius erupted with great force, killing over three thousand people.

Napleswas ruled, through a viceroy, by the king ofSpain . After the recent devastation, the viceroy had posted a warning to tourists and residents alike.

"Let's see how dutifully you have been studying your Italian, William. Read the sign aloud for me."

"'As soon as an eruption begins, you must escape as quickly as you can,'" William recited. "'If you worry about your property, your greed and folly will be punished. Listen to the voice of this marble; flee without hesitation.'"

I clapped my hands. "Bravo!"

The volcano was still active; smoke rose from the crater high above us. Since Vesuvius was not presently spewing out ashes and lava, we nonetheless began our climb. It was difficult going in places; we occasionally had to walk through ash, which sometimes reached almost up to our knees.

At first William walked side-by-side with me. This gave me the opportunity to explain the theories concerning volcanic eruption. Strabo said that the rock was ignited by friction with compressed air, while Seneca urged that the heat came from the combustion of sulfur.

Now, I am usually a great walker. Still, I am almost forty-five years old, and I tired more quickly than William. I gradually slowed my pace. William, on the other hand, seemed more and more anxious to reach the top the closer we got. He would edge ahead of me, first by feet, then by yards. He would start running; I would call him back.

After a while, we reached a*modus vivendi* . William would run to the next turning, and then wait for me to catch up. I found walking in the ash very awkward, I fear. The servants stayed behind to help me, two in front, whom I held on to, and the third pushing me from behind. In this manner we progressed perhaps three-quarters of the way up.

Then I noticed a gleam to one side of the path. "Come, William!" I cried, and went off to have a look.

It was, as I thought, a little pocket of crystals. "Lord Devonshire, get out your magnifying lens," I said, without looking up. "William?"

"He went up, Mister Hobbes," said Samuel.

"What! After him, Samuel! You, too, Patrick! Find him, and then don't let him out of your sight.

Geoffrey, assist me."

Samuel and Patrick ran up the trail, with Geoffrey and me following. Patrick, being a trained footman, quickly took the lead and was soon out of sight himself. Samuel followed, running steadily.

I was pleased when I finally caught up and saw William standing by the lip of the famous crater, flanked by Samuel and Patrick. I was less pleased when I saw what William held in his hand. A rope.

"Where did that rope come from? And what is it for?" I demanded.

William clearly didn't think he had done anything amiss. "I bought it from an Italian. I was thinking about Galileo, sir. About what he said about the importance of observation. I thought I could see how the volcano is formed better, if Samuel and Patrick lower me in with this rope. I could become famous, sir."

"It would be simpler just to hang me with the rope," I said. "Because your family would see me hung if I even*thought* about letting you do such a thing."

Central Italy

Spring, 1633

We returned toRome by*vetturino* , and then left theHolyCity almost immediately afterward. I was anxious to be outside thePapal States before Holy Week, when the Inquisition was at its most zealous.

We returned toFlorence , then crossed the Appennines, the mountain chain which formed the spine ofItaly . The mountain road was poorly maintained and we had to choose our way carefully, lest a horse break a leg. When we camped, the wind howled all night.

After a brief stop inBologna we pressed on, following the trade road toPadua . This highway crossed the Po, the longest river inItaly , about thirty miles downstream fromMantua . The Po was the border between the Papal States and theVenetianRepublic .

Unfortunately, we couldn't cross it at first. Our first warning of trouble was the ringing of the church bells ofFerrara .

"What does that mean, Mister Hobbes?"

"It could be anything, Milord. Plague. Fire. Invasion. Rioting. Flood."

As we came closer to the city, the problem became apparent—thePo had flooded.

Ferrarahad grown up beside an ancient ford of thePo . Once, it lay above the Po Delta. However, in the twelfth century thePo had broken its left bank, near Ficarolo, carving out a new channel. Thus,Ferrara was now cradled between two distributaries, the Sa Roma to the north and the Po de Ferrara to the south.

The Po de Ferrara blocked our progress and, at the moment, it looked more like a lake than a river.

"Why do you suppose it flooded?"

I had no idea. But you do not get a degree fromOxford if you cannot come up with an explanation extempore. "Rivers usually run high in the spring, when the snow melts. But it seems a little early still for that. Perhaps there was a spell of unseasonably warm weather up in the mountains. Or there was a lot of rain."

"But it hasn't been raining that hard."

"What matters isn't necessarily how much it rains here, but how much it rains at the river's source," I explained.

"So what do we do now?"

"We had best retrace our steps, find higher ground."

"And where will we spend the night?"

"If we are fortunate, in a barn."

We found one. After an uncomfortable night spent listening to the farm animals complain about their visitors, we made another attempt to cross thePo , this time by boat. It took some doing to find a native who was willing to chance the waters, which were still high. It didn't help matters that we needed to transport the horses, not just the people. That meant several trips back and forth, but at last we all stood on the far bank of the Po de Ferrara.

We continued north, reaching the ford of the Sa Roma.

"Do we find another ferryman, or do we chance a crossing?" William asked.

I would have preferred to wait. But there were no boats within sight and no shelter, either. And what if the waters rose again? We could be trapped.

At least the extensive traveling I had done—this was my third trip inEurope —had taught me all the tricks of fording a river. I threw a twig in the water, and watched it move downstream.

"The water isn't moving fast here; that's good. Walk the horses and mules across. Keep them on the upstream side; they'll break the current. We'll cross in line abreast. Samuel on the upstream side. Then myself, Lord Devonshire, Patrick, and Geoffrey. Face upstream, and crabwalk across. Keep one hand on your mount. Carry a walking stick in your free hand."

"Shouldn't we rope ourselves together?" William asked.

"No. If you slip, you can get entangled and drowned."

We started across. Geoffrey, of course, had only listened to half of what I said. "Geoffrey, you fool! Shuffle your feet along the bottom. Leave the capering to the Morris dancers!"

We made it to the halfway mark. The water was now at hip level. Samuel yelled "Halt!"

"What's the matter, Samuel?"

"Don't like the way the water be swirling ahead of us." He poked ahead with his walking stick. "I think there is some sort of hole there."

"All right. We'll edge a bit upstream. Samuel will tell us when he thinks we're past the bad spot." We followed this instruction. Soon, the water was just at our knees. At last we clambered up the far bank, and collapsed.

After resting a bit I shook myself, and stood up. "Let's get some distance between us and the water, just in case."

William was shivering. I pondered what could be done to help him. "My Lord, bide a moment. We will get your pack off the horse, hopefully the clothes in there are dry." They weren't, not exactly, but at least they weren't soggy wet.

"I'd rather wait until we've got a fire, Mister Hobbes."

"On your head be it, William. That's the best we can do for now. I have my tinder box, but it doesn't do us any good without something dry to burn." We rode on, and eventually found enough good wood to build a fire.

By this point, William was sneezing violently. We got him changed and situated close to the fire.

"Thang you very much, Mister*Ha-a-a-shoo!* Hobbes."

Venice

April, 1633

I was delighted. As I expected, this Venetian bookseller had a copy of Galileo's*Dialogo Sopra i Due Massimi Sistemi del Mondo* . William's Uncle Charles had been most anxious to read it, and it wasn't available in London .

It wasn't surprising that the*DialogueConcerning Two New World Systems* was available in Venice , even though the Catholic Church had banned it. The Venetian Republic had a long history of ignoring papal pronouncements—the Interdict of 1606–7, for example. The Venetians were hardly going to be fazed by the*Librorum Prohibitorum* . If anything, the Venetian printers probably thought of it as a marketing device.

Of course, I wasn't going to risk carrying the book through, say, Milanese territory. I would find an English merchant to ship it back to London . Together with William's Italian souvenirs.

Then I noticed that William, too, had found something of interest to read. A history of Venice , perhaps? I walked up, softly, and looked over his shoulder.

The book William was so engrossed in was*The Catalogue of the Chief and Most Renowned Courtesans of Venice* , complete with over two hundred miniature portraits. And rates of hire. Presumably a later edition than the one presented to Henry III of Valois in 1574.

I was painfully reminded that William would be sixteen years old in October. Clearly, Cupid was getting

ready to tyrannize, right on schedule.

Venice

Ascension Day

(Thursday, May 5, 1633, Gregorian)

Venice. The Most Serene One. The Queen of theAdriatic . The Bride of the Sea. The last epithet was particularly apt today, because it was Ascension Day, the day thatVenice , with great pomp and circumstance, renewed its marriage to the sea.

TheGrand Canal was filled with thousands of boats: private gondolas like our own; fantastically decorated barges hired by the guilds of the city; war galleys from the famous Arsenal of Venice. So many boats were present, and so closely were they packed together, that you could walk from one to the other.

Some of the gondolas carried families; others, loud parties of young blades from the noble houses, and here and there one could see an especially ornate one. These usually carried one of the great courtesans ofVenice , dressed to the hilt. The infamous wantons knew that the young noblemen, as well as distinguished foreigners, would be attracted by these displays, like moths to a flame. I think the up-time term is "advertising."

Like many of the people ofVenice , we wore carnival dress. In William's case, it was a*bauta* , a white mask and a black cape. His blond curls stubbornly thrust out beyond the mask, like flowers seeking the sunlight.

"Ah, we are ready to get underway," I said. The doge's ceremonial galley, the*bucintoro* , had taken its place at the head of the aquatic parade. "Study the bucintoro; there is much symbolism in its construction." I passed the telescope to William.

The bucintoro was double-decked, with the rowers on the lower deck, and the doge and his entourage on the upper one. The flanks of the upper deck bore depictions of sirens riding seahorses, leaping dolphins, and the like. The prow of the bucintoro carried a golden woman, with a sword in one hand, and scales in another.

"The sword and scales are symbols of justice, I assume."

"Yes, and the woman,*Justitia* , is a maiden, a virgin. She implies that the government ofVenice has not been taken by force."

The prow had a decorative double beak. The upper beak showed waves. The lower beak featured bushes and stones. "And the two beaks, they represent the sea and the earth," said William.

"That's right."

"Where is the doge? He isn't on his throne."

"Look for a golden parasol, near the front."

"Ah, I see him now."

The nautical procession reached the convent of Sant' Elena, and waited there expectantly. After some minutes of suspense, the murmur of the crowd rose in volume. Through the telescope, I could see the flat boat of the patriarch of Castello. It approached the bucintoro and halted. I passed the instrument to William, who took a long look.

"What's happening now?" he asked.

"The*benedictio* ," I answered. "The patriarch says three times, 'We beseech Thee, O Lord, to grant that these waters be calm for our men and all others who sail upon it.' Now watch."

The patriarchal*piatto* was in motion again, circling the bucintoro. The patriarch touched the doge's ship with an olive branch.

"What's that all about?"

"He dipped the branch in holy water. He has blessed the doge."

Pilot boats leapt ahead of the bucintoro, to guide it, and the bucintoro and the patriarchal piatto followed. The rest of the procession crowded behind them.

"Now what?"

"Not much until we reach theLido ."

William looked disappointed, and looked back the way the way we had come. "I want a better view of the war galleys. I am heading back."

William walked to the stern of our gondola, had a look about, and then turned to look forward. He stayed where he was, however. I smiled; it appeared that the young lord was tired of tutoring. For that matter, I was content to just watch the spectacle myself.

I didn't know it at the time, but he was under observation.

* * *

The procession finally reached theLido . The patriarch poured water into the sea from a large*ampulla* . The doge raised his arm above the waves.

"What's going on, Mister Hobbes?" asked William. "Isn't there enough water in the ocean already?"

"The patriarch just blessed theAdriatic with holy water. The doge holds a golden ring in his hands. He will say, '*Desponsamus te mare, in signum veri perpetuique dominii*.'"

William's Latin was equal to this challenge. "We marry you, oh sea, as a symbol of perpetual domination."

"Yes.Venice rules the sea even as a husband rules his wife," I said. "In theory, at least." I didn't explain which proposition was true only in theory.

The crowd roared as the doge dropped a golden ring into theAdriatic .

"How long has this ceremony been performed, Mister Hobbes?"

"There has been a*Sensa* celebration for over six centuries; it honors a naval victory on the Ascension Day of 997. It used to just be the blessing of the waters. But in 1177 Pope Alexander III gave a ring to the doge, and said that it was a symbol of Venetian naval supremacy. The ring which is cast into the sea each year is modeled on that original."

"Is this the original bucintoro?"

"I don't think so." I conferred with the gondolier. "No, there have been several of them, over the years. This bucintoro first sailed in 1606. It cost seventy thousand ducats."

"Did the one before it sink?"

"No. It got too dilapidated and leaky, so the Venetians replaced it." I chuckled. "It would be funny if the bucintoro sank with the doge on it. AllEurope would say, 'he finally decided to consummate his marriage to the sea.'"

* * *

I settled into a chair and pulled out a book to read. After a while, I closed my eyes. I felt the pleasant, warm caress of the afternoon sun and relaxed. I needed to relax; the Sensa ceremony had been the culmination of two weeks of carousing inVenice and I had to keep constant attendance on William. But now I could relax.

The next thing I knew, it was dark outside and I was hungry.

"Geoffrey? I would like to speak to His Lordship."

"He's out, sir."

"Out? Out where?"

"A gondola came to pick him up."

"Whose gondola?"

"Some lady or another. Very finely dressed. Lots of pearls."

"My God—you let him go without telling me? You didn't find out her name?"

"There was fancy writing on her gondola, sir. Ask our gondolier. He was up and about at the time."

I rushed down to our townhouse's little dock. Our gondolier was napping, inside his boat. I shook him awake.

"His Lordship, where is he?"

"He is in the best of hands, sir. He went off with Lucrezia Cognati."

"Who might that be? Some contessa? A*cittadina* ?"

"Oh no. A*cortigiana honesta* . Of the first rank."

A courtesan. "We must rescue him at once." The gondolier rolled his eyes but said nothing. "Where does she live?"

"Near the Campo San Cassiano. On the Ponte delle Tette."

* * *

I stormed into the courtesan's house, followed closely by Samuel and Geoffrey. The lady's bodyguard, a muscular Moor, appeared and asked our business. When he refused to let us interrupt Lucrezia and William, I rushed past him and the estimable Samuel clipped the bodyguard when he turned to follow. What a team we were.

The second line of defense was the lady's maid, who was screaming at us like a harpy out of the myths. Even though she was the servant to a bawd, she could not be treated so forcefully.

"Calm yourself, woman. We are here to claim what is ours."

She stopped screaming, and suddenly looked sly. "Oh, what might that be?"

"A young gentleman, entrusted to my care."

"How young? An infant?"

"Certainly not."

"A pity, for every woman yearns to hold an infant in her arms."

"I don't want to strike you, but if you continue—"

"Wait. Does he have blond curls, lovely enough to make a lady's fingers itch?"

"Don't be impertinent. Where is he?"

"Receiving an education yonder." She pointed, languidly, at a closed door. "That is the purpose of his travels, isn't it?" She smiled at Samuel, who smiled right back, damn him.

"Enough!" I burst into the boudoir, surprising Lucrezia and William in the very act of—

Playing a game of chess.

Northern Italy

May, 1633

"I can't eat anymore," said William. "I just can't."

We had taken the canal boat back toPadua and then followed the main caravan route fromVenice to the Germanies: west throughPadua andVicenza toVerona , then north up the Adige, to Trento andBolzano . There, we left the river valley, and headed northeast toward theBrennerPass.

We took lodging in Bressanone, at the famousInn at the Sign of the Elephant. The food at the inn was tasty, and the portions were, well, elephantine. In fact, one of the traditions was to bring you a huge platter of meat, and, if you could finish by yourself, it was on the house. No one, not even a fifteen-and-a-half year old boy who had been riding all day, was equal to the task. With a sigh, William pushed his plate away.

On the outside of the inn was a gigantic fresco, with a life-sized rendition of an Indian elephant, complete with a turbaned mahout on its back. I told William the story behind it.

"In 1550, King John III ofPortugal gave an Indian elephant to Archduke Maximilian the Second of Austria. Maximilian, at that time, was living inSpain . Maximilian was summoned home, and he took the elephant with him. We are following in its footsteps."

"Watching where we walk," William quipped.

It would have been beneath my dignity to respond. "By the time the beast reached Bressanone its strength had ebbed, and its handlers allowed it to rest at the High Field Inn for two weeks. That's the old name of this inn. Then they rode it across the Brenner Pass, and ultimately made a triumphal entrance intoVienna ."

"Well, if an elephant can cross theAlps , we shouldn't have any difficulty," William said. Thereby tempting Fate, I think.

* * *

The next day, we were in Vipiteno, our final stop before theBrenner Pass itself. Knowing that a rough day was ahead of us, I urged William and the servants to retire early that evening.

The following morning, the innkeeper motioned me over. "Plague," he whispered. "Word came in last night."

"Here, in Vipiteno?"

"No, thank God, not here." He crossed himself. "Still, it isn't far away. It is inInnsbruck . Many cases, I hear."

It would not be easy, coming from the Brenner Pass, to swing wide ofInnsbruck , and thus avoid the plague carriers.

"What about theReschenPass ?" I asked. TheReschenPass lay northwest of Merano, a town further up the Adige thanBolzano .

"Bandits are a big problem right now. One of Tilly's mercenary companies decided that charging tolls was more profitable than soldiering. Then they got tired of that and just used the pass as a base for

raiding the villages nearby. The Jaegers will deal with them eventually, but with the plague inInnsbruck , they probably won't clear out the Reschen until June or even July."

"That's too late for me. Any other choices?"

"It depends."

"On what?"

"On how crazy you are."

"Never mind, then. Can I get something to drink?"

My resolution to do nothing didn't last long. Samuel approached me. He had a gift for languages, which no doubt had come in handy in the past.

"You heard about the plague inInnsbruck ?"

"Yes."

"Well, there's a rumor going around that the first case was someone who had an argument with an English visitor. So now some folk are saying that the Englishman laid a curse onInnsbruck , and that's what brought the plague."

"Enough." I turned to the innkeeper. "I changed my mind. I am crazy enough to hear about option three."

"It is the high pass, the Passo del Rombo. The Timmelsjoch. Or, as we called it in the village I was born in, the Secret Passage."

"Secret sounds good. Leaving immediately sounds even better."

"I will give you a letter of introduction to your guide. He lives in the village of San Leonardo de Passiria. You head west from here in the direction of Merano, you go over theJauffenPass , and then San Leonardo lies below you, where the Veltina meets the Passiria."

"Thank you."

"Mention me in your prayers." The innkeeper checked something in the ledger, then looked up. "I must warn you, the guide is not quite right in the head."

"Why do you say that?"

"He climbs. For the fun of it."

Crossing theAlps

May, 1633

Our guide was Joseph Hofer, a chamois hunter, and the younger son of the innkeeper of San Leonardo.

"So, you wish to cross the Timmelsjoch. You have come to the right man. It is still a bit early in the season, but have no fear.

"There are five of you, yes? With mules?"

I corrected him. "With three mules, and two horses."

"Horses, you say? Unless they be mountain-bred, exchange them for mules. Speak to the innkeeper, while I gather the equipment for five new mountaineers."

"Equipment?" Joseph had already disappeared into a storeroom. I shrugged, and went off to search for the innkeeper.

While I was away, Joseph decided to have some fun with William. I didn't learn the particulars until after we had crossed the Timmelsjoch, but I set the incident down now in its proper place.

Joseph commandeered them to carry out goods suitable for mountain travel. Bearskin coats. Beaver gloves. Backpacks. Alpenstocks.

"What's that for?" William asked. "If it is a walking stick, why is it so long?" The alpenstock was a thick ash staff, perhaps eight feet long, ringed with iron at both ends. It also bore a metal point.

"It is essential in theAlps , young man. It is the only thing that can save you from a dragon."

"A dragon?"

"Indeed. If you shoot a dragon, you will merely annoy it and it will devour you. If you run, the result will be much the same. You must wait bravely until it opens its mouth, and then thrust the alpenstock between its jaws, jamming them open. The dragon will then starve to death." Joseph waited, deadpan, for William's reaction.

"Are dragons common in the mountains? I mean, if they are, wouldn't you need to carry more than one alpenstock?"

"Don't worry. They're rare, so one's enough."

It was then that I returned, as yet ignorant of Joseph's little joke. But I was quite conscious of the ominous pile of gear. "I hope we are going to keep the climbing to a minimum."

"No climbing, sir," Joseph said. "But we also want to keep the slipping to a minimum, so we need these crampoons." He held out devices which looked vaguely like horseshoes, but matched the size and shape of human feet. They were studded with nails, and each was equipped with a leather strap.

"You fasten them under your feet, like so"—he demonstrated—"and now you can walk on ice, if need be."

William tried them on. "Ouch, the bars dig into my feet."

"They take getting used to."

I intervened. "Let's stow them in the saddlebags until we really need them."

* * *

We managed to get off to a mid-morning start. We had eight mules, five for our party to ride, and three to carry supplies. Two of these would ultimately be given to Joseph, so he could take back the loaned mountaineering gear after we crossed the Timmelsjoch.

The path, at first, was fairly easy, as we walked along a mountain stream, the Veltina. After perhaps a dozen miles, Joseph motioned us up the left side of the river valley. It was steep and rocky, and the mules became a little balky.

Then we heard a shriek. We Englishmen halted abruptly, and reached for our weapons. "God's blood, what was that?" I cried.

Joseph had continued up the slope, unperturbed. "The marmot, the mountain squirrel. That was its alarm whistle."

"Can you eat them?" asked Samuel.

Joseph nodded. "They are best caught in April or May, when they have just come out of their winter sleep and are still befuddled." He smacked his lips. "Bop 'em on the head, and then it's dinner time."

The trail now swished back and forth as it climbed further into the mountains. Now and then, we found ourselves in light fog and had to slow down even more.

It was after one such patch that we had our first clear indication of how high we were. No trees.

"Where are the trees?" William asked.

"From here on up there are no trees, until we are over the pass and descend into theTyrol ," said Joseph. He pointed to the relatively flat section ahead, limestone carpeted with white wild flowers, the*edelweiss* . "These are theAlps ."

"I thought theAlps were the mountain peaks."

"No, no. They're the high pastures. Although the shepherds don't usually come this way."

I thought that strange. "If the shepherds don't use this path, who does?"

"Folks who like to move goods from one country to another with a minimum of fuss."

Smugglers, in other words. "How much further up do we have to go to reach the pass?" I asked.

Joseph leaned on his alpenstock. "Let me think. Oh, we are perhaps three-quarters of the way to the top."

Samuel whistled. "And I thought the Kinder Scout back home was high."

"What's the Kinder Scout?" asked Joseph.

"The highest point in the Peak District, back in Derbyshire. But it's just a hillock compared to theseAlps ."

Before we left this resting place, William collected some of the edelweiss, to be dried and pressed, and pasted into his journal as souvenirs. They didn't grow in the lowland.

We trudged on, weaving higher and deeper into the mountain range. A golden eagle soared overhead. At last the trail opened up a bit, and leveled out somewhat. Ahead of us was a valley of sorts. Not a river valley, merely a saddle point between two great peaks. Patches of snow lay helter-skelter on either side of the trail ahead.

"We are at the top of the pass," said Joseph. "There is the Jochkopfl, behind us, on the right, and there the Wurmkogl, ahead on the left." Their tops were lost in the clouds.

We set up camp under an overhang. Snow started to fall, and we all crowded closer to the fire.

"Good thing we brought firewood with us," William said. "There is not a branch, or even a twig, up here."

The next morning, the valley floor was completely white. We put on our crampoons, and continued our journey. The snow sparkled in the sun and crunched under our feet as we walked.

As the oldest, I was the first to tire and I decided to ride my mule, not lead it. It was a mistake. Off to one side, a small slab of snow slid down with a*whoomp* . It came nowhere near us, but my misbegotten mule bolted. I held on for dear life, and my companions pursued us.

The mule halted abruptly at a small declivity; I sailed off the cursed beast and into the hollow.

The next thing I knew, I was staring up at William and Joseph. I hurt everywhere and I was lying on a bed of snow, quite bemused.

"What are you doing down here, William? For that matter, how did I get down here?"

"The mule threw you," he said. "Joseph slid down, and I followed. It was harder than I expected, but I made it to the bottom. Joseph said that he thought you were knocked silly for a moment, but there was deep-ish snow at the bottom and that cushioned you. I was so relieved when you finally stirred. How are you feeling?"

Samuel yelled "watch out below," and hurled down an alpenstock, the rope tied firmly to it. Joseph picked it up and brought it to me. I looked at it in puzzlement.*You* take a fall like that and see how quickly you come to your senses.

"All right, Mister Hobbes. Take hold of this staff with both hands. Your lordship, you put one arm under his and the other on your own alpenstock. Take it nice and slow." He looked up, and raised his voice. "Start pulling now."

After some pushing and pulling, we made it out of the hole.

"I think I would like to call it a day," I said.

Joseph nodded. "Just a little further on is a good place for a camp." When we got there, Samuel stripped

the packs off one of the extra mules and transferred them to my erstwhile mount. "I think you would do better with this one, Mister Hobbes. Less temperamental."

"Thank you, Samuel. Right now I would rather feed my last mule to a pack of wolves."

William was too keyed up to rest. He found a gentle slope, and practiced the*glissade* , which is what Joseph called the slide. William held his alpenstock by his side so that it trailed behind him. Then he bent his knees and pushed off. He slid rapidly down, moving the stick back and forth like a rudder, and was at the bottom within seconds.

"Yahoo!" He ran back to the top.

I was too tired to protest.

"He is a true*bergler* , a mountain man, in the making," Joseph said.

* * *

"It is here that I must leave you," said our guide. You follow this stream, it is called the Otztaler Ach, down to Solden, Langenfeld and Otz. Shortly after Otz, it joins theInn ."

"We don't want to go anywhere nearInnsbruck ," I said.

"No problem. You turn left, and go up theInn valley. Soon you come to the turn off for Imst. It is on your right. It is a market town, so you should have no trouble finding it."

My plan, as I told William, was to cross theFernPass , and descended to Lermoos and Reutte. From there we would follow the Lech downstream to the city ofAugsburg . We could rest there a few days and find out what the Swedish and Habsburg armies were up to, and how best to pass the lines. I assumed that we could just join a merchant caravan; trade continued even in time of war, at least when the armies weren't on the move.

William was still under the impression that we would remain on the great road toHamburg . It passed north through Nürnberg in Franconia andErfurt in Saxony, and finally curved northwest to end on theNorth Sea coast. In fact, after we crossed the Thüringerwald north of Nürnberg, we would swing east to Grantville.

We said our goodbyes and Joseph, leading two mules, began his return journey. He left behind one alpenstock; William had insisted on buying it. "We might encounter dragons in theFernPass ," he said. And that's when I learned of Joseph's little tall tale.

In Imst, we came to a roadblock. Obviously the authorities didn't want the plague carried fromInnsbruck to other parts of theTyrol . They were suspicious of us even though we came from the south; they thought we might have tried to circle around the town. That's when William's alpenstock and pressed edelweiss flowers came in handy, as they were proof that we had come across the Timmelsjoch, avoidingInnsbruck . TheBrenner Pass is too low to find edelweiss and not steep or snowy enough to need an alpenstock.

Nürnberg

June, 1633

I watched William as he happily munched on his*lebkuchen* . He was lucky to find this spiced honey cake for sale, even though it was one of Nürnberg's famous specialties. While the honey was still readily available in the woods surrounding the city, the Thirty Years' War intermittently interrupted the flow of spices into the bakeries.

Why, Nürnberg itself had been threatened by Wallenstein's army the previous year, until Gustavus Adolphus won the battle of Alte Veste. With American aid.

This was not, of course, the first time William had heard about the Americans. But Nürnberg was a part of the new Confederated Principalities of Europe, ruled by Gustavus Adolphus and supported by Grantville. We were repeatedly reminded of the influence of the people from the future. For example, William had seen several strange gadgets in the shops, which, said the merchants, had come from Grantville. Others were local copies of "up-time" designs. William showed great interest in these devices.

One afternoon we decided to visit Nürnberg's tennis court. We were both avid fans. After a hard-fought set, we retired to the gallery. There, William confronted me, this time intellectually rather than physically.

"Mister Hobbes, I have been thinking. About this Grantville we keep hearing about. It's a city from the future!"

"That's what we've been told."

"It just suddenly occurred to me. That they must have history books. And we must be in them! Not you or me personally, of course, but our country. Think what we can learn from them."

I waited, without saying anything, but I was pleased by his insight.

"Mister Hobbes, I know you have your instructions from my lady mother, but this is our chance to steal a march on our rivals. As the earl ofDevonshire , I must insist we go to this Grantville. You can tell my mother that I forced you to go, that I said that I would go alone if I had to."

I couldn't help it, I started laughing. When I collected myself, I explained. "It does appear that you have forced my hand . . . to tell you that what you demand has been our goal, our secret goal, all along."

"What?"

"This whole trip, although you didn't know it, you have been on the road to Grantville."

None So Blind

By David Carrico

Magdeburg

January, 1635

The slap knocked Willi sprawling, eyes watering with pain. He had to bite his lip hard to keep from

crying out.

"Five nothings!" Willi felt Uncle's hand grab the back of his rags and haul him up. The hand shook him so hard he felt like a pea rattling in a cup. "You spend all day on the streets and all you bring me are three pins and two worthless quarteredHalle coins!"

Willi dropped to the floor again. His head was spinning, but his hand had fallen across his stick. He instinctively grasped it, then pulled it to his side. It took a moment to rise to all fours. As soon as his head settled some, he pulled himself up on the stick.

"I'm sorry, Uncle, but the place where I was, not many people put coins in my bowl." He hesitated. "And . . . and I think someone took money from my bowl. It kind of sounded like it."

"What? Did you see who it was? Why didn't you stop . . ." Uncle's voice died away as he realized that no, Willi did not see who the culprit was and therefore could not stop him. "Hmm. Well . . . I guess that might not be your fault. But you'll have to do better in the future. Here." Something thumped into Willi's chest and dropped to the floor. "That's all you've earned today."

Willi knelt down again and felt around the dirty floor. Within a moment his fingers encountered what he expected to find—a dried hunk of bread. It was more than he had expected. When Uncle felt he had been cheated, those in his family were more apt to receive curses and blows than blessings and food. Willi gathered the bread up. He would go hungry tonight, he knew, for it wasn't much more than a crust.

It took Willi a moment to peer around and figure out from the play of light and dark which way his corner was. It took some time to make his way there, stepping with care and feeling his way with his stick. At least none of the family was in a mood to push things or plant feet in his way in the hope he would trip tonight. In the last four years, he had provided that entertainment many times, often falling helplessly to the ground with cruel laughter ringing in his ears.

Willi's blanket was still where he had left it, wadded up behind an old trunk so that no one would notice it. Threadbare and full of holes though it was, he did feel warmer with it wrapped around his shoulders. The winter was not even half over, and he felt like he hadn't been warm since forever.

The bread was eaten slowly, one small bite at a time; partly because it was so dry and hard that it took a lot of chewing to make it possible to swallow, and partly to make it last longer. It would at least give Willi the illusion of having enjoyed a full meal—a most uncommon experience in his short life.

The last bit was being swallowed as Willi heard someone coming toward him amidst the noise of the other children chattering and yelling. He cocked his head to one side, then smiled as he recognized the step. "Erna," he said.

"How do you know that?" the girl demanded as she took his hand and with care set a small pottery cup in it. "How do you always know it's me?"

"You walk different." Willi sipped the water in the cup.

"But even when I try to sneak up on you, you still know it's me."

Willi held his hands out and shrugged. That caused water drops to splash out of the cup, and he licked them from his hand. "I don't know how. I just do."

He felt her plop down beside him. "So where were you today?" she asked.

"By the cathedral."

"The cathedral? No wonder you were so late getting back. You'd better not let Uncle know you went there. He's told us more than once to stay away."

"Well, I won't tell him, so if you stay quiet he won't hear, now will he?"

Erna swatted his arm. "Why did you walk so far? Weren't you afraid of getting lost?"

"I've heard Fritz and Möritz talk about it, so I knew the way there. I hoped the folk coming out of the church would give alms, but they were as cold as the building itself. And what they did give, someone else took."

"That really happened?" Erna leaned close.

"Yeah. Someone tossed a coin in and then someone else snatched it back out before it stopped ringing. It was so fast I felt nothing, saw only a dart of shadow." It wasn't the first time that Willi had cursed his ruined sight. It wouldn't be the last.

"Well, next time take someone with you, to watch over you."

"Who? You?"

Willi was knocked sideways by her punch on his shoulder. "Yes, me. I can watch from a ways away and make sure nobody robs or cheats you."

Willi shrugged. "If you want to. But how will you earn your bread if you're near me?"

"Uncle's been teaching me some new stuff. I'll manage."

Willi wanted to ask what new stuff, but just then Uncle called out, "Lights out." As usual, his stinginess with lamp oil was getting the lamp blown out at the earliest moment.

Erna left amid the sound of scurrying around. A moment later she was back. "Lie down and I'll cover us." Willi curled up on his left side facing the old trunk, wrapped his arms around his stick and hugged it to his body. He felt the weight of first his blanket, then hers, covering him. Erna wiggled under the blankets and put her back against his.

The two of them were too small to gain a space close to the fireplace and its few coals—Uncle not being any less stingy with the firewood. Those went to the older, harder children; older than Willi's eight years. Forced into the outer part of the room, they had learned that if they shared their blankets they stayed warmer than if they slept alone. Even so, there were many nights that they shivered together as the cold cut through the meager coverings.

Erna went to sleep as soon as she stopped wiggling to find the right position. Willi was kept awake by his growling stomach for some time, but at length he drifted off.

* * *

The next morning Erna ripped the covers off of Willi. "Come on! It's daylight. If we don't get out there, we won't get anything." She barely let him use the chamber pot, and then they were in the street. "So, where to this morning?"

"Not near the cathedral, that's for sure." Willi pondered. "How about Zenzi's? I haven't been there in a few days."

"Zenzi's it is. C'mon." And so, stick in one hand and Erna tugging on the other, Willi was towed to one of his favorite places, a bakery that was several blocks away.

"Here we are," Erna announced in triumph. "You want your usual spot?"

"I can find it." Willi pulled his hand away and reached out to touch the front of the building, then walked along the front to where a beam jutted out. He put his back to that bit of corner and settled to the ground with a sigh. Reaching inside his ragged jacket, he pulled his bowl out and set it on the ground in front of him. He leaned back against the corner, set his stick against his shoulder, settled to wait for opportunity.

Erna crouched in front of him. "Lean forward."

"What?" Willi was confused.

"Lean forward, I said."

Willi did so. He felt a band of cloth cross his eyes and get tied behind his head. "What did you do that for?" His hand fumbled at the cloth, only to get slapped.

"Leave that alone." Erna leaned close enough that he could feel her breath on his face. "Willi, you can't see. But the people can't tell that unless they get a really good look at your eyes. This way they can tell right away and you'll most likely get something from them."

"But I can see!" Willi's voice broke, to his embarrassment.

"Willi." Erna's voice was full of pity, which only deepened his embarrassment. "It's been almost four years. You only see light and shadow. You try to see more, and all you get is more falls and more of those bad headaches. Just wear the rag. You'll feel better, and you'll make more coin, too." Willi heard her sit back. "I'll be up and down the street, doing my thing and keeping an eye out. Won't nobody dip into your bowl without my seeing it."

"All . . . all right," Willi choked out, feeling as if he was giving up on his dreams to see again.

Erna patted his cheek, for all the world like she was the mother he could hardly remember instead of a slip of a girl not much older than him. "That's my Willi. I'll keep watch." He heard her stand and walk away.

Willi sat in his darkness. The rag soaked up his tears.

Magdeburg

February, 1635

The two men with sergeant stripes on their sleeves marched into Frank Jackson's office, stopped in front of his desk, then saluted smartly—or as smartly as a couple of West Virginia hillbillies with no military service could manage.

"Cut it out," Frank said in a weary tone. "Bill, shut the door. Siddown, both of you." He looked at Bill Reilly and Byron Chieske. "We," Frank emphasized that word, "have a problem. You guys are going to help solve it. You know who Otto Gericke is?"

The two men looked at each other. Byron shrugged. Bill turned back to Frank. "He's some kind of mucky-muck here inMagdeburg , right? Burgomeister, or something like that?"

"Yep, he is; one of several. He's also the engineer appointed by Gustavus to rebuildMagdeburg . And a more thankless task I can't imagine." The other two men nodded in agreement. "But when he's wearing his burgomeister hat, he's the only one of the city council who can pour water out of a boot even when the directions are written on the heel. As a consequence, he's the one who's in charge of anything important, including the city night watch. And he's asked for help in upgrading them into something resembling a police force."

Bill looked to Byron again. Byron looked puzzled. "So why doesn't he approach the admiral for some help from that investigative unit he set up?" Although there had been pretty wide-spread deprecation of the "NCIS" unit at first, after a few successes in investigating some crimes, including a bloody double murder, no one thought they were a joke now.

Frank grimaced. "There's been one too many exchanges of insults. That wouldn't stop the navy guys from working at it—the admiral keeps them on a pretty short leash. The city boys, though, have been 'insulted,' they claim. They refuse to work with the navy.

"Mike's pretty pissed about it. He doesn't need extra trouble right now, and for a squabble to boil up between the navy and the civilian government is just not a good thing in more than one way. I wasn't in the room, but my understanding is that he more or less told the admiral that if his investigators couldn't keep from talking trash, he'd better muzzle them. Oh, it was a little more polite than that, but the message got across." Frank grinned an evil grin. "I also heard that the admiral's subsequent talk to his crew chief was a bit . . . ah, blunt." He sobered. "But the city watch still won't have anything to do with them."

Frank folded his hands on his desk. "Bill, I know you were about done with your degree. What was your major again?"

"I was in my last semester for a degree in Business Admin, with a concentration in business law and contracts."

"Right. And you worked for that security firm inFairmont for a while, right?" Bill nodded.

Frank turned to Byron. "And I know you were majoring in criminology and had just qualified to serve as a reserve officer for the county sheriff. Correct?" Byron nodded. "I checked with Dan. He said something about you doing some ride-alongs."

"Yeah, some for Dan and some with the sheriff's deputies."

"Were you bucking to join the Grantville PD?"

"State Trooper."

"Ah. Well, that's all water under the bridge. Dan Frost's partner, Dennis Grady, is based here inMagdeburg , so by rights this job ought to go to them. Building police forces is what they do. The city council is too cheap to pay their consultancy fees, though, so Mike told me to handle this problem.

"Here's how it is. You two have more experience in law and law enforcement than anyone else I can lay my hands on, so you're it. As of now, you are no longer part of the transportation detachment. You're seconded to the USE Department of Justice. You'll have to find out where it's at and who's in it—I don't have a clue. Your first assignment, straight from the Prime Minister, is to shape theMagdeburg city watch into something more than a good-ole-boy's club that walks around at night with torches."

The two of them looked at each other wide-eyed for a moment, then turned equally horrified glances on the army chief. Frank stared at them for a moment longer, then grinned. "You're both officers now—Reilly, you're a captain, and Chieske, you're a lieutenant. Carve up the work however you want, but one of you needs to work with Gericke and try to get the organization and procedures laid out. The other one needs to start working with some of the watch, so they can get used to the idea of us Grantvillers poking our nose in their business."

Frank focused on Byron alone. "Chieske, you're probably going to end up with the second job. I think you can do it. But there's one thing you won't do. You take the strong and silent type to an extreme. You make Calvin Coolidge look like a town gossip. I haven't figured out yet if you just don't like to talk, or if you caught on at an early age if you kept your mouth shut you'd stay out of trouble. I don't care, actually. But you will knock it off with the city watch."

The general directed a stern look at him. "I don't mean you should turn into a smart-aleck motor-mouth. But you will talk to these men, using reasonably complete sentences. You will instruct them. You will correct them. You will even, God help you, discipline them if you have to. You're not one of those street corner white-faced clowns. You're an officer in the army, my army, and you will do your job to the best of your ability, no matter how much it makes you uncomfortable. Is that clear?"

Byron nodded.

"I said, is that clear?" Frank's voice was frostier in tone.

"Yes, sir."

"Good."

Byron shivered a little. Frank sometimes had that effect on people.

General Jackson smiled again. "Who knows? If you play your cards right, Gustav Adolph might draft you. You could end up in the history books as the first two agents of the Imperial Bureau of Investigation. Or maybe the first two USE Marshals." He stood and shook hands with them. "Odogar has got your rank insignia and badges in his desk in the outer office.

"Get to work."

Magdeburg

March, 1635

Frank's thoughts were right. They divided the work so that Bill Reilly—Captain Reilly, now—worked with the burgomeister. That left Byron to work with the men of the watch themselves.

A few days after trying to work with all of them, Byron had decided that it was going to be tough to get through to the watch as a group. Despite the fact that many of them were close to his own age, or even older in a couple of cases, they reminded him of nothing more than a group of high school jocks. He knew they weren't stupid—these were the cream of the patrician and merchant families, after all—but they had adopted a uniform "We don't need to know anything you have to show us" attitude. Byron had muttered a few words about the NCIS to Bill, who sympathized with him. They both knew that there was plenty of pride and arrogance to go around. The watch had almost certainly given as good as they got in the insult arena, but that didn't make the results any easier to deal with. Byron had gone to Otto Gericke and asked the burgomeister to designate one member of the watch—one who might be a little more open or reasonable than the others—to partner with him.

The result was Gotthilf Hoch, one of the youngest members of the group and from a minor patrician family. Byron watched him as he squirmed a little in his chair. He had been sizing Gotthilf up for the last day or so. He thought he could work with him. No time like the present, he supposed, so he had asked the young man to step into his office.

"So, why did you join the watch?"

Gotthilf's eyes widened in surprise. "The statue speaks!"

Byron grinned. "I'm not that bad, am I?"

Gotthilf returned the grin uncertainly, as if he didn't know how Byron would react. "Nay, but there are those who have wagered you would only speak when spoken to or when ordered to. Coin changes hand tonight when I tell them of this."

"All right, so I don't talk a lot, unlike some others I could name." The grins returned at the thought of a few of the members of the watch. "So, why did you join?"

Gotthilf flushed a little. "After . . . after Tilly's men destroyed the city, I thought to help protect it again."

"And?"

"And . . . I thought it would be good to be seen as a member of the watch." That all came out in a rush.

"Aha. You liked the idea of wearing the sash and carrying a musket or torch around at night with a bunch of other guys." Byron glanced at the younger man, only to catch his profile as he stared down the street in his turn. "That sounds like the ambition of a fifteen-year-old boy." Gotthilf's flush increased. "But the idea of protecting your city, now . . . that's a goal worthy of a man."

Gotthilf turned to stare at Byron.

"Yep, that's an ambition I can respect," Byron continued. "Thing is, it doesn't go far enough."

Gotthilf's stare turned puzzled.

"You were thinking of protectingMagdeburg and your family from outsiders. What about protectingMagdeburg and its citizens from assault from within?" Byron pointed out the window to the street. "These people have the same desire for peace that you do. Shouldn't they be given your protection? From theft and murder and rape, not by soldiers but by those who are just stronger and more vicious?"

Gotthilf's eyes followed Byron's finger. For long moments he stared out the window. When he turned back to Byron, his jaw was set firm. "The talk is that you Grantvillers come to overturn our laws and create anarchy, that you are all but lawless yourselves. Look at how your admiral insulted the city by raising those outside the law to enforce it in his precious NCIS."

"The rumors have it wrong, as usual. We believe in laws, but we believe in moral laws; laws that are based on reason and logic, not on custom and ritual. And the admiral has his reasons—after all, sometimes you have to set a thief to catch a thief. But that has nothing to do with protecting your people." Byron smiled at Gotthilf's surprise. "You already have the tools you need to reach your desire. Eyes to see, ears to hear, and a mind to reason. If you have those, all you need to know is how to use them."

The young man was still thinking about that when Byron ended the discussion with, "Meet me tomorrow morning here. Leave your sash at home. In fact, dress in something old and worn, something that looks like it's been used for more than sitting for a portrait." His grin was fully as evil as Frank Jackson's. "And wear your most comfortable shoes or boots. We're going to be doing a lot of walking.

* * *

Gotthilf Hoch, stalwart member of theMagdeburg city watch—in his own opinion, anyway—was walking as escort today for Lieutenant Byron Chieske of the USE Army. At least that was how he thought of it. He knew that Byron referred to him as his partner, but that implied an equality that Gotthilf didn't feel. As a member of a patrician family in the city, he wasn't sure he should be forced to work with this up-timer. However, Burgomeister Gericke had made it very clear he expected Gotthilf to do so, so here he was.

He looked up at Byron as they walked down the busy streets ofMagdeburg . This wasn't the first day they'd been walking the streets. When he questioned Byron about why, he got a response that he was still mulling around, trying to understand: "I need to learn the city—learn it the way the people know it . . . not from horseback, or with a group of the watch or a company of friends, but up close and personal. And if I've got to be out there, you're going to be out there with me." That devil-may-care smile was on his craggy face as he finished.

It was a fair distance to look up at Byron—he was on the tall side, even for an up-timer, whereas Gotthilf was short, even for one born before the Ring of Fire brought Grantville to these times. In fact, on those few occasions when Gotthilf was being honest, he would admit that he almost bordered on being a dwarf. That made the contrast with Byron even stronger.

Byron glanced down at him and raised an eyebrow. The man was a walking definition of laconic, Gotthilf decided. He could talk, but at times his facial muscles did most of his talking for him. In any event, it wasn't difficult to interpret this question.

"Yes, we're almost there." He stepped around a steaming pile of dung left just moments before by a horse. "Another block, I think." Byron nodded and continued walking.

They were well away from the docks, in an area ofMagdeburg that was very much still in a state of transition. The sack of the city in 1631 by Tilly's army had burned most of it to the ground. Almost four years later, the city was still in recovery. Money was flowing in because ofMagdeburg becoming the capital of the USE, from the naval yards and from many of the new up-timer inspired businesses. Nevertheless, much of the city was still a mess.

Take this street, for instance. It must have served as a fire break, since most of the buildings on the west side of the street showed no evidence of flames. The east side buildings were, for the most part, ash and a poor grade of charcoal. Many of the former building sites had been cleared, with a few of them even showing evidence of reconstruction. The west side buildings hadn't totally escaped damage, however, as doorway after doorway showed evidence of having been forced or kicked open by Tilly's marauding troops.

The area was busy, though. Enterprising vendors brought wagons, carts, or even packs full of anything that would sell, and set up in the open spaces created by the fire. These weren't the big merchants; they were peddlers, small farmers from outside the city, itinerant craftsmen. Withered or dried fruits and vegetables; firewood that was more twigs and small branches than solid wood; cloth scraps and ribbons and old clothes; odds and ends of plates and cups and knives; pins and needles; even a portable butcher shop—bring your own meat; all could be found down this street. It was even whispered sometimes that some of these folk were those who would also perhaps purchase items without inquiring too much into whether the seller was the rightful owner.

A rangy dog ran by, splashing them both with liquid from a rather noisome puddle. Gotthilf cursed as the smell reached his nose. His immediate reaction was to look and see how badly his clothing was soiled, resentment boiling in his mind. It took the visual reminder that he was wearing old clothes from one of the servants for him to relax. His best tunic and culottes were still hanging in the wardrobe at home. For once he was glad that this inscrutable Grantviller had made him wear something other than his finest clothes. Only then did it dawn on him that his servant's opinion might not be the same as his.

Byron's clothes were equally scruffy and unremarkable, Gotthilf noted. In fairness, he had to admit—with reluctance—that the lieutenant hadn't asked him to do anything he wasn't willing to do himself. There were enough up-timers inMagdeburg these days, and enough down-timers starting to dress like up-timers, that his worn clothing attracted nothing more than the occasional calculating stare that assessed the value, then caught sight of Byron's face and looked away.

Although it was broad daylight, Gotthilf caught glimpses of women sidling up to men on the fringes of the crowd, offering themselves as they pursued the wherewithal to buy enough food to stay alive—or enough beer or spirits to stay drunk all night would be more like it. Young though he was, he had seen enough of the streets to have the cynical attitude of one who had observed the worst that mankind could do to itself. He had no illusions as to whether the raddled harridan he was watching at the moment would choose food or drink when darkness came.

Gotthilf's head turned forward again as another cross-street was reached. Byron stopped, which caused Gotthilf to halt as well. "This the area?" the up-timer asked.

"Yes, Lieutenant." The up-timer's abruptness irritated Gotthilf again, but he didn't let that interfere with his responsibilities. "The people of these streets have little love for the town watch, but such complaints of theft as have made their ways to our ears seem to center near this street."

"And no one has seen anything?"

"Not that we have heard."

"Hmm." Without speaking, the American moved to the west side of the street and leaned against the front of a building, hands in pockets.

After a moment, Gotthilf followed. "The building is in no danger of falling, you know. We don't need to prop it up." Byron's mouth formed a fleeting grin, but his eyes remained focused down the street. "What are you doing?"

"Watching."

"For what?"

"Don't know. I'll let you know when I see it, though."

Gotthilf shook his head, wondering if all the Grantvillers were this crazy.

* * *

Willi settled into his corner in front of Zenzi's with a sigh. Erna hadn't come with him. She'd said something about Uncle wanting her to do some work somewhere else today and left before he did. The way had seemed longer than usual without her chattering beside him. He'd had to go slower, as well, but he'd walked the route often enough that his feet automatically took him to Zenzi's.

The rag across his eyes was securely in place, or so his testing fingers told him. Willi pulled his bowl out of his coat, salted it with the couple of quarteredHalle pfennigs like Uncle had told him to do and set it in front of him. He leaned back against the corner and propped his stick against his shoulder, settling in for the day. Pursing his lips, he began to whistle.

* * *

Byron felt the pressure of the wall on his shoulder blades as he stared down the street. He watched Gotthilf out of the corner of his eye as the youth looked around in imitation of what Byron had been doing the last few days. His gaze was slow, but Byron thought he was actually starting to observe what he was seeing.

Gotthilf looked back to him. "This is some more of that pattern stuff again, isn't it?"

"Yep. That's what I'm trying to do here, today. Start understanding how this street works. Once we can see that, then we can start looking for the thief, because he'll stick out like one of the emperor's Finns at one of Mary Simpson's parties."

That got a laugh from the young watchman.

* * *

Willi heard steps coming from the door of the bakery toward him. He cocked his head for a moment, then smiled. "Frau Zenzi." He gave a nod. "Good morning to you."

From the sound of her steps, Frau Kreszentia Traugottin verw. Ostermann—known as Zenzi to one and all—was not a small woman. Her husband, Anselm, was the baker for*Der Haus Des Brotes* , but she

was the one the buyers dealt with. She held her own in exchanges that sometimes were impassioned and occasionally vituperative. Willi had overheard descriptions of ancestry, personal appearance and habits that, if true, were incredible. And more than once he had heard her take up the hardwood oven paddle and use it to chase would-be thieves or extortionists from the bakery. Swung edgewise by someone who knew how to use it—which Zenzi did—the paddle could break bones and crack skulls.

For all that, however, Frau Zenzi had been nothing but kind to Willi from the first day that he hunkered down outside her shop. Whether it was his age or size or affliction, she had always had a kind word to say to him and would often slip him a piece of warm bread with butter. Once she had placed a sweet roll in his hands. Willi's mouth watered whenever he thought of that day, when he'd had a taste of heaven.

"So, Willi, how are you today?" Willi liked Frau Zenzi's voice. It was deep and warm and furry sounding, but would never be mistaken for a man's voice.

"Today I am fine, Frau Zenzi. And how is your business today?"

"Eh, well, it is not as good as I would like, but it is good enough. God provides." Willi heard her clothes rustle as she bent down. "Hold out your hand, Willi."

He did so, and felt a cup placed in it. The tang of buttermilk came to him as he sipped.

"It's not much," she said. "I would have more, but the bread sold out early today, even the rolls that were burned on the bottom."

Willi licked his lips, feeling the thick coating of the buttermilk on them. He lifted the empty cup and felt it taken from his hands. "Thank you, Frau Zenzi. It was good." He hesitated. "Frau Zenzi? Why do you give this—the bread, the milk—why do you give them to me?"

He felt her kneel down in front of him, then her hand touched his head. "Do you not know, young Willi?" He shook his head. "'Inasmuch as you have done it unto the least of these, my brethren, you have done it unto me.' Those are the very words of Jesu Christus. I don't understand many things about the Bible, or about the words of Luther or Calvin, but these words of Jesu I understand. To the least, I will give. And you, young Willi, are among the least."

She patted his head gently, then stood. Willi's throat felt swollen from the emotion he was feeling that moment. To think that someone did care for him even a little fueled a warmth in his belly that made him forget the cool day.

"Uff." Frau Zenzi sounded disgusted. "Here comes that Dürr woman again, wanting us to bake something for her. If ever a name was fitting it is hers, for she is as thin and dry as an old stick."

"She sounds mean," Willi ventured.

"Ha! That's because she is mean, Willi my lad, for all her trying to sound sweet. Well, I'd best go deal with her. Soonest begun, soonest done."

Willi heard her steps move off. He sat quietly in his darkness for a moment, feeling the warmth inside, then resumed his whistling.

* * *

Byron pushed away from the wall of the building. "Come on. Let's go for a walk." Gotthilf was beside him as he started down the street.

The pace was more of an amble than a walk. Byron kept his hands tucked into his jacket pockets as he looked around. He decided that most of these folks would have been right at home at an up-time flea market either as buyers or sellers. The energy, the conversations, the raised voices, even some of the gestures were all the same. If the people had been speaking English instead of German, this could have been the Saturday morning meeting at the old drive-in theater over byFairmont .

One trade in particular caught Byron's attention. He was looking the right way to see several silver coins exchange hands for a single table knife, fork and spoon setting of stainless steel flatware. The vendor looked nervous when he saw Byron staring at him after the exchange was made.

"Don't look now," Byron said after they were several steps past that point, "but the fellow in the faded green coat may be dealing in stolen merchandise.*Don't* look," without changing expression as Gotthilf started to turn.

"Why aren't you confronting him?" Gotthilf was scowling.

"Because I can't prove it . . . or at least not yet."

"But you saw something back there."

"Yep. I saw him sell something that could only have come from Grantville." Gotthilf started to turn again, and Byron grabbed him by the arm. "*But* . . . that doesn't mean it's stolen. Only that it might be."

Gotthilf settled beside him again. "So, you just ignore it?"

"No. Because it might be stolen. So it's our responsibility to look into it. We'll ask some questions in Grantville about what I saw. We'll ask some questions around here about this fellow. We'll start putting the pieces of the puzzle together, and depending on what picture we get we may arrest the guy."

Gotthilf stopped. "Pieces? Puzzle? Picture? What are you talking about? And what does that have to do with stolen property?"

Byron's jaw dropped for a moment. "Um . . . I think we just tripped over an up-time thing." He spent some time describing jigsaw puzzles, until Gotthilf understood the concept. "So, police work is a lot like that process, except we have to make the pieces ourselves."

"I understand . . . I think. But it seems like a lot of work when we could just arrest him now and have done with it. You saw it, you think the items were stolen, the magistrates would probably be satisfied with that."

Byron wanted to smack his forehead. "Gotthilf, it's about the truth. It's about what I can prove, not what I think." He reached into his inside pocket and brought out a piece of paper. "Listen, this is even in the Bible. From Deuteronomy chapter seventeen, verse six: 'At the mouth of two witnesses, or three witnesses, shall he that is worthy of death be put to death; but at the mouth of one witness he shall not be put to death.' That's basically establishing that justice will be based on more than one man's opinion."

Gotthilf still looked stubborn. Byron was glad that he had talked to Lenny Washaw about this stuff. He had had a feeling that having something from the Bible that would support his teachings would impress at

least some of the down-timers. He wasn't much of a church-goer himself, but he knew Lenny through his wife Jonni and her sister Marla. Lenny was a Methodist deacon, so he knew more Bible than Byron did, that's for sure. Once he had explained his need, Lenny had come up with several passages for him.

"Listen, Gotthilf, have you ever read the story of Susannah and the Elders?"

"No."

"It's in your Bible. Read it. You'll see what I'm talking about."

* * *

They continued strolling down the street. Byron had quit talking and was just looking around. Gotthilf was trying to see what the up-timer was looking at, but he saw nothing noteworthy.

His feelings ran through a cycle of confused, irritated and frustrated, over and over again. He thought he understood what Lieutenant Chieske was saying, but it just didn't make any sense. If you thought something was wrong and you knew who did it, everything in him said you should do something about it. It didn't make sense that you should just talk to people.

Gotthilf shook his head, walking two steps past the up-timer before he realized he had stopped. He turned and stepped back to where Byron had his head cocked to one side. "What is it now?"

"Listen."

After a moment Gotthilf could hear it; someone was whistling. Someone was whistling well, although he didn't recognize the tune. Byron had caught the direction and headed toward the sound. Gotthilf trailed in his wake, shaking his head again. Now the madman wanted to see someone whistling.

Byron stopped so suddenly that Gotthilf almost trod on his heels. The whistling was in front of them. He stepped around the up-timer, only to see nothing—nothing, that is, until he looked down to see a small boy seated in front of a bakery, whistling.

Gotthilf had to admit the boy was good. For a moment, he stood there and listened. He didn't think he knew the tune, but something about it . . . He shook it off when Byron knelt before the boy.

"Hello." Byron's voice was light, but his expression was serious. "My name is Byron. What's yours?"

Gotthilf noted the dirty rag tied around the boy's eyes and the wooden bowl with several coppers in it sitting on the ground in front of him. A beggar. His mouth twisted in distaste.

"Willi." The blindfolded head turned to look up at Byron, as if the boy could see. "You sound funny. Are you fromJena ?"

Gotthilf was ready to wager there was nothing wrong with his eyes.

"No," Byron responded, "I'm from a lot farther away than that."

"Mainz?" Willi was obviously trying to think of someplace far away.

"No," Byron laughed. "I'm from Grantville."

Willi's mouth made an O. He started asking excited questions, which Byron answered patiently, one after another. When the boy ran down, Byron asked his own question.

"Do you know the name of the song you were whistling?" When the boy shook his head, Byron said, "It's called 'The Rising of the Moon.' My wife's sister sings it a lot at the Green Horse tavern."

"Oh, I never heard the name. That's pretty. I just heard the song when Un . . . when someone I know would hum it."

Gotthilf snorted and nudged Byron with his foot. When the up-timer looked up with a frown, he said, "We have work to do, or so you told me, yet you sit here talking to a beggar who can probably see as well as you can."

The boy's mouth set in a hard line. He reached up to pull off the bandage, then raised his face to them. Gotthilf swallowed a curse as he stepped back from the sight of the scarred and cloudy eyes.

Byron took Willi's face between his hands, tilting it this way and that to let the light shine upon it. "Can you see anything at all?" The question was asked in a tone that matched his gentle hands.

"Some light, some dark." Willi's voice was low.

"Has it gotten worse?"

Willi nodded.

"When did it start?"

"When the soldiers came." The boy started putting his bandage back on to hide his eyes.

Byron looked up to Gotthilf. The sack ofMagdeburg —four years ago. Gotthilf swallowed in sudden nausea. "Where's your mother and father?"

"Soldiers killed them." Willi's voice was now almost inaudible.

"I'm sorry." Byron rested a hand on the boy's hair for a moment. "Who do you live with now?"

"Uncle."

"What is his . . ."

"Willi! It's time to go." Byron was interrupted by another boy running up to Willi's side. "Come on, you know Uncle doesn't like us to be late." The boy helped Willi pick up the bowl and put the coins in his pocket. "Come on!"

"Wait." Byron reached in his pocket and pressed something into the boy's hand. "Goodbye, Willi. Nice talking to you."

Gotthilf stood beside Byron as the two boys hurried down the street, Willi being led by the other.

"You know when I said I'd let you know when I found what I was looking for?"

"Yes."

"I think I just found it."

"The boy?"

"Yep. Boy that size shouldn't be begging, blind or not. On my watch, you don't abuse or take advantage of kids. Someone's not taking proper care of him, and I think I'll find out who."

"But he's just a beggar." Gotthilf was astounded at the up-timer's thoughts. Astonishment fled in the next instant, however, as Byron turned to him with a transformed face. His eyes were cold. His face was still, as if engraved in stone, except for a muscle tic in his left cheek.

"'We hold these truths to be self-evident' . . ." Byron's voice, cold enough to match his eyes, was obviously quoting something. ". . . 'that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.'" After a moment, he continued. "That's from the American Declaration ofIndependence . It expresses our belief that all men are created of equal worth. And that includes Willi."

Byron's hands snaked out and grabbed the front of Gotthilf's jerkin. He suddenly found himself nose to nose with the taller man, feet dangling inches above the ground. "That boy is a victim." The up-timer's voice was, if possible, even icier than before. "And no victim is ever going to be dismissed as 'just' anything. Not on my watch. If you don't learn anything else today, learn that."

The up-timer released his grip. Gotthilf landed hard on his heels with a jar that brought a*clack* from his teeth and set his head spinning. He looked up to be transfixed again by the cold glare from Byron's eyes.

"You've got some Bible reading to do. While you're doing that, I'm going to do some research."

Still a little wobbly, Gotthilf watched the back of the tall up-timer recede down the street.

* * *

Willi was two streets over before he was able to dig in his heels. "Erna!" He wrenched his arm out of her grasp. "What are you doing?"

"Getting you out of trouble," she hissed in his ear. "One of those men was an up-timer."

"I know that. His name is Byron. He was nice."

"Well, I think the man he was with was one of the city watch. He looked like one I saw wearing the sash a week or two ago."

Willi swallowed. "He wasn't nice."

"That's right. And you just remember that. We're going to have to tell Uncle, and he's not going to like it. Now come on."

"Wait." Willi held out his hand. "Byron gave me this. What is it?" He heard the sound of breath sucked in. "Well?"

"It's a silver pfennig. Uncle will like that for sure. Now put it away and come on."

* * *

As it turned out, it was two days before Gotthilf saw Byron again. He spent a frustrating morning trying to locate the Bible passage he had been directed to read. Finally he gave it up and went to visit his pastor. The ensuing reading and discussion lasted most of the day. Verse by verse the old scholar walked him through the account, in the process showing him the wisdom and knowledge owned by Daniel, the hero of the tale.

"It is a cautionary tale from several aspects," the pastor concluded. "First, to those who are in positions of authority: it says to guard themselves against temptation, and warns them that if they do succumb to temptation, nothing they can do will hide their sin. They will be found out."

He turned a page. "Second, to the community: to not be quick to judge without first carefully weighing the facts. Things such as this must be diligently examined, and even the highest ranked involved should be questioned carefully.

"Third," and here he gave a direct look to Gotthilf, "to those charged with these examinations: to be diligent to look for the facts, and not be swayed by opinions or statements from others. It is reprehensible to allow someone to be falsely accused and convicted of a crime."

"That's what he said," Gotthilf muttered.

"He?" the pastor asked.

"Byron Chieske, the Grantville lieutenant I'm supposed to be working with."

This led to a discussion of the events of the previous day. Somehow it didn't surprise Gotthilf to find that his pastor agreed with the up-timer.

"He sounds as if he is a man of wisdom, integrity and insight. I suggest, young Gotthilf, that you listen to him."

"Yes, sir," Gotthilf sighed.

The following morning Gotthilf tried to apologize to Byron for not showing up the previous day.

"Don't mention it," Byron waved it off. "I was up to my eyebrows in looking for an orphanage."

"Orphanage?"

"Yeah. A place where kids who lose their parents and don't have kinfolk go to live."

Gotthilf struggled to absorb another new up-time idea. "We have no such things."

"That's what I found out." Byron shrugged. "So then I asked what happened to the kids whose parents were killed in the sack."

"And?"

"Most of them were placed with kin. If no kin was found, older children were placed as apprentices and younger children were placed with families who would care for them until they were of an age to be apprenticed." Byron looked satisfied, to Gotthilf's eye. "The church kept records, they did. When I explained my concern about Willi they not only opened those records, they gave me a clerk to read them. And here," he reached in his pocket and drew out a notebook which he threw open, "is a list of families who accepted young boys into their foster care about that time."

Gotthilf reacted to Byron's smile with an uncertain smile of his own. "Let me guess: we go to talk to these people."

"Right. Here's the addresses. Let's go."

* * *

They turned away from the next to the last address on their list. "All children accounted for and healthy," Gotthilf muttered as he pulled the address list out one last time. "We're down to one Lubbold Vogler."

"It's called the process of elimination," Byron assured him. "You work through all the possibilities until you arrive at the one that fits. So, we've eliminated all the others, we should get our answers from Herr Vogler at this last address."

But the face that opened the door at their knock disappointed them. "No, no Vogler here."

"Did he live here before you, do you know?"

"No." And the door was firmly closed.

They stepped down to the street. "Where do we go from here?" Gotthilf wondered.

Byron looked around with narrowed eyes. "C'mon. And think of a question you can ask." Gotthilf followed him over to an old man sitting on a step, one hand on a cane and another holding his pipe. The up-timer nodded his head to the old man. "Good afternoon,*Großvater* . I am Lieutenant Chieske, and this is Herr Hoch."

"Fuchs," the old man grunted around the stem of his pipe.

"Herr Fuchs, we are searching for one . . ." Byron turned to Gotthilf, who fumbled the paper out of his pocket. "Lubbold Vogler."

Herr Fuchs took the pipe from his mouth and spat expressively.

"Does he live there?" Byron pointed to the house they had just left.

"Nay."

"Did he live there?"

"Aye."

"Do you know where he went?"

"Nay."

"Did he have some small children?"

The old man finally showed some expression, as his mouth tightened. "Aye."

Byron looked to Gotthilf. He had been smiling at the sight of Byron meeting someone even stingier with words than the up-timer, but now realized he was supposed to ask something. "Um . . . er . . . when did he leave?" He was gratified when Byron nodded in approval.

Herr Fuchs thought for a moment. "Three years ago."

"Did he say where he was going when he left?"

"Nay." They waited a moment, but the old man said nothing more.

"Thank you for your time." Byron held out his hand for Herr Fuchs to shake. "You've been very helpful."

They turned to leave, and the old man took the pipe from his mouth again. "If you find him, tell him I remember he still owes me twenty pfennig. And give him a lick from me for the way he beat those children." He clenched his teeth around the pipe stem again and gave them a firm nod, which they returned.

"Well," Byron breathed. "Well, well, well, well, well." Gotthilf looked up to him as he tried to keep up with the up-timer's long strides. "I do believe we've found our man."

"Found?"

"Well, so to speak. It appears we have a name for him, which is more than we had. Now we just need to truly find him."

"And how do we do that?"

"We go back to the street tomorrow and talk to Willi. One way or another, we'll find Herr Vogler through him." Gotthilf watched as Byron's face turned cold again; colder even than the other day. "And then we'll have a little talk."

The ice in Byron's voice caused the down-timer to shiver.

* * *

Gotthilf couldn't decide if Lieutenant Chieske looked preoccupied in the early morning light, or if he was just sleepy.

"Do you have a gun?" Byron asked.

"The musket belongs to the city."

"No." Byron shook his head. "I meant a handgun; a pistol."

"I have a pistol," Gotthilf replied. "One of the new percussion cap revolvers fromSuhl ."

"A Hockenjoss and Klott?"

Gotthilf nodded.

"Got it with you?"

Byron held out his hand. Gotthilf, with mingled pride and embarrassment, pulled the pistol from his pocket and handed it to him. He watched as the up-timer handled it. The young man took a great deal of pride in his new pistol, although he thought it a bit plain. It still bothered him, however, that he had been forced to settle for the silver-chased model with bone handles. His father had made it very clear that their family was not named among the*Hoch-Adel* , so there would be no gilded toys.

"A good weapon." Byron handed it back. "A little too pretty for my taste, though." Gotthilf was unable to keep his astonishment at the up-timer's reaction from his face. Byron laughed, producing by what seemed sleight of hand a weapon from underneath his jacket "Now this is what I would call a good pistol. None of that fancy work on it that has to be kept polished and clean."

Gotthilf stared at the pistol. It wasn't pretty. It was all metal, and looked like a slab with no decorative work on it. No gold or silver chasing, no carved ivory or woodwork. Just pure function—to shoot, perhaps to kill. A chill ran down his spine at the sight of it.

"Keep yours with you all the time now." Byron made his disappear again. "And Gotthilf," Byron started to turn away, "make sure it's loaded."

* * *

Erna watched as Willi tried to argue with Uncle.

"But Uncle . . ."

"No, I said! You will not go out, not with those . . . those . . . spies looking for you."

"But . . ." Will started.

"No!" A slap knocked Willi against the wall, where he slid to the floor. "Now do as I say."

Uncle looked at the huddled boy for a long moment, then turned away and left the room. Free to move without the glare of Uncle's gaze being on her, Erna hurried to Willi's side and helped him sit up.

"Are you all right?" She pulled his head around to see where he had been hit. Willi's ear was a bright red, so that must have been where the slap landed. "Are you all right, Willi?" she whispered.

Willi tried to stand, then folded up again. "'M dizzy," he murmured.

Erna helped over to their corner and covered him with their blankets after he laid down. She crouched by his head. "Willi?"

"Mmm?"

"Willi, don't you try to talk to Uncle for a while. He's . . . something's not going right for him. I heard men yelling in the back of the house a couple of nights ago. It woke me up. The back door slammed, then he came into our room and stood by the front door for the longest time."

She shivered, remembering what the light from the other room had revealed. "Willi . . . Willi, he had a gun. A pistol."

"Why would Uncle have a gun?" Willi slurred.

"I don't know," Erna replied, still whispering. "But he does. And it scares me."

"Mmm."

A long moment of quiet passed.

"Willi?" There was no response. Erna checked to see if he was breathing. He was, so she guessed he'd gone to sleep or passed out. She wiggled around, then sat with her arms around her knees, waiting until Uncle told her to go do her work.

She hadn't been able to tell Willi the most important part. After Willi had been knocked to the floor, Uncle had stared at him, cold and hard. Then he'd put his hand in his pocket and started to take out his gun, only to stop and, after a moment, slide it back in.

That scared Erna more than anything.

* * *

The space outside the bakery was empty. They loitered in the area until well past the time that they had seen Willi before. Gotthilf watched as Byron's lips tightened in frustration.

A large woman appeared in the doorway of the bakery, looking up the street. Byron elbowed Gotthilf. "Come on." She looked to them with a frown as they approached.

"Your pardon, Frau . . ." Byron began.

"Frau Kreszentia Traugottin. And you are?"

Byron introduced them as city officials looking into various irregularities. "I see that the boy is not here today.

The woman's frown turned thunderous. "You're not looking to harass Willi, are you?"

"No, no, indeed not," Byron soothed. "We want to talk to him because we think he knows something that will help us. And we want to make sure he's being taken care of. It bothers us that a child that young is begging in the streets."

Gotthilf watched as Byron's conversation with Frau Kreszentia—"call me Zenzi"—elicited the information that no, she didn't know where Willi lived; no, she didn't know anything about an uncle; yes, the last few months he had been here almost every day; and yes, he always came from one direction, often with another youngster leading him.

The conversation drew to a close. "Bide," Frau Zenzi said as she stepped back into the bakery. She returned a moment later with two rolls, to hand one to each of them. "You find my Willi, you make sure he is all right, you tell him his place is still here. Yes?"

They assured her they would do exactly that and took their leave. Munching on his roll, Gotthilf looked back to see her standing in the door of the bakery, looking after them.

Gotthilf swallowed the last of his roll. "For someone who doesn't like to talk," he commented to Byron, "you certainly are proficient at it."

Byron paused in licking his fingers. "Just because I can do it doesn't mean I want to." He finished the finger licking, and continued, "And you'd better have been paying attention, because you're going to start doing all the talking and question asking soon." Gotthilf stared at the up-timer with wide eyes. Byron returned a grin. "Yep. Count on it. You'll talk; I'll just stand around and look threatening."

"Ha." Still strolling down the street, Gotthilf looked up and stiffened. "Byron." He tried very hard not to shout or act excited. "Isn't that the boy who pulled Willi away from us?"

Byron directed a casual glance that direction. "Yep. Now look away." They did so. "The trick is to not stare at the person, but to look that way just often enough to keep him in sight. Except in this case I think it's a her."

"What?" Gotthilf absorbed another surprise. "Are you sure?"

"Yeah. I've been around girls in pants all my life, so to me they're not the automatic disguise for a girl they are for you down-timers." That was the first time Gotthilf could remember Byron using that term. He noted in passing that it was used in a neutral manner. "Girls move differently than boys, even that young. And if you look at her hands, from what I remember they're slenderer than a boy's usually are. So, I think that's a girl." Gotthilf absorbed that as well.

There was a moment of silence.

"Gotthilf?"

"Aye?"

"What's she doing out here? I mean, it looks like she's sound and healthy. She ought to be in school, right? Or in some kind of service?"

"Yes. She should definitely not be out on the street in boy's clothes." Gotthilf was starting to understand what Byron had meant about looking for things that didn't fit the pattern.

"So," Byron hissed, "we have two weirdnesses now—a boy begging who shouldn't be, and a girl dressed in boy clothes who is . . ."

At that exact moment they both saw the girl snatch a kerchief from the pocket of a man she bumped into. She was so fast they barely caught a flash of it before it was stuffed inside her jacket.

Gotthilf saw that Byron's face had gone very grim as he muttered a string of words in up-time English. Gotthilf didn't recognize the words, but he recognized the tone. If some of them weren't blasphemous, he'd eat his hat. "Okay," Byron said after he had to stop for breath, "that's the third strike. Now I really,

really want to talk to Uncle."

"So do we take the girl now?" That was Gotthilf's instinctive reaction, but he'd been with Byron enough by now to realize that might not be the best thing to do.

"No." Byron shook his head. "No, I'm starting to get a bad feeling about this. I want you to hustle back and get Captain Reilly and at least a couple more guys, either army or city watch, I don't care, as long as they've got pistols. No muskets. You get there and back as fast as you can. If Bill wants to know what's going on, you just say I said to get here now." Gotthilf opened his mouth. "Go!"

Gotthilf went.

* * *

It was over half an hour before Gotthilf arrived back at Byron's side, accompanied by Bill Reilly, two of the city watch and another up-timer. Completing the crew was Otto Gericke, who had been talking to Bill when Gotthilf had burst into his office, panting and wheezing from his run.

Byron met them back up the street, waving them to the side of a house on the west side.

"Is she still here?" Gotthilf asked.

"What's up?" Bill was matter of fact as the men gathered around.

"Possible faginy racket. Got a girl in boy's clothes working as a dip down the street. Pretty sure she's got a mule—think I've got him pegged. We think the same bunch had a blind kid out here begging a few days ago. Girl came and pulled him away, nobody's seen him since."

Bill pulled at his chin. "So, what do you want to do?"

"Follow the girl home. Both she and the boy mentioned someone named 'Uncle.'"

"Ah. You think he's the fagin?"

"Best guess."

"What is this 'faginy'?" Gericke asked. Gotthilf listened closely as Captain Reilly described a plan to teach children to perform criminal acts for the gain of those who taught them. He also explained that a 'dip' was a pickpocket and a 'mule' was someone who would take stolen goods from the 'dip,' reducing the risk that the pickpocket would be caught with them.

"This 'Uncle' is the man who would do this?" Gericke was frowning. The captain nodded. "I want this man."

"So do we, Master Gericke. So do we." Reilly turned back to Byron. "So, what's the plan, Lieutenant?"

"Gotthilf and I go first. The rest of you follow at least a half block behind, in more than one group. Once we find the place, we figure out what to do next."

"I am a magistrate," Gericke said. "You will be under my authority."

Byron's smile was sharp-edged. "Thank you, sir. That will make things easier."

So it was that Gotthilf found himself once more at Lieutenant Chieske's side, walking down the street with the girl barely in sight ahead of them. The late afternoon shadows were unfolding, and she disappeared and reappeared as she moved in and out of them.

Unfortunately, her route was not straight. Turning the third corner, Byron muttered, "Man, I wish we had radios." Gotthilf was confused again—a state that was all too familiar the past few days of working with the up-timer. Byron caught his expression. "No, I don't mean the crystal radios, I mean . . . oh, forget it, I'll explain later. Might as well be wishing for cars, while I'm at it."

After they passed the next lane that crossed the street, Byron started limping. Gotthilf slowed to keep pace. "No, you keep going," the up-timer said. "I've decided I want to talk to the guy following us, so this is my excuse for dropping back. You keep her in sight and I'll catch up in a few minutes."

True to his word, before long Byron slid back into place beside Gotthilf, who looked over at him. "So?"

"Bill saw me dropping back, so he moved up as well. We took the guy down a few minutes ago. He was her mule, all right; he had that cloth we saw her snitch. He's not talking right now, but the boys have him tied up and are bringing him along."

Just then the girl veered toward a house that looked to have burned. Roof beams were visible and charred. Gotthilf wouldn't have thought there was anyone there, but she just tripped up the steps and opened the front door. It closed behind her before they could react.

* * *

Erna was back. Willi sat up from where he was lying in the corner. He felt some better. She was talking to Uncle about Möritz and some things he was bringing. Willi wasn't sure what that was about. But he was very glad that Erna was back. He stood and moved toward the sound of her voice. Maybe she could come talk to him now. "Erna?" he called.

* * *

The others closed up with them. Lieutenant Chieske conferred with Captain Reilly and the burgomeister for a brief moment. Gotthilf watched as the captain sent the other men to surround the house.

Byron turned back to Gotthilf. "You ready? Got your pistol?"

Gotthilf swallowed, nodding as he pulled the pistol from his belt.

"Okay. Burgomeister Gericke is wearing his magistrate hat at the moment, and he really wants to have a conversation with Uncle. You and I will be the first in the door. We're hoping this guy won't cause trouble. Fagins usually don't. It's petty crime they're in, not enough to take big risks for."

Byron pulled his own pistol. "But we're going in prepared. Stay with me, follow my lead, and watch my back. Whichever way I go after I clear the door, you go the other. Got it?"

Gotthilf was poised on his toes as they stepped up to the door, gun before him, breathing rapidly. He felt as if his vision had narrowed to a circle just in front of him. Byron raised his hand to knock on the door.

* * *

"Uncle! Uncle!" That was Fritz, shouting as he crashed through the back of the house. "City watch and up-timers outside. They have Möritz, and they're surrounding the house."

There were thunderous knocks on the door. A loud voice called from outside, "City watch! Open up in the name of Magistrate Gericke!"

Willi recognized the voice. "Byron." He was perplexed as to why the up-timers had come here.

He had spoken loud enough for Uncle to hear. "You," Uncle hissed. "This is all your fault."

Willi heard a loud click.

"No," Erna screamed. Willi felt her push him.

There was a loud*Bang.* Willi was knocked to the floor.

* * *

Byron threw the door open at the sound of the shot. Gotthilf followed him into the house, stepping to the right of the door because the up-timer had stepped to the left. His horrified gaze was greeted by Willi lying on the floor, with the girl they had been following sprawled across him. A dark crimson splotch across the front of her jacket was widening as he watched. Gotthilf tore his eyes from that sight to focus on the man who Byron's pistol was pointed at with unwavering aim.

"Drop the gun." Byron's voice was like the chill of a blizzard. Gotthilf could almost feel snow in the air. Belatedly, he brought his own pistol to bear on the man standing against the far wall. "No one else needs to get hurt."

The man's laugh was high-pitched, almost manic. "And what will you do with me if I do? What would be my fate?"

"Lubbold Vogler, we arrest you on the charges of theft, attempted theft, aiding and abetting theft, receiving stolen property, contributing to the delinquency of a child, and murder." Gotthilf marveled at how matter of fact Byron's voice sounded.

"Ah, all very impressive, although I'm not sure those are all crimes underMagdeburg law. Still, the last could be troublesome." The other—Vogler, since he didn't reject the name—gave a slight bow over the pocket pistol that was a twin to the one Gotthilf held. A wisp of smoke curled up from the barrel, but Gotthilf could see that the hammer was cocked again.

Watching the man's eyes, Gotthilf was very uneasy. He couldn't read Vogler's thoughts, but he knew they were racing, because the eyes were shifting frequently, like a wild animal looking for a way out of a trap.

Byron took a slow step to his left. Gotthilf took a step to the right.

"Drop the gun, Vogler." Byron's voice was even and cold.

"I think . . . *not!*"

Boom!

Almost everyone in the room flinched at the loud report of Byron's pistol, a sound that left more than one set of ears ringing. Uncle, however, did not flinch.

Uncle—Gotthilf decided he preferred to think of him like that—jerked against the wall behind him, down which he slid until he sat slumped against the wall, legs outstretched and head lolling like nothing so much as a rag doll tossed haphazardly across the room. But rag dolls don't have pistols fall from their lax hands, and rag dolls don't have crimson blood flowing from holes in their chests and don't leave large bloody smears on walls.

Byron gestured toward the large boy in the back of the room who was trying to sneak out. Gotthilf pointed his pistol in that general direction and the boy froze, trying to emulate a statue. Meanwhile, Byron slid Uncle's pistol away from the corpse with the toe of his shoe.

There was a sound in the door. Gotthilf glimpsed Captain Reilly out of the corner of his eye.

"All over," Byron said. "Have someone take the big one into custody. He looks to be about the same age as the mule, so he may be an accomplice as well. The little ones are all pretty much victims, I think. They should be held together until someone can make arrangements for them."

The next few minutes were bustling, as watchmen and up-timers came in and collected the children. Gotthilf put his pistol away after the largest was tied and hauled out.

Burgomeister Gericke walked in after the flurry of activity was over. "So, you killed him, Lieutenant Chieske."

"Yes, sir," Byron responded.

"I would have preferred him alive, Lieutenant."

"So would I, sir. But he had already killed a child and was trying to shoot me. I had no choice."

Gericke's eyes turned and bored into Gotthilf's. "Do you agree with the Lieutenant's assessment, Watchman Hoch?"

Gotthilf swallowed, stiffened, and stuttered, "Ye . . . Yes, Herr Magistrate. It happened as Lieutenant Chieske described it."

The burgomeister's eyes shifted again. "Do you have any contrary comment, Captain Reilly?"

"No, sir. From what we could hear outside, it sounded like it went down the way they describe it."

Gericke paused for a moment, sighed, and nodded. "I agree. The death of the child is ruled a felonious murder on the part of Lubbold Vogler, committed for reasons unknown. The death of Lubbold Vogler is ruled justified self-defense on the part of Lieutenant Byron Chieske after said Vogler attempted to kill him." He looked older, for some reason.

The two up-timer officers relaxed from their stiff positions, with almost identical expressions of relief crossing their faces. The burgomeistershook all their hands, including Gotthilf's, then left the death house.

"Well, your first case solved," Bill Reilly started to comment, when a sound arose from behind them. They turned to see the body of the girl moving.

* * *

Willi roused slowly, head aching from the second knock of the day. He tried to move, but someone was lying on top of him. He heard people talking, but it was all blurry to him. "Get off," he whispered, but the person didn't move. He pulled his hands out and started pushing. With some difficulty, he managed to free himself enough to sit up.

The other person's head was on his lap now. He put his hand on it, feeling it, looking with his fingers to see if it was someone he knew. The face was small, thin, with a bump in the nose; a familiar face, it was.

"Erna." He reached down and shook her shoulder.

"Erna." She rolled limply and his hand slipped, to land in something warm and sticky.

"Erna!" He brought his fingers to his nose. The smell of blood filled his nostrils. Something was wrong. Something was very wrong. What had happened? His thoughts were reeling.

Steps sounded in the room. He felt Erna lifted off him, while other hands picked him up.

"Willi?"

"Byron?" Willi was confused. The last thing he remembered, he was home. How did Byron get here? "What happened to Erna?"

"Willi . . ." He felt the man shake his head. "Willi, Erna is dead."

The cold bubble in his chest burst, filling him with shock and grief. The screams followed.

* * *

Night had fallen some time ago. Gotthilf felt himself sagging where he stood, watching the final discussions between Captain Reilly, Lieutenant Chieske, Burgomeister Gericke, Frau Zenzi and her husband, and the senior pastor ofMagdeburg .

An amazing number of things had occurred in relatively short order. Not long after the burgomeister left, wagons had appeared: one for the corpses and one for the children found cowering in the house. The two larger children, Fritz and Möritz, classified as thugs from the testimony of the smaller ones, were tied up and made to march behind the wagons. The captain and the burgomeister intended to question them some more. They wanted to get to the bottom of Vogler's faginy scheme, in the hopes that this was the only one.

Willi, once he was worn out from the screaming, would have nothing to do with the wagon. He kept breaking out in sobs for Erna. Byron was the only one the boy would talk to, so Byron carried him all the way back. He was sleeping now, rolled up in a blanket in the back of the children's wagon.

The conference broke up. The burgomeister and pastor walked off together. Byron stopped at the children's wagon for a moment with Frau Zenzi. Willi sat up rubbing his eyes, listening to the words from

the grown-ups. He began crying again, quietly, a child's sobbing.

Captain Reilly came to Gotthilf. "Big day, huh?"

Gotthilf nodded.

"I'll be honest with you. I never expected to find anything like this, especially since we're just getting started. The burgomeister and I were talking about it; it just doesn't make sense for this guy to have a gun. That's several weeks' income to a petty crook. Doesn't make sense. There's something going on, here. We need to keep digging." He placed his hand on Gotthilf's shoulder. "This will be big news, you know. You and Lieutenant Chieske should get commendations of some sort for this."

Willi finally nodded and Frau Zenzi folded him in her arms. Gotthilf watched as she nodded to Byron over the boy's head. Byron stepped back, looked around with weariness evident in every motion, then started down the street.

Gotthilf nodded again as he watched Byron. "Where is the lieutenant going?"

Reilly looked at Byron's receding back. "I suspect he's going to get a drink somewhere." He returned his gaze to Gotthilf. "You're his partner. Go with him. It's always hard on a cop when he shoots someone, and he needs you to be with him on this just as much as he has the last few days. If he doesn't want to talk, don't try to make conversation. Just sit with him." The captain gave Gotthilf a small push on the shoulder. "Go on. We'll talk to you tomorrow."

Gotthilf received a sidelong glance from Byron acknowledging his presence when he fell into place beside the up-timer, but no words were said. The statue was back, Gotthilf decided.

Weary himself, Gotthilf trudged alongside until Byron turned in at a tavern. He looked up to see they were entering the Green Horse. That was all right with him. A stool pulled up to a horse watering trough would have satisfied him at this point.

Byron walked up to the bar. "Ale. Two. Large." He spun a coin on the bar top, received the two steins and walked over to an empty table in a dark corner, where he sat with his back to the wall. Gotthilf sat with him and applied himself to his stein.

They were on the third refill when Byron began talking. He began by pulling his pistol out and laying it on the table.

"There it is. The M1911A1 .45 automatic. Like most pistols, designed for one thing and one thing only: to kill people. It does a good job.

"I was supposed to join the Sheriff's reserve. I was going to order a Glock, but then the Ring of Fire happened. So, here I am with Jonni's Grandad's old .45 that he brought back from World War II. It still works great. But I sure didn't expect to have it use it for real so soon."

Byron's face was getting red, Gotthilf noticed.

"I had the drop on him. All he had to do was put the gun down. That's all he had to do. He'd have stayed alive for a while, anyway. All he could see was his way."

"The man murdered a child, Byron," Gotthilf responded. His voice was quiet. "And all but in front of a

magistrate. He would have been hanged within the next day." Byron shook his head. "Put the gun away, Byron." Gotthilf pushed it with a finger. "Put it up before someone notices."

"Right."

It was the fourth refill before Byron spoke again.

"I failed, Gotthilf. I screwed up royally. Gonna turn in my badge and go back to shipping supplies."

"You didn't fail, Byron."

"Two people are dead because of my mistakes. I failed."

"You did nothing wrong. Vogler killed the girl, then committed suicide by trying to kill you. You did the best you could."

"Then why's that girl dead? Huh? You want to explain that to me?" Byron was genuinely angry, Gotthilf saw. A hot anger, this was, unlike the cold anger he had seen a couple of days ago.

"Sometimes evil wins, Byron."

"You're barely old enough to grow a beard." Byron's voice was thick with sarcasm. "What do you know about evil?"

Gotthilf felt anger of his own rise within him. "Four years ago Tilly's soldiers destroyed this city . . . my city . . . my home. My house and the houses of thousands of others were burned to ashes. Bodies were everywhere. Don't talk to me about evil—I've seen the results first hand. I know about the evil men can do. And sometimes evil wins. But what was it you said to me—that protecting my city from theft and murder and rape, not by soldiers but by those who were just stronger and more vicious was a goal worthy of a man?"

Taken aback, Byron nodded.

"So, we lost this battle. Does that mean we stop fighting the war?"

Byron looked at Gotthilf, and after a moment gave another firm nod. "You'll do, Gotthilf. You'll do. And you're right."

Toward the bottom of that stein, Byron said, "None so blind as those who will not see. Vogler just didn't see, is all."

"Is that from the Bible, too?" Gotthilf thought it sounded scriptural.

"Nope. But according to my friend Lenny Washaw, it was written by a Bible scholar; guy by the name of Matthew Henry, I think. But it's true enough, man—it's true enough."

"Yes." Gotthilf just agreed with Byron.

Byron turned and faced Gotthilf. For all the ale he had been drinking, he appeared to be stone cold sober.

"This is why we do the job, man. This is why we will go back out on the streets tomorrow—to make sure that something like this—Does. Not. Happen. Again. Not on my watch."

"Not on our watch." Sometime during the day, when he wasn't paying attention, something had changed. Gotthilf now understood why Byron was so serious about their work. It surprised him a little, but he did understand it. And after watching a girl's life ebb away because of the greed and anger of one evil man—not even an enemy, but a resident ofMagdeburg —he agreed.

Byron was turning his stein in circles on the table. After a few moments, he looked over at Gotthilf with a sly grin. "So, you going to tell me what Gotthilf means?"

Gotthilf had to think for a moment as to what the English would be. "Means God's Help."

"Does it now?" Byron laughed. "Well, that's probably appropriate, my friend. I suspect we'll need a lot of that help in the future—partner."

Gotthilf returned a smile of his own as he warmed inside. "I agree—partner."

The Prepared Mind

By Kim Mackey

"Chance favors the prepared mind."

—Louis Pasteur

Grantville, May 1632

When Amy Kubiak walked into the biology classroom, Lori Fleming had her head on her desk. Amy smiled. Pete Farmer had been a good biology teacher when Amy had had him in high school. But now that she was working to become a teacher herself, she knew that she would have had trouble if Pete was her colleague. He had been so patronizing to his female students, unlike Greg Ferrara. Lori, on the other hand, wasn't patronizing at all, and her experience in the USDA helped her make her biology lessons more connected to reality, unlike Pete's mania for microbiology.

"Lori, you okay?"

Lori raised her head slowly. "I'm fine. Just another long meeting last night with the Ag group. I swear, men say that women are the gossipers, but you get J.D. and Gordon and Willie Ray together . . ."

Amy laughed. "I was wondering why Alexandra was looking so bushed. When did the meeting finally break up?"

"Midnight. Again." Lori grimaced. "But at least I have tonight free. Once we get Tony's little job done."

Amy grimaced herself. "Nice how we got 'volunteered' for it. Ever notice when cleaning work needs to get done that Tony always seems to find other things he has to do?"

Lori got up from her desk and stretched. "I noticed. I just wish he was less of a bureaucrat and more of a leader. He may be head of the science department, but that doesn't mean he can't, or shouldn't, get his hands dirty along with the rest of us."

"Speaking of hands, he better start keeping them to himself in the future. I like teaching, especially chemistry, but now that I've got other options . . ."

Lori tilted her head quizzically. "Other options?"

Amy nodded. "My roommate, Nicki Jo, has been hired by Colette Modi to get the ball rolling on a chemical company that will be set up inEssen . She's cutting back to half-time at the methanol plant so she can spend more time with the chem team doing research. She said if I ever need work, she could use me in a heartbeat. And now that the Modis are flush with cash from Louis de Geer, it would pay pretty well."

Amy paused and smiled at Lori. "We're procrastinating, aren't we?"

Lori laughed. "Yeah, we might as well bite the bullet and get it done. Onward!"

Together the two women left the classroom and headed down the hall.

* * *

"Oh God!"

Amy laughed as she pulled on her latex gloves. "That bad?"

Lori looked into the open door of the science department's refrigerator and shuddered. "Worse than bad. Horrid. Smelly. And there are . . . things growing on the walls!"

Amy looked around the corner of the refrigerator door and shook her head. "Want me to go get some sulfuric acid? Or a flame thrower?"

"No, I think the hot water and bleach will do. But this looks like it's going to take awhile. You still up for it? It's my responsibility, according to Tony."

"Yeah, well, too bad he didn't tell you that last fall. Or that it was stuffed with Pete Farmer's bacteria and fungi supplies. You could have used them."

Lori shook her head. "Probably not. This first year I was just happy to stay a chapter ahead of the kids in the textbook. I was too scared to try any labs beyond some basics with plants and animals. Not to mention I had no time outside of school to think about labs what with all the extra work helping with the agricultural stuff."

She sighed. "Well, let's get started. If we find anything we want, we can put it in the cooler to stay fresh."

It was fifteen minutes later when they found the paper bag labeled "Kwik-Stiks."

"Kwik-Stiks?" Amy asked, opening the bag. "What are Kwik-Stiks?"

"I don't know," Lori said, "cultures of some kind? Let me see."

Amy pulled several silver packages from the paper bag along with a product sheet that she handed to Lori. Lori nodded as she read the sheet. She pointed to the first few lines.

"See? I was right. 'Lyophilized reference stock cultures.'"

"Lyophilized?" asked Amy.

"Freeze-dried, essentially. Keeps micro-organisms in good condition for awhile. So what have we got?"

"This one sounds interesting.*Clostridium sporogenes* . Putrid odor. Yummy."

Lori took the package, marked Microbiologics on the label, and looked more closely. "Yeah, but notice the expiration date. October 2000. Which would have been last October. Way out of date. Anything else?"

Amy rummaged through the paper bag and pulled out another Kwik-Stik. "How about this one? *Penicillium roqueforti* . Even more yummy. Roquefort cheese organism. And can't we use this to get penicillin?"

Lori shook her head. "No, you need a particular strain of penicillium, not just any strain. I forget the exact species. As I recall, Alexander Fleming, the guy who discovered penicillin, had his cultures contaminated by accident. Besides, this one has an October 2000 expiration date as well."

While Lori had been talking Amy had been rummaging in the bag and she pulled out the next package in triumph. "Bingo! expiration June 2001!"

"*Penicillium italicum*, causes blue mold of citrus fruits." Lori smiled. "Closer, but still not the right one."

With a flourish Amy pulled another package from the bag. "Next to last one. Ring a bell?"

"*Penicillium Notatum*. High yield. Expiration March 2001. A little out of date, but it still might be viable. Expiration dates are generally conservative. This is the stuff we want."

"Cool!" Amy said. Moving quickly the two women searched through the remaining paper bags in the refrigerator. Most of the Kwik-Stiks they found were far out of date or of organisms that didn't seem important. Only three were*Penicillium Notatum* , two labeled low yield, with expiration dates of June 2001, and the one labeled high yield. They transferred the penicillium Kwik-Stiks to the cooler while they finished cleaning the refrigerator, then transferred them back.

"So what should we do with the Kwik-Stiks?" Amy asked.

Lori shrugged. "I'm not sure. I do know that the chem team took some stuff last fall, so they may already have some penicillium cultured up. Ask Nicki Jo tonight when you see her. If they can use them, I bet Len Trout would be happy to give them up. And they probably won't be viable for much longer."

* * *

That night at the Modi house Amy told her boyfriend, Franz Dubois, and Nicki Jo Prickett about the Kwik-Stiks.

"*Penicillium Notatum*? Oh yeah, the chem team already has some of that cultured." Nicki Jo said. "But it's good to have more. Given the expiration date, I bet the school district will let us have it for free. Use it or lose it, and it's probably too close to the end of the current classes to use it in a high school lab experiment."

Franz Dubois looked puzzled. A second cousin of Colette Modi, he had arrived in Grantville in December 1631 fromHanau nearFrankfurt . Always fascinated by chemistry, he had found himself spending many hours talking with Amy Kubiak. Within a month he had discovered that he was fascinated with Amy Kubiak as well.

"*Penicillium Notatum*? Used to produce penicillin?"

Nicki Jo nodded. "Yup. But penicillin isn't really that much of a priority right now. We're in the seventeenth century, not the early twentieth. We need stuff that is going to prevent or cure the major epidemic-type diseases we might see, like typhus, bubonic plague and smallpox. That's why the chem team is concentrating on things like DDT and chloramphenicol and the medical people are working on smallpox vaccinations. Oh, we'll be making some other antibiotics, mainly the sulfa-like drugs, which aren't that difficult if you have the ingredients. Sulfanilamide is even in one of my organic chem books. But synthesizing pure penicillin in sufficient quantities is pretty difficult, according to the sources we have. That'll have to wait a few years. In the meantime, we're sending out cultures of*Pencillium Notatum* , along with instructions, to various hospitals and universities aroundGermany as we get visitors headed in the right direction."

"But if we can't really make penicillin right now, what good is it to send out the cultures?" Amy asked.

"I think the rationale is not to have all your eggs in just the Grantville basket," Nicki Jo said. "If something happens to us, the people in charge wanted to make sure there are plenty of the right penicillium species available for the day when someone*can* manufacture it. It probably took a decade of intense effort up-time to mutate the original Fleming strain into even the lower yielding strains we have cultured right now."

Amy looked over at Franz. "What about those two men fromCologne you're translating for? Aren't they physicians or something?"

"No," Franz said. "One, Gerhard Eichhorn, is a surgeon, and the other, Matthias Wagener, is the praeceptor of a hospitaller order inCologne , the Antonites. They're leaving for home next week though."

"What's a praeceptor?" Amy asked.

"Essentially just the head monk," Franz said. "But with responsibility for overseeing all the hospitals the order administers inCologne and interacting with the city council to ensure things run smoothly."

Nicki Jo nodded. "Well check with them to see if they'd like some of the penicillium. The Kwik-Stiks would be more convenient to transport than the actual cultures. I'll check with Greg to get the okay and he can arrange for permission from Len Trout."

* * *

Matthias Wagener turned one last time to look back at Grantville before urging his horse into a canter to catch up with Gerhard Eichhorn.

"An interesting six weeks, wouldn't you say, my friend?" Matthias said when his horse came level with Gerhard's.

Gerhard snorted. "You've always had a gift for understatement, Matthias. Do you finally believe they are really from the future?"

Matthias shrugged. "Of course. Or from some future. But the philosophical questions are the most fascinating. Why did God decide to send them here? And why now?"

Gerhard smiled. "So you don't subscribe to the opinion of some of the Protestants we met? That God sent Grantville back in time to punish Catholics for Tilly's sack ofMagdeburg ? The timing would certainly indicate a correlation of some kind."

Matthias waved his hand in dismissal. "Highly unlikely, Gerhard, in my opinion. God is not so petty. If anything, God sent them back for the children. Think of how many children will be saved now that we know more about disease and the reasons for early mortality."

Matthias shook his head. "And not just children. Now that we know about the importance of sanitation, we can focus on building better sewage systems."

"Well, I will help when I can. But your position as praeceptor of the Antonites should be sufficient to enlist the city council behind the changes that need to take place."

"Easier said than done, my friend." Matthias shook his head again. "Too many will resist the changes because the Americans are starting to ally themselves with Gustavus Adolphus. Others because they will see no economic benefit, just expense. Still others will say it is good that so many children die young, rather than to grow up into misery and pain and starve to death.

"As for you, Gerhard," Matthias continued, "I would be very careful if I were you with the knowledge you've gained in Grantville. Franz Wilwartz is always looking for ways to make your life more miserable."

Gerhard grimaced. It was true. Franz Wilwartz, like many barber-surgeons inCologne , was more barber than surgeon. He had always been jealous of Gerhard's skill in treating wounds and other ailments. Twice in the past five years he had threatened to file a complaint against Gerhard with the *Beleidmeister* about not following guild regulations. And now that his daughter had married one of the more prominent physicians inCologne . . .

"Oh, I'll be careful, Matthias. I just hope I can convince the guild of the need to change some of their regulations. I'll need your help in that, of course."

"You'll have it, Gerhard." Matthias said. "So what did you do with the*Penicillium Notatum* the Americans gave you?"

Gerhard turned and slapped the box tied to his saddle. "On ice, as the Americans would say. Hopefully I can keep it relatively cool until we can get back toCologne . And yours?"

Matthias smiled. "Given the fact that the package was already out of date, I decided it was important to get it back toCologne as soon as possible, so I hired a special courier. Gysbert should have it in four days, at the most, God willing."

"Gysbert Schotten? The herbalist?"

Matthias nodded and smiled again. "The greenest thumb inCologne . If anyone can get the mold to grow, he can. I just wish I could see his face when the package arrives."

* * *

Insane, thought Gysbert Schotten, Matthias Wagener has been driven insane.

How else to explain this enigmatic package on his desk and the fact that it had been delivered by special courier?

For weeks he had been receiving letters and manuscripts from the praeceptor. His enthusiasm for the "new science" had been contagious. But this . . .

Gysbert shook his head. He had done what he could to prepare a room for experimentation. But the documents he had received indicated that he would have to take extensive precautions to keep the cultures from being contaminated, and how was that going to be possible? He had no autoclaves, although perhaps a regular oven might work. Dry heat instead of steam. He had no microscopes, no thermometers, nothing.

"Father, should we begin?"

Gysbert looked at his assistant, Wolfram Muysgin. Wolf was a good boy. Eager, enthusiastic. Good instincts for many things. But now those instincts would have to be retrained for an environment very different from what they had assumed. No more "humors" or blood that was "too hot" or "too cold." Oh no. Disease caused by small animals called "bacteria." Or even smaller ones called "viruses." And a constant . . . what was the word? Ah yes, a constant "evolutionary" war fought between bacteria, yeasts, molds and fungi. An ongoing, ever-present need to keep things as sterile as possible. What was the phrase the praeceptor had stressed so emphatically? Ah, yes. "Cleanliness is next to Godliness."

"Father?"

Gysbert shook himself. "We'll start in a minute, Wolf. But first, I think we need to pray to God for success. If He has truly sent Grantville here from the future for benevolent reasons, perhaps He will bless our work if we ask him. Let us pray."

Together Father Gysbert and Wolf Muysgin bowed their heads and prayed.

Imperial Free City ofCologne ,

July 1633.

Wolf Muysgin stopped once again to consider his new workplace. The new laboratory for the hospital was a two-story brick and stone building that had been built next to the Antonite's herbal garden. The laboratory had been built at an angle so that the winter sun would light up the windowed rooms of the second story as much as possible.

Once inside Wolf removed his shoes and slipped on a pair of wool socks, then added a pair made of

linen. He followed up with a fresh lab coat that stretched to his knees and waved to the laundress, Frau Hessler, as he entered the stairs leading to the second floor. The first floor of the laboratory was given over to the laundry and experiments that did not require the same decontamination protocols as the second story. There were two doors on the stairs, and after passing through the second he was surprised to find Father Schotten in the hallway.

"Father, you're back! How was your trip to Grantville?"

Gysbert smiled and motioned Wolf into his office.

"Wonderful, Wolf. But also frustrating. And disappointing in some ways."

"Wonderful I can understand, after all the stories the praeceptor told us. But frustrating and disappointing?"

Gysbert nodded. "Frustrating because the Americans we have heard so much about are terribly busy, Wolf. They have little time for visitors with difficult questions. Doctor Nichols was especially busy dealing with outbreaks of disease. Nothing too serious, mostly dysentery and flu. But he was not very helpful."

Gysbert sighed and sat back in his chair. "My search of their books and encyclopedias was the disappointing part. Essentially nothing beyond what we were already told."

"So we are on our own, Father?"

Gysbert nodded. "Yes, I'm afraid so Wolf. If we want a medium to produce higher levels of penicillin, we will have to experiment ourselves. Corn steep liquor of the type and purity suggested in the literature is too expensive for us. So let's investigate various kinds of vegetable extracts, I think. You can start working on that. For myself, I will attempt to find an answer to the contamination problem. It does us no good to produce penicillin in quantity if it lasts only a few days because of bacterial or other contamination."

Gysbert suddenly smiled. "But enough of that. Frau Hessler seems to think you have made a breakthrough with your yeast cultures. True?"

Wolf nodded enthusiastically. The brewer's and baker's guilds ofCologne had helped finance the Antonite laboratory when they had been told about the possibility of improved strains of yeast. "True Father. Come, let me show you!"

Imperial Free City ofCologne ,

April 1634

To Gerhard Eichhorn, the gloom in Steel Mountain House was as palpable as a cold north wind along theRhine .

Deservedly so, he thought, when the family's only son is about to die. For four days Simon von Hardenrat had become weaker and sicker. Gerhard had been called in on the second day when the family became alarmed at Simon's high fever. Nothing Gerhard had attempted had seemed to work, despite the new medical knowledge he had gained thanks to his trip to Grantville in 1632.

What good is knowledge if it only informs your own helplessness?

"Any change?" Gerhard asked as he entered Simon's bedroom. Peter von Hardenrat, Simon's father, shook his head wearily. Peter had relieved his wife at his son's sickbed sometime in the early morning.

"No major change, Herr Eichhorn. The fever is no worse, but no better, either. We keep bathing him with cool distilled water, as per your instructions. But I fear the infection is spreading. And his neck is starting to bulge."

Gerhard Eichhorn sighed. "It is as I feared. He may have either diphtheria or a very severe bacterial infection. Something the Americans called*Staphylococcus aureus* ."

Peter nodded. "Is there anything we can do? Besides pray?"

Was it time to try again? thought Gerhard.

The first experiments had not been very successful, leading Gerhard to suspect that the Americans had been right about the need for purification. But the Antonite monks had been working for almost two years with the*Penicillium Notatum* cultures. Maybe they had had better fortune.

"Perhaps." Gerhard said. "How well do you know the praeceptor of the Antonites in the hospital on Schildergasse?"

* * *

"Surely you're jesting, Father. Could it really be that simple?"

Gysbert nodded. "It seems so, Wolf. Borax is the solution to our contamination problem. And not only does it limit most contaminants at only two-tenths of one percent, but in combination with the pressed pea juice you discovered as a medium, the yields are thirty to forty percent above baseline. Clearly borax not only lowers contaminant levels. It also acts like a fertilizer to improve production. We can start thinking about experiments with people soon."

Wolf cocked his head. "Is that wise, Father? I thought the literature said the penicillin had to be purified to be effective."

Gysbert smiled. "I think the literature may be wrong, Wolf. Remember that cut I had last week? It became a bit infected. So I decided to do a little experimentation on myself. What do you think?" Gysbert held up his finger for inspection. Clearly the cut had healed well, with no sign of redness.

"But . . . I thought the Americans said . . ."

Gysbert smiled again. "Perhaps the Americans don't know everything, Wolf."

"Father Gysbert?"

Gysbert and Wolf looked at the door. Dietrich Tils, the praeceptor's secretary, was standing in the doorway.

"Yes, Dietrich?"

"The praeceptor wishes to see you. Immediately."

* * *

"And if Hardenrat's son dies, Gerhard, what then?"

Gerhard shrugged. "He is a fair man, Gysbert. And one ofCologne 's most prominent citizens. If you save his son, the Antonites will gain a powerful friend indeed. Isn't that so, Praeceptor?"

Matthias Wagener nodded. "And he is indeed a fair man, Gysbert. If we try and do not save his son, he will not hold it against us. But if he discovers we could have done something and did not try . . ."

"Fine. Let us try then. But we must remember that penicillin leaves the body very quickly. The boy will have to have additional doses of the juice every three hours. How should we administer it?"

"As throat and nose drops, I think," Gerhard said. "Do you have enough?"

Gysbert nodded. "Just enough for ten days, I think. If he isn't cured by then . . . may God have mercy on his soul."

Magdeburg,

January 1635

"Holy crap, James, is this for real?"

James Nichols nodded at Mike Stearns. "As real as it gets, Mike. This hospital inCologne is saving lives using home-made penicillin." He smiled. "I told you sending out those cultures would pay off."

"But I thought we needed some high tech to make penicillin."

"Well, you do to make pure penicillin. But this stuff is pretty crude. Turns out this monk, an Antonite named Gysbert Schotten, is a pretty decent jack-leg biochemist. So through a bit of luck and a lot of hard work he was able to make enough crude penicillin to start supplying most of the hospitals and physicians inCologne . It won't be enough for a nation of millions, but it's certainly enough to take care of a city of forty thousand."

"So, should we start making this stuff?"

James smiled. "We already have." He shook his head. "Who would have believed it? Pea juice and borax to improve the yield. One of those 'duh' moments, like Greg Ferrara had. It might not be as effective as pure penicillin, but if we need an antibiotic that we can use topically, it should work in a high percentage of cases. And the nice thing is, we can spread this around to a lot more places than sulfanilamide or chloramphenicol. We just need to try and make sure that people use it wisely. Back in the fifties they were putting penicillin in everything from toothpaste to lipstick."

When James had left Mike walked to the window of his office. Pea juice and borax. Not something that had been in any of the books in Grantville, that was for sure. Synergism. Up-time ideas fusing with

down-time hard work and perseverance.

Smiling, Mike Stearns turned back to his desk.

Little Angel

By Kerryn Offord

Grantville,

January 1634

Maria Helena Kolb slowly searched the line of trees. Somewhere, hidden in the shadows, she was sure Benji Matheny was hiding in ambush.*Time to send in the cannon fodder.* "Daisy,Regina , when I give you the word, I want you to run around that tree over there and, if you find Benji, throw your snow balls at him." Maria Helena smiled at the younger girls. "Do you understand?"

Both girls held up their hands, each holding a carefully crafted snowball, and nodded.

"Right, then wait a moment for me to make some more snowballs."

Daisy andRegina waited impatiently while Maria Helena finished shaping some snowballs. "Are you ready yet, Maria?" Daisy asked.

Maria Helena checked her access to her ammunition, then taking a snowball in each hand, nodded.

Daisy andRegina burst out from behind cover and ran for the tree Maria Helena had indicated.

Benji stood up and opened fire on them. Maria Helena, still behind cover, was presented with Benji's back as a target. She, quite naturally, took full advantage of the exposed target, and opened fire.

It was a massacre. Three to one odds, even if two of the three were barely four years old, were enough to completely trounce eight year old Benji.

Totally outgunned, and short of ammunition, Benji took to his heels, the girls in pursuit.

* * *

"Where do you think you're going, young man?"

Benji threw a look over his shoulder. The girls were close now. He ran up to his Great Grandma Aggie and took shelter behind her. Peeking round from behind her he could see Maria Helena idly tossing a snowball in her right hand.*It wasn't right that a girl should be able to throw as well as she could.* "They ganged up on me, Granny Aggie. It's not fair." Benji noted that Maria Helena was patiently waiting for him to make a break for the house. "Granny, tell Maria Helena to drop that snow ball."

Aggie Beckworth smiled at Maria Helena. "Okay, girls, you've had your fun. You can drop that snow ball you're tossing, Maria Helena."

Maria Helena looked from the snow ball in her right hand to Benji, who was making faces at her from the protection of Granny Aggie. With a sigh she gave it one last toss and let it fall to the ground.

Benji slid out from behind Granny Aggie and . . .

Thwak!

The snow ball Maria Helena had been hiding behind her back was in flight almost before Benji stepped clear of Aggie. It hit him flush in the face. The snowball Benji had been in the act of throwing went wide.

* * *

Aggie Beckworth struggled for breath as she laughed at the shock and surprise on Benji's face. She hastily grabbed a handkerchief from a cuff and coughed into it. It took a few minutes for the coughing spasm to come to an end. Short of breath, Aggie looked down at the anxious faces. "It's all right, children. Just a bad cough. Now get inside where it's warm. We don't want you catching a cold."

Benji, Daisy andRegina ran up to the house, shaking the snow from their clothes before going indoors. Maria Helena gave Aggie a searching look before walking back to the house. Every few steps she looked back to make sure Aggie was following.

* * *

Lora Matheny looked from the blouse in her hands to her daughter. "Look at this blouse, it's filthy. How did you get it so dirty?"

Scuffing her feet, Daisy looked up at Lora through her eyelashes. "Me,Regina and Maria Helena had a snowball fight with Benji."

Lora sighed. She had a pile of washing to do, and she was sure her washing machine was on its last legs. The weather was lousy for drying clothes, so she had washing draped all around the house drying. The laundry door was sticking, and with her husband Jeff still working in Nürnberg, she'd asked her father if he could fix it. He'd promised to come in after work, and that meant she'd probably have an extra for dinner. Two, if he brought Uncle Stu along to help.

"Go and play withRegina and Maria Helena then, and try to stay clean."

"Yes, Mommy." Daisy slipped away.

Lora walked over to her favorite chair and slumped into it. She was exhausted. It wasn't that the kids were a real problem. They could be trouble, but that, as Jeff always said, was in the design specifications. It was*everything* that was getting her down. Yesterday she'd visited her mother at the assisted living center. If you could call what her mother was doing living. Her half-sister Karrie was just as bad. The rental income from Mom's home was contributing to their care, but things were tight, so tight that Grandma Aggie had moved in so that her place could be rented out. It made for a crowded household, but she wouldn't have it any other way. Family was important. If only the sun would shine so she could get the washing dry.

A few days later

Dell Beckworth lowered his pack to the ground. Then, rifle in hand, he joined his brother at the edge of the ring wall. Together they looked out at the scene below. "Any idea why our bit of hunting ground is suddenly worth twenty percent more than last year?"

"Nope." Stu kicked away a bit more of the unstable cliff edge. The brothers watched the loose soil and rocks fall to the ground a couple of hundred feet below. "The way we're losing bits of it over the ring wall, I'm surprised anybody wants to buy it."

"Yeah, but the letter came from someone." Dell reached into his jacket pocket and pulled out the offending letter and reread it. "Yep. It still says Joachim Schmidt wants to buy our bit of dirt. Any idea who Joachim Schmidt is?"

Stu shook his head. "Nope, and Mrs. G. doesn't know who he is either."

Dell raised his eyebrows at that little tidbit. In his admittedly limited experience, Mrs. Gundelfinger knew everybody and everything that was happening in Grantville. "What? Something the marvelous Mrs. G. doesn't know? That's a first."

"Hey, don't knock her information network, Dell. It saved us a hell of an embarrassing interview when you dropped that letter of credit from the Mehlis City Council right under her feet."

Dell shuddered. That had been a bad moment. "Don't remind me. The way she picked it up. Looked at it, then smiled up at us, and casually asked if we'd bought a bridge recently still gives me the heebie-jeebies."

"Yeah, that was a nasty moment. But things got better when she asked us into her office. Hell, she even paid us something for the information the Mehlis city council had Derek Modi designing their new bridge. I'd say having Mrs. G. accepting us as clients is the first bit of good luck we've had in years."

Dell folded up the letter and put it away. "Yeah, lucky. From the latest financial report she gave us, we could be out of debt inside ten years." He spat over the edge of the ring wall. "Shit, I'm fifty-five this year. I want to be more than just out of debt in ten years time."

"Ain't that the truth? Still, if we accept that offer for our bit of hunting ground we could give it to Mrs. G. to invest."

Dell paused to survey what he could see of their land. It was typicalWest Virginia hill country. Wooded hills that looked like inverted ice-cream cones. "Yeah, except she gave us a 'don't sell' warning even before that letter arrived."

"Makes you wonder what she knows that we don't? But I bet Mr. Too Big For His Britches has the same information."

Dell grinned at the name they had for one of the more successful opportunists in Grantville. Both of them hoped to one day see Mr. Too Big have a Too Big fall. "Yeah, as an ex-county commissioner he'll have the contacts. You think Joachim Schmidt's a front for him?"

"Yeah, I'd bet money, if I had any. It's unusual for the bastard to offer over the odds though. That means he must be in a hurry to close the deal." He cast a curious gaze over their acreage. "I can't think what could raise the value though. You can't build on it. You can't really harvest the timber. It's too much

trouble to selectively log, and if you did any clear felling, the hill would slide out from under you." He looked down the slope, towards a rocky outcrop. "The only thing I can think of is that that seam of coal."

Both of them looked in the direction of the dog-hole mine where they'd harvested coal to heat the hunting hut that was now lost up-time. Stu shook his head. "But Mrs. G. says we don't own the coal. The mineral rights on most of our land were owned by the coal company, and they escheated to the government."

"Most of the mineral rights?"

Stu sighed. "Yeah, most. Great-grandfather John Beckworth didn't sell the rights on the piece he bought way back when he first settled in the area."

"Don't tell me. That bit was left up-time."

Stu nodded. "An accurate survey might show some of the bit left behind still holds its mineral rights, but I wouldn't bet on it."

"Shit, our luck stinks," Dell said. "Come on. We've seen all there is to see. We might as well head home. Just keep an eye out for dinner."

* * *

"Hurry up and finish your breakfast, Daisy. You don't want to be late."

Daisy struggled to swallow. She shook her head. "No, Mommy." Toddler Haven was a fun place to go, but Mom only let her go one morning a week. She wished it could be more often since most of her friends went there. Daisy rubbed her jaw. It hurt. She looked at the remains of her breakfast. She didn't think she could eat any more, so she slipped from her chair and ran over to give her mother a hug.

Lora hugged her back. Then she helped Daisy and her adopted sister,Regina , into their winter jackets and helped them put on their mittens. Once the girls were dressed for the elements, Lora put on her heavy coat and they set out for Toddler Haven.

* * *

"Mrs. Matheny, Gaby McPherson calling from Toddler Haven . . ."

"Hi, Gaby. I hope Daisy andRegina are behaving themselves."

"Actually, it's about Daisy that I'm calling, Mrs. Matheny. Mrs. Beckworth has taken Daisy to the hospital. She said to tell you to get there as soon as you can.Regina is still here at Toddler haven, but Mary Moran says she'll take her home with her."

Lora gulped for air. "Can you give me any idea of what's wrong with Daisy, Gaby?"

"Not really, Mrs. Matheny. Daisy complained of neck pains and a sore jaw. And she's wet herself. She was awfully embarrassed about that and the fuss Mrs. Linder and Mary were making. It might just be a bug that's going around, Mrs. Matheny, but Mrs. Linder insisted Daisy should see a doctor."

"Right. Thank you for calling, Gaby, and thank Mary for me. Bye."

Lora hung up the phone and stood staring into the distance.

Aggie placed a hand on her shoulder. "Is something the matter, Lora?"

"They've sent Daisy to the hospital, Gran."

"Come on, we'll have to pack a bag for Daisy in case they want to keep her overnight, and something for you. You'll want to stay with Daisy. Don't worry about Tommy, I'll take care of him." Aggie hesitated. "I'll give your father a call. You don't want to be alone at a time like this."

* * *

Dr. Susannah Shipley was nearing the end of her shift in the emergency room when Daisy Matheny was brought in by a panicky Heather Beckworth. By the time Heather finished her description of Daisy's symptoms she was already fearful of the probable diagnosis. Susannah tried to put Daisy at ease while she did a quick examination. She paid special attention to the jaw and abdomen. Next, she asked Daisy whether she had hurt herself recently. Daisy showed Susannah the sore finger she had scraped while picking up snow during a snowball fight. It had happened three days ago. Susannah made a quick mental calculation and came to a shocking conclusion. This little girl was probably going to die. But she wasn't going to give up without a fight.

"Nurse, find me a critical care bed for Daisy Matheny and admit her immediately. I need to call the pharmacy."

Nurse Annette Salerno grabbed a phone and started to make arrangements to admit Daisy.

Susannah used another phone to call the pharmacy. "Raymond? I've got an emergency. Do we have any plasma in stock from someone we know had a tetanus booster shot? The more recent the better."

"What sort of emergency, Susannah?" Raymond Little asked.

"A four-year-old girl with acute tetanus poisoning. I know the patient. She hasn't had any vaccinations against tetanus. She should have had her first DTaP shot just before the Ring of Fire, but she was ill."

"Oh shit! Right. Just a moment and I'll check."

Susannah waited impatiently for Raymond to come back to the phone.

"We've running low, but I can send you a couple of units. The antibody counts might not be very high though. It's been almost four years since the donors had their booster shots."

"That's better than I expected, Raymond. It'll have to do, since it's all we've got."

* * *

Dell Beckworth left Lora at Daisy's bedside and made his way to Dr. Shipley's office. "Can you tell me what's wrong with Daisy, Doctor?"

Dr. Susannah Shipley was tired. She tried to sit up straight in her chair. "I'd rather talk to Daisy's mother or father, Mr. Beckworth."

"Well, that'll be a trick. Lora's in there crying over Daisy, and her father's miles away down in Nürnberg."

Susannah slumped a little. "Can you get a message to her father?"

"Oh, shit! It's that bad?"

"We think Daisy has tetanus."

"Tetanus? But surely you can treat that. There're vaccines . . . aren't there?"

Susannah shook her head slowly. "Up-time, there were vaccines and anti-toxins and we could always get more. I'm sorry, Dell, but we've run out. We've used what we brought back with us on neo-natal cases. We're doing the best we can using plasma taken from some of the last people to get a tetanus shot up-time, but I don't think it'll make much difference in Daisy's case."

"What the hell do you mean you don't think it'll make much difference in Daisy's case?" Dell yelled.

"Everything is happening too fast, Mr. Beckworth. Even if we had the anti-toxin, I don't think we could do anything for Daisy. Even up-time, when someone wasn't immunized, tetanus was a very dangerous disease. It's caused by a toxin that kills in extremely low doses. Daisy, from what we can tell, has had more than a lethal amount." Susannah rested her hands on her desk. "I'm sorry, Mr. Beckworth, but I think you should prepare yourself for the fact Daisy isn't going to get better."

"Not get better?" Dell shot to his feet, the chair went flying backwards. "You mean she's going to die? She's too young to die. Daisy's only fucking four years old."

"I'm sorry Mr. Beckworth, but we've doing everything we can. In Daisy's case, I don't think it's going to be enough."

"How much time, Doctor?"

"The speed it's been working, a couple of days, if that."

"Shit!" Dell buried his head in his hands. He sniffed, and pulled out a handkerchief, blew his nose and mopped his eyes. "I better see about getting a message to Lora's husband."

Susannah remained seated. She grabbed a handkerchief and blotted her eyes. Sometimes she really hated her job.

* * *

"Hi, Mary. I've come to takeRegina home. How is she?"

Mary Moran opened the door to let Stu inside. "She's sleeping just now. But what's happening with Daisy? We were all worried about her at work."

Stu stared blankly at Mary and shook his head.

"Oh, how's Lora coping?"

Stu sighed. "Not very well. Look, I'm sorry, but could you just getRegina , please. Mom's home alone with Lora's kids, and she's not very well herself."

* * *

Stu started to worry as he turned to walk up the drive. Lora's house was dark. There should have been lights on. It wasn't that late, and anyway, surely his mother would stay up until she got news of Daisy.

When he arrived at the door he became even more worried. The sound of a child crying could be heard. It sounded as if Tommy had been crying for a long time. It wasn't like his mother to let a child cry like that. He rushed inside.

The sight before him made him jerk. For a moment, in the first flash of light, he'd mistaken the blanket-covered toys on the floor for a body.

Tommy had never been able to settle without his blanket as long as Stu had known him. He picked up the blanket to give it to the baby, but the odor made Stu back off. It smelled as though Tommy hadn't been changed for a while.

Stu was worried about his mother now. There was no way she would let a baby stay wet. He headed for his mother's room, but she wasn't there, either.

Stu paused. The sleeping weight ofRegina was somehow comforting, but she was starting to feel heavy. *Best to put her to bed before searching for Mom.* He headed for the girls' bedroom, then froze. His mother lay curled up on Daisy's bed, some of Daisy's favorite toys gathered in her arms. Beside her, holding her hand, sat Maria Helena.

Maria Helena carefully slipped her hand out of Aggie's and walked over toRegina 's bed. She opened the bed covers and gestured to Stu.

The look of calm acceptance in Maria Helena's eyes almost caused him to throw up. He placedRegina on her bed and left her in Maria Helena's capable hands. Then he moved to check his mother. She looked peaceful, too peaceful. He touched her hand. It felt cold. He felt for a pulse. He couldn't find one. Finally, he took her spectacles and held them close to her mouth. No sign of water vapor.

Stu swallowed and turned to check on Maria Helena andRegina .Regina appeared to be sound asleep. Maria Helena met his gaze. Blinking and breaking eye contact he looked around the room before returning to look at Maria Helena. "Benji?" he asked.

Maria Helena pointed up the hall.

"Will you be all right, Maria Helena?"

She nodded.

Feeling guilty for leaving her in the room with a dead body, Stu walked over to Benji's room. Benji was curled up in bed and Stu had to make sure that Benji was just sleeping. He was.

Quietly Stu slipped out of Benji's room, closing the door behind him. He looked at the bed where Maria Helena sat beside her sister. He couldn't leave the two girls in the same room as a dead body. It just

didn't seem right, but first things first. He had to get Tommy cleaned up and properly settled.

Nürnberg,

two days later

Jeff Matheny looked at the radiogram with dread. The look Tom Johnson, the radio operator, had given him when he passed it over promised bad news. The fact that the radiogram was folded and sealed suggested the worst of bad news. With great trepidation he broke the seal. He looked to the bottom first, to see who it was from. "Dell."*Shit, the only Dell he knew was his father-in-law. Why was his father-in-law sending him a radiogram* . He moved his eyes to the main text.

DAISY DYING STOP
TETANUS STOP
GET HERE ASAP STOP

Jeff swallowed. His daughter was sick, and he hadn't known. He looked at the header of the radiogram to see when it had come in.*Oh, shit. It's two days old. My daughter may have died without me at her side. And hell, Lora. My family needs me* . Jeff set off to tell his boss he was heading for Grantville.

After the funeral

Stu Beckworth stopped walking to turn and look back at his niece's home where friends and family were still gathered to comfort the family. He spat at the ground. "The sooner that bastard goes back to Nürnberg the better."

Dell nodded his agreement. Lora's husband had arrived in Grantville barely in time for the funeral. There might have been some excuse for that, but there was no excuse for the way he ignored the two girls in favor of his sons. "Yeah! The sooner the better. For a moment there, I thought you were going to thump him."

"Believe me, Dell, if you hadn't dragged me away from there I would have done more than thump the bastard. Maria Helena went from excited and animated that her 'father' was coming home to totally lifeless as he walked right past her, and her sister was reduced to tears. I could have killed him there and then."

"Yeah, well, then it was a good thing I dragged you away. There's been enough death in the family for now."

Stu shoved his hands in his jacket pocket and started walking again. Dell fell in beside him. They walked another half mile before Dell broke the silence.

"Why the hell isn't the government doing something to protect the children, Stu? Okay, so they got that smallpox immunization program up and running, but what about tetanus?" Dell stared at the setting sun. "I

asked Dr. Shipley after Daisy died. She said she hadn't heard anything. You got any idea what it takes to make a vaccine?"

"No. Do you?"

"No. Dr. Shipley suggested I talk to Dr. Ellis. He was part of the team responsible for the smallpox vaccination. I think I'll drop in after work tomorrow and ask him. You want to come along?"

Stu looked torn. He hesitated, and then shook his head. "I think I'd better hang around Maria Helena and her sister. Maybe the bastard will spend a bit of time with them before he goes back, but just in case he doesn't, I want to be around to let the girls know that they're important."

The Home of Dr. Emery Ellis, M.D. (retired)

"Sorry about what happened to Daisy. A real shame that." Dr. Ellis shook his head.

"It's Daisy I wanted to talk to you about."

Dr. Ellis stepped back from the door. "Come on in, Dell. But I have to tell you, I've spoken with Dr. Shipley about Daisy's case, and there was nothing more she could have done."

"Yeah, that's what she told me. But that's not what I want to talk about. I want to talk about what it takes to make a vaccine."

Dr. Ellis guided him to a seat before sitting down himself. "I guess you really want to know about a tetanus vaccine, don't you? Well, generally speaking, once you can reproduce the bacteria in the laboratory, making a tetanus vaccine becomes a possibility. The trouble is, the bacteria are anaerobic, meaning that they live under conditions without oxygen. It's damn near impossible to culture the bacteria without developing some special equipment first. I hear Les Blocker is trying to do that, but he's not making a lot of progress."

"The vet? Any idea why he's not making much progress?"

Dr. Ellis shook his head. "Yes, the vet. Veterinarians actually know a lot about vaccines, Dell. The big problem is the lack of trained staff. There just aren't enough trained laboratory technicians. Come into the study and I'll show you what I have on vaccines and vaccinations.

Dr. Blocker's Veterinary Clinic

"Hi, Dell. Dr. Blocker's fallen a bit behind. If you'll just wait in the waiting room, he'll see you as soon as he's free."

Dell glanced over towards the waiting area. The first thing he saw was the young girl. He froze for a moment. She looked so much like little Daisy. Backing away from the waiting area he turned to June. "If you don't mind, I'd prefer to wait outside."

Outside the surgery Dell leaned against the wall. The sight of the girl had brought back memories of that

night spent beside Daisy's bed praying for a miracle that didn't come. When his breathing returned to normal, he pushed off from the wall and started to look around. The animals in the paddock beside the surgery attracted his attention. He'd always had a bit of a soft spot for the llamas. Or were they alpacas? He'd never really been sure of the difference.

He lean against the fence and he watched one of the animals approach. It didn't appear threatening, so he stood his ground until the llama started to gently butt its head against his chest.

"He wants you to scratch under the halter."

"Dr. Blocker?" Dell asked.

Les leaned forward and scratched the llama. "Call me Les. You're Dell, aren't you? Dr. Ellis told me you might come around asking about vaccines."

"Yeah, I'm Dell. Dr. Ellis told me you were working on a tetanus vaccine. Can I ask how far you've got?"

Les shook his head. "Not very far at all. In fact, we've basically shelved it as too difficult. We just don't have the trained staff. I'm spending half my days trying to train some new veterinarians and the other half tending to animals."

"What will it take to get you back working on a tetanus vaccine?"

The vet pushed away the llama and gave Dell a wry grin. "More than twenty-four hours in every day would be a great place to start. Come on, let's go for a walk. If I hang around the surgery, I'm bound to be called away."

The office of Helene Gundelfinger

Mrs. G. looked across her desk at the two up-timers who had asked for an urgent appointment. "Herr Beckworth, Herr Beckworth, how may I help you?"

"We want to sell everything we have. We need to raise as much money as we can."

Helene gently tapped a pencil on her desk. "I can't recommend that. Can you tell me why you need the money? There are a number of investments I've recently made that should make a fine return in time."

"We don't have time. Hell, too much time has already been wasted."

"Easy, Dell. Mrs. Gundelfinger deserves to know why we want the money." Stu turned to Helene. "I'm sorry about Dell, Mrs. Gundelfinger. My grandniece, Dell's granddaughter, died last week. She shouldn't have. If she'd been vaccinated, she wouldn't have died. We want to underwrite a research program to produce vaccines like they had up-time."

"Children die, Herr Beckworth, are you sure your research program will do any good?"

"Yeah, I know children die, Mrs. Gundelfinger, but not my grandkids, and not from such a fucking lousy way as tetanus. Not when a simple vaccination can prevent it." Dell answered.

"Tetanus?"

"You probably know it better as lockjaw."

Helene thought a moment. She had seen people die of lockjaw. It wasn't a pretty way to die. She glanced up at the ceiling. Above her office her daughter was taking her nap. She would do anything to prevent her daughter suffering that fate. "You might not need to sell all of your investments, Herr Beckworth. If you can gather people capable of developing such a vaccine, I will help raise the money. Would I be correct in assuming you want the vaccine to be available to the greatest number of people and not just the well-to-do?"

Dell nodded. "Especially the children."

Daisy Matheny BioLab,

Grantville,

a few months later

Dr. Emery Ellis surveyed his domain. He had come out of retirement to serve as the first director of research at Daisy Matheny BioLab, the company named after the first up-timer to die of tetanus. Whereas most new businesses struggled to raise capital, Daisy Matheny Biolab hadn't even had a true public offering. Shares had been offered only to selected individuals. People who would rather see affordable health care for all, rather than more money in the bank. There had been a few rumbles from people who hadn't been invited to participate. Emery grinned when he considered the possible social implications of not being a shareholder in Daisy Matheny Biolab. He and his wife were safe. They held a hundred shares

* * *

Lora stood with Tommy in her arms watching the nurse give the children their shots. It wasn't the tetanus vaccine. They weren't even thinking of human trials of that vaccine yet. Maybe next year. Instead, she and the children were being vaccinated against typhoid. It was a double vaccine, a needle and an oral vaccine embedded in a sugar cube.

Maria Helena volunteered to go first. There was no sign of emotion on her young face as she sat quietly waiting for the nurse to finish. Then she stood up and walked over to Stu. Lora bit her lips when their hands met. She was sure money changed hands. She'd have to have words with Uncle Stu about the evils of bribing the children.

Then she watched Benji approach the nurse. Lora braced herself for a repeat of the fuss he'd made for the smallpox vaccination. But Benji surprised her. He couldn't carry "stoic" like Maria Helena, but the expected fuss failed to materialize.

The smile that passed between Uncle Stu and Maria Helena caught her attention. Then she grinned. Of course, that was why Maria Helena had gone first. There was no way Benji was going to appear less brave than a girl.

His dose administered, Benji retreated as far away from the nurse as he could get. He slowly sucked on his sugar cube while he rubbed his arm. That leftRegina next in line. Maria Helena moved closer to her sister and held her hand.Regina didn't cry out, but she did give the nurse an accusing "that hurt" look.

That left just Tommy to go. Sucking on his sugar cube, a rare treat given the price of sugar, he kept his face buried in Lora's shoulder through the whole operation.

* * *

Benji andRegina ran on ahead, but Uncle Stu was dragged along by Maria Helena pulling at his hand. Lora smiled at the happy picture they made. There had been a special closeness between the two since the night Grandmother Aggie died. These days Maria Helena was almost a typical happy-go-lucky nine-year-old.

Lora had worried about her father. He had felt badly about his inability to do anything to help Daisy and had been the real driving force behind the Daisy Matheny Biolab. Once the biolab was up and running he'd been lost. In the end, he'd taken advantage of some of the contacts he'd developed lobbying for the biolab and gone into business with a gun maker in distant Melis. He was finally showing signs of being over his guilt at not being able to save Daisy.Reading between the lines in his latest letter, Lora was sure he'd found a new woman friend.*Well, good luck to him* .

* * *

Dr. Ellis caught her standing under Prudentia Gentileschi's magnificent portrait of Daisy.

"The artist did an incredible job, Lora. But how did she know what Daisy looked like?"

"Jeff was missing the kids, so we shot some videos and sent them to him in Nürnberg. When Prudentia asked about any pictures we might have of Daisy, Dad sent Jeff a radiogram asking for the tapes. She really caught Daisy."

Dr. Ellis nodded. "Yes. A marvelous memorial for a life lost so young." He gently made to lead Lora away from the painting. "Come, I'm sure your family is wondering what happened to you."

Lora gave the painting one last look before letting Dr. Ellis lead her away.

CONTINUING

SERIALS

Franconia! Part 1

by Virginia DeMarce

Grantville,

February 1634

"No, no, no, no, no, no, n-o-o-o-o." Amber Higham threw both of her hands up in the air.

The class came to a stop.

"This unit worked last year. It worked like a charm. Why isn't it working this year?" She glared at her students. "So, tell me! We're using a down-time period play. We're using an up-time ripoff of the down-time play. Why aren't you getting the connection? Why, why, why?"

For someone who could be so cool when managing adult committees, when Amber was in full steam in the classroom, she tended to go for agony.

Nobody said anything. The couples standing in the middle of the floor looked at her with their mouths half open.

Finally, Michelle Matowski looked up from the piano. "Maybe last year you had boys who could carry a tune?"

"Yeah. Or dance." Kurt Washaw, the male half of one of the couples, stuck his thumbs in his pockets.

"This is just a class unit. I'm not putting you in costume. I'm not putting you on stage in front of people. I'm just trying to get you to see that what was 'then' up-time has connections to what is 'now' down-time."

"Who cares?" That was David Thornton, also a reluctant singer and dancer.

Amber ran her fingers through her gray-streaked hair. She thought that part of the problem was that Kurt and David, like Lorie Lee Carstairs in the back of the room and close to a half-dozen other of this year's up-time kids, had been left behind in Grantville to finish out the semester, parked with uncles and aunts or family friends, when their parents went off to do other things. Kurt's and Lorie Lee's folks were inMagdeburg ; Dave's inBamberg . In some ways, this year's class was having its growing-up even more disrupted by Grantville people starting to fission off into the rest of the United States of Europe than their older brothers and sisters had been by the Ring of Fire itself three years before.

None of which solved the problem. "Michelle, please take it again from the beginning."

The next try wasn't any better.

"Want a little help, Mistress Higham?"

She looked over at the open door. A couple of boys stood there. Fifteen or sixteen, maybe? She raised her eyebrows and beckoned them in. "You know me, but I don't think that I know you."

The taller boy nodded. "We just came from Master Saluzzo. Your headmaster. We are traveling with an English playwright who greatly admired our grandfather. We have been on the continent for some months—he is with the King's Men company, but concluded quite some time ago to travel and see what might be found. Since in the very nature of things, traveling players must earn their keep by playing, it took our little company some time to get this far."

The other boy picked up the narrative. "He has come to use the libraries here. After experiencing those 'some months' of our company, Master Massinger has decided that for as long as we remain here, we shall go to school, so he will not need to fret about what we may be doing while he pursues his studies. Particularly since many of the classes are taught in English. Particularly since the National Library is in this building, so he can escort us to it in the morning and ensure that we leave with him in the evening."

With immaculate timing, they traded off again. "Since our grandfather was an actor, Signor Saluzzo thought we might well enjoy the drama class. Most particularly since it has no 'prerequisites.' While he has found us to be far from lackwits, it appears that we are most sadly deficient in 'prerequisites,' at least as far as mathematics and natural philosophy are concerned. Nor does Master Massinger know how long we will be remaining, so the headmaster doubts the wisdom of trying to remedy the situation. So, mistress, aside from some more Latin, of course, which one's mentors always find to be an excellent thing, and the literature ofFrance with Mistress Hawkins, since our French is already tolerable, we are at your service. In your service, indeed. Should you need a set painted, a costume created . . ."

The shorter boy broke in. ". . . a ditty sung, a few words smithed to fit a new scene, a female part played . . ." He stopped, looked over the class, grinned. "Not, it would appear, that you will be in need of that particular talent of mine, although unlike my brother I can still squeak a fine falsetto. Nonetheless, on our way down the 'corridor,' we heard your song." He sighed deeply. "Now, I am Tom. That one next to me is Dick. Had our parents produced yet another son, methinks that he likely would have been Harry, but I fear that we must borrow someone else."

Amber looked at them. Down-time English, obviously, from their accents. Slightly built, both of them. The taller couldn't be any more than five feet six. The other stood shorter by a couple of inches, but he also appeared to be younger, so he might still have a growth spurt. Straight hair, barely a couple of shades apart. For the taller, it was light brown; for the shorter, dark blond. Faces with small, neat, features. There was no sign of any incipient jutting jaw. Neither would ever model as Conan the Barbarian. They should have looked like a couple of budding bank tellers, but . . . they didn't. With the cocky angle of their heads, the little banty rooster strut with which they walked, they looked more like budding . . . buccaneers? She could imagine them on the deck of one of Drake's ships, laughing as they chased a Spanish galleon.

Boys from a troop of traveling actors? Boys unafraid of the stage? Amber motioned them to the center of the room. "We have quite a few Harrys in this town, but not of an age to take sophomore drama."

A solemn nod. "Ah, yes. Harry Lefferts. We have heard of him."

Amber wished that they hadn't. "So . . ." She looked at the three couples who were still standing in the middle of the classroom.

Kurt and David sat down, leaving a down-time boy named Zacharias Schaupp to sing as "Harry." Lorie Lee shoved sheets of paper with the lyrics into the hands of the two new kids. They took a hasty look. Michelle played through the tune a single time. Juliana Ostertag started out on Cole Porter's interpretation of Bianca's dilemma, with Mikayla Tito backing her. Tom cut in with the line containing his own name. Dick did the same. One light—still very light—tenor. But Grantville's high school, thank goodness, was still in a position to put lapel mikes on its student performers at need. One fairly strong baritone. Good timing. The result wasn't a polished performance, but it was a performance rather than a struggle. A performance delivered with a glee that pulled the other students along. Amber grinned. The semester's prospects were looking up. These two boys, Zacharias . . . if she could just talk Lisa Beattie into letting Wolfgang Fischer off farm chores long enough to rehearse . . . Plans bubbled up in her mind.

* * *

"So there they are. Tom and Dick."

"The Smothers Brothers?" Lady Beth Sawyer laughed.

"The Quiney brothers, if you want to be prosaic. But they do have that same glint of irreverent mischief in their eyes. Every teacher who gets one of them, let alone both together, is going to have to scramble to stay on top of things. Would you believe that they've actually performed in*The Taming of the Shrew* ?" As Kate and Bianca. They like*Kiss Me, Kate* better, they say. They've really taken to the concept of the musical play. The play with music woven into the action rather than just performed on the side or during interludes."

"You sound positively invigorated."

"I wasn't even going to try to put on*Oklahoma!* this spring. There just weren't any boys who could carry the roles. But now. I have Curly and Jud. Just you wait the end of until April."

"By April, I'll probably be inMagdeburg ."

"Oh, gosh, Lady Beth. That's right. I'm going to miss you like crazy."

Grantville,
March 1634

"So you think it's odd?" Michelle Matowski frowned.

"Not odd here, so much." Tom Quiney shook his head. "You're lucky, you fair young maidens, that you landed in the Germanies and not in the comparably fair Isle of Albion."

"Why?"

"Our grandfather, we've said, was an actor."

"It shows."

"A man of many words as well. He was a scribbler like Master Massinger. But although he made his living from words—a good living from words—he left our aunt and mother unlettered. Illiterate, as you have Latinized it in your American English."

"You mean that your mom can't read or write?" Michelle waved the rye roll with*Bratwurst* that the high school cafeteria was offering for this day's lunch right under his nose, only to find it plucked out of her hand from behind."

"Hi, Dick," she said without even turning around. "Give me that. Give it back. Now. Don't you dare take a bite."

"There are more where it came from."

"I don't have any more lunch money and they don't take credit cards. Give me that*Bratwurst* !" She lunged up just as he started to run, managing to grab the back of his belt.

Tom leaned back and started to whistle a theme which reminded them both that the farmer and the cowboy should be friends.

* * *

Michelle hadn't given up. During rehearsal after school, she cornered Tom again. "Did you really mean that your own mom can't read or write?"

"Yea. Forsooth. All that sort of Elizabethan English stuff."

She frowned. Tom and Dick had picked up American English really fast, but Tom had the mannerism of retreating to something that sounded like the King James Version of the Bible when he was uneasy and then pretending that he hadn't done it by making fun of himself.

"Well, why not?"

"At home . . ." He paused. "Back inEngland , that is . . ." He shrugged. "Princesses are tutored, of course, as are the daughters of many of the great and powerful nobles. But among the merchants, among the artisans . . ." He stopped again.

Dick, Lorie Lee trailing after him, plopped himself down on the other side of Michelle. "One thing I have learned, here in Grantville, is that the middle class is rising." His left hand waved through the air in an upward direction. "According to Mr. Edgerton, the middle class is floating through history almost like one of your balloons, ever following an updraft."

"So?" Lorie Lee focused her eyes on his nose to the point that they crossed.

"The members of the German middle class, while thus rising, school their daughters. Aside from a few peculiar Puritans, the English middle class does not. Our aunt married a physician, very upright and prosperous. He finds it neither strange nor undesirable that she is unlettered."

Tom nodded. "Nor can we truly endorse the endeavors of the Puritans, given that they only wish their daughters to read pious literature and have done their best to extirpate our very calling."

"What he means is that most true-born Englishmen cherish an ignorant damsel." Dick winked. "They are more like to be horrified than pleased by the schooling of females. More like to be scandalized than enchanted by those who are both fair and learn'd. It is far from all English men who share the admiration that Browne expressed for the late lamented dowager countess of Pembroke."

Michelle opened her mouth.

"We, of course, share it to the full," Dick continued quickly. "Don't we, Tom?"

"Oh, verily. Without the slightest shadow of a doubt."

Michelle twirled a strand of hair around her finger. "You*could* sound a little more convinced. Are we stopping at the Freedom Arches once the rehearsal is over? I'm starved."

* * *

"Mistress Higham . . ."

The woman perched on the edge of the orchestra pit in the high school auditorium looked up.

The man moved back a little. "Mistress. My most humble apologies. I had expected Mistress Higham."

"Mary Simpson's in town for a few days, on her way to theUpper Palatinate . Amber's extremely busy meeting with her, meeting with the other arts people, taking notes about what everyone is saying. I told her that I'd supervise the rehearsals this week." She extended her hand. "I'm Annabelle Piazza. Pleased to meet you."

He backed up even farther, startled that the wife of the president of the State ofThuringia-Franconia , the new name proclaimed only a couple of weeks earlier, would have accepted such a task.

"No, stay. You must be Master Massinger. Amber told me that you would be coming."

A couple of hours later, she asked, "What do you think?"

"The style of the acting is much different from that customary inEngland . The acoustics in your theatre are excellent. Much of the humour is truly mordant."

"But . . . Master Massinger?" Annabelle raised her eyebrows. "I hear 'but' . . ."

"I do not care for the music. That is the truth. Although Tom and Dick like it very well, I find it dissonant. Discordant. Perhaps it is suitable to the message of the piece, though. The play itself is most certainly relevant to the current situation inFranconia . According to the information in regard to the probability of a peasant revolt that we are receiving by way of the newspapers, of course. They certainly comment very freely, compared to the censorship that is imposed inEngland ."

"Censorship?"

"Why, of course." He smiled. "It is a rare man among us actors and playwrights, who has not spent at least some brief time in His Majesty's gaols for something he has written or spoken. It was not, as you say, 'politically correct' of me to write a play in which the protagonist was a Jesuit. One worthy of admiration. It led to accusations that I was a recusant. A decade ago—nay, eleven years ago, now—my play about a slave revolt in the ancient Greek city of Syracuse, although safely situated in antiquity and thus detached from modern politics, was found displeasing by some persons in authority. This . . . who knows? Perhaps I shall pen something inspired by it. Yet another*New Way to Pay Old Debts* . Perhaps Sir Giles Overreach may have some parallels among the imperial knights." He gestured:

Now, for those other piddling complaints,
Breathed out in bitterness; as, when they call me
Extortioner, tyrant, cormorant, or intruder
On my poor neighbour's right, or grand encloser
Of what was common to my private use ;
Nay, when my ears are pierced with widows' cries,
And undone orphans wash with tears my threshold;
I only think what 'tis to have my daughter

Right honourable ; and 'tis a powerful charm,
Makes me insensible of remorse, or pity,
Or the least sting of conscience.

Annabelle shook her head. "It never occurred to me that*Oklahoma!* had anything to say about what's going on inFranconia . It's way older than I am. I just thought of it as one of the standard musicals that Amber has put on regularly ever since she started teaching. About every four or five years, depending on whether or not the student body has enough dancers available to carry it. It needs more than something like*Guys and Dolls* . Maybe that would make an assignment. I'll suggest to her that she could have the kids do essays on the topic."

* * *

"Essays," Amber said. "Essays. Annabelle, you would not believe what Dick Quiney has done."

"After a week of supervising 'rehearsals with Dick,' I'd believe almost anything. But I hope it wasn't caused by the topic I recommended."

"No, no. That went fairly smoothly. But then we moved on to this year's take on Arthur Miller's*The Crucible* . We always taught that, anyway. It's more relevant than ever, now, since I can tie it right into the theme of connections between up-time and down-time. Going from*Kiss Me, Kate!* as an up-time version of a down-time play to*The Crucible* as an up-time take on a down-time historical phenomenon. This year, I got Veronica Junius to come and give them a talk. That ties it even closer to 'real life' for these kids, since she was caught up in one of those persecutions five or six years ago. Before she came to Grantville, anyway. But . . ."

"What did Dick do?"

"See for yourself." Amber pushed several sheets of paper across the table. With the disappearance of staples and paperclips from ordinary life, they had two holes neatly punched in the upper left corners and were tied together with a short piece of string.

"What on earth?" Annabelle started to giggle.

"Yes. Master Massinger assigned Dick to write five pages the same week that I assigned the class to write five pages on witchcraft inMassachusetts . Dick, ever ready to kill two birds with one stone . . ."

"I rather like it. At least, it's the first historical analysis of Arthur Miller in blank verse that I've ever come across. How is it for content?"

"Not bad," Amber admitted. "Really not bad at all. He's a bright kid."

Grantville,
April 1634

Kurt Washaw struck a couple of chords on his guitar, with Michelle following on the piano.

Lass' die Ritter und die Bauer Freunden sein!
Lass' die Ritter unde die Bauer Freunden sein!

Amber Higham laughed. Among the four of them, the Quiney brothers, Zacharias Schaupp, and Dave Thornton had translated several of the songs from*Oklahoma!* into German—into what amounted to a down-time political cabaret based on the farmers' revolt that was breaking out south of the Thüringerwald . Instead of cowboys and ranchers, now the imperial knights and the peasants were supposed to strike up a friendship. To be friends.

Not patrons and clients. Not lords and serfs. Friends.

Aside from*Oklahoma!* , she had gained most of her knowledge of the range wars of the Old West from a couple of novels. Maybe she ought to look up what had gone on. If she ever had time. She tilted her head toward Master Massinger.

"Have you read any novels by Zane Grey? Or Louis L'Amour? I'm pretty sure that the National Library has nearly complete sets."

* * *

"Mr. Quiney, why do always talk about the middle class as if you don't belong to it?" Oliver Edgerton settled his spectacles on his nose.

Dick, no longer confused by the elderly man's preference to address his pupils with titles of respect ordinarily only directed at adults and social superiors, nevertheless took a moment to think.

"Well, we're not. In one way, maybe. But not in the other one."

"Could you elaborate?"

"Partly, when you talk about the middle class, you mean what this school calls 'economics.' Whether a family has attained a certain prosperity or not." He made a statement, but there was a question in the way his voice rose at the end of the sentence.

Edgerton nodded.

"In that way, probably, we are middle class. Not wealthy, but my grandfather did well and invested his income in property."

"So you*are* middle class." Dick looked around. There were a couple of boys from the next grade level in this class. That was Romeo Frost, son of the former police chief, who had spoken. Dick wanted to laugh every time he heard the name, but carefully did not. Guests should be courteous to their hosts.

He wasn't sure if he should continue. It could reflect badly on Master Massinger. But he felt a need to explain and it was easier to say these things directly to a fellow student than to say them while he was facing Mr. Edgerton.

"Middle class also means respectable, Romeo. As in 'middle class values,' as our teacher puts it. Players, actors as you call them, are not respectable inEngland . Not respectable by definition, no matter how well-behaved. And our own family, Tom's and mine, has not been all that well-behaved. I never

knew my grandfather. He died a couple of years before I was born. But I do know that even though my mother was born a quite respectable span of time from the wedding date, she was preceded into this world by her sister, who was born a scant half-year after the marriage of my grandparents. I scarcely remember my grandmother. She died when I was not yet six. But from what I recall, I can't imagine why he, uh . . ." Dick paused, looked at Mr. Edgerton and the up-time girls, and quickly substituted another, mildly similar, word for the one that had been in his mind. ". . . uh, bothered her. She was old when I knew her, of course—not that far off three score and ten."

"Your aunt was surely not the town's only early-born child," Mr. Edgerton commented.

"Well, no. But then my aunt's only child was a trifle early also. My parents' own marriage took place during Lent and was so irregular that they were excommunicated over it. Not to mention that my father was cited to the church court for having gotten another woman pregnant while he was betrothed to my mother. Her child was born a month after their wedding. Although I will grant that my oldest brother, who died as a baby, showed up almost nine months to the day." Dick cleared his throat. "What with one thing and another . . . anyway, my father is a vintner and the thin, vinegary beverage that is all his vines produce in these cold latter years has greatly soured his spirit, so that Tom and I were not displeased when Master Massinger invited us to travel with his company. Nor, I think, was our father ill-pleased to see the back of us. It was time that we were apprenticed."

He looked around at his classmates then. "And I am well pleased to be here. As is Tom."

"Are you staying?" It was Romeo Frost who asked.

"Not for long, I think. Probably not past the summer. Master Massinger plans to move on toMagdeburg once he has completed his studies in the National Library. Ah, now it is the State Library, I recall. He is accustomed toLondon and is anxious for the livelier pace of a national capital again."

* * *

Zacharias Schaupp handed a neatly tied pile of paper to Amber Higham. "Do I get extra credit?"

Ah, the ever-hopeful student. "What is it?

"It's*Oklahoma!* Translated into German."

"All of it?"

"All of it. Except, not exactly . . ."

"How not exactly?"

"Master Massinger. Tom and Dick's master. You know him?"

"Yes, I know him."

"Since they like the music—partly, he says he is sure, just because he doesn't like it. Partly because of the words connected to it. But since they like it, he set them the task of writing all of it for now, setting it inFranconia . The idea came to him when Tom and Dick were telling him about*Kiss Me, Kate* , when a modern writer took a play of this time. He has taken a play of your time and taught them to use it for now. He did not write it. They did, as an exercise, as you would say. In English, of course. Their German

is not that good." Zacharias wriggled. "But mine is, so I put it into German. Do I get extra credit?"

"Don't they want extra credit?"

Zacharias looked at her, his face blank. "Why would they need it? They've been flying so far ahead of the rest of the class ever since they came to Grantville that Kurt says they'll certainly break the curve."

* * *

"Anyway, Mr., Massinger," Annabelle Piazza bubbled, "Ed is going to pay them for it. The state government wants to have copies printed. It will send the manuscripts to Wuerzburg andBamberg just as soon as possible and get them done locally, so the Hearts and Minds people can start spreading it around. We've won the election, sure, but we still need to win this Ram Rebellion."

"I rejoice for them." Philip Massinger paused.

"Is there anything else?"

"Truly, Mistress Piazza, there is one thing that I do not understand. In all of the works in your library, and I have searched them diligently, with assistance of the reference librarians, there is not one word about the future of my young charges. Who should, by all rights, have been the brightest lights of the English stage in years to come."

Annabelle sighed. "Grantville is a small town, Master Massinger. There are certainly many topics about which our libraries had no information at all."

Note for readers. In OTL, the original time line of human history, both Thomas and Richard Quiney died in January 1639, probably of the plague.

The Doctor Phil Chronicles:

Doctor Phil's Family

By Kerryn Offord

Dr. Gribbleflotz' office,
HDG Enterprizes,
Jena

Phillip took the next letter from his inbox. It was marked personal, and checking the back, he could see it was from his American friend, Jonathan Fortney. He broke the seal and started reading. He had to smile. Jonathan could be quite droll. The suggestion that his new wife might want to spend all his money on fine jewelry was clearly a joke. His Dina wasn't like that. "*Hmmm, instructions on making synthetic rubies and sapphires attached*." Always interested in the American cheat sheets, he checked through the bundle of pages until he came across the notes.

There were several pages, so he checked the time. "*Plenty of time for a quick glance before lunch*."

* * *

". . . Corundum, a mineral consisting of aluminum oxide, Al2O3. . ."

"What?" Phillip stared hard at the paper in his hands. "Ruby and sapphire are a form of aluminum?" He turned to look up at his model of the aluminum pyramid with the strategically placed faceted gems. Gems that included rubies and sapphires.

He slammed a fist down on his desk. It felt so good he did it again, and again.

* * *

A slightly worried Maria Blandina poked her head through the doorway. She could see her husband standing over his desk, and it looked as if he'd been pounding it with his fist. "Are you all right, Phillip? I heard some banging."

"Yes, Dina. Everything's all right. I have just realized why my special pyramid doesn't work. It's not the members that are supposed to be aluminum. It is the facetted gems. Of course it didn't work. With both the facetted gems and the structure itself made of aluminum, there was no balance."

Dina relaxed. It was just a problem with his aluminum pyramid. Not that she understood Phillip's fascination with pyramids, but if her brilliant husband was interested in them, they had to be important. "That's very nice, Phillip," and just to prove she had been listening, she asked a question. "What should the structure be made of?"

Phillip sighed. "I don't know. I'll have to research various materials until I find the one that gives balance." He stopped speaking and looked at Dina with some concern. "Darling, you're looking a bit pale. Do you feel unwell?"

Dina didn't feel all that well, in fact. "Perhaps it's a bit warm in here."

* * *

It had been Dina's American friend, Gerry Stone, who started it. Phillip had been teaching a group of laborants the new science when Gerry disagreed with something he said. The laborants had been aghast and horrified that someone should disagree with him. If it had been anybody but the FrauKastenmayerin's friend, Gerry Stone, of the House of Stone, Phillip was sure blood might have flowed. But Gerry had raised some interesting questions. They had entered into a lively debate, moving into the seminar room so Gerry could use the blackboard to explain his interpretation of the new science. Soon senior laborants joined in. Then, hesitantly at first, the junior laborants had started asking questions.

After that, Phillip's teaching seminars had turned into in-house seminars where anybody could stand up and talk about what they were doing or hoped to do. The lively discussions had forced Phillip to work even harder on his reading of the American text books so that he could answer the laborants' questions.

The gentle hubbub of conversation petered to a halt as Phillip, notes in hand, made his way to the podium. Today's seminar was about the current status of his exploration of the invigoration of the*Quinta Essentia* of the Human Humors.

Phillip knew that some of his laborants didn't believe that he would ever be able to invigorate the*Quinta Essentia* , but one day he hoped to prove them wrong. Until then, any idea was a useful teaching tool. He had to prepare himself for any possible question the audience might ask, and the laborants had to

understand the new science well enough to ask intelligent questions.

* * *

While Phillip stood behind the podium checking his notes, Hans Saltzman and another laborant erected the stand holding the book of flip sheets he had prepared for this presentation. He waited patiently for the laborant to return to his seat and for Hans to place a cloth covered stand beside the podium. When Hans indicated he was ready Phillip turned to his expectant audience.

"Good afternoon everyone, and thank you for coming for this seminar. As you all know, I have been investigating the invigoration of the*Quinta Essentia* of the Human Humors. I have high hopes for my research, but, as I'm sure you know, there have been problems." He answered the many grins and smiles with a smile of his own.

"My scale model pyramid," he waited while Hans pulled away the dust cloth to reveal the scale model aluminum pyramid, "failed to invigorate the*Quinta Essentia* of the Humors in selected laboratory animals. My first thought was that the framework of my pyramid," he ran a finger along the metal frame of his model, "was constructed of impure aluminum. The Americans confirmed this. Of course I immediately demanded that they provide me with pure aluminum." Phillip waited for the light laughter to settle. He doubted anybody believed he had demanded anything. His views on dominating American females were well known. "They in turn told me that they were currently unable to produce pure aluminum. Which reminds me," he searched his audience for a familiar face. "Kurt, what progress are you making with the aluminum project?"

Kurt Stoltz answered from where he was seated at the back of the seminar room. "Slowly, sir. We've successfully produced some cryolite. However, to make enough to try and make aluminum, we'll have to make larger batches of hydrofluoric acid, and well, we're still experiencing difficulties producing suitable vessels that the acid won't dissolve. You'll remember what happened to Jochim Fritsch."

Phillip swallowed. The surgeons had been forced to amputate Jochim's right arm below the elbow. It had been a very high price to pay for a moment's carelessness with hydrofluoric acid, and the accident only reinforced his belief that he wanted nothing to do with the stuff. "How is Jochim?"

"The stump has healed well, Doctor. And he is becoming amazingly dexterous with his hook."

"Very good, Kurt. I'd like you to continue experimenting with the hydrofluoric acid, just be extremely careful. Now, where was I?"

"Pure aluminum for the framework of your pyramid, Herr Doctor," Hans Saltzman, his personal assistant, volunteered.

"Thank you, Hans. Right, pure aluminum." Phillip found his place in his notes. "Lacking pure aluminum, I was forced to shelve the project until such time as it became available. However," He paused dramatically. "There has been a new development. Recently, a good friend of mine in Grantville sent me a 'cheat sheet' on the production of rubies and sapphires." Phillip smiled at the sudden shifting of bodies on seats. "Yes, that is correct. The Americans know how to make gems. But that wasn't the most important aspect. No. What I found interesting was the identity of the major components of the gems. Corundum, also known as aluminum oxide."

There were noisy intakes of breath as various members of the audience realized the significance of this discovery. "Yes," Phillip agreed. "If both the gems and the structural members were aluminum, then the

pyramid was out of balance." He shook his head in disgust. "All that time and effort wasted because of a lack of such basic knowledge." He gave his audience a searching stare. "And let that be a lesson to you all. Make sure you know the composition of everything you intend using before you commence your experiment. It will save you considerable disappointment. I speak from experience." Phillip gave his model pyramid a gentle pat before indicating to Hans that he should cover it again.

"This brings me to the current state of my research into the invigoration of the*Quinta Essentia* . Obviously the members can not be formed of aluminum. Which begs the question, what should the members be made of?" He nodded for Hans to reveal the first page of the flip book.

"The human spirit is embodied within the mind, even if the spirit itself is not physically*of* the mind. But as the various experiments of the various scientists have proven, as my own extensive electrical experimentation has shown, the mind, and therefore the spirit embodied within the mind is effected by electrics."

Phillip walked around his electrical demonstrations. "The external*gross* electrics of the sparks of the Wimshurst machine . . ." He patted the machine before moving to the batteries. ". . . the more subtle electrics of the various batteries . . ." He flicked a switch completing a circuit, turning on a weak light. ". . . all have their effects on the spirit, but the electrical nature of the mind, and of the spirit actually happens at far too minute, far too small a level for these gross manipulations to effect with the subtlety that is needed to perfect the union of mind and spirit. This happens at a microscopic, or as the learned ones of the future said, a*quantum* level."

Phillip, now well into the swing of things, indicated that Hans should show the next page. "Now, as Oerstaed proved, electric is linked to magnetic." After a moment to check that his audience was following, he moved over to the large chart of the elements the Americans called the Periodic Table. "Free flowing electrons found in electric metals such as, nickel, copper, silver and gold, platinum, cadmium and cobalt . . ." He tapped each element with his pointer as he named them. ". . . will be strongly influenced by the magnetic potentials. But in all things,*balance* is the most needed. The metals with poor electric potentials like zinc and tin are too difficult to effect to provide the balance needed by the body. Similarly, the freely electric metals like copper and gold and yes, even aluminum, do not provide*enough* resistance to the electrons. Only in the middle do we find the needed balance, and that balance is most favorably found in nickel."

Hans flipped the next sheet revealing the important facts about nickel. "A framework of nickel can intercept the grosser variations of the magnetic influences, while allowing penetration, and indeed, *influence* of the*geomagnetic* forces which link our spirits to the world."

Phillip let his eyes roam over his audience. Everyone appeared to be deeply interested. "One might think that iron would be preferred, since iron is so often thought of as magnetic." He shook his head. "But one would be wrong. A*balance* is required. Iron is*too* magnetic for the*Quinta Essentiahumanum* to be distilled. Aluminum, for all its other virtues is utterly*transparent* to the grosser magnetism. No, it is in *nickel* that we find the balance of free electrons*and* magnetic potentials which provide the shielding from those grosser variations while allowing the quantum development of the magnetic vector potentials which influence the human body at the quantum level. With this, we can look for behaviors, expressions, dreams, or fantasies, which express the true nature of this elimination of the quantum distortion."

Phillip smiled at his audience. "Nickel is a new metal, but not unknown. It should be easy to obtain a supply of the required ore. In fact, I have already sent an order to Annaberg for ore for research purposes."

He held up his hands to silence the sudden noisy intake of breath. It was obvious that many in the audience well remembered what happened the last time he'd ordered ore for research purposes. "Do not panic. I learnt my lesson Sphalerite. That mistake will not be repeated. I placed the order with Ostermann Transport using the new scientific unit of kilograms."

"What ore are we talking about, Herr Doctor?"

Phillip located the source of the question. "Kupfernickel." He nodded at the shocked looks he received. "Yes, that's right. The miners in Annaberg are dumping nickel ore. The price I was offered was," Phillip exchanged grins with Hans Saltzman, "extremely attractive. I am approaching completion of my calculations, and hope to soon begin the effort to produce the needed nickel members. Now, are there any questions?"

* * *

Michael Siebenhorn, Kurt Stoltz, and Hans Saltzman walked out of the seminar room together. "So, Hans, what does the good doctor know about making gems? Will he be trying to do it himself?"

Hans squinted at the sun, then adjusted his pale blue Gribbleflotz "gimme" cap. "I don't think so, Kurt. He's intensely interested in making his nickel pyramid. He feels he's very close to proving his theory."

"I've spoken to several Americans about his investigations, Hans. Most of them laughed. None of them believe such a thing is possible."

"I've heard the same, but that is no reason not to support his researches. One never knows. Maybe the Americans are wrong. We won't know until the doctor runs his experiments."

"In the meantime, Hans, what can you tell us about Kupfernickel?" Michael asked.

OutsideSt. Martin's in the Fields a few days later

Phillip was worried about how he would be received by Dina's parents. It had come as a shock, but a pleasant shock, to discover that Dina had had no idea that he was a wealthy man. It was nice to know she had married him for the man he was and not what he could offer. However, her friend Herr Stone had indicated that Dina's parents had heard rumors that he was some kind of charlatan. Herr Stone had quickly assured him that they didn't believe these rumors. This news should have reassured Phillip. And maybe it would have, if Herr Stone hadn't expressed an interest in seeing his doctorate.

Phillip had a guilty secret that he had even kept from Dina. He wasn't entitled to use the title of Doctor. He'd never earned a doctorate. He'd never even completed a bachelor's degree. The impressive piece of parchment he had displayed in his office was a fake. Well, maybe not a fake. There were lawyers' letters confirming its validity. He knew he deserved to hold a doctorate degree, but theUniversityofJena had had the nerve to suggest that he was insufficiently scholarly.

While he had been a poor insignificant alchemist struggling to finance his research doing assays, the university faculty had been prepared to overlook his use of the title. However, with his association with the Kubiak females, members of the faculty had become jealous of his success. He had rashly taken up the offer made by the Frau Kubiak to do something about his little problem. That of course had happened before he met Dina.

The rectory ofSt. Martin 's in the Fields was in sight when he finally came to a halt. "Dina, there is something I have to tell you."

Dina turned her shining eyes to him. "Yes, Phillip?"

He froze for a moment. Those honest, trusting eyes. He had to be strong. She had to know the truth before he confronted her parents. "I'm. . . ." He stumbled to a halt. How to explain he had lived a lie. A lie that could reflect badly on his dearest Dina and her family. He swallowed. "I'm not a doctor. I've never earned a doctorate degree." He looked down into her eyes, silently pleading that she'd forgive him.

Dina reached for his hands and squeezed them gently. "I know, Phillip. Your friends inJena told me the whole story."

Phillip was shocked. "You knew?"

She burrowed into his chest. "Yes." Then she looked up and gave him the sweetest of little self-satisfied smiles. "Your friends described how you have put one over the self-important professors at the university. A couple of them have asked if you could arrange for them to receive similar degrees."

"But it's a lie, Dina. I haven't completed the requirements. It is an empty title backed up by a worthless piece of parchment."

"No, Phillip. It isn't an empty title. You are a doctor of philosophy. The first doctor of philosophy. You have completed the course requirement with your research into the new sciences."

Phillip purred. He gathered his wife into his arms. "I love you, Dina."

* * *

Dina spared the streets a quick glance to check who might be watching. There was only the barrow boy with the cart loaded with gifts for her family. So she stood on tip toes and gave Phillip a quick peck on the cheek. "I love you, Phillip."

She gazed into his eyes for a moment more before slowly slipping out of his embrace. She tucked her hand over his arm and led him towards the Rectory. "Now don't worry about Papa and Step-mama, Phillip. Let me handle them. Gerry warned me that Step-mama and Papa are worried about the boys." She turned and gave Phillip a brilliant smile. "The fact that their studies are progressing so much better since they moved in with us will right many a wrong in Step-mama's eyes."

* * *

When pastor Kastenmayer opened the rectory door, Maria Blandina threw herself at him. "Papa!"

"Dina!" Ludwig opened his arms for his daughter to rush into them. "You're looking well." Looking up, Ludwig smiled apologetically at Phillip. "Hello, Phillip. I apologize for my daughter. Anybody would think we hadn't seen each other for years."

"Dina misses her family, sir."

"What? With three of her brothers living in the same house, she can miss her family?"

Dina giggled. "Even then, Papa. How is everyone?"

The approaching clatter of leather on floor boards had Ludwig gently releasing Dina. "Brace yourself, I think you're about to find out."

The hall door burst open and a mass of arms and legs charged towards Dina.

"Dina, Dina, Dina. We've missed you so much. Have you come back home?"

Dina knelt down and reached out to hug little Thomas. "No, Thomas. Phillip and I have just come to visit. I live inJena now."

Thomas pouted. "It's not fair. Phillip, Fritz and Joseph get you all the time. Can I come and live with you? Please?"

"No, Thomas. You have to stay with Mama and Papa. I'll visit whenever I can, and maybe you can visit me inJena sometime."

Maria Blandina greeted her other brothers before she stood to greet her step mother. She offered her hands. "Step-Mama. How are you?"

"I am well, thank you." Salome looked around. "I think it would be best if we all went inside."

Dina looked around guiltily. She'd been so happy to see her family that she'd forgotten about being out on the street. She waved to the locals who had stopped to watch the strange sight, and then gestured to the barrow boy to follow before taking her husband's hand and following her family into their home.

* * *

The soccer ball had been such a hit with the boys that they had pleaded to be allowed outside to try it out. Salome and Dina waited at the window until they could see the men folk and boys kicking the new soccer ball around. Then Dina started unwrapping the remaining parcels.

"Oh!' It was a cry of pleasure. Salome ran her hands over the roll of quilted border suitable for attaching to the bottoms of petticoats and drawers. Hand-quilting those borders was very time-consuming, but they kept a person's ankles warm and toasty in cold weather. She looked up at her step-daughter. "A sewing machine?"

Dina grinned. "You know me so well."

Salome returned the grin. Yes, she knew all about Maria Blandina Kastenmayerin and sewing. "But what would an alchemist want with a sewing machine?"

"I believe he bought it to make laboratory coats after the American fashion to protect his worker's clothes." Maria Blandina shook her head, an amused smile on her face. "He thinks like a man. It took his housekeeper to think of a better use."

Salome looked down at the precise stitching on the quilting. "What I wouldn't do for a sewing machine. What with the boys growing and your father . . ." She stopped for a moment, then looked closely at Dina. "Child, are you well?" She touched a hand to Dina's head. "You seem very pale. Have you been

ill?"

Dina shook her head.

Salome dropped a hand to Dina's breast. "What about here? Do you feel tender?"

Dina jerked a bit with the contact, then nodded. "Yes, just a bit. There's nothing wrong is there?"

Salome reached out and hugged Dina. "You poor thing. How long have you been married?"

Dina looked up at her step mother. "You know how long I've been married. It's been a little over two months since we . . . oh!"

Salome smiled at Dina's excited face. "It's really too soon to tell, but if you are, I suggest you see one of the American doctors about a delivery in theLeahyMedicalCenter . Take the word of someone who knows, anesthesia during childbirth is the only way to go."

Dina touched her breasts, then her belly. "Phillip. Oh, I have to tell Phillip. He'll be so pleased."

Salome reached out to stop Dina. "No, not yet." She led Dina to a chair and sat her down before sitting beside her. "Don't raise your hopes just yet. Many times I thought I was pregnant when I wasn't."

Dina sighed. Then she nodded. "Yes, I'll wait until I'm sure." Her gaze switched from her step mother to the quilted cloth on the table. "Phillip gives me a generous allowance, and it would please me to give you something you want. Please, let me buy you one of the new sewing machines."

Salome swallowed. Her vision was all blurry. Wiping the tears from her eyes, she nodded. "Thank you, Dina."

Hearing her brothers' pet name for her on her stepmother's lips reduced Maria Blandina to tears. She walked up to Salome and wrapped her arms around her. "Mama, if there's ever anything you need, please, just ask."

Salome choked back tears. "You called me Mama . . ."

* * *

Salome watched her step daughter join her husband and son-in-law out in the courtyard. Phillip Gribbleflotz was no longer the monument to bad taste he had been. That was probably due to Dina's influence. He still wore expensive clothes, but now they were better coordinated and less gaudy. Dina, she noted, had succumbed to some of the American fashions. The colors, Salome was forced to admit, suited her. They gave her a glow that hadn't been there before. Mind, Salome thought, watching the affectionate way Dina's husband slipped an arm around her, maybe the glow had another source.

She moved away from the window and took in the rolls of fabric and clothes Dina had given her. Most of it was the sort of hard-wearing material that she would buy herself, just never so much at one time. She picked up the fine linen shift Dina had made for her and just stood there admiring it for several minutes before finally wrapping it in its paper. Then she returned her attention to the fabric on the table. If Dina did buy her a sewing machine . . . She gave a contented sigh. That would cut out the endless tedium of stitching together clothes and leave her with a little time for herself.

Salome gave the little bundle of knitting and crochet needles Dina and Phillip had given her a contented look before calling for the servant she was training to help put things away.

* * *

Pastor Ludwig Kastenmayer sat back in his armchair. "It was very nice of Dina and Phillip to bring the presents for the boys, wasn't it, Salome?"

"Yes, Ludwig." She hesitated a moment. "What do you think of Dina's husband?"

Pastor Kastenmayer pursed his lips. That was a difficult question. Phillip could support Dina. That was good. They seemed very happy together. That was always nice. It didn't appear that his wealth was pushing him on the slippery slide to damnation. And with Dina as his wife, that was even less likely now. There was the matter of the mysterious doctorate to still be considered, but Phillip had said he had legal proof supporting his claim to the title of Doctor of Philosophy. And finally, there were the letters from the university commenting on how well the boys were progressing in their studies since they had moved in with Dina. Professor Hofmann had been particularly generous in his appreciation of the help young Phillip Kastenmayer had been with the new physics and mathematics.

"I think we did much better than we imagined marrying Dina to Phillip Gribbleflotz."

The Fortney Residence,
Grantville

Phillip stopped to examine the two-storied, white, timber house. There were, he noticed, a lot of windows. But no more than most other houses in Grantville. He shook his head at the wastefulness of the Americans, walked up the path, and rapped on the front door. He didn't have to wait long before he could hear footsteps from within the house. There was a rattle of bolts and the door opened a few inches to show a chain across the door. A young face stared at him through the gap.

"Yes?" the woman asked.

"Is this the Fortney residence?" She nodded. "Herr Dr Gribbleflotz." Phillip passed the woman one of his business cards. "Is Jonathan Fortney available?"

The woman looked at the card, then up at Phillip. "I'm sorry, Herr Dr. Gribbleflotz. Herr Jonathan is not available. Herr Caleb is at home if you would like to see him."

Phillip hesitated, then nodded. "Yes, I'll see Herr Caleb."

The woman smiled. "If you'll just go round the back, you can't miss him." Then she shut and bolted the door.

Phillip looked at the closed door for a moment, then shrugged and followed the woman's instructions.

Round the back of the house he immediately understood what she had meant about not missing Jonathan's father. A section of sail had been strung up to provide shade while he worked on a small motor vehicle.

"Herr Fortney."

A man in a soiled blue coverall turned at the sound. He pulled a rag from a pocket and wiped his hands clean before approaching and offering his hand. "Hi. Caleb Fortney. How can I help you?"

Phillip reached out and grasped Caleb's hand. The hand shake was firm, but he was thankful that Jonathan's father didn't attempt to show off his physical strength as so many of the Americans tended to do. "Phillip Gribbleflotz. I really wanted to see Jonathan about some information he sent me recently."

"Yeah, Jonathan's spoken of you. Which information are we talking about?"

"It's for making gems. Some of the senior laborants have voiced an interest in the process, so I was wondering if Jonathan could talk to them."

"Ah, the gemstones. Well, you're in luck. I've actually made some rubies. I wanted to make a ruby laser, so I made a furnace to make the ruby. If you'll wait a moment, I'll see if I can dig it out."

"No, Herr Fortney." Phillip raised an arm to restrain Caleb. "There is no need for you stop what you're doing. Would you be willing to talk to some of my laborants about the process?"

"Sure. Where and when?"

"The company has a facility here in Grantville that we can use whenever suits you, Herr Fortney. We will be happy to pay for your time."

"Hey, you don't have to pay me. And enough of this Herr crap. Call me Caleb."

"Please, call me Phillip. And I really do insist that we pay for your time. You have no idea of how much preparation you'll need to do, Caleb. These seminars are a teaching exercise and the laborants are encouraged to ask questions. Some of the questions can be surprisingly acute."

Caleb raised his eyebrows. "That the voice of experience I hear?"

Phillip nodded. He'd only been caught out a couple of times. Fortunately he had years of experience to draw on and made a close guess on the answer both times. After those close shaves he'd never gone into the seminar room so badly prepared again.

"In that case, I'll be happy to accept a fee." Caleb nodded towards the car he'd been working on. "I'm just about to go for a test drive. Is there anywhere I can drop you off?"

"Drop me off? You mean, travel in your car?"

"Yeah. Where're you staying?"

"The Higgins. If it's not too much trouble."

Caleb led Phillip over to the passenger side and opened the door. "You sure you wouldn't like to go a bit further afield? The Higgins is only a few minutes away."

"Dina is visiting her family."

Caleb grinned. "At the rectory at St. Martins? That's more like it. Come on, hop in. I'll just tell the housekeeper where we're going."

Well, at least that explained who the woman was. Phillip looked down at the car. It was a small four-door car. Compared to most of the American cars he'd seen, a very small car. He slid in and sat down. It was very different from the buses he had traveled in before. To his left he could see the steering wheel, the device by which the vehicle was steered. But other than the speedometer, that was all he recognized. He looked in the back. There was a bench seat that could take two or three people, and that was about all there was to it. A moment later Caleb returned and climbed into the driver's seat.

"Right. Shut your door and we'll be off."

Phillip copied Caleb's action of grabbing the handle on the door and pulling it closed. Then he sat still while Caleb did something under the steering wheel. There was a whirring noise, then the gentle rumble of an internal combustion engine. Caleb did something with the lever to his right and the car started moving.

Phillip sat back to enjoy the trip. He'd been on the Grantville buses often enough that the car's speed didn't bother him. But he was curious to know how fast they were going, so he leaned over a bit to read the speedometer. "Twenty-five miles per hour? It seems faster than that."

Caleb darted a look at Phillip before turning his eyes back to the road ahead. "You ever traveled in a car before?"

"No." Phillip shook his head. "Just the bus."

"That explains it. It's a perception thing. The closer you are to the ground, the faster you think you're going. If you were in something really low like Trent Haygood's buggy, you'd really think you were motoring."

Phillip tried to visualize what Caleb was talking about. He couldn't. "Could you explain how this 'perception' works?"

Caleb shook his head. "No, it's just something I know."

"Well, if you ever find an explanation, I'm sure we can schedule a seminar."

"Maybe you'd be better off getting someone else. I wouldn't know where to start."

* * *

Phillip enjoyed the run out to the rectory. He felt very important being driven in a private car, and waved to anybody who stopped to stare. "Caleb, how is it that you can run a car? I thought there wasn't enough fuel."

"You're thinking of gasoline. This car's a diesel. That means we can run it on just about anything that'll burn. If your nose is sensitive enough you'll be able to smell the rape seed oil. It's not cheap, but if we keep the speed down we should average over fifty miles to the gallon."

"Speed?" Phillip gave the car another look. "How fast can this car go?"

"The book on it says ninety-two and a bit miles per hour, but I've never had the old girl up to more than

eighty-five."

"Eighty-five miles per hour?" Phillip had thought he was traveling fast at twenty-five. What would that kind of speed be like? Was it even safe? "You're kidding. Surely traveling that fast can't be safe."

Caleb grinned. "It's not the speed that kills you, Phillip. It's the coming to a sudden stop."

* * *

Phillip checked his watch. The car trip had been exciting. It had also brought him back to the rectory well ahead of schedule. But for Caleb's kindness, he'd still be waiting for his bus. Phillip dropped his watch back into its pocket and entered the rectory.

He could hear voices coming from the kitchen. It sounded as if Dina was sharing confidences with her step mother. That pleased him. He set off for the kitchen.

". . . said I was pregnant."

Phillip froze at the door. That was Dina talking. Did that mean she was with child? Phillip took a deep breath. It was, after all, a perfectly normal thing for a married woman to have a child. A couple of the older women he employed inJena were married with children. Only, he'd never thought of being a father. But now that the possibility existed, he quite liked the idea. He could almost picture a pretty little girl who would take after her mother, or a boy to share his interests in alchemy. A broad smile on his face, he pushed open the kitchen door.

"Phillip!" Dina flew into his arms. "Such news. Dr. Shipley says I'm with child."

Phillip wrapped his arms around her. "That's marvelous, Dina. We must see about reducing your work load back home."

Dina pushed her way out of Phillip's arms. "I'm not ill, Phillip. I'm pregnant. It's a perfectly natural condition."

Phillip glanced hopefully at Dina's step mother. The self-satisfied look on her face told him there would be no support coming from that quarter. He struggled to think. What would Jonathan tell him to do? Then he smiled. When women start to gang up on you, there is only one way to survive. Abject surrender. "Yes, dear." He reached out to Dina. She smiled and burrowed into his chest.

Salome snorted and left them alone in the kitchen.

The Higgins Hotel,
Grantville

Phillip sat on the bed beside Dina. She lay there with her hands on her belly and her head in his lap. Phillip gently caressed her neck and shoulders.

"Phillip, Mama suggests I should have the baby in Grantville to take advantage of the medical services."

"Of course, Dina."

"With the train service, I can stay at home until almost the last minute, and still have our baby at the Grantville hospital."

Phillip stilled. He didn't have much experience of children, and even less experience of babies. But he was pretty sure of one thing. "Dina, I don't think even your baby will decide to come to fit the train schedule. It'd be much better if you moved in with your family, or we rented an apartment as you near your time."

"What? Leave home for a couple of weeks? But who will teach the children?"

"I'm sorry, Dina. But if you want to have the baby in Grantville, then you'll have to move here before you're due. Hans and your brothers can take your classes while you're away."

Dina grabbed Phillip's hand. "No. You're just trying to cut back my work load."

"No I'm not."

"Prove it."

"Be reasonable, Dina. You can't rely on the train service to get you to the hospital in time. What you need is a personal ambulance . . ."

Suddenly, Phillip scrambled to his feet. "Don't go away. I have to make a telephone call."

"A phone call?"

He dipped down and kissed Dina on the tip of the nose. "Yes. I want to call a man about an ambulance."

* * *

"*Call a man about an ambulance?*" Surely that wasn't possible. Dina shook her head. If anybody could solve the problem of getting her fromJena to Grantville when the time came, it was Phillip.

She lay back on the bed and started to daydream about the child she carried. It would be a boy, with the intelligence of her husband, who would follow in his footsteps.

Downstairs at the Higgins Hotel

Phillip waited impatiently for his call to be put through. Eventually someone answered.

"Fortney Consulting. Caleb Fortney speaking."

"Hello, Caleb. This is Phillip Gribbleflotz. We met earlier in the day."

"Hey, hi, Phillip. What can I do for you?"

Phillip hesitated. How to ask? Obviously the Jonathan way was best. Just come straight out and state

what you want. "I was wondering about that car you were driving earlier. Could you teach me to drive?"

"Yeah, well. Sure I could teach you. But I'm not the greatest teacher. Absolutely no patience. Just ask my daughter. I think Dick Clelland, the Driver's Ed teacher at the high school, would be your best bet."

"Thank you, Caleb. How do I go about making arrangements?"

"Just call the high school and ask the secretary to make an appointment. Mind, you'll need to provide your own car. Do you have one?"

"I was wondering it you could help me there. Do you know where I might buy something like the car we traveled in earlier today?"

"You can have that one if you like. It belongs to my daughter, Lynette. She married Kevin Fritz late last year and, well, they could use the money."

Phillip beamed. This was better than he had hoped for. The little car would be perfect on the narrow streets ofJena . Not that he intended to drive through them very often. Just once or twice, right past the university. "Thank you, Caleb. I'll let Frau Kubiak negotiate a fair price."

"Rightyo, and thanks. Lynette and Kevin will appreciate a quick sale. Reading between the lines, I think they're expecting my first grandchild."

"Thank you, Caleb, and congratulations on becoming a grandfather."

"It's not a sure thing yet, Phillip. The wife might be jumping to conclusions, but there must be a good reason why they suddenly asked if I could get the car ready for sale."

A month later

Phillip waved goodbye to Trent Haygood, engaged gear, and drove off. After a month of commuting to Grantville for driving lessons, Dick Clelland had declared himself satisfied with Phillip's driving. However, Jonathan had suggested that Phillip might benefit from some lessons from a real driver. He shuddered when he remembered that first trip as a passenger inTrent 's vehicle. Caleb had been right. That close to the ground you really did think you were traveling very fast. Of course,Trent had driven fast. Over eighty miles per hour. It had been an interesting few hours, but now Phillip considered himself sufficiently skilled to safely drive Dina betweenJena and Grantville. Thanks to Caleb, he even had some idea how to maintain the car and its engine.

Phillip stopped just outside theLeahyMedicalCenter . He zeroed the trip meter, took note of the time and started the stopwatch function on his pocket watch. Then he set off home.

It was a gentle drive along the road connecting Grantville to Rudolstadt andJena . He kept the speed down for several reasons. Firstly, fuel economy and preserving the tires. The other reason was the fancy new road could be damaged if he traveled too fast.

He was happy to find that he had no difficulties with other road users. Not even when passing through Rudolstadt and the villages on his route. Apparently the locals and their animals were used to the American vehicles, although a number of dogs had attempted to give chase.

Pulling up outside the door of his apartments at HDG Enterprizes, Phillip stopped the stopwatch. One hour eight minutes and four point three-four seconds. Not bad for a run of, he checked the trip meter, of twenty-six and three-tenths miles. It was certainly much quicker than going by train, and it was door to door.

Phillip undid the seatbelt, a safety measureTrent had recommended he use, and reached for the door latch. That was when he realized he'd attracted a crowd. Pushing the door open he set about showing off his new car.

Two months later

Dina knocked on the door of Phillip's laboratory and poked her head in. "Phillip. You haven't forgotten that I have an appointment to see Dr. Shipley this afternoon?"

"Of course not, Dina. If you're ready, I'll come now."

Dina suppressed a sigh. She had used to think Phillip was perfect. She now knew that he wasn't. But she had to admit, he tried. Although sometimes he was just "trying." Like right now, when it should be obvious that she was ready to go. "I'm ready, dear."

* * *

Phillip knew how to take a hint. He marked his place and put the book he'd been reading into his shoulder bag. He could read some more while Dina was with the doctor. He called over to his assistant. "Hans, you know the drill."

Hans nodded.

"Right, Dina, I'm all yours." Phillip slung the shoulder bag over his shoulder and escorted Dina out of his office and set off for the garage.

The garage was a work of art. There was plenty of room for the car, and anybody working on it. It was heated by a radiator, because Caleb had suggested that there might be problems with the fuel jelling in cold weather. The car itself was covered by a heavy quilt custom made for the job.

A couple of laborants removed and folded the cover while Phillip led Dina to the passenger door and helped her in. After making sure she was comfortable and was wearing her seatbelt, he walked around to the driver's side. Stopping a couple of times to polish specks off the metal work and the rear window. Before entering the car he checked the windshield for blemishes. Finally he got in.

"You think more of this car than you do me." Dina accused.

Phillip was shocked. "No I don't, Dina. What ever gave you that idea?"

"You certainly pamper it more than you pamper me."

"But dear, the car is temperamental and needs delicate handling . . ." Phillip bit his tongue. In the mood she was in right now, Dina was bound to take that the wrong way.

"I am not temperamental."

Phillip wilted under his wife's glare.*Yes. Definitely a big mistake.* "Of course you aren't temperamental, Dina." Before Dina could start an argument Phillip started the car and reversed out of the garage. To fill the silence he inserted a tape into the car tape deck. To the strains of Elgar's Pomp and Circumstance, they set off for Grantville.

The Higgins Hotel

Phillip frowned. What the book on pyramid power said didn't agree with his findings. That meant either there was something wrong with the author's theory, or there was something wrong with Phillip's pyramid. He slumped back in the easy chair and contemplated the possibility that the author's theory was wrong. It wasn't an attractive thought. If the theory of pyramid power was wrong, then all of his efforts to invigorate the*Quinta Essentia* of the Human Humors had been wasted. Alternatively, Phillip couldn't imagine what he could have done wrong with his pyramid. He had even obtained pure nickel for the structural members, and Michael and Kurt had made some new gems from aluminum oxide which he'd had faceted by a local jeweler. What Phillip needed was access to a computer so he could check his calculations. At least, Gerry Stone had suggested he run his calculations through a computer spreadsheet just in case the problem was accumulated rounding errors. Dina's friend Ronella Koch taught mathematics at the Grantville high school and she had arranged for Ronella to check the numbers for him.

Phillip looked up at the clock. Dina had said that Ronella wouldn't be free to run the calculations until after school, but it was now well past six. He sighed. He had always heard that when women got together to gossip, they could forget about time. And he wanted those calculations. He wasn't sure if he wanted his calculations to be right though, because that would mean he had wasted nearly four years on a pipe dream. Maybe he wasn't destined to be remembered in the same breath as his great grandfather, the great Paracelsus.

Phillip took another sip of wine. Now that he had Dina, he could live with not being as famous as great grandfather Paracelsus. He knew he would be remembered through his children. Right now, that was much more important than fame. And he was scared. What did he know about raising children? And then there was the bombshell Dr. Shipley had delivered earlier in the day. Twins. His Dina was carrying two babies. Of course Frau Mittelhausen would be there, but maybe Dina would like a nursery maid to help. Maybe he should see Dina's stepmother about hiring one. Phillip froze at the thought. That was probably the wrong way to go about it. Maybe a better bet would be to ask Dina if she wanted help first. He nodded. Surely Dina wouldn't bite his head off if he suggested employing a nursery maid, especially as it would leave her more time for her teaching.

Proud of his logic, Phillip closed his pyramid power book, placed it on the occasional table beside his chair, and picked up the first of the books on babies and child rearing Frau Kubiak had found for him.

* * *

Dina entered the suite first. Together she and Ronella looked around the room. The light was on, so Phillip should be in the suite. "Phillip." Dina called.

There was no response. Both women started to walk around the room. Then Ronella stopped and gestured for Dina to come over.

"He looks kinda cute, doesn't he?" Ronella asked, pointing to the sleeping Phillip.

Dina nodded. Yes, Phillip did look cute sleeping slumped in his chair. He must have dozed off while he waited for her. There was an open book on the floor that must have slipped from his grasp when he fell asleep.*I wonder what he was reading?* She bent to pick it up, and almost burst out laughing. She showed Ronella the book.

"*The Expectant Father*." Ronella grinned. "What else has he been reading?"

Dina looked through the mountain of books beside Phillip. All but the book on pyramid power were about pregnancy. Reading the titles she started to get worried.*What to Expect When You're Expecting* ,*What to Eat When You're Expecting* ,*Pregnancy for Dummies* ,*Fit Pregnancy for Dummies* ,*Dr Spock's Baby and Child Care.* Even one titled*The Womanly Art of Breastfeeding* . Then there were the ones on raising twins.*Raising Multiple Birth Children: A Parents' Survival Guide* . Ouch. Dina wasn't sure she liked the idea of needing a survival guide. Even worse was the idea that Phillip had, or intended, to read these books, and maybe try to implement the ideas put forward. Heck, look at the effort he'd put into his research into pyramid power. Dina wasn't sure she wanted Phillip that focused on her babies.

Ronella looked up after looking at the titles. "Girl, you've got problems. Whoever gave Phillip these is either too well meaning for words, or they have it in for you."

Dina didn't get to respond, because just then Phillip jerked awake.

"Dina, where have you been? I expected you home hours ago."

Dina flushed. "I'm sorry, Phillip. We got talking and just forgot the time."

"Well, you're home now." He turned to Ronella. "Thank you for seeing my wife safely home. Can I escort you to your home?"

Ronella turned expectantly to Dina.

She took the hint. "Phillip, the reason I'm so late is we got talking about the chemical engineer you said you wanted. You know Jerry Trainer?"

"What?" Phillip was suddenly all attentive. "Herr Jerry Trainer? He is willing to work for us?"

"No, Phillip." Dina shook her head. "But he has an apprentice he's been training for the last few years. Lori Drahuta. Mrs. Penzey thinks she might be interested."

February 1636,
1:00 am

Phillip had thought he was prepared, but right now, he was on the verge of panicking. He'd woken up when Dina jerked and cried out. At least her waters hadn't broken yet. There was still time to get to Grantville if they hurried. "I have to get you to the hospital, Dina." Phillip slipped out of bed and made for the bell pull. He pulled it and could hear the distant ringing of a bell. He grabbed some clothes and made

for the dressing room door. "Don't go away, I'll be right back."

* * *

Frau Mittelhausen bustled into the bedroom. She could see immediately that the doctor had grabbed some clothes and made for his dressing room. She spared the mess he'd made a single sigh before turning her attention to the mistress. Helping her out of bed she helped Dina into a fresh nightdress and started to wrap her in a dressing gown and coat to keep out the cold. "How do you feel, Frau? I've sent Hans out to get the car ready. Would you like anything to eat or drink?"

Dina shook her head and let Frau Mittelhausen take charge.

* * *

Dina let Phillip help her into the car. "I'm all right, Phillip. Are you sure it's safe to drive to Grantville at night?"

"Of course it's safe, Dina. Jonathan and his father fitted the extra lights just in case we had to make a night run. It'll be just like driving during the day, but without the traffic."

Dina nodded. That sounded safe. She tried to make herself comfortable in the car seat. The seat belt wasn't very comfortable, but Phillip insisted she wear it, so she made the best of it.

It was a still winter's morning. The moon was high in the sky, moonlight illuminated the countryside. Phillip, she could see, was fiddling with the radio-cassette player. Then he started the car moving forward. He was driving a little faster than normal, but as he had said, the road was clear of other traffic. Dina tried to relax. Suddenly she jerked. Another contraction. She didn't need Phillip's watch to know they were getting closer together.

Dina noticed Phillip flicking a switch. She thought nothing had happened until she looked up at the road ahead. It was well illuminated for hundreds of paces ahead. She could see the beam hitting the windows of the neighbors. She sighed. She'd have to placate them when she got back from Grantville.

"We'll soon be out ofJena , Dina. Then I'll be able to go a bit faster."

"That'll be nice, Phillip." Dina snuggled deeper into her heavy fur coat. Phillip had one just like it. Sable, if she remembered what the furrier said. A special delivery fromRussia . Whatever, it was very warm.

* * *

Dina jerked awake. She tried to work out where they were, but she wasn't used to seeing the countryside by moonlight. She turned to ask Phillip, but stopped at the sight of him concentrating on the road ahead. She looked out the side window, and rapidly turned back to face the front. Surely the landscape was going past overly fast. She edged over so she could see the speedometer, and immediately wished she hadn't. She sat back firmly in her seat, with both hands gripping it firmly.

"You're awake, Dina? Don't worry, we'll soon be in Grantville."

Dina swallowed. Surely Phillip shouldn't be looking at her when he was driving. "Keep your eyes on the road, Phillip."

"Of course dear, but there's nothing to worry about. I know this road well."

There was a screeching of tortured tires and Dina felt the car sliding.

"Whoops! Sorry about that. Went around that curve a little fast. Nothing to worry about. There was nothing coming the other way. We'll soon be there, Dina. Rudolstadt should be just around this next curve."

Dina could feel her nails digging into the upholstery.*When would this nightmare trip end?*

She could hear the muted roar of the car engine reverberating back off the buildings as they sped through Rudolstadt. And Dina was sure they were speeding. Everything was wizzing past so much quicker than when Phillip normally drove through Rudolstadt. Even the sound of tires on cobblestones suggested excessive speed.

Before she'd realized, they were through Rudolstadt. The hospital was only a few miles away.

LeahyMedicalCenter

Phillip screeched to a halt outside the admissions area at theLeahyMedicalCenter . He leaped out of the car and ran around to the passenger door. Even before he got to Dina, medical orderlies were approaching with a trolley. "It's my wife. She's about to have a baby. Two of them!"

The orderlies carefully lifted Dina onto the padded trolley and set off for the medical center. Phillip ran alongside, holding Dina's hand. She was wheeled into a delivery room and transferred to a hospital bed. Dr. Shipley arrived and immediately suggested Phillip might like to wait outside.

* * *

Dina looked tired but happy. Dr. Shipley had claimed that it had been a remarkably easy labor. Phillip wasn't so sure. If that had been an easy delivery, he wasn't sure he wanted his Dina going through a difficult one. He'd already talked to Dr. Shipley about that. She had suggested that there was a simple medical procedure that could prevent him fathering another child. She had suggested he talk to Dina about the option. Phillip had been terrified for Dina. The way she screamed and yelled, she must have been in extreme pain. And the blood. He'd almost fainted at the sight of so much blood. But after the nurse had given her the two wrapped bundles, Dina had been all smiles. It was as if the pain had never occurred.

He looked over at his children. A boy and a girl. He smiled. That meant there was one each. Not that a parent should place a claim on a child. But he was sure his daughter would take after her mother. His son, maybe he would have the look of his mother, too. That was all for the good. They'd have to think of names. Dina had suggested Salome Blandina for a girl, after her mother and step-mother. She had asked Phillip if the boy should be called Theophrastus, but he'd managed to dissuade her. Anyway, there was plenty of time to worry about names. Dina and the children were healthy. That was what was important.

A Week Later,
HDG Enterprizes (Jena)

The car drew to a halt just outside their apartment inJena . Dina waited for Phillip to open the door and help her out. That was when she saw the two women. One of them was a young American. That was probably Lori Drahuta. She'd indicated interest in finding out more about what the position at HDG entailed, and been invited to visit. The other woman looked much the same age. She had rich black hair and an unlined porcelain white face. Her clothes left little to the imagination.*Who was this woman?*

Dina watched silently as the female approached a clearly embarrassed Phillip. She looked over at Frau Mittelhausen. The housekeeper looked embarrassed that the homecoming had been disrupted, but she wasn't looking at Phillip with condemnation. It struck Dina that Frau Mittelhausen's look was more one of pity.

Dina looked back at the woman. There was something unnatural about her. Dina stepped closer.

Makeup. That explained it. This female, whoever she was, gave the lie to the American claim that lead-based cosmetics were unhealthy. She had seen the sales records for the new Oxide of Zinken, and there was no indication that anybody was buying it in the quantities this female was using. She must be applying her makeup with a trowel. Dina was sure of one thing now. This female was not someone she wished to associate with. Her friend Ronella had pointed out an American woman dressed up and made up to appear much younger. She would have used the same expression, "mutton dressed as lamb" to describe this female. Obviously she was much older than she appeared. Just how much older was impossible to tell. Dina stepped up beside Phillip. One of his hands shot out and latched onto her hand.

"Theophrastus. Aren't you pleased to see me?" the female asked.

Dina felt the tension in Phillip. He gave her a beseeching look before returning his gaze to the female. "Hello, Mother."

Butterflies in the Kremlin, Part 3:
Boris, Natasha . . . But Where's Bullwinkle

By Gorg Huff and Paula Goodlett

"Order Kameroff to take his battalion to the west." The barely bearded Russian wearing two stars on his collar moved his finger along the map, over a set of hills then northwest along a river. "He is to take dispatch riders and notify us at the first sign of the enemy."

"Yes sir," said the grizzled veteran with the graying beard half way down his chest and a single silver bar on his collar. There was probably a bit of amusement in his voice. But if the "general" felt any offense at that amusement, he kept it to himself.

The "lieutenant" left to deliver the orders. The "general" hid a sigh. This was his first time in the War Room and he was trying hard to keep up a good front. But he was scared. He had been doing fairly well in the standard games. A little too well, it turned out. He looked over at "Captain" Timriovich. At least Boris wasn't looking too happy either. The "general," actually Third Lieutenant Igor Milosevic, had made the mistake of cleaning up at the standard board games sent by Vladimir Petrovich Yaroslavich. They had become all the rage in Muscovite military circles. With serious wagering on the outcomes.

Igor looked back at the map, then pointed at a hill just north of the map piece that represented his main

army. "We'll build the temporary fort here." He then described how he wanted it organized. He really was good at this stuff when he managed to forget for a moment about the real generals breathing down his neck. Before he had finished the "lieutenant" returned. Igor didn't even notice.

* * *

The "lieutenant" did notice. Gorgii Ameroff was an old campaigner. His rank was between that of a major and lieutenant colonel. Just at the moment, he was caught between being thoroughly impressed and heartily offended. Impressed because the "general" was mostly doing it right. For too long, the years of campaigning had taught him not to expect "doing it right" from soldiers that young. Offended for mostly the same reason. Gorgii Ameroff was a member of the bureaucratic or service nobility and held, roughly, middle rank. Totally aside from his youth, the "general" was from a modest family, more merchant class than nobility. Gorgii was still trying to work out how he felt about that. It just didn't seem right that this baker's son would have such talent or potential to gain such rank. The changes brought on by the Ring of Fire were disturbing and they would be increasing now thatVladimir had sent not just books and games but a person. A real live up-timer.

* * *

Bernie was going nuts. He had been at the dacha for a while now, and was frustrated. He had run headlong into a massive wall of ignorance and arrogance. Mostly, but not entirely, his own.

"What is a gravity feed?" Filip Pavlovich asked. "How can one make water grave and serious? Water does not flow because it is serious. Water flows because water wants to return to its proper level. Aristotle said it. So to make this 'seriousness feed' the book speaks of, you would have to make the water serious. How do you do that?" Filip Pavlovich was in part having a bit of fun with Bernie, but only in part. The use of the word gravity in describing the system of getting a liquid from one place to another was confusing and a bit irritating. It obviously meant something different than seriousness but he didn't know precisely what. Besides, explaining that new meaning was the up-timer idiot's job. Filip Pavlovich saw no reason not to have a little fun in the process.

"It didn't say water falls because it is serious." Bernie tried clenching his teeth and counting to ten. "It said that the force of gravity causes it to fall. It didn't say anything about water being serious, for crying out loud. The force of gravity is a force of nature. Oh, hell . . . never mind. Let me think a minute."

Bernie stormed away from the workshop. He had never thought himself arrogant. He just figured that among people who thought there were only six planets, he'd do all right. He'd tell them how to make stuff and they would. The problem was, Bernie didn't really know how to make stuff. He had quite a bit of the knowledge needed, but he had no idea how to put it together into a form that would produce a product.

That should have been all right. There were a number of very bright, very creative, people at the Dacha. They had been arriving a few at a time. However, as yet there was very little crossover between what Bernie knew and what they knew. Their map of the world and his were so different that communicating, even with a good translator, was difficult.

Right at the moment, the problem was with the toilets. The manuals talked about a gravity feed. To the local experts, gravity meant "dignity or sobriety of bearing." In fact, though Bernie didn't know it, the gravity feed was something they already understood quite well. However, the terms were different. They would have called it a "natural flow feed" or something similar. That would have referred to Aristotle's assertion that there were natural and unnatural types of motion. Water flowing down hill was natural motion. There was no force that made things fall. Things fell because things had a natural desire to go

where they belonged. Steam went into the air and rocks onto the ground because that's where they belonged. Water, as was the case here, just naturally wanted to travel to the lowest point. Granted, Galileo had chipped around the edges of Aristotle, but just around the edges. Besides, few people here had read Galileo.

Bernie didn't know it, but an extension of this Aristotelian world view had led to many of the concepts that the up-timers thought of as superstition. After all, if water just naturally wanted to flow down hill, didn't it make sense that a wheel would just naturally want to turn, that a candle would just naturally want to burn? That any device that was made well enough would want to perform its natural function and, given the opportunity, would do so on its own? And if water had a natural desire to flow down hill, what about people? Was it not self evident that people were innately good or innately evil? Innately superior or innately inferior, good blood, bad blood?

It was a subtle but profound difference in the way people thought about the world. The early modern period, the period the Ring of Fire had thrust theWest Virginia mining town into, was when that notion of a world where things did what they did because it was their nature to do so was being replaced. Slowly, one chip at a time, with the notion that things happened because of external forces like gravity and drag. But it hadn't happened yet. It would have beenNewton who really shifted the world view and he hadn't been born yet. He probably wouldn't be born in this universe. Here it would be Grantville that the change spun on, and the change would come much faster. Worse, Muscovy, in general, was lagging about two hundred years behind the rest ofEurope .

Bernie didn't know any of that; he didn't even know that Aristotle had gotten it wrong. He knewNewton had some laws—three, he thought. He sort of thought that Einstein had gotten it right and corrected the bits thatNewton had gotten wrong with his theory of relativity. That was how the A bomb worked. More importantly, Bernie didn't know that the problems sprung from a difference in world view. Half the time he thought they were playing with him. Half the time he thought they were idiots, and half the time he thought he must be the idiot. There were too many halves ofRussia .

Bernie entered the kitchen of the dacha and sat at the table. "Marpa Pavlovna, may I have a beer, please?" When the cook nodded, Bernie leaned back and tried to figure out how to explain gravity.

The cook handed him a beer. His "Thanks" was a bit absent minded. At the same time she also put a plate of ham and cheese sandwiches in front of him. He'd had a little trouble explaining to Natasha Petrovna that no, he didn't want to stop work in the middle of the day and have a big meal then take a nap. It was weird. Everybody inRussia took a siesta in the middle of the day. Bernie had thought that only happened in, like,Mexico .

Bernie rubbed his temples with his fingers, trying to ease the headache he invariably got when he tried to explain a complex concept to Filip Pavlovich. In a few moments a pair of cool feeling hands began rubbing his temples for him. Bernie leaned back against the chair and let one of the maids, Fayina Lukyanovna take over. One of the thingsVladimir had not lied about was the availability of willing women. Bernie had been being hit on ever since he had reached the dacha. Boris had told him that it was probably because they wanted to get information from him. That was fine with Bernie. He'd tell them anything they wanted to know.

"What is now, Bernie?" Her voice was low, gentle. "'Sewer system' again?"

Gravity was the least of his problems with the sewer system. Bernie had arrived at the dacha with complete designs for a toilet and complete designs for a septic system. But it wasn't working right. The toilet had backed up, the sink had backed up, the bathtub had backed up. Each and every one of them

was producing the most awful stinks it had ever been his misfortune to smell. He couldn't use the indoor bathroom anymore. The room had been closed off and some pretty horrible sounds came from it. Bernie was pretty sure that the problem was in the septic system or in the pipes. He had finally remembered the U shaped pipes just below the sinks. He had had those installed and that had seemed to fix it for a little while. But then things got worse.

"I don't know how to fix it." Bernie groaned. "God, your hands feel good. The bathroom is going to drive me crazy until I figure it out."

"Natasha Petrovna wishes to speak to you." Fayina stopped rubbing his temples. She was dark haired and short, well padded. He noticed that she was wearing one of those crown-looking headdresses with her hair loose. Customs were different here. Confusing. Single women wore a smaller headdress than married women and left their hair loose. Married women kept their hair covered all the time. "New books have arrived from Grantville."

* * *

"I have good news for you, at any rate," Natasha said. "Here. You have letters. I have letters fromVladimir as well. And more books. Perhaps the answer will be in the new books."

Bernie took his stack of letters, wondering who had written him. Dad wasn't much of a letter writer and his sisters, well, they were busy. The handwriting on the top one was vaguely familiar. And the envelopes, some of them, were from up-time. Bernie opened the first one carefully and read:

Dear Bernie,

Gosh, it's been a long time, hasn't it?

I just wanted to let you know that the folks in Grantville haven't forgotten you.

Also, your Dad and sisters are just fine. The CPE is having an effect on Grantville. Lots of people are moving. ToJena andSuhl and evenMagdeburg . There's a contingent off inFranconia and a lot of the folks that got rich since the Ring of Fire have bought estates in the country with servants and the whole bit. But for every one that moves out, two or three down-timers move in. Then there are the tourists. Grantville is more crowded than ever. A lot of people are talking about moving their businesses toMagdeburg . Partly because its gonna be the capital of the CPE but partly because it's on theElbe and materials will be cheaper there. Not to mention real estate.

The new anchor at the TV station is all right, but she's no Becky. You felt like Becky was talking to you, not just reading stuff off a prompter.

Anyway, things are rocking along just fine here. Wanted to let you know. Write me, why don't you? Tell us about life in the wilds ofRussia .

Best,

Brandy.

"Thank God." It was a relief to read something that wasn't an encyclopedia. "Someone who speaks my kind of English. Natasha, when can I send a letter back to Grantville?"

Natasha looked up from her own letters. "The courier will leave tomorrow. You can send a letter with him." Bernie knew Natasha didn't approve of his tendency to sit in the kitchen. She was also the reason he was growing a beard, even though it itched. He still wasn't going to wear some silly robe out in public, though, no matter how much she nagged at him.

"Good. I'll get right on it and have Grigorii make a drawing as well." When Bernie had arrived at the dacha, he had been introduced to a secretary and an artist. Grigorii Mikhailovich was the artist whose job it was to take Bernie's descriptions and very rough sketches and turn them into usable drawings. "Brandy can probably find out what I've done wrong. It's a darn good thing your brother stayed in Grantville. When I've finished the letter, I'll take a look through the books and stuff he sent. Maybe I can figure out how to explain gravity."

"Seriousness?" Natasha's voice was curious. "Don't they know what seriousness is?"

Bernie groaned. Then headed back to face the brain cases.

* * *

"Bernie Janovich, what is the center of gravity?" Pter Nickovich had been waiting impatiently while Bernie was out of the room. His English was not good and the discussion of gravity was more confusing than helpful. He knew there was something there because the notes he had received on flight mentioned gravity regularly. Center of gravity, specifically. He sat and thought, giving no sign how much it hurt him not to understand about gravity and how to fly. Finally, Bernie returned with the letters and Pter asked his question before the sewer system could distract them again.

"Hey, I actually know that one." Bernie grinned at Pter. "Cars need a low center of gravity for stability."

Pter just looked at him. As usual, Bernie hadn't explained anything.

Bernie lost his grin. "Okay. Try it this way. Bend over." Bernie bent over. "As your head moves forward, your rear end moves backward, otherwise you fall on your face. That's to keep your center of gravity over your feet." Bernie stood up again. "Try to balance something on one finger. It's the same thing. To keep it balanced you have to keep your finger under the center of gravity."

"You mean that center of gravity just means the point of balance?" Pter couldn't help his look of shock. "The place where you would place the fulcrum?"

The outlander shrugged. "Pretty much."

Pter considered, then asked. "Then why does how high the center of gravity is matter?"

"There is other stuff besides gravity. Centrifugal force and stuff."

"Explain that, if you would." Pter tried not to grit his teeth. He knew he was close to something but wasn't sure what. He listened to Bernie's rambling explanation. It was there he knew, if he could just grasp it. The secret to everything. It came in bits and drabs . . . gravity was a force like centrifugal force. Then another piece when Bernie squared his stance and had someone push from the side. The person

pushing on him to try and over balance him was a force. The key came when he asked why they used rockets to get to the moon. "Why not wings?"

"No air in space."

"Why not?"

"Gravity, dude," an obviously frustrated Bernie insisted.

Pter froze. He could see it in his minds eye. "How much does air weigh?"

"I don't know." Bernie shrugged. "It's pretty light; we can look it up. Uh . . . maybe not, but we can writeVladimir about it."

The outlander didn't realize. How*much* air weighed didn't really matter. What mattered was*that* air weighed. That it had weight. It was pulled down to the ground by a force; water was, too, but more so. They wouldn't have to look the weight of air up, Pter could think of several ways to work it out. Looking it up might be easier if it was in one of the books. The important point was that air had weight. That was how the balloons worked. That was how it all worked.

* * *

Vesuvius erupted. Russian words spewed forth. Bernie didn't understand. Didn't want to understand after he caught the Russian words for idiot and uncultured repeated several times. At least this time everyone was an uncultured idiot, not just Bernie. Which was a relief. Everyone, Pter included, everyone from Adam to Aristotle . . . especially Aristotle. Everyone in the entire history of the world, both histories. Only two exceptions could be made: God and Sir Isaac Newton. God for creating such a complex world from such beautiful simplicity and Sir Isaac Newton for understanding it.

"Don't you understand, you uncultured outlander? We can fly."

"What in blazes are you talking about?" Filip Pavlovich was not one to accept being called an idiot by much of anyone. "Of course we can fly, once we know how. If the outlanders from the future could do it we can learn to do it." He froze then. "You know how?"

"It's all forces don't you see . . . damn Aristotle to the worst region of hell. Innate desire. Natural tendency. Bah . . . it's forces. Water is heavy, air is light, the force of gravity works better on heavy than light, that's what makes it heavy."

Jeez, Bernie thought, y*ou'd think he just found out that Jennifer Lopez was a sure thing.*Bernie left the geeks to their talk. Somehow he couldn't stop grinning. These guys got such a charge out of this stuff. Now if only he could get the plumbing to work.

* * *

That night, instead of the studying, Bernie watched as Gregorii Mikhailovich drew out another Rocky and Bullwinkle episode for Daromila. One of the other letters was one from her, pestering him about it. And he had promised, after all. It was kind of hard, sometimes. Gregorii didn't like the dress the Natasha of the cartoons wore. He even blushed a bit.

* * *

The older he got, the less he slept. Filaret stalked around his room, thinking. They were on a dangerous path and he didn't think Mikhail realized just how dangerous it was. Mikhail was a good boy, but too gentle for the real world. Still, something he'd said kept coming back to Filaret.*Knowledge, freely given.* Filaret had started the only print shop inMuscovy . Like most things, it was a royal monopoly. He had also been instrumental in starting schools in monasteries. Again a monopoly, this time of the church. Giving things away didn't come naturally to him, especially something as valuable as knowledge. Freely giving knowledge had its drawbacks, didn't it?

But the more he thought about it, the better it sounded.*Freely given. Charity. A gift to the poor. Alms of knowledge?* What an interesting idea. The agreement with the Yaroslavich family was that the government could do what it wanted with the knowledge from the Dacha. It wouldn't do to give everything away. But some of it. . . . Things that would help a lot of people and would cost a lot to administer.*A gift from the czar, granted freely to every citizen and serf inMuscovy . The right to make the turning plow.* One of the new plows produced by the Dacha. And, of course, the Yaroslavich family could still sell the right to make the plow to anyone who would buy what had already been given them for free. It would serve as a reminder to the Yaroslavich family who was Czar. At the same time, it would remind everyone that even knowledge was the czar's to give and withhold at his will.

* * *

Boris stared. A flying ship. Not a little one that they talked about in Grantville, but something the nerds—Boris liked that word—at the Dacha were calling a half blimp. There were drawings, still rough sketches, rough estimates of carrying capacity, all of which seemed to agree that bigger was better to the extent that they could build bigger. Everyone in the section would have seen it by now. The rumors would be flying faster than the half blimp could travel. And he had to come up with a recommendation. How was he supposed to know if it would work? Meanwhile, he had dozens of requests for things he knew they could make. And suddenly hundreds of requests for transfers to his section. "Pavel, get in here."

Pavel came quickly enough. Boris smiled. Pavel looked nervous, as well he should. "You will be missing dinner at home again." Boris handed him the report. "Go out to the Dacha and find out about this."

"But, Papa," Pavel started to complain.

Boris cut him off. "I know all about the party at the Samelovich house. They want you to get their little Ivan a job in the section, but he doesn't speak English and the only thing I've heard he's good at is getting drunk. Make your apologies, but get out to the Dacha."

Boris put the rest of the reports in his case and headed for home.

* * *

Daromila was snickering again. Boris looked up, a bit bleary-eyed from reading reports. "Woman—" he put on his "stern patriarch of the family" voice. "—what are you on about this time?"

She snickered again. "Nothing, dear. Just a letter from Berna."

"Oh ho!" Boris puffed out his chest. "I shall have to have words with him. Stealing my wife's affections from me. That's what he's doing."

Daromila gave him a telling look. "Boris, dahlink," she said, using the same sultry voice Natasha

occasionally used when she was teasing. "You know you are the only man for me."

Boris groaned a bit. Daromila and Natasha both teased him about the inept spy Bernie spoke of. "I never should have brought him here," he said mournfully. "I knew he was going to be a bad influence."

Daromila grinned. "Possibly more than you know." Then she wouldn't say more, just began writing another letter.

* * *

"So what is this Bernie like?" Czarina Evdokia took a sip of strong Russian tea.

"I'm not sure. He knows many things. He drops ideas without being aware of it, but . . ." Natasha hesitated. "I guess I was expecting some great philosopher. He is just a man. A workman. Much like the craftsmen on either of our estates." Natasha and the czarina were having a quiet lunch together.

Evdokia nodded. "That sounds like the little I saw of him at court. I find the possibilities of the future amazing." She stopped a moment. "Do you believe they sent someone to walk on the moon?"

Natasha considered. "Yes. I do believe it."

"Why?"

"Partly becauseVladimir confirms it in his letters, but mostly because Berna talks about it the way we would speak of Ivan the Terrible or the Mongol rule. Not a fantastic tale, just something that happened."

"Can you imagine? And women went, too. Russian women."

"Valentina Tereshkova.Vladimir wrote about her and Yuri Alekseyevich Gagarin. Berna didn't remember her name but didn't dispute that the first man and the first woman in space were Russian." Natasha paused and looked at the czarina. There was a look in Evdokia's eyes. A dreamy, hungry look. To Natasha the fact that the first man and woman in space were Russian was an interesting piece of information and made her feel good about being Russian. For the czarina, it seemed more somehow.

"I have always dreamed of flying," Evdokia's voice had a soft faraway tone. "Since I was a little girl. Floating up to the clouds and looking down to see the whole world spread before me." She visibly pulled herself back from dreams of flight, but a bit of the smile lingered. "Child's dreams, but it warms me somehow that it was done, and by Russians first."

"Who knows?" Natasha offered. "What they, those people from the future, could do, we can learn to do. Pter Nickovich says we can fly. He thinks he understands gravity. You may fly yet."

Evdokia laughed a bit sadly. "Even if we learn to fly, it will not be allowed." Then she grinned with more joy. "It is a pleasant thought, though. Now tell me of the progress of the Dacha."

Natasha grinned as she began her report. "As I said, Pter Nickovich thinks he understands gravity. Fedor is not convinced . . ." These weekly lunches were interesting. She would give a very unofficial report on the doings at the dacha. Then there were the letters from Grantville. Natasha almost always had a new one to share.

* * *

"Thank God," Bernie said when Natasha handed him the latest batch of letters. "There wasn't anything about plumbing in those books. I hope I've got an answer to that problem." Natasha had made a rare foray into the kitchen, searching for him. He was having his usual sandwich lunch.

Dear Bernie,

Vic Dobbs says you left out the vent stack for your plumbing, that's the problem. Without the vent stack you get a build up of pressure in the septic system and it forces the dirty, yuck, water back up. He made a drawing to show you what you did wrong. He also said you'd probably never seen one, since they're usually inside the walls, so don't feel bad about it. This ought to fix the problem. Just in case,Vladimir has contracted to have several books on plumbing that Vic recommends scanned and reprinted. A couple had already been copied. They're included in this shipment and the others will be coming in the next batch.

I saw your father in town yesterday. He said to tell you hello and wants to know can he sell your car? It's in the way, he said. He also said you should write him and your sisters. They want to hear from you, too.

Old Grantville is rocking along just fine right now. We've got, I swear, thousands and thousands of people around here now. It's so different from before.

Vladimirsays you're doing pretty well. I hope so. I bet it's a lot different than working on cars was. But then, who'd have ever dreamed I'd wind up working in a research center, of all things?

Well, gotta go. I need to have this done before I get to work so it can go in Vlad's pouch. Just let me know if you need any more information. Oh, and I hope you get this before the house blows up.

Best,

Brandy

* * *

"You have wood in your hair." Natasha grinned like she had caught him out. "Quite a bit of wood. What have you been doing out there in that shop of yours?"

Much to Natasha's surprise, Bernie went outside to shake off the wood shavings. "Sorry about that," he said when he came back to finish his lunch. "I didn't realize. I brushed myself off, but didn't know I had it in my hair. We were working on the pattern lathe. Finally got the setup for that connecting piece Ivan the Tolerable wanted." Bernie had gotten into the habit of giving various people at the Dacha nicknames. "Now I need to talk to the guys about this vent stack thing. Maybe we can get the bathroom back in operation." Bernie gulped down the last of his sandwich and beer and rose from the table again. "Excuse me. I really want to get this fixed."

* * *

After Natasha left the kitchen the cook, Marpa Pavlovna turned to her assistant (and niece) Anna Stepanovna. "Did you see that? Have you ever seen one of 'them' worry about dropping anything on the

floor? He may be a little strange in some ways, but he's not one of 'them.' How is your English coming, Anya? The quicker you learn, the sooner you'll be able to understand."

Anya shrugged. "Better. I understood nearly all he said, that time. I will be able to report it nearly word for word."

Marpa frowned. "He seems a good young man."

Anna stirred the contents of a pot and shrugged again. "Because he acts like a peasant?" At Marpa's look she continued. "The nobles don't worry about mud on the floor because the servants can't box their ears for it. He seems much like any other man to me. Just not used to having power. He'll be just like the rest, given a little time."

Marpa began clearing the table. Anya was a hard one. Which was probably all to the good. They had a job to do, after all, and little choice about doing it. Their family's debts had been taken over by a man neither of them knew. Through his agents, that man had assigned Anya the task of finding out everything she could about Bernie. It was not the first time Anya had been given such an assignment. She was a very pretty girl with hair like spun gold and deep blue eyes. The very picture of innocence. Anya hadn't been innocent since the day she was born.

* * *

"Could you light a couple more candles?" Bernie smiled at the cook's assistant. "I can't tell you how much I miss good lighting, I really can't."

Anya decided to try it. It was late at night and almost everyone else was asleep. She had been about to lay down on the massive stove when Bernie had stumbled in to the kitchen with a single candle and disturbed everyone. She nodded, and went for the candles.

The outlander went to another room and sat down at a table with a book. She knew that he thought sleeping on stoves was strange, but it made sense in a Russian winter. The amount of wood it took to heat the whole house was too much, a serious expense even for the wealthy and impossible for the poor. Even with the improvements Yuri had suggested based on the books from Vladimir Petrovich Yaroslavich, it was still a lot of wood. Not as much, though. The Dacha now had cold air come down one side of the chimney, so it was warmed before it entered the house. The main rooms were warmer now.

Anya took Bernie Janovich more candles and lit them for him. "Good lighting?"

Bernie Janovich grinned. "You speak English? Wow, that's great."

"Only little." Anya struggled with the words a bit more than was really necessary. "I learn. You wish beer? I get beer."

"Just one for me, please. I'm going to study a bit more, then I've got to get some sleep. And have one yourself, if you like."

Anya wondered for a moment if she should, but decided she might as well. She went to the kitchen, poured two beers and placed one in front of Bernie Janovich when she got back.

He motioned toward a chair. "Have a seat. I get lonesome sitting by myself. And even if you don't

understand everything I say, you're company." When Anya hesitated, he urged, "Come on. Have a seat."

Shrugging, she complied. Bernie Janovich was an important person even if he didn't know it. A complaint from him might anger her employer, both her employers. Besides, she was supposed to get close to him. He took a good look at her. Anya lowered her head and peeked at him from under her lashes. She wanted to show interest but not appear too easy to get. She needed him to work at seducing her. Throwing herself at him as some of the girls in the Dacha did would not get her what she wanted. Then what did he do? He buried his nose in the book. What was wrong with the fool?

* * *

All the things he didn't know meant Bernie had to study. It was worse than being in school, as far as he was concerned. All the stuff that he had been sure that he would never need once he graduated high school, he needed now. He was having to interpret words he'd never heard and in contexts he'd never dreamed of. What the hell was calcareous grassland? Calcareous turned out to be to do with chalk or calcium, at least that's what the dictionary said. But calcareous grassland? How could there be chalk grass? He had to go to the dictionary all the time to find the weird stuff that the Russian nerds wanted.

Then there was Bernoulli's Law. Pter Nickovich had found a description of how wings worked in one of the books. The explanation described a wing's dependence on Bernoulli's Law. Then they had looked up Bernoulli's Law, done the math and come to the conclusion that it couldn't work that way. Bernoulli's Law, Bernie was assured, would require a small plane to be traveling at over three hundred miles an hour to fly. They wanted to know if powered flight was really possible and if so how.

Bernie knew it was possible; he had flown twice and seen planes flying more times than he could count. But he didn't know how they worked. He built paper airplanes and wooden airplanes that flew, based on the rubber band powered airplanes he had played with as a kid, but he couldn't explain how they worked.

What Bernie didn't know, and for that matter most people in the Ring of Fire didn't know, was that planes flew through a complex mix of Bernoulli's Law,Newton 's Laws and the complexities of air flow. The mathematicians and natural philosophers who surrounded Bernie now would have understood the complex explanation but Bernie didn't have it. He had seen the drawings of air flow over a wing and assumed that they were accurate. They weren't. This didn't mean the shape of the wing was wrong. They weren't really inaccurate either, just simplified. Using the drawing out of those books for the cross-section of the wing would produce a wing that would fly quite well. Assuming, of course, that you added the ailerons and the rest of the plane.

Every day he had people asking him questions that he didn't have the answers to. They weren't meaningless questions that didn't really matter, like how many planets there are in the solar system. Well, most of them weren't. The astrologers were nuts to know the locations of Neptune, Uranus and Pluto. Mostly, though, the questions were about how things worked and how to treat injuries and diseases.

"I just don't know enough. I don't know if anyone does." The candles were half burnt and the girl was dozing in the chair. She jerked awake at the sound of his voice. He looked over and saw how tired she looked. "Oh, Lord. I've kept you up when you need to sleep. I'm sorry. I lost track of the time. I'll get out of your way and let you get some sleep. I'm really sorry."

* * *

The outlander grabbed up a candle and hustled away. Anya watched him go in amazement. He was

strange this, this Bernie from the future. That strangeness was giving Anya pause.*What was his game? What was he up to?* It hadn't occurred to her that Bernie might simply be a nice guy. She hadn't met many nice guys in her life. She worried about him possibly being onto her, but there wasn't really any evidence for that.*This is just too easy.* Anya didn't trust easy; easy usually meant a trap.

Anya had never seen the man her reports went to and didn't know his name. He was simply referred to as "the prince." The Dacha was filled with experts, but it was also increasingly filled with spies. She thought half the servants in the place, and more than a few of the craftsmen, must report to someone. This didn't in any way diminish the quality of the service. It was just as important for agents to provide good service as it was for a normal servant. In fact, most of them were normal servants just making a bit of extra money on the side.

For the ones, like Anya, who were agents, quality was even more important. The people who had trained and placed the agents had a pretty unforgiving attitude. If an agent got fired for spilling the soup, the result could be a tragedy for that agent and his or her family.

* * *

Filaret's forehead was creased with concentration. He was writing something, as he usually was. Mikhail sat quietly and waited for his father to lift his head. Filaret eventually did. He smiled when he realized that Mikhail had come in the room.

"Listen to this." Filaret picked up the sheets of paper. "I'll be reading it at the services next Sunday. I'll have copies printed. A lot of fair copies."

Filaret read:

Patriarch Filaret's Advisory

On the Ring of Fire

It is clear through multiple sources that God, in his infinite wisdom, has chosen to take a hand in the conflict among the German States. He provides through this example clear evidence of both His infinite power and His will, that the Roman Church and the Protestants, whether Lutheran, Calvinist, or other peculiar sects, are wrong. God has endeavored to make clear to them that which of their errors is most wrong is not a matter worth fighting over.

That is clearly God's message to them. But what is God's message to us? It is obvious that we are not in need of the sort of correction the German States required, else surely God would have placed the Ring of Fire here inMuscovy . While His admonishment, gentle as it is, is for the Germans, the gifts which He sent with it are clearly for all the world. Willingly or not, the knowledge the up-timers bring is spreading to all the world. To their credit, the up-timers themselves seem willing enough to share most of the knowledge that God gifted their ancestors and our descendants with. This is an especially gracious gift to Holy Rus. For, while we have been strong in our adherence to scripture and the true faith, circumstances have left us behind the more western nations in some of the more mundane and earthly matters. We have been blocked byPoland from sharing in the technical advances made in the west.

The czar, in his wisdom, has long had a policy of trying to correct that problem so that we, the true heirs of Christianity and the Roman empire, could maintain the faith in relative safety, while at the same time limiting the corrupting influences from the west. God has smiled on Czar Mikhail's endeavor by providing new skills developed over time; many of them developed right here in Holy Rus. Yet like greedy children we complain "Why an American village? Why not a Russian village?" We know, after all, that in the twentieth-century Holy Rus was one of the two great powers. After studying the history, it is obvious that God chose an American village to protect Holy Rus, especially the church. TheRussia of that time had fallen into corruption. For most of the twentieth century the Russian Orthodox Church, in fact all Christianity, had actually been banned. It was to protect us from this corruption that God chose an American village.

He placed it inGermany to remind us that He sees the whole world and cares about even those who have fallen away from the true church. More than that, He placed it inGermany to remind us that we have to work at it. To remind us not to be too proud to listen and learn from others and to protect us from too much of their direct influence, so that we might learn from them without becoming them. To protect our great Russian culture and still allow us the benefits of the good things they brought with them. As to the German culture, well, they don't really have one so it doesn't really matter.

"Well?" Mikhail raised an eyebrow. "Is that really why God did it the way he did it?"

Filaret looked at his son severely for a moment. Then shrugged. "I have no idea."

"Not exactly what one wants to hear from the patriarch of the church." Mikhail's grin was full of mischief.

"It wasn't my idea to become patriarch," Filaret complained. "It wasn't my idea to become a monk, for that matter. I'd much rather have been left out of Godonov's revenge."

"Wouldn't we all?" Boris Godonov had done his level best to exterminate the Romanov family. He hadn't been that far from succeeding, either.

Filaret shook his head. "God remains mysterious and beyond human understanding. He could have placed the Ring of Fire anywhere from anytime and the same questions would arise: why there, why not here?" Filaret shook his head again. "I'm not by nature a theologian. I have never much cared how many angels can dance on the head of a pin. But God chose to do this while I was patriarch, so I had to come up with something. It had to be something the people could mostly accept. Which was not that easy to do."

"If it only helps us modernize," Mikhail murmured.

"It should, I think. The idea is that God was correcting the Germans but giving the gift of knowledge to the whole world. Hopefully, it lets people feel that we aren't barbarians taking German scraps." Filaret grinned. "Besides, to go with it will be the design for the turning plow. A gracious gift from Czar Mikhail. Complete instructions on how to make them and the czar's permission to use them as needed—a gift to all the people."

* * *

Filaret read about the so called "Old Believers" in the up-timer histories and was disgusted. It would rip the church apart the way that idiot Nikon handled it. There were some arguments about minor matters of

ceremony, true. Mostly among scholars—people who probably had too much time on their hands. He couldn't understand why anyone would fight over it. Nikon's scholars were probably technically correct, but it was a "how many angels can dance on the head of a pin" question. Who cared?

"Have you read this, Ivan Fedorovich?" He motioned toward the book.

"Yes, Patriarch."

"Do you have any idea what they were fighting about?"

"No, Patriarch."

"Tell me about the small village churches." Filaret needed to know this. He had been in them and authorized them but they were from a different class. Ivan Fedorovich's class.

"They are the centers of the villages." Ivan Fedorovich was a priest, a fairly new one. "The priest is chosen by the villagers and often helps them with writing letters and such. When villagers get together to celebrate or to mourn, to rejoice or complain, it is the village church where they gather."

Filaret considered what Ivan Fedorovich was saying as he considered the article on Nikon from the *Encyclopedia Britannica 1911* . He seriously considered having the young man, who according to the article was twenty-seven years old and might or might not be in a monastery, murdered. "I don't understand. What do the peasants care about whether the priest uses two fingers or three when he blesses them?"

Ivan Fedorovich snorted and Filaret looked at him with a raised eyebrow. "Won't make any difference." Ivan Fedorovich shook his head and fell unconsciously back into the accent of his peasant village. "Parish priests work for the villages; they're the ones that pay 'em. Whatever this Nikon says, they'll do it the way the villagers want."

"Oh . . ." Filaret paused, struck by a thought. "That's why." The house-to-house searches mentioned in the article on Nikon. "He took away their priests. He must have. Had them appointed from outside, not hired by the villages." It was starting to fit together. "It wasn't about ritual. It was about control. He would have had the same fight if he had insisted they use two fingers instead of three. The leaders would have changed but not the fight."

Ivan Fedorovich was nodding. "It must be. It's the one thing that really belongs to the peasants; their faith. The one thing that they control."

"I'll have to think about this." Filaret thought a moment. "In the meantime, have this Nikon or Nikoles located. Just in case."

* * *

Anya watched the balloon with the multi-wicked candles suspended below it as lifted into the air. Pter Nickovich was doing "a preliminary experiment into the lifting power of hot air." In other words, he was playing. It was his third balloon so far; each larger than the last. This one was a tall as a man and as wide as it was tall. And it trailed a series of lead weights. Lifting first one then the next into the air below it. It lifted five of them, then stopped rising, proving that hot air is lighter than cold air. Which any five year old in any peasant village inRussia could have told him. The balloon was pretty enough, she guessed. Pter Nickovich's was holding his "experiment" in a corner behind the main building of the dacha where it

would be out of the wind. Which also meant out of the sun. It might have been prettier if his balloon was in the sunlight.

What had really brought her out into the cold to see it was the idea that, some day, a much bigger thing like this might let people fly. Pter Nickovich wasn't looking at the balloon; he was writing out calculations. Then he looked over at Filip Pavlovich. "I was right. The heated air lifts a little more than a quarter of an ounce per cubic foot."

Filip Pavlovich just nodded.

"I must have the hydrogen you promised me." Pter Nickovich insisted.

"Yes. Fine. We'll talk about it, but inside." Filip Pavlovich was visibly cold even in the heavy clothing. "Where it's warm."

Anya smiled, though she didn't let it show. Pter Nickovich was not one to take being laughed at well. As they blew out the candles that were heating the air for the balloon, Anya tried to figure out what was going on at the Dacha. Bernie, the person that this was all about, had had very little to do with the development of the balloon. Nor with many of the experiments that were going on. There was a guy, the son of a fairly powerful bureaucratic noble, who was sitting in one of the buildings, winding wires in a coil. Slowly, carefully making what he said would be a generator of electric. He carefully painted the wire and laid one circuit around the coil, then waited for it to dry before he did the next. He was a volunteer, here because he wanted to be.

* * *

"What was it like to live in the future?" Anya asked as much for herself as for her controllers.

"I don't know." Bernie shrugged. Anya had noticed he did that a lot. "Funny thing, I never thought much about the future when I was living in it." He snorted. "I was in no hurry to grow up. There was no real need. I had a pretty good job. Enough money for most of what I wanted. Never found the right girl, but had a lot of fun looking."

Bernie paused a moment and his eyes got a distant look. "I think that was what hit me so hard about the Ring of Fire. It wasn't that I lost family. I lost my future."

"Your future?" Anya leaned back in her chair and considered. "I don't understand."

"Yep." Bernie nodded. "Losing your future isn't like losing your kids or your wife or stuff like that. You feel like a jerk complaining about it, but I couldn't help it. Like everyone else, I was in shock at first. I just couldn't come out of it. People started doing things. Things that mattered. President Stearns, Jeff Higgins . . . everyone was making it work and I was still sitting around doing what I was told. The same old Bernie. No direction, no drive."

Anya let Bernie talk.

"I just couldn't think of anything useful to do. Then Vlad and Boris offered me this job. I had no idea if I could do it, but I couldn't take much more of Grantville. It wasn't home anymore, but it was too much like home." Bernie looked at Anya blearily. "Know what I mean?"

Anya had no idea but she nodded anyway.

"I think the trip out was the first time I had been sober for three days running since the Ring of Fire." Bernie certainly wasn't sober at the moment, but she got his point anyway. Bernie preferred beer to vodka and the truth was had rarely been drunk since he had arrived at the Dacha. He barely drank at all by Russian standards, which were the only standards Anya had.

Anya thought about what Bernie had said. It sounded like he had had his life all planned out but just didn't realize it. She hadn't considered what it would be like for the outlanders from the future. She wondered briefly what it would be like to be sent four hundred years into the past. Briefly, because she had no real idea what the world had been like four hundred years ago.

"And now?" She wanted to keep the outlander talking.

"Now, I'm too busy to worry about it that much." Bernie grinned. "Too much to do. The Nerd Patrol is always hitting me with new questions and I spend so much time reading and helping out that there isn't that much time to mope anymore. That's the secret to a happy life, kid. Have something to do. Better something that matters. But something."

Anya didn't dispute that, but she didn't believe it either. To Anya happiness was not having people tell her what to do. Maybe being able to tell others what to do. It was the unattainable, being boss, not servant. Russian village life was noble life writ small. There were differences but clan was very important. The status of your family within the village was all important.

Grantville

"Well, the problem is that it's not like we could repossess it." Dori Ann Grooms hesitated a moment andVladimir saw the blush rise. "I'm sorry. That really wasn't the best way to put it, Herr Yaroslavich. What I mean was that your collateral is simply too far away for the Bank of Grantville to accept it as surety for a loan. It's not like it was in the old . . . ah, new . . . back up-time. We couldn't send a lawyer to dispossess anyone who was living in this village, could we?"

Vladimirnodded. He'd thought that might be the answer, but it had been worth a try. He needed more money, cash on hand. Most of his family's wealth was tied up in land. Much of the rest was tied up in the Dacha research center. "Do you have any suggestions, then?"

Dori Ann shook her head. "Edgar said you might have better luck with the Abrabanel Bank. Seems like they've got agents everywhere."

* * *

Cousin Rafael's secretary ushered the Russian prince into the office, close the door and left, while Don Francisco Nasi sat in a corner and grinned.

"Ah . . ."Vladimir was clearly unprepared to discover that Don Francisco would be sitting in on his conference with the distant cousin who headed their bank in Grantville.

Don Francisco waved him down. "I'm not here to interfere in your business with Cousin Rafael, Prince Vladimir." He smiled at the look on Vlad's face. "Yes, I am quite aware what*knaiz* means."

"Then you do understand that I will not . . ."

"Betray your people? Please. Do I look like a fool?" Francisco waved away the whole idea. "All that is going on here is that when I learned of your appointment with Rafael, I decided to take the opportunity for a semi-private meeting. But I am more then willing to wait my turn. Please go on with your banking."

Then for a while Francisco mostly watched asVladimir and Rafael discussed banking matters. Oh, he put in a comment here and there. "Vladimir's Dacha has already produced half a dozen products that are being licensed to various groups inMuscovy . Are you sure, cousin, that speculative venture is the right description?" Which got Francisco a dirty look from his cousin. And a curious one fromVladimir .

Then some time later. "Paper rubles with the printing in the hands of the*Duma* . No disrespect intended,Vladimir , but the czar's cabinet isn't exactly known for its restraint."

"A lot if that was simply not being aware of the consequences. Printing gobs of money would not benefit the great houses."

"If they realize that and if they care." Rafael said. "Printing gobs of money as you put it may not be good for the economy but in the short run it can be very good for the printers. Even if they show restraint, determining the amount of money needed to run the economy with out causing hyper-inflation is no easy task. Not even with computers. I can't avoid the conclusion that accepting payment in the czar's paper would be a speculative investment. I really have to insist on New US Dollars."

So it went for about two hours. Francisco mostly watched the exchange, and kept Rafael from skinning the Russian prince too badly.Vladimir wasn't as good at this as he apparently thought he was. But, finally, agreement was reached andVladimir was provided with a letter of credit.

At which point, by prior arrangement, Rafael excused himself and it was Francisco's turn. "The reason I invited myself to your meeting was that I wanted talk to you about where you think the CPE andRussia are headed."

At firstVladimir demurred, pointing out that mostly his mission had to do with information that was mostly free for the asking, from the National Library and theResearchCenter .

Nasi grinned. "That is true enough, but incomplete. Yes, your shop is getting most of its information from the research center, but you are also involved in what the up-timers call 'industrial espionage.' For instance, the sewing machine that went toMoscow with Bernie Zeppi was accompanied by rather copious notes on how it was made and what machines would be needed to make more."

Vladimirsmiled. "The twins were more than happy to explain how it was done. It isn't like I broke into their factory in the middle of the night and stole the designs."

"And Fedor Ivanovich Trotsky, whose last name has such unfortunate connotations? Is he also staying within the bounds of law?" Nasi laughed atVladimir 's expression. Trading Boris for Fedor Ivanovich had not been a good deal. "Never mind. He is not very good and we aren't that worried about him. The largest danger he represents is that he will report rumor as fact. But please consider my offer. There are things I won't tell you, but I won't lie to you unless absolutely necessary. All I ask from you is the same courtesy."

* * *

"Vlad." Brandy waved the letter. "What precisely is a clan?"

"Huh?"

"Your sister is talking about clans. I'm not sure what she means." She handed him the letter and waited impatiently as he read it.

"Clan seems a fairly good word." He pursed his lips like he wasn't quite sure. "I think I would say family connections, but I am not sure. From what I understand your government frowns on what you call nepotism, right?"

Brandy nodded, wondering where this was going.

"Muscovyis different. Nepotism is an institution of government."

Brandy giggled, thinking he must be exaggerating to make his point. But Vlad was looking serious, even concerned. "You don't mean*literally* ?"

Vlad nodded, looking a little shamefaced. "Yes. If a person whose extended family is of lower rank is placed over a person whose family is more highly ranked . . ."Vladimir hesitated. Brandy had seen it before, both in Vlad and other down-timers. She had even done it herself, trying to explain things like the Goth style of dress. It wasn't just that the concept was missing, it was that there were half a dozen interrelated concepts that were all a bit different from the down-time concept.

"A person's rank inMuscovy is determined by three things," Vlad finally continued. "His personal rank in the bureaucracy, his family's rank and his inherited rank. However, they are all at least somewhat mixed together. My family is small but descended from independent princes. Because it is small and doesn't have a lot of connections to other great families, it's fairly weak. In my case, that is somewhat counter-balanced by the fact that I am the prince. But a cousin of mine, if I had one, would be of significantly lower rank than a cousin of Ivan Borisovich Cherkasskii, because the Cherkasskii family has connections by marriage to many other great families. Also, because the Cherkasskii family has served in the government ofMuscovy for many generations and counts several boyars among it ancestors.

"So, say my cousin and Ivan Borisovich's cousin both get jobs in the bureaus. My cousin, through talent or luck, advances more quickly. So my cousin is placed as section chief over a section in which Ivan Borisovich's cousin serves."

"Makes sense."

But Vald was shaking his head. "Because the Cherkasskii clan is higher ranked than the Yaroslav clan, it would be against the law for my cousin to be placed in authority over Ivan Borisovich's. He could have higher personal rank, but still could not be put above Ivan Borisovich's cousin in the same chain of command."

"Like, say, he's a prince?" Brandy tilted her head to the side.

"Yes." Prince Vladimir got a bit red in the face. "But not just that. It's the rank of the family as much as that of the individual. The family's situation must be considered first. Before individual wants."

* * *

Vladimirhad just opened the packet fromMoscow when someone used the door knocker. He looked at the clock he had purchased and stifled a curse. Time passed so quickly. Brandy Bates and her mother, Donna, had agreed to come to dinner tonight. It would be a quiet dinner, just the three of them.

One of the letters in the packet caught his eye. Surely it must be important. As all of them were—to their originators, at any rate.Vladimir was beginning to dread the packets, in truth. There was yet another over-large stack of letters in this packet. Vlad knew they would contain more requests, demands, and commands, depending on who the writer was. And probably half of the questions would have already been answered.

The turnaround time for communications was over two months. The message packets came every week or so. Often he got requests for clarification of some point, did the research and sent an answer. Then a week or two later he got another message saying "never mind, we figured it out." They had obviously figured out the problem before he ever got the request. Sometimes their solutions matched the answer he had sent and sometimes not.

Sometimes the solutions were better than the answer he had sent. That meant opportunities Vlad could take advantage of here in Grantville. There were, as of his last report, something like a hundred of the brightest minds in Muscovy living in his dacha a few miles outside ofMoscow . This wasn't anywhere near the number of bright minds that were in Grantville by now, but still constituted a fairly robust R&D facility. Sometimes they came up with solutions that the up-timers wouldn't because the up-timers knew "it didn't work that way."

Vladimiraveraged sending one message packet a week back toMoscow . Usually it would include the most recently copied up-timer books and what answers he had been able to get for the lists of questions that came in every packet.

His major-domo announced Brandy and Donna moments after he broke open the impressive looking letter. As they were shown in, he read the first paragraph. "Will you look at this!"Vladimir stood and stomped around the room. "Just look at it!" The letter had the imperial seals as well as those of the Russian Orthodox church. It was from Filaret, the patriarch of the church. Who also happened to be the father of the czar.

"Well, I could." Brandy giggled. "But it wouldn't do much good, you know. I can't read your language, remember. Suppose you just tell me what it says."

Vlad stopped his pacing and looked startled for a moment. "Ah . . . yes. I forget. You've learned so much about me and my country that I feel you must know the language by now. Silly of me, I suppose. Come ladies, come. Sit down, please. Will you have a glass of wine?"

Brandy smiled. "I do the same thing. It always surprises me when you need a word translated these days. Anyway, what does that very impressive looking letter say? It must be important, considering all the seals and ribbons. And yes, please. After this day, I could use a glass. I could use several for that matter. It's really been a day."

Donna Bates was enjoying the conversation. Brandy and Vlad's relationship had been developing nicely over the past few months. True, there had been hopes of a relationship with Henning Drugen. Henning was a good man, very responsible. The problem was that he wouldn't release any responsibility to Brandy. He made the decisions and expected Brandy to comply with them. That relationship just hadn't worked out. Henning and his sister, Justine, had moved to a home in Forest Grove a few months back.

But Vlad, well, Vlad was different. He and Brandy discussed things and came to mutual agreements. Donna had high hopes for this one. Vlad was basically theMuscovy ambassador these days, as well as a pretty good researcher.

"Tell me, Donna Ivanovna, was the government in yourAmerica as impossible to please as mine is?" Vlad's face was still a bit flushed with irritation. "The patriarch, of all people, sends me a request to have the entire library sent toMoscow . Impossible, totally impossible. Have they no idea of the size of such a project? Have they any idea of the expense?

"Oh, and you will love this part."Vladimir waved the paper again. "At the same time, I am to prevent the sale of up-timer books to other nations. EspeciallyPoland and nations ruled by the Habsburgs. And I am to especially prevent the books from falling into the hands of the Roman church. Let me read you this. It is impossible."

"To Knaiz Vladimir Petrovich Yaroslavichov

It is most necessary that the knowledge of the up-timers be limited to those of the true faith or at the very least provided to those of us of the orthodox church first. This must happen before it becomes available to those influenced byRome . You must acquire the library, especially the National Library, mentioned in your dispatches and send it to the Church as soon as possible.

You are to be congratulated on sending so many books so rapidly. As you know, I am an expert on books and the time it takes to make copies. It is clear that you are somehow acquiring originals of the books you have sent because so many could not have been copied so quickly.

The spiritual tracts and philosophical knowledge gained by the up-timers must especially be sent to the church first. This is so that they may be reviewed before they are released. We wish to avoid partial understanding and crisis of faith among the followers of the true faith.

Further, it is essential that advances in techniques, new techniques and the knowledge of science be limited to nations that share in our beliefs. Some Protestant nations, particularlySweden , may be allowed this knowledge but it must be kept fromPoland and the Habsburg beast. Especially, knowledge of medicines and healing must be controlled, lest the unscrupulous Roman clergy use it to bolster faith in their misinterpretation of God's word.

"Can you believe it?" Vlad asked. "Can you believe it?"

Donna very nearly snorted wine up her nose.Vladimir was still stalking around the room and waving his arms in the air. It was clear the man was under a little too much stress lately. And this letter from the czar's father certainly hadn't helped. Still, watching Vlad stomp around was entertaining. "You really need to calm down a little bit. You're going to give yourself a stroke. Come on. Sit down and relax a bit. After all, as they say: the czar is very far away."

Vladimirslumped into a chair and poured his own glass of wine. "Every week I send a report. And every week I get more and more impossible requests. And I have no doubt that there are at least half a dozen more in this packet alone." A piece of paper fell out of it.

"Well, if it isn't going to violate national security or something, why don't you pull them out and read them to us?" Donna suggested. "That way you can blow off steam before you try to answer them. Unless you're afraid of the servants or something like that."

"Not my servants," Vlad asserted. "Well, not most of them. I hired local help, except for a few. Grigorii Ensheevich and Vasily, they are both from my lands and Grigorii Ensheevich almost raised me. Vasily grew up with me. Was educated with me, for that matter. I'm safe with them." Vlad didn't mention the rest of the Bureau personnel, but dug into the packet of letters and grinned mischievously. "Oh, you're going to enjoy this, Brandy. Here. You have a letter from Berna." Vlad handed Brandy a letter, one that was not decked out in ribbons and seals. After she took it, he picked up another missive. He was glad to see it had fewer ribbons and seals.

"Oh, no." Brandy stared at the letter like it might be a snake. "Two months ago it was 'send me a sewing machine.' Last month it was 'send me a generator.' And we've done it, every time. What do you suppose Bernie wants now? I'm almost afraid to read it." Brandy glared at the letter, suspicion all over her face.

Donna stifled another snort at the look she wore. "Come on, Brandy. At least it will be in English. Read it to us."

"Okay, Mom." Brandy gingerly opened the letter. "I'll read it. But hang on to your hat. There's just no telling, there really isn't"

"Hey, girl"

"You know," Brandy muttered, "he could use my name, just to freaking be polite." She continued,

"Well, if Dad really wants the old car out of the way how about we do this? I'm sending you an authorization to take money out of my savings account. Will you give Dad some money for me? Tell him it's a storage fee, or something. Anything to keep him from getting rid of the car. Then, if you could have Vlad get someone to pull the engine out of it for me, I'd really appreciate it. I'm enclosing a bill of sale from me to you, just in case.

The body doesn't really matter that much, I don't guess. But I want the engine and the transmission. I want them bad. Actually, I'd like to have all of it, but there's no way to ship it, not in one piece, probably. Ask Vlad, will you? I'd take it all if I could get it.

I've asked Natasha to ask Boris (I love that . . . Boris and Natasha, the Russian spies.) to authorize paying for the transport back here. If worse comes to worse, we'll tear the whole thing apart and try to build our own version. God, I miss the car, I really do.

Thanks, Bernie

"Oh, Lord." Donna couldn't repress the giggle. "Bernie wants his car. InRussia . In the year 1633. That

makes a lot of sense."

Brandy, Vladimir and Donna laughed. "I can't imagine what he'll do with it." Brandy shook her head. "What do you think,Vladimir ? Should you send Bernie his car?"

Vladimirslumped farther into his chair. "I told you there would be more impossible demands, didn't I?"

Brandy grinned. "The difficult we do immediately. The impossible takes a little longer. What did you get in that letter?"

Vlad waved a piece of paper. "Money. Money like yours, in fact." He passed it to Brandy, who looked at it and passed it on to Donna. "Colorful."

It was. About four by eight inches, printed in red. "Who's this?"

"The czar Mikhail." Vlad pointed at the images. "A cross, a proper cross, on the other end."

Donna flipped the paper over. "And that would be the palace, I suppose? Or a government building of some sort?"

"The Kremlin." Vlad took the bill back.

"And what does the writing say?" Donna looked at him curiously.

"This bill is legal tender for all debts, by order of the czar, with the support of the*Duma* and the*Zminski Sobor* . One ruble."

"Bernie or you, Vlad? I mean, this isn't the sort of thing that Bernie would come up with." Brandy had known Bernie Zeppi for years. This wasn't his sort of thing.

"Me, mostly. I started sending information about your banking system well before Bernie left."

* * *

Vladimirbelieved in going to the best source he could find. He discussed the matter of book copying with the staff of the research center. Then sent the patriarch information on the book-copying system they had instituted. Parts of it. like scanning pages into computers could not be replicated inMuscovy . Other parts could, like the waxed silk sheets for the new duplicating machines.

Having, he hoped, explained to the patriarch that he could not just buy the National Library and ship it off to the Kremlin, he set to work on the next impossible demand. He made an appointment with Wilkie Anderson, theTechCenter teacher of auto mechanics. The man had the strangest desk he had ever seen. It was red and appeared to be the front end of a truck. Wilkie noticed him staring and pressed a button. The blaring noise rockedVladimir back on his feet.

Wilkie grinned. "That always got the students attention. Yes, it is the front end of a S10 pickup truck. And I've hooked the horn up to the electricity. I don't honk it that much, but I still enjoy seeing people jump. Now, what can I do for you, Mister . . . ah . . . Yaroslav?"

"Yaroslavich," Vlad said. "A peculiarity of Russian nomenclature. But, no matter. I come because I have a question. Is it possible to 'pull the engine' of a 'car' and have it transported to another place?"

Wilkie nodded. "You can pull any engine. But some of them won't do you much good. What kind of engine is it?"

"I'm told it is a 1972 Dodge Charger."Vladimir waved the bill of sale Bernie had sent. "I don't really know what that means, but that's the car. Bernie Zeppi wants me to pull the engine and transmission and send it to him inMuscovy . I'm here to find out if that is possible."

"Not a bad choice." Wilkie leaned back in his chair and motionedVladimir to another. "It's a good bit less complicated than some. No computers in it, at any rate. And I remember that car. Bernie bought it for a couple of hundred dollars back when he took my classes. We restored it together, out in the shop. Me, Bernie, all the class. Leon McCarthy, from the body shop classes, even got involved and fixed a couple of dents. But why pull the engine? Why don't you just put it in neutral and pull it with horses? How far does it have to travel and what are the roads like?"

"It has to go toMoscow and will make a good part of the trip by way of theBaltic sea ."Vladimir shrugged. "The roads are fairly bad. Horrible, by up-timer standards. On the other hand, we can use more than two horses if we have to."

"Russiaused to have oil wells up-time." Wilkie leaned forward. "Are you folks planning on getting into the oil business or do you figure on buying gas from the Wietze oil fields? I gotta tell you, they aren't getting much high octane yet."

"I have no idea,"Vladimir admitted. "For all I know they want to use the engine as a planter for up-timer roses. I am also told to send those."

"Well," Wilkie shrugged away the possibility of Russian oil fields, "if you can get it onto and off of the boat, it really might be easier just to tow the darn thing. Sure, it weighs more than a wagon. But it's also got shocks and ball bearings on the wheels. Most of the time it'll be easier to pull than a wagon, even with the engine in it."

* * *

Brandy came uponVladimir in theResearchCenter . He was engrossed in yet another volume of the encyclopedia. "What's up?"

"Your Mr. Wilkie says thatRussia in the up-time had oil fields. If they were there in the up-time, they will be here now. I wish to locate them. And I shall have to arrange for some people to come here for training at the oil field. In fact, I should probably have a number of people come here."

Brandy sat down at the table across from Vlad and nodded. "Probably not a bad idea. Who will you have come?"

Vlad sighed a bit. "I'm quite sure that the Embassy Bureau already has people on the way. But this is too much for just a few people to absorb. I'm going to write Natasha and have her pick the best of the people from our lands. As well, I'm sure she knows some students who would be interested." Vlad looked Brandy in the eyes and said in a serious tone, "Muscovypolitics are not pretty, Brandy. Not pretty at all. It hasn't been that long since Czar Ivan and the time of troubles. It will take a lot of work, but I believe most strongly thatRussia must take advantage of the knowledge in Grantville. Most strongly. That is why, although it will be atrociously expensive, I will send Bernie his car. I will send books. Eventually, I hope to send teachers."

"You're not trying to be Peter the Great, are you?" Brandy asked. "I just don't see you going around cutting off beards and all that silly stuff."

"Not silly, my dear. Not silly at all." Vlad made a vague gesture and frowned. "It was a symbol. And symbols can be very powerful. The beards might have been the wrong symbol at the wrong time, perhaps. But something had to be done. Or rather, would have had to be done, had it not been for the Ring of Fire."Vladimir sighed.

"The history of my country isn't a happy one, not according to the very few books here in Grantville. These books, they barely mention the time of troubles after the death of Ivan the Terrible, the three false Dimitri's that leftMuscovy bleeding and broken.Poland invaded—intervened they say—and took Patriarch Filaret prisoner. The Poles held him prisoner for years, Branya. Years. Then, afterwards, he was forced to take a vow of chastity by Boris Godunov. The purpose of the vow was to disqualify him from the throne."

Vlad closed the book with a snap and stared into the distance. "It hardened him, Brandy. Which may well be to the good. I don't know whether it was being forced to take holy orders or the imprisonment. Whatever it was that caused it, he was different when he came back. There is a cold-blooded practicality that wasn't there before. He manipulates everyone. The czar, Mikhail Fedorovich, is not in control. His father is."

"Do you know him?" Brandy settled in for a long talk. "The czar, I mean." She couldn't help but be interested.Vladimir attracted her in a way that few people did. She wanted to understand him and his country.

"Yes." Vlad gazed into an unseen distance. "My family is very wealthy, on the whole. And the treasury was bare when Mikhail came to the throne. My sister and I are the last of our particular branch, which concentrated the wealth even more. So we were invited to court quite a bit. Not as much as some, but fairly often. Our father traveled for the Embassy Bureau for many years; it gave us a different outlook. Natasha and I were educated more than some." Vlad's face grew more animated. "Natasha does know the czarina quite well, and I have sent her letters and books. Perhaps the czarina, with Natasha's help, can become more of an influence."

"You said once that the czar supports Gustavus Adolphus, didn't you? Or is that his father's doing?"

"Some of both I think." Vlad leaned forward. "Money. Always a problem, the money. The Poles cleaned out theMuscovy treasury. The time of troubles left roving bands of thieves that travel throughRussia , some of them even now, after nearly twenty years of Mikhail's rule. Mikhail is loved by the people but he is not very strong. He is governed by the boyars and Duma men. I respect your system of government, Brandy. I really do. But how much of it can be adapted toMuscovy . . . that is harder to say. I don't know how much we can do. We have Natasha. We have your Berna, even. I will work for change, with all my heart."

"I'll help." Brandy stood up. "As much as I can."

Crude Penicillin:

Potential and Limitations

By Kim Mackey

"That which we know frequently impedes us in acquiring new knowledge."Claude Bernard (1813-1878), French physiologist.

Background and Early History of Penicillin

The Age of Disinfection began with the work of Pasteur and Lister in the 1860s and 1870s. While this initial work focused on external disinfection, doctors and scientists were soon looking for ways to use substances for "internal disinfection," that is, to rid the human body of disease-causing organisms. Unfortunately, these initial efforts were limited. "Their attack," Iago Goldston wrote, "was too direct, too primitive for the wily ways of nature. They thought to catch sunbeams in a butterfly net." [1, 81].

"At the Congress of Internal Medicine held inWiesbaden in 1883, the assembled body of scientists solemnly recorded it as their sober judgment that "inner disinfection is an impossibility." [1, 80]. Influenced by the work of Von Behring and others, scientists turned to anti-toxin therapies to cure human ills rather than chemotherapy. This attitude changed somewhat in the early twentieth century with the work of Paul Ehrlich and the discovery of salvarsan, but between 1915 and 1935 there was little progress and scientists began to doubt that the theories of Ehrlich were correct. It was in this context that Alexander Fleming, a member of the staff of the Inoculation Department at Saint Mary's Hospital inLondon , and recently appointed Professor of Bacteriology at theUniversityofLondon , discovered penicillin in September, 1928. Unfortunately, Fleming limited his observations on penicillin's bacteria-killing power to "a few sentences or very short paragraphs in medical journals, most of them with very limited circulation." [2, 1]. Thus proof of the remarkable antibiotic power of penicillin would have to wait for the work of Florey and his colleagues twelve years later, well after the introduction of sulfanilamide's.

As with any major discovery, the history of penicillin is filled with facts, pseudo-facts, omissions and myths. For example, because of the way in which penicillin attacks bacteria ("it could only act on them during the very short phase in their life history when they were actually dividing" [2, 3]), it is highly unlikely that the mold contaminated the plate*after* the bacterial colony had been established. This is important, because "if the phenomenon had been produced in the manner Fleming thought it had, it would be a very common occurrence in bacteriological laboratories all over the world, and Fleming could claim credit only for observing something unusual and acting upon it. In doing so he did himself an injustice, because the stringent requirements in terms of time when the mold reached the plate and the temperature to which it was subsequently subjected render its accidental production almost impossible in countries with tropical or continental climates, and very unusual in those with temperate climates. Fleming was a great deal more fortunate than he ever realized." [2, 3-4].

Another myth that can be dispelled is the source of the mold. In 1945 when a film about penicillin was being produced, Fleming told the producer, for whatever reason, that the mold must have drifted in off the street. This was highly unlikely, however, since the windows were seldom open because they were

too difficult to reach. In fact, the plates were most likely contaminated by mold from the mycology laboratory run by Dr. C. J. La Touche on the floor below Fleming's lab, since, as noted in Flemings original paper, one of La Touche's molds, "had exactly the same cultural characteristics as the mold on the original plate, and, although he did not say so, ability to produce the same amount of penicillin." [2,4]

The dispelling of this myth is important for the 1632 universe. Why? Because knowing that molds and other substances in the soil have antibiotic properties and can be isolated and cultured is a huge percentage of the battle. Once this fact was appreciated up-time, many substances were quickly isolated that were useful in fighting a wide variety of bacterial infections.

It will be very important for down-time scientists and physicians to appreciate the potential and limitations of antibiotics. While penicillin can treat a wide variety of bacterial infections, there are also a wide variety that it cannot, especially in the crude form. Fortunately, production of crude penicillin, once you have an appropriate mold strain, is fairly simple.

Alexander Fleming did not start serious experimentation with the penicillium mold until December 1928, and when he did much of the work was done by a research assistant, Dr. Stuart Craddock, who had just qualified in medicine in July 1928. "It was soon found that penicillin could be produced by growing the mold at room temperature in the laboratory's routine broth, which was made in small batches from a tryptic digest of bullock's heart muscle. A pellicle formed on the surface, the fluid below became bright yellow and was usually free of mold particles. Although they could be removed by filtration without loss of penicillin, this was usually omitted." [2, 6]

The procedure for estimating penicillin content "consisted in making serial dilutions in fresh broth, to each of which were added a few drops of a staphylococcal suspension. Following incubation, the highest dilution in which no growth of organisms had occurred was recorded as the*titre* . It was soon found that after growth at room temperature for five to seven days the titre was generally 1/100 to 1/300 and very occasionally 1/600. Thereafter, it began to fall so that all but a trace of penicillin had gone after fourteen days." [2, 6]

In January 1929 attempts were made to concentrate the penicillin and it was fairly quickly discovered that penicillin was readily soluble in both ether and alcohol, but not significantly so in acetone. It is important to note that penicillin's instability was not a major problem for the experimenters. What drew Fleming and his assistants away from testing penicillin for antibiotic purposes were experiments with rabbits which seemed to indicate a quick elimination of penicillin once introduced into the body. Unfortunately, Fleming drew the wrong conclusion from the experiments and felt that the reason was the absorption of the penicillin by tissues and serum, rather than elimination through the urine.

The earliest successful uses of crude penicillin to cure bacterial infections seem to have been the attempts in the early 1930s by Dr. C. G. Paine inSheffield [3]. Paine obtained a culture of the mold from Fleming and grew the mold much as Fleming had done. Both gonorrheal infections in babies and an eye infection in a miner containing Pneumococcus were cured. Unfortunately, Paine did not publish any of the results of his experiments with crude penicillin and the next wave of crude penicillin work did not take place until the 1940s.

With the coming of World War II and the work atOxford by Florey and his associates, penicillin's antibiotic properties became well-known. Unfortunately, while theOxford product was very potent, it was not very pure, nor was it initially available in large quantities. "This led a number of workers to re-examine the therapeutic properties of crude penicillin filtrates. Essentially, three methods were developed for the topical application of crude penicillin. These were 1) use of liquid filtrates which were usually applied using lint or other absorbent material; 2) the use of dressings inoculated with P. Notatum

often in conjunction with liquid filtrates; and 3) the application of crude penicillin in agar, the so-called pen-agar method. In addition, crude filtrates were also occasionally administered by injection." [4,41]

Due to the fact that the partially purified product became more widely available after 1945, the large-scale production of crude penicillin covered only a short period of time between 1942 and 1945. However, in this time period, numerous doctors and scientists grew and used crude penicillin to cure serious illnesses involving bacterial infections. FromCairo toHawaii ,Boston toNew York , doctors and scientists refused to wait for the limited supplies of pure penicillin and manufactured crude penicillin to effectively treat thousands of infections. [4], [5], [6], [7]

Crude Penicillin Production in the 1632 Universe

As I've already noted, one of the biggest hurdles to penicillin production is just the idea that organisms found in the soil can destroy or inhibit the growth of bacteria. Once this idea is accepted, then it becomes necessary to*find* the organisms. Fortunately for Grantville, it is at least somewhat plausible that in a school the size of Grantville's, a biology teacher would have in stock kits containing*Penicillium Notatum* . An investigation of one of the premier suppliers of biological materials, Carolina Biologicals, reveals numerous microbiology kits that contain the mold. But culturing the mold is not producing penicillin. Doing that will require active and ongoing cultivation, like any crop. And, like any crop, you can improve your yield by fertilization, trace nutrient supplementation, and better media. In addition, like some crops, you will want a "biocide" to kill off organisms wanting to consume your product.

Most improvement of penicillin yields will come about through active experimentation. While corn steep liquor was a preferred medium for commercial production in the mid-twentieth century, there are other media just as good, if we assume lower levels of production in a seventeenth-century environment. For example, "an extract of ground dried peas at 10 percent concentration has been reported as a successful penicillin media . . ." [10, 695] Another media from the same source was cottonseed meal. Still a third possible surface culture medium was "wheat bran moistened with an equal weight of water." [8, 262].

It seems clear given the historical evidence, that an adequate medium for relatively large-scale (beyond small laboratory batches) production of crude penicillin will be found and utilized.

But obtaining the media for crude penicillin production is just one factor. Another will be obtaining the appropriate containers and manpower to produce the crude penicillin on a regular schedule. Another factor that will be important is some substance or substances that can act as an effective "biocide."

In terms of an effective biocide, the most useful for penicillin production is borax. In a 1945 study done inWisconsin , "37 different chemicals were tested for their ability to prevent the growth of contaminants and still allow penicillin production in contaminated shake flask fermentations. Of the chemicals tested, only borax and boric acid could be used at a level high enough to delay the growth of contaminants and still not interfere with penicillin production." [8, 515]. The importance of this to 1632 is that borax was one of some twenty-seven common mineral substances used in medicinal or cosmetic recipes [11, 125]. While the most expensive mineral ingredient (2–3 guilders per pound), borax nevertheless was available throughout much ofEurope . The amount necessary to prevent contamination of penicillin cultures is quite small, two-tenths of one percent. Since borax has other important uses however, as in the making of borosilicate glass, it is likely that resources inTuscany will be developed fairly quickly, helping to drive down the price.

Uses and Limitations

From the literature on the use of crude penicillin, it is apparent that it will be most useful for infections in open wounds, and infections involving staph, strep, and gonorrheal bacteria. Syphilitic sores might also respond to treatment, although a complete cure would likely have to wait until large doses of a partially pure product could be injected. Diphtheria is also penicillin sensitive, so application as throat and nasal drops might drastically lower mortality rates. Unfortunately, penicillin will not work with cases of typhoid, cholera, plague and typhus, nor will it be effective against viral diseases. Crude penicillin will also have other limitations. Batches will tend to be highly variable in all but the best laboratories or hospitals. There will have to be a continuous production line because without refrigeration, penicillin loses its potency fairly rapidly over a span of about two weeks. Even with refrigeration the maximum lifespan will be measured in weeks, not months. There will be a constant need to maintain sterile conditions to prevent contamination. Hence either autoclaves or dry heat ovens will be required.

Crude penicillin production, however, will be much more likely to be attempted and utilized than sulfanilamide and chloramphenicol production outside the USE. Technologically speaking, it is much closer to the typical activities attempted by down-time medical practitioners of all kinds. Crude penicillin production will foster the development of sterile procedures, instrumentation, glassware and microscopes. As technology improves, the work on crude penicillin will set the stage for purification of a pure product that can be used internally through the use of injections or IVs. It will also foster investigation of the soil for the complete cornucopia of organisms that are part of the modern arsenal of antibiotics.

Now the crucial question, of course, is can a hospital or laboratory produce enough crude penicillin to serve a population of thousands? Evidence fromHawaii in 1945 seems to indicate that this is indeed possible [4, 47]. InHawaii approximately forty liters of crude penicillin filtrate were being prepared every week. This was enough for 16,000 dressings and this amount in turn was enough to serve 100 physicians aroundHawaii as well as any ship or naval depot that required the product. Given the likely per capita ratio of doctors in 1945, this was sufficient to serve at least 100,000 people. Given the necessary incubation period for maximum yield, maintaining this level of production on a weekly basis probably requires somewhere in the vicinity of 500 to 600 liter bottles or containers. This certainly seems doable within the context of 1632, especially given the resources that were expended on hospitals by many urban centers.

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Herd Immunity

By Vincent W. Coljee

Life, disease

And

Death in the 1630s

Imagining life in a small town inGermany in the 1630s is difficult for the average twenty-first century dweller. Picture awaking from an interrupted night's sleep, courtesy of the local swine brawling in the alley below your bedroom window. Extracting yourself carefully from between the siblings sharing the bed with you, you arise and count your bedbug bites.

This may sound crude and uncivilized, but they were the plain facts of awakening in that day and age. Bedbugs, communal sleeping, bedpans, contaminated drinking water and lack of personal hygiene were commonplace, depending on where you lived. This also meant that disease was rife, childhood mortality was through the roof, and overall life expectancy inGermany during the Thirty Years' war was less than that of the Roman era.

In the cities, the death rate usually exceeded the birth rate. It was in the cities that epidemics of plague, typhoid, smallpox and many other diseases ran rampant. For example, the plague hit the city ofAmsterdam multiple times in the 1600s. This caused a loss of about twenty percent of the population each time the plague hit in 1624-25, 1635-36, 1655 and 1664.

Nonetheless, the population ofAmsterdam had grown from 60,000 in 1600 to double that by 1632 and to 200,000 by 1670. This was in spite of the loss to disease. That many cities grew in this period of history was due to immigration from other cities or from the rural population. Rural communities, while by no means healthy by twenty-first century standards, suffered less from the continued onslaught of disease

than the cities did.

Medical

treatment

On top of having a far greater chance of coming down with a disease, there were few remedies that were known to be effective for many of the diseases. Many people used folk remedies which were passed down along the generations or adopted from friends or neighbors. Some of these folk remedies survive to this day, such as chamomile tea for soothing the stomach and nerves, or willow bark tea as a pain reliever and to reduce inflammation.

Often, ingredients were picked because of the physical appearance of the source of the ingredient For example, walnuts were thought to have the "signature of the head." Some of these remedies were effective because at least one ingredient contained a suitable active agent (e.g., salicylates in willow bark). The problem then was with dosage control (a particular problem with the digoxin content of digitalis).

If Grandma's home remedy didn't work, you had to consult a medical professional. Regular doctors, trained at university, were often unavailable to most of the population.Cambridge andOxford universities, for example, graduated on average just one MD per year.

The MDs mostly learned "classical" medicine, based upon the Greek physicians Galen and Hippocrates. These ancient physicians emphasized knowledge of the "humors," which constituted the fluid contents of the body, such as bile, blood and phlegm. Disease was thought to be the result of an imbalance in the humors, which could be detected by studying the patient's bodily functions. Their prescriptions often consisted of purgatories, enemas and/or bleeding their patients, to "purge" the patient of the bad unbalanced humors. It must be admitted that their teachings went beyond this**,**and many aspects still make sense now, such as advocating a balanced diet.

Unfortunately, even Galen made mistakes. For example, in his time, vivisection or dissection of human bodies was forbidden and he studied his anatomy on pigs. This meant that the Renaissance anatomists ran into a few differences when they started their dissections of real human bodies. Nonetheless Galen's teachings were still adhered to, in spite of being wrong.

Worse, the MDs "cures" were often life-threatening in their own right. Consequently, the general population, even if able to afford access to MDs, might avoid them like the plague.

Consider Dr. Symcott's treatment of the younger son of the Earl of Bridgewater**,**who suffered an apparent stroke. Symcott describes blowing tobacco and sneezing powder up the patient's nostrils, putting mustard and vinegar in his mouth, administering enemas and suppositories, applying dead pigeons to his feet, holding a hot frying pan close to his head and finally leeches to his rectum. It is no surprise that the patient died.

When Symcott himself came down with gout, his brother, aLondon merchant, felt free to give him advice on how to treat it, thus exemplifying how much lay people held university trained doctors in contempt.

There were some notable exceptions, however. Graduates ofPadua ,Leiden andEdinburgh received more practical anatomy lessons than those who attendedParis ,Cambridge orOxford . Also, doctors trained in Arabic medicine tended to have a more rounded and generally more scientific underlying

education which included, for example, keeping instruments clean for surgery. Many of these doctors were either Jewish or recent Iberian Jewish "converts" to Christianity. Their superior track record led to them being retained as court physicians, even for the pope.

Aside from regular university trained doctors, MDs, there were numerous lay physicians. This is a catch-all term which includes barber-surgeons, midwives, herbalists (who include "white witches"), and even bath attendants and executioners. The lay physicians by far outnumbered MDs, and were more deeply rooted in the community. Many of these had practical experience which made them more effective than the MDs. Hence, they had plenty of patients.

Since the MDs didn't appreciate this competition, they did everything in their power to exclude the opposition. For example, a century before the Ring of Fire, in the aftermath ofColumbus ' travel to theNew World , there was a syphilis outbreak that hit—among other places—the papal court. Two court physicians, Torrella and Pintor, managed, with a varied degree of success, to treat this disease with metallic mercury, as well as other corrosive and abrasive substances, such as calcium oxide (similar to drain cleaner), ammonia and vitriol (acid).

One of the difficulties with using mercury was that it was a substance known to be used by many lay physicians in treating skinconditions. The MDs didn't want the lay physicians to be able to treat the skin lesions of syphilis. They pointed out to the powers-that-be that mercury has rather severe side effects which could impair the mental health of the patient or even kill him/her. Hence, they contrived that the "professional and safe" use of mercury would be the sole realm of the trained MD.

There were many women among the lay physicians. Treating the sick was one of the few niches a woman could work in, especially when left destitute by widowhood. This, combined with their common practical education in midwifery or in herbology, and the fact that they would charge far less, frequently made these women more successful in treating the sick than the MDs. Consequently, they were denounced by the MDs. In the 1630s, James Primrose, an English MD, published a pamphlet, "Popular Errours," which was very critical of female practitioners.

The tale of Madame Louise Bourgeois shows how much power the MDs had and how willing they were to use it against women practitioners, even when the MDs were in the wrong. Madame Bourgeois had been the royal midwife since 1601 when she attended the delivery of a French princess, the sister-in-law of the king, in 1627. There were six doctors present. When the princess died a week later, the "learned" doctors did an autopsy and laid the blame at the feet of the midwife, so as to exonerate themselves. The midwife, with all her practical experience, wrote a very extensive reply in defense of her reputation. She brought forth an overwhelming amount of evidence showing that the princess was suffering from a massive abdominal infection in her last trimester, but had no sign of that infection in her uterus. She completely refuted the doctor's claims that the princess died from having incompletely passed the placenta at birth. Scientifically and medically she was correct as far as we can evaluate the evidence through the eyes of history. The doctor's responses to her refutation of the autopsy report was little more than "Woman, you don't know your place, shut up or we shall try and get you killed." Such was the influence of the court physicians that the increasing attacks forced her to end her career at the French court.

This battle would continue until the MDs finally managed to achieve a virtual monopoly on "healing" during the Victorian era. Whether or not they were more successful at curing people by that time is debatable, but they certainly won the propaganda war.

How would the Ring of Fire

One seemingly small, but in fact huge, contribution Grantville would bring is a concept in modern science that is called the "Scientific Method." Originally, Descartes outlined the main tenets of this method in his 1637 book,*Discourse on Method* . One basic principle that is requested of anyone asking a question scientifically is to be objective. This is very difficult because virtually everyone makes assumptions of some kind and some of these assumptions inevitably end up being wrong. The scientific method further declares that any theory or hypothesis, a suggested explanation of a phenomenon, should be testable. The method involves a number of other principles, such as: "cause and effect" have to follow one another and plausible alternatives have to be eliminated.

For example, whether the active ingredient in willow bark extract, aspirin, does*not* relieve pain is a testable hypothesis. The experimenter would think about what factors, other than the aspirin, could affect the outcome. This would probably result in an experimental design in which one group of people (the treatment group) gets the aspirin and another group (the control group) gets a sugar pill.

All of the groups must be of people who are already in pain and are suffering of similar levels of pain. An example could be to test the relief of acute pain, such as after receiving an injection or chronic pain, such as from arthritis or migraines. The groups must be sufficiently large so that if there is a difference in outcome (pain relief or not) between the groups, the experimenter can fairly infer that this is attributable to the difference in exposure (aspirin versus sugar pill).

Ideally, the experiment is what is called double-blind. That is, the subjects don't know if they are getting the treatment or the control, and the experimenter who records the outcomes doesn't know which subjects get what, either.

If the treatment group exhibits more pain relief, and the difference is significant , then you can infer that the hypothesis that aspirin does not relieve pain is incorrect. That doesn't mean it is proven that aspirin relieved pain in the sense that a mathematical theorem is proven. Rather, it means that the probability that the difference was the result of chance variation in pain subsidence is very small.

Likewise, if there isn't a statistically significant difference between the two groups, that doesn't absolutely prove the hypothesis. Chance variation could have swamped the positive effect of aspirin if the sample groups were too small. For example, a study might only include four people. Two of these people get a sugar pill but still claim to have a degree of pain relief, as do the two people who had aspirin. This means there was no difference in the result. However, if one does these kinds of studies with hundreds or thousands of people, clear differences in the effectiveness of a drug as compared to a placebo can be shown.

Thus, when plausible alternatives have been disproved (in the practical, not the absolute, sense) and the cause and effect relationship seems reasonable, a theory can be accepted in principle. However, it remains a theory, so it is still possible to do more experiments to try to disprove it. That is why people speak of the "theory of gravity" and the "theory of natural selection" while for almost all scientists these are accepted as "scientific fact."

This leads to a natural confusion between what scientists and the public consider to be "facts." Since theories are formulated in a manner which could theoretically be disproved, they cannot actually be "facts" as the concept is defined in the English language. Unlike mathematics, where one can prove that two plus two equals four, nothing ever gets "proved" in science. So there are no facts, as such, in science.

That makes science an awkward tool, especially when countering critics who ask for proof. Even when providing overwhelming evidence, nothing is proved conclusively, the likelihood of finding evidence to the contrary merely diminishes.

While scientists are often good at their jobs of posing scientific hypotheses and testing them, they are not trained in communicating those results to the general public. Science, even in this modern era is often misunderstood and wrongly portrayed by the media, thus people in general have little idea of what science can and cannot do. This leads to the peculiar headlines of "Tomatoes Can Kill You," or "Broccoli Cures Cancer" and subsequent rushes to toss tomatoes out or buy broccoli supplies, to the despair of children everywhere.

So what can science do, if it cannot come up with absolute proof? Science does experiments which can be described in numbers and probabilities. For example, a number derived from studies into the effects of smoking is that men who smoke are twenty-three times more likely to get lung cancer. Another number is that the average life expectancy of smokers is about seven years less than that of non-smokers. These numbers are based on very large sets of data, including studies of literally millions of people, so the theory that smoking is bad for your health is considered to be very reliable.

The statements that you get to hear in the media that broccoli and carrots are good for you and to stay away from red meat do not usually provide the numbers that underlie them. In order to understand the numbers and methodology, one needs to understand statistics.

Statistics is the mathematical study of the collection, organization and interpretation of numerical data. Statistics can be arranged in many different ways depending on how one quantifies things and then separates the numbers (do you include or exclude people who have an allergy to aspirin, and such). Since most people find these kinds of numbers extremely boring and can never stay awake long enough to read or listen to what it is all about even when they have to, it makes for a confusing world. Even so, one isn't usually provided with the data itself by the general media, just a blanket statement of "fact." Thus, most people don't have the means to understand it. It doesn't stop people from drawing conclusions based on media hearsay, however, which will be discussed further in the section on vaccine scares.

One important scientific hypothesis unknown in the world of the 1630s was the "germ theory." It was still presumed in 1630 that "miasmas," bad smells, caused disease. When the plague hit the countryside in Northern Italy around the town ofPistoia in 1631, the learned medical doctors were asked for their opinion as to what to do to prevent its spread. Their sole advice was a prohibition of silkworms and the production of raw silk in town. Since silkworms produce foul odors they were considered very suspicious. Plague is known in our time to be caused by a bacterium carried by lice hopping a ride on rats. The town officials took much more drastic measures, and managed to keep the plague at bay through a very strict quarantine. When commercial interests conflicted and greed overcame fear, the increase in trade also increased the spread of the plague.

Bacteria are invisible to the naked eye, but can be seen with light microscopes. Anthony van Leeuwenhoek would extensively report on them by the 1670s. The connection between bacteria and disease was not made until much later. The question of where these little "animals" were coming from gave rise to two theories, spontaneous generation (germs materialize out of thin air) and the germ theory (germs make more germs). Pasteur concluded that the spontaneous generation idea was unlikely in the 1860s (note, we cannot not say disproved since we cannot prove a negative). He showed that sterilized media did not get bacteria or mold to grow in it, unless the bacteria or mold were introduced to it. Thus the germ theory became accepted. It was not until much later that overwhelming evidence was provided for the germ theory through the effort of many scientists in many different countries. This research

culminated into Koch's postulates.

Koch's postulates, developed in the 1880s and 1890s, set forth an experimental framework for collecting evidence that a particular organism (pathogen) is responsible for a disease. The postulates (what the experimenter is attempting to "prove") are:

1. The organism must be found in all animals suffering from the disease, but not in healthy animals.

2. The organism must be isolated from a diseased animal and grown in pure culture.

3. The cultured organism should cause disease when introduced into a healthy animal.

4. The organism must be re-isolated from the experimentally infected animal.

However, it is not in fact necessary to prove all four postulates to establish causality.

What are Pathogens?

Pathogens are endoparasites, that is, organisms which enter your body and adversely affect human health. They are the creatures, "bugs" or "germs," that make you sick, and include both organisms invisible to the naked eye (viruses, bacteria, yeast and protozoa) and larger organisms (especially worms and insects). Other organisms are not pathogens themselves, but are important as disease vectors (they carry the pathogen from one host to another.

Pasteur, among others, hypothesized that germs caused disease. In the last century and a half, research has shown that for many diseases a bacterium could be isolated that was determined to be causative for the disease. Bacteria are small single-cell organisms that are all around us. A square inch of skin will have millions of bacteria on it. Bacteria are the most abundant organisms on the planet. The overwhelming percentage of bacteria are harmless to people and some are beneficial. A small percentage (less than one percent) of different types of bacteria can be harmful.

Still, there were a number of different diseases such as smallpox, measles and rabies which seemed to be infectious diseases, but for which bacteria were never found to be the pathogen.

It was shown by Dmitri Iwanoski and Martinus Beijerinck in the 1890s that you could pass an extract of contaminated material through filters which could retain the smallest known bacteria, and you were left with a fluid which was still infectious in animals. The first scientists to show that filterable agents were connected with human disease were Landsteiner and Popper in 1909.

Later, using electron microscopes (first built in 1911) which can magnify objects much smaller than those detectable by light microscopes, viruses were found to be the pathogens responsible for many of the mystery diseases. Since electron microscopes won't be feasible for some years, to some degree the down-time doctors are going to have to take statements about viruses on faith. That is, we can't show them the viruses. However, we can show them that filterable agents carry disease.

Viruses lack some of the traditional attributes of organisms. Viruses cannot replicate themselves without infecting another cell. They reproduce, but need a host cell to do so. Likewise, they cannot metabolize on their own, and they lack a cell membrane. On the other hand, they engage in genetic transmission of information, and, like bacteria and protozoa, can cause contagious disease. Most viruses are harmless to

human health because they lack the capacity to infect and survive in human cells.

Viruses consist of a protein shell which contains some genetic material. This can be either Ribonucleic acid (RNA) or Deoxyribonucleic acid (DNA). The individual building blocks, called nucleotides, of the DNA and RNA of viruses are chemically the same as the nucleotides of the DNA and RNA of our own cells. DNA and RNA are the carriers of genetic information; they describe the cell's proteins by means of a particular sequence of nucleotides. The DNA remains in the nuclei, and acts as the master blueprint. Enzymes transcribe this information, synthesizing a "messenger" RNA equivalent which acts as the working copy of the instructions. The RNA passes into the cytoplasm, and there other enzymes assemble amino acids into the corresponding protein.

Viruses subvert the metabolic machinery of the infected cell, causing it to replicate the viral genetic material, express viral proteins, and assemble and export viral particles. The viral genetic material contains genes encoding, e.g., the viral coat proteins. The number of viral genes is usually small relative to that of a bacterium or protozoan.

A slight chemical difference between RNA and DNA makes RNA less resistant to physical and chemical attack. And because cells use a particular RNA transcript for just a short time, they are less likely to have elaborate enzymatic mechanisms for "proofreading" RNA. Hence, RNA viruses tend to have less genetic material, and that material is usually more prone to mutation. Since RNA viruses change more rapidly, they are harder to immunize against, and also more likely to "jump the species barrier**.**" That is, a bird influenza virus can become a human virus.

A parasitic disease is a disease caused or transmitted by an animal parasite. Malaria, amoebic dysentery, trichinosis, tapeworm infestations, and sleeping sickness are examples of parasitic diseases. Most parasitic diseases are no longer of much concern in the developed world since they are not very prevalent. In developing nations and inEurope of the 1630s, parasites are very common.

During the 1630s, there were many pathogens on the loose in the human population. Having an idea of the germ theory and thus knowing what is causing disease, allows the deployment of various effective means to fight disease. The first and foremost would be improvements in sanitation. As Ben Franklin said, "an ounce of prevention is worth a pound of cure." Some of this may seem simple in principle, such as getting people to wash more frequently, boiling water prior to use as drinking water and not to dispose of human waste in the streets. However, it was not uncommon for people to wash the parts of their body which were visible in public. People washed their hands and face daily, and the relatively high number of drownings, beyond an inability to swim, may in part be attributed to their desire to wash in a river, canal or ditch. It is debatable whether that superficial cleansing would aid their general health when that same river, canal or ditch was also the main thoroughfare for sewage.

The progressive influence of the Ring of Fire would hopefully lead to improvements in sanitation by civil engineering projects to build sewage systems, clean drinking water supplies, and eventually, sewage treatment. Prior to that happening, making vaccinations to the more common and deadly diseases universal would make a major difference.

Vaccinations

What precisely is a vaccination? Vaccination (also called immunization) is the process of administering weakened or dead pathogens to a healthy person with the intent of conferring immunity against a targeted form of a pathogen. The weakened or dead pathogens will still have some of the features that live

dangerous pathogens also have. These features, also known as antigens, are often distinctive of that pathogen, and thus can be used for identification, much as fingerprints are for people. If, when independently administered to a host, they still elicit an immune response—that is, activate the same body defenses as are activated when that antigen is presented by the original pathogen—they are called immunogens, and may be used in vaccines. In essence, vaccines cause the body to prepare against a pathogenic attack before it actually occurs.

When a person is given a vaccine, s/he will have an immune response against it, even though the weakened or killed pathogen is unlikely or unable to cause the disease. The immune system, over the course of two to three weeks, will develop cells (B-cells or more specifically called plasma cells) which produce antibodies against the antigens present in the vaccine.

Aside from B-cells, the human immune system has several other weapons to fight germs. There are a group of cells called T-cells which can be trained to recognize specific antigens similarly to B-cells. Instead of making antibodies, T-cells can directly bind in a lock-key manner with specific antigens. They can then ingest the antigens, and if the antigens are part of a virus or bacterium, swallow it whole and digest it. Beyond B-and T-cells, human cells make their own antibiotics, and have some cells, called natural killer cells, which behave as the computer game Pacman and just go out to gobble up anything that antibodies attach themselves to.

Microbial (including viral) pathogens can be weakened (attenuated), so they are less virulent to humans, by progressively adapting them to a new environment (a tissue culture) which is less like that of the human body. The advantage of attenuated vaccines is that they are very good in producing immunity. Unfortunately, they can still cause the disease (especially in individuals with weak immune systems), and they can evolve back into an non-attenuated form.

Pathogens can also be inactivated (killed) by physical or chemical methods. The advantage of the killed organism vaccine is that if the inactivation was complete—all of the organisms are dead—then there is no chance of contracting the disease as a result of the immunization. (Of course, if you miss some, then you are exposed to the fully virulent beastie.) The disadvantage is that the killed organism may be only weakly immunogenic.

How does vaccination make a difference in human health? Apart from enabling individual people to survive otherwise deadly diseases, once enough people in a community have been immunized, that community as a whole will also have resistance to the disease. This is called "herd immunity." Depending on the disease virulence, i.e. how easily it can spread from person to person, herd immunity can protect even those individuals in the community who are not immunized because there is no one in their surroundings who can spread the disease to them. This can have a very significant impact on infant mortality.

How difficult is it to create a vaccine? For that question, we first need to take a step back in history and see how vaccines used to be made. Second, we can use modern knowledge and experience to ensure that any new vaccines made in the Ring of Fire world would be safer and more effective than those that were tested and developed early in our own history.

Historical

Vaccines

Normally, when we get infected with a pathogen, we get sick. If it doesn't kill us we build up immunity which provides us with a very good defense against that disease should we encounter it again. However, this defense doesn't necessarily last a lifetime. Depending on the disease, protection can be for as little as a few months. This is because the human body can build immune defenses for the short, medium and long haul. For some reason, which modern medicine is still trying to determine today, we get some diseases and our immune system forgets we ever had them. Even immunization against them is relatively ineffective. Usually we don't even try. We merely provide relief for the symptoms and fight the disease with other medicines. Most diseases, however, elicit a longer term immune response. Some immunizations do last a lifetime. In the modern world we generally receive many shots while we are children that are meant to provide lifetime protection.

The first reports of vaccination appear in the western literature in the beginning of the 1700s. This involved collecting a pustule (pock) from a patient who had a mild case of smallpox and applying the pus extracted directly into an open wound on the leg or arm of a person wishing to be immunized against smallpox. This practice, initially called grafting or inoculation, came to be known as variolation. It should be noted that, outside the Western world, no wound was made to apply the pus to. A minimal drop was placed on the skin and the location was merely scratched with a blunt needle, very similar to how vaccinia is still provided today. The "learned" doctors again had to "improve" on the matter by preparing their patients by bloodletting, purges and other nasty ways of making a person suffer prior to making deep incisions and placing in large quantities of pus. This caused much more severe disease and even outright smallpox among their victims. The last royal Briton to die of the disease was the four-year-old son of George III in 1783. His father had survived the disease, but his son didn't survive the doctor's inoculation.

These first reports of variolation at the London Royal Society are derived from two foreign fellows of that society who had observed the technique in theOttoman Empire . The medical establishment was rather disdainful of the technique, but it had the support of Lady Mary Wortley Montagu, the wife ofBritain 's ambassador to theOttoman Empire .

It should be noted that variolation has a much longer history in many parts of the world. It was a prevalent technique used in Africa and the Ottoman Empire as well as inChina andIndia . The thought behind the practice was simple: if someone*had* a mild case of smallpox, transfer it to someone else and they would have a mild case themselves. The reality was somewhat different. Smallpox can be highly lethal, with around a thirty-percent mortality rate for those who catch it from others. Almost everyone who recovered was seriously scarred. In men, infertility after smallpox was common. It normally was transmitted through person-to-person contact but could also be transferred by air.

The smallpox virus present in a ripe pustule was mostly dead, in that it generally consisted of fluid containing partially destroyed virus particles surrounded by active immune cells already fighting the virus. This, as well as the indeterminate amount of time between harvest of the pustule and infecting a healthy individual on the skin, allowed for a greatly weakened infection. The patient would get a large pustule at the site(s) of incision. After a period of about eight days, a fever would appear as well as small red marks (on average between ten and one hundred) on various parts of the body, most close to the site of variolation. The fever would usually break within two days and the marks would develop to small distinct smallpox pustules, which would mature and heal without leaving a distinct scar in the two weeks that followed.

Variolation was also performed in theBritish Isles and was happening right under the noses of the learned MDs and they never even noticed. It was practiced by lay physicians and midwives in the countryside and was passed along in various rural communities.

Smallpox was a constant major killer inWestern Europe in the early modern period that Grantville landed in. It was a childhood disease in that people tended to catch the disease before the age of five. Of children below the age of five who did get it, about forty percent died. Adults, while also vulnerable, had a much better chance of survival. Variolation increased life expectancy inEngland by about ten years—a large jump. No major reported vaccination of another disease took place in the 1700s. Under influence by a campaign started by Jenner, variolation was phased out in the Western world in the 1840s and replaced with vaccinations of cowpox instead. Cowpox is a virus related to smallpox but has adapted to infect cows. Because the virus is more at home in cows, it doesn't tend to make people ill when given as a vaccination, but because it is related to smallpox it does prepare the immune system of those vaccinated with cowpox for infection with smallpox.

To go into additional vaccine development, it is necessary to mention Pasteur again, as he is credited with the discovery of immunology. This is the science that describes the process by which our bodies defend ourselves against pathogens. His discoveries consisted of making weakened strains of several diseases, anthrax and rabies among them, and using these to immunize cattle and people. In honor of Jenner, who had coined the term "vaccine" for the immunization of people against smallpox using cowpox, Pasteur coined the term "vaccines" to generally denote artificially weakened strains of pathogens used for immunizations. His first vaccine, for chicken cholera, was made by accident. His assistant, Charles Chamberland, was supposed to inject some chickens prior to vacation, but did not. When he returned a month later, Chamberland proceeded to inject the chickens with the month-old culture. Instead of coming down with the deadly disease, the chickens were only mildly ill. Re-challenging these chickens with a fresh culture of chicken cholera did not cause disease in these chickens because they had been immunized. Pasteur laid the connection between using a weakened or dead pathogen and achieving immunity without disease.

Today some vaccines are still made from weakened or dead pathogens. This process is highly regulated by health authorities such as the American FDA. It has a very high profile because of the vaccine scares among the public in the past few decades. However, there are newer vaccines which don't use a whole organism at all. Instead, they are what are called subunit vaccines. These can be fairly crude (e.g., the membrane, or protein, or polysaccharide fraction of the killed organism) or highly characterized (e.g., a particular immunogenic protein made by recombinant DNA techniques). The design and manufacture of subunit vaccines won't be possible in the immediate post-RoF era.

Vaccine

Scares

In the past decades there have been two vaccine scares which have kept people from using vaccines, first in the 1970–80s with DTP vaccine (diphtheria, tetanus, and pertussis) second in the 1980–90s with MMR (measles, mumps and rubella). In each case, the media failed to grasp the relative danger of the vaccine compared to the damage that the disease causes. What people clamor for is proof of safety. Misunderstanding of how science or the immune system works causes problems. The scientists either fail to explain these correctly, or more likely, the media fail to report them correctly. While science cannot offer one hundred percent safety, it can provide percentages. These numbers have been able to overwhelmingly describe the safety of vaccines.

Doctors and nurses, including those in Grantville, are acutely aware of the power of vaccines in the prevention of disease in individuals and the ability of vaccines to provide herd immunity for the community. They would have to be certain to explain the "facts" of how vaccines work very clearly, once

they are in the 1630s.

Vaccines work by stimulating the immune system, the full process of which can take three or four weeks for a first immunization. Should someone already have a disease, and they are vaccinated after getting infected, the vaccine will not help them. There are many people nowadays who still believe that getting a flu shot actually gives them the flu. Personally, I have heard claims of people saying that they had a case of the flu within a week of vaccination. Considering that most people call any kind of sniffle the "flu", and how common the common cold is, I know what I suspect rather than the flu shot.

People from Grantville will have to be very clear in how they describe what vaccinations do and how they work. With exception of the rabies vaccine, vaccines can only work preventively. Thus if they go into a community, vaccinate against diphtheria, and the very next day people are already dying of it, they were too late for those people who had already contracted the disease. When people die, responses are often not rational and reasons are sought. In the world of the 1630s, inEurope , the hand of God was seen everywhere by many people. Given irrational responses the world wide throughout history against vaccinations, any vaccination program initiated by Grantville would have to be a program of information at least as much as medicine.

Grantville has arrived in the 1630s

. . . now what?

Grantville is in luck. Aside from having two active doctors, eleven registered nurses, and a confusing number of EMTs, they also have three retired MDs. In addition, among the first people they run into is Balthazar Abrabanel, a Jewish court doctor, although he was suffering from a heart attack at the beginning of the tale. By the time the town meeting at the high school's gymnasium was called, Grantville had been in 1631 for three days.

One of the aspects not discussed in the subsequent chapter is what James Nichols as head of the "Medical and Sanitation Committee" would be setting out to do. I would very much assume that he and the committee would be extremely busy. We have assumed that Grantville was lucky, and among the refugees to pass by them in the first few days there were none with plague, typhoid, cholera, smallpox or any other deadly debilitating disease. Were they not to have been so lucky, the 1632 history line would be somewhat more depressing, since a large percentage of people described in the stories would never have made it. Many diseases could have been controlled by forcing improved sanitation on the part of down-timers (as described in part in 1632), in addition to quarantining people with disease. Many other aspects of modern know-how on sanitation, the rapid development of one or some of the antibiotics, such as Chloramphenicol and knowledge of epidemiology would allow for rapid responses to health care crisis. The prevention of large scale outbreaks of disease is one of the means that the committee would respond. For example, developing means to prevent a smallpox outbreak among the up-timers would have had to be dealt with immediately.

Smallpox

A description of theBoston smallpox epidemic of 1721 may serve as an example of what Grantville could expect should it not take action. In 1721,Boston had been free of smallpox since the epidemic of 1702.Boston had a strict quarantine rule for incoming ships. Each incoming ship was inspected for the

presence of disease. If any member of the crew showed symptoms of disease, the ship was anchored next toSpectacleIsland , at the far end of the harbor.SpectacleIsland had a hospital where sick crew members could be treated. No member of the crew was allowed ashore inBoston until three weeks after everyone was symptom free. This method was effective. The previous October, a ship coming in fromLondon flew the yellow flag, indicating disease on board. The ship only had eight people on board who had not had the disease. By the time they reachedBoston harbor, seven had come down with it. They were fortunate in that only one had died and had been buried at sea. The last person who had not shown signs of the disease until reaching the harbor was Captain John Gore, aBoston native. Three days later he came down with the disease and a week later he died. By staying out of town, choosing not to see his wife a last time, he saved the city from a smallpox epidemic.

The next yearBoston was not to be so lucky. When a large fleet came in from theCaribbean , ships were processed as usual by the harbor authorities. They were cautious since there were smallpox epidemics ongoing in bothLondon andBarbados . There was one oversight in the regulations. It didn't apply to naval vessels. The captain of the Seahorse, the Royal Navy escort frigate for this convoy, was much more interested in claiming prizes and capturing pirates than he was in health. He failed to report, and claimed ignorance of, widespread smallpox among his crew. He instead claimed he suffered from "massive desertion." Within weeksBoston , a city of about 11,000 people, started to suffer from a smallpox epidemic. In the end, there would be 5,759 cases of which 848 died.

When, during this epidemic, aBoston lay physician, Zabdiel Boylston, who had been trained first by a Dr. Cutler inBoston and later as an apothecary inLondon , started using the practice of variolation, he met with fierce resistance from the official medical establishment in the city. As Dr. Cutler's assistant, he had seen the vast devastation that smallpox left behind in the community before catching it himself and having to fight for his life in 1702. He helped variolate 287 people during the 1721 epidemic, among which were his own children. The opposition was so fierce that he was nearly arrested, crowds were instigated against him and he came close to being lynched. Of the variolated people, six died, most likely due to having caught wild smallpox prior to variolation.Boston was particularly vulnerable to a smallpox epidemic because so many of its citizens had not had the disease. Grantville may be in even greater danger.

But one could say "so many people have been vaccinated in Grantville, why would smallpox harm those?" The answer is two-fold. First, all routine vaccination with vaccinia stopped in 1972 in theUSA . The most recent people to be vaccinated would have been members of theUS armed forces where the practice was stopped in 1990. Most people born after 1972 are unvaccinated, thus herd immunity would be very low.

A second complication is that vaccinia does not necessarily provide lifelong or complete protection against smallpox. This is unlike survival of actual smallpox which does confer lifelong protection. So Grantville's population lacks herd immunity to smallpox.

This is literally asking the "speckled monster" to strike. Smallpox inWestern Europe in the early modern era was endemic (around all the time). People very rarely had a chance of living their lives without encountering it. Among the refugees, camp followers, armies or cities nearby, there would be active smallpox. It would be only a short time before Grantville would come into contact with smallpox, and this would call for a drastic response.

Dr. Nichols was present at the shootout with the mercenaries at the farm right outside the Ring of Fire on the first day. He would not have failed to notice that among the dead mercenaries half or more of them would have shown the telltale signs of smallpox survivors. The question would be whether he and the other medical experts from Grantville would know and realize the lack of herd immunity to smallpox. It is

very likely that they would. Would they also know that a booster would be the better gamble than to count on thirty-year or older immunization? Again, it is very likely that they would. They would certainly know that the half of the population born after 1972 has no immunity whatsoever.

Grantville will not have any supply of vaccinia. It is unlikely that any cow present in Grantville will have cowpox, and horsepox, also known as "grease," was as extinct as smallpox in the time Grantville came from. That means the source material for the vaccine must come from down-time territory. What source material would they go for? It is unlikely that any of the up-timers have much background in making vaccines. They would have textbooks and perhaps some more detailed medical articles from Doc Adams or one of the retired doctor's archives, but none would likely provide a precise description of how to formulate such a vaccine from source material.

The question becomes whether to formulate the vaccine at all or take a more primitive approach. Here**,** Balthazar Abrabanel may be helpful. He may very well have known about variolation (inoculation with attenuated smallpox), and may even have practiced it, considering his contacts in theOttoman Empire . Among the up-timers, there would be some knowledge of variolation.

Modern knowledge about the germ theory could make variolation a relatively safe option, with two possible careful modifications. One modification would be to take the source material, fluid/pus from a smallpox pustule**,**and to lightly heat it (at 60° C for an hour would do), thus further inactivating it. This is possible with the available technology. The heat-treated viral material, would likely still be capable of inducing immunity, but would not be as likely as the traditional variolation material to spread live smallpox or to induce the other possible complications seen with variolation. As it would be a mostly disabled virus, all members of the community could be variolated.

This would be started with those members of the community who had most recently been vaccinated. These would also be the people who would have to be used to greet incoming refugees and screen them for possible quarantine purposes. One advantage would be that by variolating these previously vaccinated people, their blood will be rich in antibodies to smallpox after the variolation. They could donate a pint or less of blood and their plasma would serve to protect those few people who may come down with complications or show signs that they may become more ill with smallpox. This form of passive immunotherapy is called an enriched immunoglobulin. In this case the blood donated is enriched for antibodies/immunity against smallpox. Giving this plasma will provide people with some immunity against smallpox that will last for about one month. Smallpox elicits a stronger immune response than cowpox. While cowpox immunity may not last or offer complete protection, smallpox immunity does. A single variolation would be sufficient for a lifetime and the up-timers and their children will need it.

Should Grantville be so lucky that smallpox is not present in their area ofGermany at the time that they landed, they are provided with an additional option. The technology required to vaccinate or variolate the Grantville population is very minimal. Given their knowledge of vaccination they could go out and look for cowpox or grease and provide people with a primitive vaccination based on these pathogens. Another source, possibly known to the veterinarians of Grantville, would be the cats of theNetherlands . Cowpox and grease are viruses closely related to smallpox virus that are adapted to organisms other than people. While people can be immunized with these viruses, the chances of becoming seriously ill are much lower than with smallpox virus. If they should follow such an inoculation by variolation, the whole population could be safeguarded at a relative minimum level of risk.

So Grantville has fought its first major enemy and won an overwhelming victory. It has defeated the greatest scourge in the history of mankind. They took a risk, and decided to go with the aggressive, but in the end safest, route and everyone in the community has been variolated aside from the youngest babies who will undergo the procedure by age two. Herd immunity should function to keep those little ones safe

to begin with. A procedure has been set in place to continue the practice on incoming refugees to keep it that way. This would involve a quarantine for the set period (about two to three weeks) while they are building up their immunity.

After beating smallpox, the medical professionals of Grantville can congratulate themselves and after a great sigh of relief start to lose sleep again over the many other diseases they face.

Plague and Other

Nasty Bacteria Vaccines

Herd immunity in Grantville will be very high to those diseases we in the modern era are almost all immunized against. Measles, mumps, rubella, polio, pertussis, tetanus and diphtheria would not be a problem to start with. But diseases which currently are virtual unknowns in the developed world, such as typhus and plague**,**will find up-timers fertile ground if ways to protect them are not designed. Even with quarantines, eventually one or another of these diseases will hit. Making antibiotics would be trying to cure the disease after it hits and there will be plenty of cases where up-timers will need those drugs when they won't even know what is hitting them. But for several well-known diseases it would be possible to make whole-cell vaccines and provide immunity. These whole-cell vaccines would be less safe than current vaccines and would likely have more side effects, but they would work. From a community perspective, the safety they would provide would by far override the side effects, such as fever or sore arm at the injection site.

Using very basic bacteriology techniques, presented in any introductory bacteriology book, the bacteria causing the most dangerous diseases could be isolated, verified and grown. Many of these diseases have very clear symptoms. Samples can be taken from carriers of the diseases among the refugees or from the nearby towns. In these samples, the bacterium causing the disease would be present. These will be grown, isolated and a single type of bacterium selected. This bacterium would have characteristics similar to those described in the medical textbooks as to what the disease bacterium looks like. Finally, however horrible it may sound, it would be used to infect healthy animals, likely mice or rats. (This is an application of Koch's postulates.)

Once it is verified that this bacterium does cause the disease, it can be prepared for the vaccine. These bacteria can be grown in a large batch, isolated and heat-killed. It is easy to verify whether or not any bacteria survived. These "dead" bacteria are tested to see if they are truly dead by growing them. It is then tried out on another batch of animals. If the animals get sick, go back and repeat the process. If the animals don't get sick, the animals will then be challenged with the real live bacterium and see if they now survive. Once the effectiveness is ascertained, these dead whole-cell bacteria can be used for vaccinations.

There are reasons why using these whole dead bacteria cell vaccines would work. Bacteria have special components on their cell walls. These are related to the sugar people put in their coffee or tea but are chemically a bit different. Our immune system can tell this difference and responds very strongly when exposed to these kinds of sugars. That is why these whole cell vaccines would be able to provide very good protection. Standard vaccinations against plague, typhoid, and typhus would seem entirely obvious. These are especially necessary for people who need to dwell away from Grantville in large cities such asAmsterdam ,Venice ,Rome ,Paris andLondon .

"Normal"

vaccines

How would the Ring of Fire world go about regenerating the vaccines we are using currently? Would it be necessary? Would it be possible and what would it take?

Measles is a disease virtually everyone would get as a child prior to the vaccine against it. It kills about one in a thousand infected children. The symptoms begin with a cough, a rash, runny nose and fever. It often progresses to severe dehydration and five percent of children get pneumonia. The measles vaccine is given as a combination shot with mumps and rubella (German measles). Measles at the time of the Romans was a much more virulent disease and was known to kill at a similar rate to smallpox. People have either adapted or it has adapted to people to be more "benign."

Measles, polio, mumps, rubella and varicella (chickenpox) vaccines all consist of weakened viruses created in the lab. The easy option would be to save some of the vials that Doc Adams likely has and use it as a starter to culture these weakened viruses. Otherwise, to make the vaccines, a sample needs to be taken from the throat of an infected child, cultured in tissue culture in the lab in human or animal cells; historically this was done in chicken embryo cells or human embryonic connective tissue cells.

In the Ring of Fire universe, it may be a while before tissue culture (sterile growing of cells in petri dishes) that could produce these weakened virus strains will be possible. But when it does become possible, a very similar route will lead to a very similar result. By culturing these viruses in tissue culture, they become adapted to living under those conditions. Only those viruses which adapt, literally change their genetic blueprints to function better in tissue culture, will survive. When this is done to generation after generation of viruses, the viruses lose their ability to replicate and survive well in people. They are then ready to function as much weakened sparing partners for the children's immune systems to train themselves on. Given the effort and up-timer knowledge, making these vaccines in a crude form would be feasible within five to ten years of the Ring of Fire.

Hib (*Haeamophilus Influenzae*B), MenC (*Neisseria meningitidis*) and pneumococcal vaccines are against three different bacteria which cause either encephalitis or meningitis. The vaccines for these diseases may be among the hardest to reproduce. They are made by linking the special sugar groups which thepathogens have in their cell walls to a carrier protein. This combination allows children under the age of two to make, and to continue making, active antibodies against these sugars, which children are not able to do without the carrier protein. There is, however, a possibility of using a whole-cell vaccine again. Whether this would work well enough for the under-two age group is a question they would have to determine the answer to themselves.

DTaP (Diphtheria, Tetanus and acellular Pertussis vaccine) is a difficult case. This is actually a trivalent vaccine, that is, one which protects against three different pathogens by providing corresponding immunogens. The simple aspect would be to create a whole-cell pertussis vaccine. The tougher parts are tetanus and diphtheria. In both tetanus and diphtheria, the bacteria are not targeted**,**but rather the toxins these bacteria produce. It is the toxins which even in minute quantities damage human cells or nerves and can kill when these bacteria infect people. Usually these bacteria have trouble growing in people because we use oxygen and it is present in our tissues. Both of these two bacteria species are obligate anaerobic bacteria, meaning that they live only under conditions without oxygen. That would make it difficult to culture them without developing some equipment for it first. If that gets done, making the vaccine is relatively easy. The toxins are produced by the bacteria and expelled into the media they are grown in. The bacteria can be filtered out, the toxin inactivated by formaldehyde and the toxoid (inactivated toxin)

concentrated. This would be very dangerous because these toxins are extremely deadly.

Other

Vaccines

Making a rabies vaccine in a crude form similar to that of Pasteur is not very difficult. It involves infecting a rabbit, letting it get sick and then killing it, extracting the spinal cord, and letting it dry. The drying kills the virus and then bits of this can be injected many times over many days.

The flu vaccine, on the other hand, would be very difficult to produce. It is likely they would choose to go for more readily available and more likely targets first because it requires much more infrastructure to make effective flu vaccines.

Tuberculosis is a major killer. In 1632, it killed three times as many people inLondon than did smallpox. The current vaccine for tuberculosis is not used in theU.S.A. orHolland , but is employed virtually everywhere else and has been used since 1921. It does not appear to prevent tuberculosis in people but it prevents the most deadly form of the disease in young children about eighty percent of the time. This vaccine is made from bovine (cow) tuberculosis bacterium. When it was originally made by Calmette and Guérin, they weakened this bacterium by continuously culturing it in the lab for thirteen years.

Conclusions

Would people from Grantville use vaccines now that they are back in the 1630s? Personally, I can't see how they couldn't. It would go with their spirit to go out and try to conquer these diseases just as much as they set out to make themselves and their neighbors safe from Tilly's mercenaries. They are already armed with much knowledge: of the scientific method, the germ theory, statistics, epidemiology and even the nature of the enemies they are fighting. They would have it in their own hands. It is a choice to make between living in fear or actively fighting the demon who feeds that fear. Would the vaccines they would develop be as safe as they are now? Not likely. There is just so much less testing that could be possible with what they have. It is very likely that in this process there will be mistakes made and lives lost. But overall, the tally will be so many lives saved, not just in Grantville, but wherever they manage to teach that dying of certain diseases is a choice, not a certainty.

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ALL ROADS LEAD. . . .

By Iver P. Cooper

A seventeenth-century visitor might well think that all roads lead to Grantville, notRome , because down-time roads pale by comparison. "Captain Gars," riding on Route 250, noted its "perfect flatness," and considered it to be "the finest road he had ever seen in his life." (*1632*, Chap. 57). Rebecca Abrabanel likewise was amazed by the "incredible perfection" of the first up-time road she saw (*1632*, Chap. 5).

Those roads give Grantville a tremendous strategic military advantage, a force multiplier. "Moses and Samuel [Abrabanel] soon realized that the striking power of the Americans, dependent as it was on their dazzling motor vehicles, was somewhat limited in range. But anywhere within reach of the rapidly expanding network of roads surrounding Grantville, they had little doubt that the Americans could shatter any butEurope 's largest armies."

Highways are also important economically. Adam Smith wrote: "Good roads . . . by diminishing the expense of carriage, put the remote parts of the country upon a level with those in the neighborhood of a town. They are upon that account the greatest of all improvements." (EB).

It should be noted that in the early seventeenth century, long-distance overland travel is mostly by packhorse or packmule, not by wagon, because of the poor quality of the highways.

Not everyone will be in favor of improving roads. Innkeepers may fear that travelers will pass their hotel by and go on to the next town. Landowners in some parts ofEurope have the right to collect whatever falls from a wagon onto the road, and therefore are perfectly happy to see them overturn. (Forbes, 524) They may also not like to see the central authority exercised more vigorously in their locale, thanks to the improved access.

What roads exist may deteriorate as a result of weather conditions, heavy traffic, and neighbors who figure that it is easier to mine stone from the road than from a distant outcrop. And if the road nonetheless attracts business, then that will in turn attract highwaymen to prey upon travelers.

Up-Time Resources

Grantville is based on the town ofMannington ,West Virginia . That is one of four states in which there is no county or township ownership of highways. Hence, the West Virginia Department of Transportation is responsible for the maintenance of over 91% of the public roads in the state. ("West VirginiaHighways") The District 4 headquarters is inClarksburg , and there is a "superintendent" forMarionCounty . The history section of the City ofMannington website notes that "a WV Department of Transportation garage is located in Mannington which assures that our highways are the first to be taken care of during bad weather." For what is in that garage, see the "Road Construction Equipment" section.

However, the city ofMannington also has a Street/Water Superintendent, and presumably a street crew, responsible for the public roads not under state control.

The Grid indicates that Grantville has a "Streets and Roads Department," with eleven up-time employees. It is possible that most of these were originally employees of the WVDOT garage, but were quickly incorporated into the municipal government shortly after the RoF.

Of the "S&R" up-timers, two are listed as "heavy equipment operators," and another two as trainees. Then we have a dump truck driver, a maintenance scheduler, an equipment maintenance manager, a retired road maintenance man, a street foreman, and a record keeper (and an eleventh employee whose position is not stated).

Another six up-timers are listed as former employees of the state highway department.

* * *

The West Virginia Division of Highways classifies state roads by surface type as follows: (A) primitive, (B) unimproved, (C) graded and drained, (D) soil surfaced, (E) gravel or stone, (F) bituminous surface treated, (G) mixed bituminous, (H) bituminous penetration, (I) asphaltic concrete, (J) concrete and (K) brick (see Roadbuilding Addendum,www.1632.org, Appendix 1 for definitions). I have identified types A, B, C, D, and E, as well as paved roads representing one or more of types F–H, in the vicinity

ofMannington,West Virginia (list of roads in Appendix 2). These roads presumably have Grantville equivalents.

According to the map in the*1632 RPG Sourcebook* , twenty-one roads were cut by the Ring of Fire. Some of these will, coincidentally, be readily linkable to the surrounding German road network. Others will lead into the middle of nowhere. The latter roads may nonetheless serve a useful purpose; modern pavement structure can be studied there.

If these "orphan" roads don't include all of the important road types, then some judicious trench-digging (and subsequent repair) may be helpful for teaching roadbuilding and repair techniques to down-time apprentices.

Canon only identifies one up-time highway as being active in post-RoF Grantville. Route 250 runs by the high school, and in its vicinity parallels Buffalo Creek. It is described as a "well-built two lane highway," surfaced with asphalt, on which it is possible to drive up to fifty miles an hour.(*1632*, Chap. 2).

Named Grantville streets in Canon include Main (Goodlett, "The Merino Problem,"*1634: The Ram Rebellion*), Turnbull (Mackey, "The Essen Steel Chronicles, Part 1: Crucibellus,"*Grantville Gazette* , Volume 7),Clarksburg (home of the Inn of the Maddened Queen)(Id.), and High Street (government offices)(DeMarce, "In the Night, All Hats Are Grey,"*1634: The Ram Rebellion*).

Several down-time roads have been given "official status." According to canon, that means that they are "invariably widened and properly graded. Graveled too, more often than not." "Route 26" is a north-south road passing just west ofEisenach . Two miles to the north of the town, it is crossed by "Route 4" (*1632*chap. 52). We also know that the road from Grantville to the (fictional) Imperial City of Badenburg has been improved. (Huff, "God's Gifts,"*Grantville Gazette* , Volume 2). As of Eddie's trip, "the main road toMagdeburg was slated for improvement as an urgent priority," but had yet to undergo its makeover. (Weber, "In the Navy,"*Ring of Fire*).

Brother Johann (Wood Hughes, "Hell Fighters,"*Grantville Gazette* , Volume 3) crossed the Alps, and eventually took a road "down theElbeRiverValley towards where theSalleRiver joins its flow. There, he saw a road construction machine in action (it had a scoop on an articulated arm). "The road, from that point, became noticeably more level. It had a layer of crushed rock which had been packed in some way. Where washes had been there were now metal pipes to allow the water flow to go under the roadbed."

That road fed into the "'American road' (presumably the extension of Route 250 beyond the RoF) along the north shore of theSchwarzaRiver ."

I don't want to spoil Virginia DeMarce's story "Bypass Surgery" (*1634: The Ram Rebellion*) for those who haven't read it yet. So let's just say that roads play a prominent role in it.

* * *

The WVDOT garage, and perhaps alsoGrantvilleCity Hall , should have copies of at least some of the WVDOT manuals (possibilities include the Construction Manual, the Standard Details Books, and Standard Specifications—Roads and Bridges).

They may also have some of the publications of the American Association of State Highway and Transportation Officials (AASHTO). Many states base their highway design manual on the AASHTO "Green Book."

In the Grantville school and public libraries, most of the information on roadbuilding is in the encyclopedias. However, the public library does have a copy of Searight's*The Old Pike: An Illustrated Narrative of the National Road* .

* * *

It is clear that the S&R department is training down-timers to work on road crews. However, S&R is geared toward maintenance of existing roads, not design and construction of new ones. If highways are to be designed scientifically, someone will need to create the appropriate educational institutions. These can be specialized (in OTL, the world's first institute for road and bridge design was established inFrance , in 1747, see Hindley 75), or a part of a larger university.

According to the Grid, several individuals hold a bachelor's degree in Civil Engineering: Jere Haygood, Kimberly Jane (Collins) Glazer, Mason Chaffin, Derek Modi, Allen Lydick , Edward Monroe, Garland Franklin, Jacob Bruner, Ronaldus "Ron" Koch, and Farris Clinter; Mason Chaffin is the Grantville surveyor, in fact. While these individuals are going to be devoting quite a bit of their time to military projects, we can hope that on a rotating basis, they can teach civil engineering students inMagdeburg ,Jena or Grantville.

West Virginia University's undergraduate civil engineering curriculum requires students to take courses in Engineering Design, Engineering Economics, Thermodynamics, Surveying and Computer-Aided Design, Statics, Dynamics, Mechanics of Materials, Fluid Mechanics, Materials, Structural Analysis, Foundations Engineering or Earthwork Design, Concrete, Steel or Timber Design, Hydrotechnical Engineering, Soil Mechanics, and Transportation Engineering. The latter is described as "Integrated transportation systems from the standpoint of assembly, haul, and distribution means. Analysis of transport equipment and traveled way. Power requirements, speed, stopping, capacity, economics, route location. Future technological developments and innovations."

The students are also required to take two 400-level civil engineering electives. It is possible that one of them has taken CE 431, Highway Engineering, as an elective: "Highway administration, economics, and finance; planning and design; subgrade soils and drainage; construction and maintenance. Design of a highway. Center line and grade line projections, earthwork, and cost estimates."

We can assume that all of these individuals have kept their course textbooks. (I still have my chemistry books from the early seventies.)

Common Knowledge:

Roman Roads

For the seventeenth-century European, the "gold standard" for highways were certainly the Via Appia, Via Flamina, and other Roman roads. According to Nicholas Bergier (1567–1623), European peasants thought they were "the work of demons, giants, and fairies using magic arts."

Bergier was a French lawyer, living in the ancient town ofRheims (Roman Durocortorum). He pioneered the study of the Roman roads, eventually writing the influential treatise*Histoire des Grands Chemins de l'Empire Romain* (1622) at the command of Louis XIII. (Von Hagen, 14–15). It went through many editions, and copies are certainly available in down-time private libraries in the USE.

USE engineers can see the Roman roads for themselves, but only if they are willing to travel a bit. Thanks to the Teutonic victory at Teutobergerwald ("Varus, give back my legions!"), the Romans did not penetrate deeply intoGermany . The Romans fortified theRhineRiver , and Roman roads connected the garrisons along the west bank. Another Roman road ran along the Danube fromSwitzerland to the Danube delta, first along the north bank and then (crossing the river north ofMunich) along the south one. (Von Hagen, 18–19) This is shown clearly on a map in the modern*Encyclopedia Britannica* .

The most elaborate form of the Roman road was the*via munita* , distinguished by a convex surface (dorsum) of rectangular or polygonal blocks of hard stone (such as lava). The*via glareata* had a graveled surface, and the*via terrena* , one merely of leveled earth. The surface used depended on both the importance of the road, and on the availability of suitable local materials.

While the*via munita* structure may sound ideal, it actually requires a great deal of maintenance to handle wagons. Once one block sinks a little more than the others, perhaps as a result of settlement of the underlying soil, it will tend to be driven deeper by the shock of each passing wagon falling onto it. Hence, wheeled traffic demanded a softer pavement, such as one of earth or broken stone, which could be smoothed out readily. (Gregory 123–4).

The early imperial poet Publius Papinius Statius described the construction of the Via Domitiana in his poem "Silvae." (The first medieval edition was published in 1472.) According to Statius, the workers dug two parallel, widely separated, drainage ditches (*sulci*) and heaped the excavated material in-between (forming the*gremium* or*agger*). Curbstones were laid between the ditches and the elevated roadbed, and the latter was flattened. The other road layers were then laid on top of the soil.

There is some dispute as to the exact nature of those layers. Based, for example, on Vitruvius' description of pavement construction in*De Architectura* , Bergier believed that beneath the road surface were three other layers. (Ramsay; Gregory 66). The modern*Encyclopedia Britannica* accepts (without proper credit) Bergier's analysis, and describes the four courses, from top to bottom, as follows:

summa dorsum: large stone slabs at least six inches deep.

nucleus: about twelve inches thick, concrete made from small gravel and coarse sand (other sources say that this was made from broken pottery or bricks, cemented with lime).

rudus: about nine inches thick, concrete made from stones under two inches in size (other sources say that these stones were larger than those of the nucleus).

statumen: ten to twenty-four inches thick, stones at least two inches in size (other sources say hand size or larger).

However, some later writers have questioned whether the road structure was usually so elaborate (Von Hagen, 35; Chevalier, 86). InBritain , at least, stone surfacing was rare, and roads were made of gravel, flint, chalk, loam, and occasionally, as an underlayer, sandstone, limestone or iron slag. (Margary, 500–1).

Roman roads were elevated, sometimes as much as four or five feet over the native ground level. (Margary 20) This seems higher than necessary for drainage, and it has been speculated that it rendered marching troops less liable to attack—enemy forces could be seen at a distance, and would also have to attack uphill. The imperial highways were also more direct than what economics alone would dictate, and this too, was probably for military reasons, as again it reduced the risk of ambush. (Belloc, 134–7;

Hindley, 41).

Down-Time Knowledge:

Medieval

And

Renaissance Treatises

The modern*Encyclopedia Britannica* briefly mentions the work of Guido Toglietta (1585) and Thomas Procter (1607). Toglietta (1585) described a pavement system based on broken stone; EB characterizes it as an improvement on the Roman structure, but provides no further details. Forbes credits Toglietta with the modern-sounding conceptualization of the wheel as the "destructor" and the road as the "resister." Toglietta "describes the construction of cobble pavements, but favors a foundation of gravel carrying a road surface of stone, sand and mortar." Preferably, this surface is two inches thick. (Forbes; Borth 64).

Procter (1607) authored the first English language text on highway construction. EB doesn't state the title, but I suspect that our English correspondents will know it under the name "A profitable worke concerning the mending of highways."

Other treatise writers will become known to us only through consultation with down-time scholars. These authors would include Andreas Palladio (1518–1580), Vincenzo Scamozzi (1552–1616), and Castelli (1577–1644). From Forbes' brief commentary, it doesn't seem likely that they will do more than help us persuade the down-timers that drainage control is important.

Up-Time Knowledge:

Roadbuilding Innovations

from 1750–1850

In*1632* , Mike Stearns announced one of Grantville's strategies for survival: "Gear down, gear down. Use our modern technology, while it lasts, to build a nineteenth-century industrial base."

Amazing improvements were made in roadbuilding technology during the period 1750–1850, and the USE can readily exploit them. Before then, when roads fell into disrepair, rulers blamed it on the wagoners, and placed onerous restrictions on loads, wheel dimensions, and so forth. Nineteenth-century builders, notably John McAdam, urged that roads should be made to suit the vehicles, not the other way around (Reader, 131).

The modern Encyclopedia Britannica presents cross-sections of roads as designed by Pierre Tresaguet (1716–1794), Thomas Telford (1757–1834), and John McAdam (1756–1836). The overview which follows is based closely on that provided by EB, and leaves out some important details which are covered later.

Tresaguet's andTelford 's roads were what you might term "Roman Lite." Tresaguet's lowest course, eight inches thick, was of uniform stones set edgewise and packed together. He then laid two-inch thick layer of "walnut-sized" stones, followed by a one inch thick layer of smaller rocks.

Telford's lowest course, like Tresaguet's, was of set stone (seven inches thick according to EB). This was known to later builders as the "Telfordbase," although the EB makes it sound quite similar to that of Tresaguet. Above this came another seven inches of broken stone, the fragments being not more than two inches in size. This was capped by a one inch layer of gravel.

McAdam abandoned theTelford base, and indeed all reliance on set stone, and instead relied exclusively on eight inches or more of broken stone. He allowed the rocks to be compacted by traffic.

McAdam's methods were so successful that the compacted broken stone road is known as "macadam." Macadam is a great road surface for horse-drawn traffic, but it is not well suited, without modification, to automobiles. We will consider the design of macadam roads in more detail in a later section.

The first European asphalt and concrete roads appeared during the end of the century in question, but they did not come into prominence until automotive traffic forced their adoption.

Road Design:

Route

Ideally, roads would be nearly straight and nearly flat, while quick and cheap to construct. Unfortunately, the landscape usually doesn't cooperate. If the straight line path encounters a hill, the builder has three choices: ascend and descend it, curve around it, or cut (or even tunnel) through it. Departures from linearity may also be desirable in order to avoid a stream or marsh, or to follow a coastline, or to cross a river at a more favorable point for fording or bridging it.

Sometimes there was both a "high road" and a "low road" connecting two points, the high road being used when the lower one was too soggy to be traversed (Hulbert, 44–45).

Roman road engineers showed a predilection for the "military crest": a road just below the crest of the hill, on the slope facing away from the frontier, so as to conceal troop movements from the enemy. (Chevallier 89).

Road Design:

Drainage

Highway engineers say that the three most important aspects of road design are drainage, drainage and drainage. (U.Texas , I:45). Standing water turns earth into mud, of course.

Drainage typically involves such expedients as raising the road, road grading and camber (see below), longitudinal ditches (or gutters), culverts (so water runs beneath the road rather than over it), and subsurface transverse drainage pipes. (The latter were used byTelford , see Smiles 429.)

The drainage ditches should themselves be graded, so they are self-cleaning (U. Texas, 7), and it may be necessary to have them feed into a containment pond of some kind if the road is subject to heavy rainfall.

Roadbuilding Methods:

Crossing Marshy Ground

Hilaire Belloc opines that an extensive marsh is actually a much greater obstacle to overland movement, unaided by roadwork, than are forests, hills or even rivers. (Belloc, 14).

InBelgium ,Holland , andLower Germany , log roads have been used in swampy areas since 2500 B.C. (Von Hagen 178). American pioneers cut down trees of similar length and laid them in the direction of travel. The logs could be used whole, or split in half. (Hulbert 48–51, Luedtke)

The*1911 Encyclopedia Britannica*comments drily, "this is ridiculed as a 'corduroy road,' but it is better than the swamp." (A suitable saying would have been, "better logs than bogs.")

Instead of laying just one set of logs, the corduroy road can have two layers, for example, transverse logs over longitudinal stringers. (Hindley, 11–12; Von Hagen, 178, Modern EB). The modern American military has also built heavy corduroy roads, with three layers of crossed logs. (FM 5-436, Chap. 14). Pegs can be used, at intervals, to connect the layers. The purpose of the additional layers is not to increase the load rating, but to make sure that the surface doesn't sink below the mud.

The logs can be placed on loose branches, or on fascines (bundles of brushwood), rather than directly on the marshy soil. If timber is not available, one can use fascines by themselves, or together with sapling sleepers and binders. (Id.)

* * *

In the 1632 Universe, corduroy roads may be laid as access roads for logging operations in heavily forested regions, such as the Thüringerwald . Obviously, the logs are readily available, and the road needs to be maintained only so long as there are still trees left to cut.

The other major use of corduroy roads will be by the military. Corduroy roads were used extensively in the American Civil War. Writing about the siege ofRichmond , Joel Cook said, "Corduroy roads ran in all directions through the swamps, and every general had his roads leading wherever he wished." (Cook 273)

Likewise, a study of the Eastern Front in World War II said that "war could never have been waged in the vast swamp regions ofRussia had they not been made accessible by improvised corduroy roads." (CMH)

* * *

There are other ways of crossing swamps. Blind Jack Metcalf built roads over bogs by laying down gorse and heather in a criss-cross fashion, then spreading gravel over the bundles. This has aptly been termed "floating a road." (Albert, 137; Borth, 85).

Besides using simple corduroy roads, the Romans created elaborate swamp-spanning causeways, called

pontes longi (long bridges). The via Mansuerisca inBelgium was structured, from bottom to top, as follows: pilings with crossbeams, longitudinal joists, transverse logs, limestone paving cemented with clay, and finally gravel. (Chevallier 89–90).

Road Design:

Width

Traffic moves on what is technically termed "the traveled way" or "carriageway," and which may be divided into one or more lanes. The roadway is the entire width of surface on which a vehicle may stand or move, and thus includes both the traveled way and the shoulders (and any median strip). The road is the entire right of way, and thus consists of the roadway and the roadsides, from fence to fence.

Nonetheless, in this section, I will use the term "road" to mean the "traveled way."

The necessary width depends on what traffic the road will bear. The Roman roads were ten to thirty feet wide, with the norm being in the fifteen to eighteen feet range. (Hindley 42) Tresaguet and Telford both favored an eighteen foot wide carriage way, but theCumberland Road in theUSA had a twenty foot breadth. (EB)

The 1911 Encyclopedia states that fifteen feet is wide enough to allow the "easy passage of two vehicles;" plainly they are thinking of wagons rather than motor cars. According to the AASHTO "Green Book," the standard lane width for modern automotive traffic is 3.6 meters (twelve feet). However, rural roads can have widths as small as 2.7 meters (nine feet).

"Plank roads" (see below) were often constructed with a single lane, eight feet wide. One lane roads will need to have occasional turn outs to allow vehicles to pass each other.

The USE's roads need to be wide enough to allow the passage of its armored personnel carriers (APCs), which are converted coal trucks.

Road Design:

The Ruling Gradient

The ruling gradient is the average vertical grade as one travels along the centerline of the road. The grade is usually expressed, not as so many degrees of slope, but as a ratio of the vertical change to the horizontal one. For example, a grade of 1 in 40, which corresponds to a slope of 1.4 degrees, means that there is a change of one vertical foot as you travel 40 horizontal feet. Prior to 1800, steep grades of 1 in 12 were common on English turnpikes (Reader, 17).

Keeping gradients small makes it easier for draft animals to haul a load, and hence reduces the fuel consumption by automobiles and trucks. It also minimizes brake and tire wear.

If the traffic is moving uphill, then the steeper the gradient, the greater the degree to which the force of gravity is directed in opposition to the uphill movement. In other words, the horse or motor vehicle must lift more of its own weight in order to proceed. If the load is one long ton (2240 pounds), then the "grade

resistance" is 22 pounds for a gradient of 1 in 100, 45 for 1 in 50, and 112 for 1 in 20 (Gregory 127).

Downhill movement is of course easier, since gravity is then on your side, but only if the gradient is not so great that a braking force must be exerted to keep control. And, of course, if you are zipping downhill in one direction, that means you will be trudging uphill when you return.

Gradient is an issue for motor traffic, not just horse-drawn wagons. Steep uphill grades reduce speeds, while precipitous downhill ones increase brake wear. Grades also affect tire wear and fuel consumption.

The effect is dependent to some degree on the weight of the vehicle. The*Encyclopedia Americana* says that "a grade of 6% or 7% has little effect on passenger-car speeds but greatly slows truck traffic."

It may seem as though the road, ideally, should be perfectly level, but this is not the case. A level road doesn't drain well. The 1911 Encyclopedia says that the minimum ruling gradient should be 1 in 150, and the master road builders of the nineteenth century typically preferred gradients of 1 in 30 or 1 in 40. Their roads rise and fall gradually, rather than remaining level.

The*Encyclopedia Americana* notes that the crests of hills should be flattened to increase visibility.

Road Design:

Elevation and Camber

Elevating the road bed above the ambient ground level helps to reduce the influx of groundwater. This tactic, which dates back to ancient times, is why major roads are called*high* ways.

Again to ease drainage, roads have a convex cross-section, known as "camber." While used by Roman engineers, it was not a universal practice in the seventeenth century.

In 1607, Thomas Procter pointed out that standing water was the bane of roads, and urged general adoption of a convex road surface. Nonetheless, until the mid-nineteenth century, there were experiments with other approaches. The "Ploughman's Road" was horizontal, but elevated and flanked with deep ditches. The "Angular Road" was slanted to one side only. In 1736, R. Phillips urged the merits of a concave road. His theory was that the water would run down the center and carry away loose material. (Albert, 135–8). In 1810, McAdam warned against a road which was "hollow in the middle," but seemed to think that a level road was just fine since "water cannot stand on a level surface." (Reader, 37). Unfortunately, it can.

On the other hand, a steep camber is also undesirable. It makes fast-moving vehicles prone to overturn (Gregory, 131; Forbes, 528, 531), especially as they negotiate curves, and the traffic tends to crowd onto the central portion of the road, causing it to form ruts. (U. Texas, I:6; 1911 EB).

1911 EB generalizes that the usual rise in the center is one-fortieth to one-sixtieth of the width. It can be shallower if the surface is waterproof; Gregory (131) teaches 1 in 48 for macadam, 1 in 60 for tar macadam, 1 in 72 to 1 in 96 for asphalt, and 1 in 80 to 1 in 132 for concrete.

Road Design:

Friction

Friction is both bane and boon for traffic. Up to a point, the lower the friction the better; the greater a load that a draft horse can pull, the less fuel an automobile must consume to cover a particular distance. However, on a frictionless surface, an object at rest would remain so, its wheels spinning uselessly, and one in motion could not stop.

Table 2.2.3 in the Transportation Cost FAQ onwww.1632.org sets forth the load which a single draft animal can haul, in a vehicle with a particular type of tire, on a level road of a particular surface type, as a multiple of the*pull* exerted by the animal.

Road Design:

Unsurfaced Roads

Construction of a primitive road (WVDOT type A) just means clearing a path: cutting back bushes; felling trees and removing their stumps; taking out boulders which block the way.

The next step up (WVDOT type B) is to grade and drain the road.

What the WVDOT calls a type C "soil-surfaced road" is more aptly termed a "stabilized soil road." The native earth can be strong or weak, and more or less susceptible to rainfall and temperature changes. In a stabilized road, this is altered by chemical or physical means.

The 1911 EB says that "in carrying traffic over a clay soil a covering of 3 or 4 in. of coarse sand will entirely prevent the formation of the ruts which would otherwise be cut by the wheels; and if the ground has, already been deeply cut up, a dressing of sand will so alter the condition of the clay that the ridges will be reduced by the traffic, and the ruts filled in."*Collier's Encyclopedia* notes, more generally, that sand can be added to clay, clay to sand, cement to soil, and oil to soil, all to create a more weather-tolerant road surface. Such hybrid soil roads are very cheap to construct (Oglesby 633; Gillette).

The civil engineers of Grantville may be aware of other stabilization techniques. For example, calcium, magnesium and sodium chloride can be added to soil to make the particles adhere better. (Id.). The modern EB suggests addition of small amounts of lime, portland cement, pozzolana, or bitumen to the top eight to twenty inches of the ground.

Road Design:

Surfaced Roads, Generally

Surfaced roads provide a "wearing surface" (also known as the "pavement," the "road metal," the "carpet," and the "surface course") which is in actual contact with the traffic, and provides enough friction for the vehicles to make headway, but not so much as to unduly slow movement.

Pavements are usually classified as rigid (like concrete, mortared brick or fitted stone), flexible (like

asphalt, wood, and compacted stone) or granular (like gravel and sand).

Each surface has its unique characteristics in terms of strength, water resistance, friction, and so forth. For example, the modulus of elasticity, a measure of the extent to which a material deflects in response to stress, ranges from 280–300 for asphaltic concrete, to 30–40 for coarse sand. (Kezdi, 255)

The combined rolling and air resistance (the two are hard to separate) experienced by a one ton vehicle traveling 25 mph on pneumatic tires is, on average, 32 pounds for concrete, 35 for sheet asphalt, 38 for grout filled bricks, 34 for wood blocks, 40 for graded and maintained soil, 50 for gravel or firm natural soil, 70 for well packed snow, and 75 for soft natural soil. (Agg, 13).

Road Design:

Lanes, Trackways

And

Road Rails

Sometimes, a road carries both heavy and light traffic. The former may need a pavement which is "overkill" for the latter. One expedient is to have lanes with different road surfaces. For example, American plank roads were sometimes built with just one eight foot wide lane of planks, flanked by a dirt lane. If the traffic justified it, the company built a second plank lane.

It is conceivable that we will build hybrid roads, with both a hard concrete lane for military vehicles, and an asphalt, wood, macadam or stabilized earth lane for horses. Napoleon reportedly favored a "tripartite road" with cobbles for the artillery, a macadam-like surface for the infantry, and an earth road for the cavalry. (Forbes, 536).

The second approach is the trackway; that is, two longitudinal bands of stone, or even steel plate, separated so as to match the wheel spacing on the heavy vehicles intended to use it. Creating the trackway was less expensive than covering the entire width of the road with metal. A double wheel trackway, on which four horses could pull a load of seventeen tons, was in use on the Albany-Schenectady road from 1834 to 1901. (Gregory, 141–2).

The most extreme form of the trackway is the road rail, used typically in mines, which evolved eventually into the modern rail track.

Road Design:

Pavement Structure

The native soil and rock underlying a roadbed were once called the "foundation" or "basement," but it is now customary to refer to them as the "subgrade." The term "subgrade" is also used to refer to imported soil (you might use this in building a road across a swamp).

The subgrade needs to be able to support the load. Peat bears a mere 56 pounds per square foot. You

can put one to four tons on a square foot of chalk, two to five on one of fine sand, three to seven on clay, four to eight on gravel, and up to eighteen tons on ordinary rock. Clay and chalk are better when dry than when wet, and rock is unpredictable because it can have soft spots and even cracks. (Gregory 129–30). A native foundation which is unreliable will be removed and replaced with an alternative subgrade.

For drainage purposes, the subgrade is usually raised above the original ground level. Before one can build the pavement structure over it, one must be sure that it is stable. Early builders simply allowed the material to settle. However, in modern times, the subgrade is compacted by rollers.

There may be one or more layers separating the surface from the subgrade. These may be called, simply, the "base course" or "the sole." When there are two distinct layers, these may be identified as an upper "base course" and a lower "subbase course," and there can actually be more than two distinct layers. Also, with asphalt surfaces, there can be a thin "binder course" between the asphalt and the base course.

Road Design:

Gravel

And

Loose Stone

Surfaced Roads

A simple improvement on the basic dirt road is to cover it with gravel. The 1911 EB says, "Smooth rounded gravel is unsuitable for roads unless a large proportion of it is broken, and about an eighth part of ferruginous clay added for binding. Rough pit gravel that will consolidate under the roller may be applied in two or more layers, but each must be of similar composition, or the smaller stuff will work downwards." The recommended foundation is "rough chalk sufficiently rolled to stop the gravel while draining off the surface water."

TheLancaster (Pennsylvania) Turnpike (1794) was hard-surfaced with gravel and broken stone. (WBE)

Road Design:

Macadam Roads

Macadam roads are still in use today, especially in areas such asNew England , where rock can be collected readily. However, rather than letting the broken stone surface be compacted by traffic, one layer at a time, as taught by McAdam, modern builders use heavy rollers. (Collier's)

The use of steam rollers for this purpose was first introduced around 1876, and by the end of the nineteenth century perhaps 90% of the major roads ofEurope had been "macadamized." (Forbes, 535). Nowadays, the principal highways employ asphalt or concrete surfaces, and only secondary or tertiary roads are of the macadam type.

The modern EB states correctly that McAdam taught use of "small, single-sized, angular pieces of broken stone." However, what is lacking there is the explanation of just how critical several of these features were.

The stones had to be broken so that they were angular; they had to be angular so that they would lock together when compacted. (Smiles, 430; Forbes, 534; 1911 EB). Pebbles rounded by the action of water would not create the desired surface. Likewise, the stones had to be small. If they were much larger than the effective area of contact between the wheel and the road surface—about one inch square—then the stones would not be consolidated by passing traffic. (Reader, 2, 32–3, 37–9).

McAdam was very insistent that no "sand, earth or other matter" be used "on pretense of binding." (Reader, 39; Forbes, However, his road had an "intrinsic" binding agent—the traffic wore down the rocks and the resulting dust acted as a binder. That may explain the modern practice, described by *Collier's Encyclopedia* , of bonding the modern macadam road "into a solid mass by means of a finely crushed stone rolled into the surface."

The up-timers' sources are not always consistent in the description of macadam roads. For example, the modern EB shows them as having 0.75–1 inch surface layer of gravel or broken stone. However, the 1911 EB says that while "Telford covered the broken stone of new roads with 1/2 in. of gravel to act as a binding material," his rival McAdam "absolutely interdicted the use of any binding material, leaving the broken stone to work in and unite by its own angles under the traffic."

Another problem with the modern EB text is a sin of omission. McAdam cambered, not only the road surface, and the base course, but also the subgrade. While this is depicted in the figure, it is not commented upon. All the encyclopedia says is that the road was "elevated," which was true but not the whole story.

Road Design:

Plank Roads

The plank road differs from the corduroy road discussed previously, in that it uses lumber (planks) instead of whole or split logs.

In the period 1835–1855, many plank roads were constructed inNew York ,Pennsylvania ,Ohio ,Michigan ,Illinois , and other timber-rich states. These roads were typically ten to fifteen miles of length, and fed into canals or railroads. Indeed, they were nicknamed "the Farmer's Railroad."

According to the 1911 EB, "the plank road often used in American forests makes an excellent track for all kinds of traffic." The construction was straightforward. First the road bed was cleared and graded, and drainage ditches dug. Then two or more columns of longitudinal sleepers were put down, and transverse planks were laid (and sometimes nailed or spiked down) on top. The planks were two to four inches thick, eight to sixteen feet long, and made of oak, hemlock or pine. For drainage purposes, the outer sleepers may be set a few inches lower than the inner ones. (Majewki, 9; WHS, ISM, WiscHS, 1911 EB)

These plank roads could be constructed at one-half to two-thirds the price of macadam roads. (Majewski) Naturally, they were cheapest to build on level terrain with forests nearby.

In 1850, Charles E. Clarke told the*Prairie State* newspaper that the three plank roads near hisIllinois farm were "the best roads imaginable—better by far than the best paved or 'macadamized' road—pleasanter for the person riding—easier for the animals, and far less destructive to the carriages that roll upon them." (Clarke)South Carolina manufacturer William Gregg even thought them superior to railroads (Majewski 9).

From the section on "Friction," we know that wood is a "fast" road surface. On a new plank road, stage coaches traveled eight miles per hour (Luedtke; Clarke). Two horses could draw two tons forty miles per day (Clarke). TheWatertown ,Wisconsin Plank Road reduced the round trip fromMilwaukee toWatertown from four to six days, to three, and allowed wagon loads to be increased from 1,500–2,000 pounds, to 3,000; freight rates were reduced by about 25%. (WHS). "Trips which took from four to six days on dirt roads were cut to from ten to fourteen hours over plank roads." (Mason) Unlike unsurfaced roads, plank roads could be used in any season (Majewski, 9).

Not everyone liked plank roads quite so much as Clarke. Asa Stoddard critiqued the Kalamazoo-Grand Rapids highway in verse, asking the reader if he had ever "brave[d] the peril, dare[d] the danger, of a journey on the Plank?"

The reason we hear such inconsistent views is that plank roads were excellent when new, but needed repairs or replacement more frequently than the plank road companies had expected. The boards decayed, warped, or were stolen. (Majewski 2 says that the expected life was 8–12 years, the true one 4–5. WiscHS states a life of 5–6 years, and Clarke says 7–8. Mason says that the roads were in good condition for 3–4 years, then needed constant attention, with maintenance costs running 30–40% of the original construction cost annually.) And toll revenues weren't sufficient to pay for the maintenance. The roads fell into disrepair and became hazardous.

It does not appear that the wood used in the plank roads was treated in any way to make it more weatherproof. It is possible that such treatment, if it could be done economically, would substantially extend the working life of a plank road.

A plank road one mile long, eight feet wide, with three inch thick planks would require 10,560 cubic feet of wood. Then for a mile's worth of two stringers, each three inches wide by three inches thick, add another 3,455 cubic feet. That is a total of about 14,000 cubic feet, or about 1,200 board feet.

Unfortunately, the USE-controlled region of early seventeenth-centuryGermany is unlikely to be, in the near future, the site of a "plank road craze" comparable to the one in nineteenth-centuryAmerica . That is because there is a relative shortage of wood. (Virginia DeMarce, Charles Prael, Manfred Gross, and Andrew Ramage, private communications.) Wood is the principal fuel, and, by "the early modern period," per capita consumption of wood was about 4–5 cubic meters per year. (Other uses of wood totaled another cubic meter, annually.) (Halstead)

The Black Forest, nonetheless, was a wood exporting region, with pine, fir and spruce being shipped down the Rhine toMainz , either as timber rafts, or as sawn lumber. (Id.)

Unlike the American wilderness, the forests of Germany—which also include the nearby Thüringerwald —are owned by various nobles, but they are likely to allow plank roads to pass through their territory if it yields a net financial benefit to them. Whether that will prove to be the case is debatable; Virginia DeMarce informs me that the Thüringerwald covers low mountains, and that roads were customarily made simply by taking off the topsoil to expose the bare rock.

Poland,Russia and Scandinavia also export wood (although there has been some question raised as to how heavily forestedSweden itself was in the 1630s). While it probably is not economical to import Baltic wood intoGermany merely to construct plank roads, the Baltic countries may themselves find such roads to be advantageous, especially to connect one river to another.

Road Design:

City Pavements

City pavements have to bear the heaviest traffic. In medieval times, the usual expedient was the familiar cobblestone street, with large stones embedded in soil, sand or gravel. Gregory (140) comments that cobbled roads were "largely used on the North German Plain, where there is no local supply of squared stone, but cobbles are plentiful in the glacial drifts."

In nineteenth-centuryEngland , the noisy cobbled roads were gradually replaced by set stone pavements, which are described in the 1911 EB. The paving stones should be flat, square, and about three inches wide and nine inches deep.

The stones are fitted closely together, and the joints sealed with a grout of lime or cement. This is adequate, says the 1911 EB, if the foundation is concrete or broken stone or hard core.

It was not always possible to lay a proper foundation, as this required tearing up the original street. If so, then one could use a "bituminous grout," which was the result of adding a composition of "coal tar, pitch and creosote oil" to packed down gravel.

The 1911 EB notes that brick, wood and asphalt can also be used in paving. (We will take up the issue of asphalt in the next section.)

The use of brick dated back to about 1885, and brick roadways are said to have "stood well under hard wear for fourteen years." The 1911 EB provides particulars concerning the composition of the clay, the manufacturing method used to minimize chipping, and tests for moisture and abrasion resistance.

1911 EB adds that wood pavements were introduced inEngland in 1839, and improved in 1871. In essence, these streets feature wood blocks, fitted together. There is much debate in 1911 EB as to which is the best wood to use. The improved pavement was laid over an elastic foundation of tarred wood boards, which in turn rested on sand. The pavement joints were filled with tarred gravel.

Gregory (140) is actually quite complimentary about wood block pavements, provided the wood is hard and heavy: "they form a smooth surface, which makes one of the quietest of road; the surface is easily cleaned and is durable. Wood pavement is well adapted for horse traffic and motors: it has the advantage over asphalt or macadam that it is not thrown into waves."

Road Design:

Modern Asphalt Roads

Within the Ring of Fire, there are several modern asphalt roads. Such roads were completely unfamiliar

to seventeenth-century Europeans. In K.D. Wentworth's "Here Comes Santa Claus" (*Ring of Fire*), General Pappenheim mused, "The unfamiliar substance was hard as rock, yet seemed to have been laid down in malleable form somehow, then smoothed like butter before it solidified."

The nineteenth-century author-to-be Laura Ingalls Wilder was equally surprised by her first encounter with asphalt: "In the very midst of the city, the ground was covered by some dark stuff that silenced all the wheels and muffled the sound of hoofs. It was like tar, but Papa was sure it was not tar, and it was something like rubber, but it could not be rubber because rubber cost too much. We saw ladies all in silks and carrying ruffled parasols, walking with their escorts across the street. Their heels dented the street, and while we watched, these dents slowly filled up and smoothed themselves out. It was as if that stuff were alive. It was like magic." (NAPA)

The usage of the terms "tar," "bitumen" and "asphalt" is somewhat quixotic. I will use "tar" to refer to coal tar, and "bitumen" to refer to solid or semisolid petroleum per se. "Asphalt" may mean the crude source (rock or lake asphalt), or the derivative road material.

WhileParis had its first asphalt footpath in 1810, it took time to develop the proper techniques for asphalt paving, and the modern EB says that the "first successful major application" was on the rue Saint-Honore in 1858.

We have the expertise to lay it, we have the necessary equipment in the WVDOT garage . . . but where do we get the asphalt?

There is, of course, asphalt in theMiddle East . In fact, the first use of asphalt as a road surface was by the Babylonians. (NAPA) The asphalt came from Hit, inTurkey . (1911 EB, "Hit"). But theOttoman Empire is hostile to the USE, and the trade route is in any event a long one.

Fortunately, there are European sources (Earle, 28–33; 1911 EB). According to the 1911 EB "Asphalt" article, "the material chiefly used in the construction of asphalt roadways is an asphaltic or bituminous limestone found in the Val de Travers, Canton of Neuchattel; in the neighborhood of Seyssel, department of Am; at Limmer, near the city of Hanover; and elsewhere." Forbes (539) mentions Wietze, too, which would be a logical place to look since we are already drilling for oil there.

The Val de Travers (Swiss) rock asphalt, a bituminous limestone with an oil content of about 10–12%, has been known since pre-Roman times, but in OTL, it was first described scientifically by Dr. d'Eyrinis (1712). The Limmer deposit was discovered around 1730 but not worked until 1840. The 1911 EB article fails to mention that there are also deposits at Vorwohle.

Our access to French sources is uncertain, thanks to the war. However, their premiere asphalt mine can be found at Seyssel, nearAnnecy , in Haute-Savoire. In OTL, it was discovered in 1797. There is also asphalt at St. Jean de Maurejols and Arejans, both in the Department of Gard.

Another European source I am aware of is inSicily , nearRagusa . It is mentioned in 1911 EB, but only in the article onRagusa (the town "is commercially of some importance, a stone impregnated with bitumen being quarried and prepared for use for paving slabs by being exposed to the action of fire"). If the up-timers have the 1911 EB on a searchable CD, they might well find it. Otherwise, its discovery will be fortuitous.

Asphalt can also be found inHungary ,Romania , and, of special note, Osmundsberg inSweden . (Forbes, 539) Unfortunately, the Swedish source is obscure even today.

The modern encyclopedias do not mention any of the European sources. Rather, they tout the benefits of the lake asphalt ofTrinidad .Trinidad is nominally under Spanish control, but Sir Walter Raleigh trounced the Spanish garrison in 1595, then used the asphalt to caulk his ships.Trinidad is indeed an incredibly rich source; it exported 23,000 tons in 1880; 86,000 in 1895; and almost twice that a few years later. (Borth 169). The 1911 EB also notes that asphalt can be mined inCuba andVenezuela .

A third source came into prominence once oil drilling became a big business. The crude oil was subjected to fractional distillation, and the heaviest fraction was suitable for use as a road asphalt.

The sources on roadbuilding history are not always precise, or in agreement, as to whether the "asphalt" used was rock asphalt, lake asphalt, oil well asphalt, or even coal tar.

* * *

The modern asphalt road evolved in three stages. First, a thin coating of coal tar or asphalt was sprayed onto macadam roads. The tar acts as a binder, so that vehicular traffic does not raise clouds of dust. It also acted to waterproof the road. This early form can be termed a "seal coat tar macadam."

According to*Collier's Encyclopedia* , the stones are best laid in several layers, each only slightly thicker than the largest stones used, so they can lock together. A typical thickness is 1.5–4 inches. The stones are spread and rolled. Then hot asphalt is sprayed onto them (one to three gallons per square yard). Stone chips can be spread and rolled in, to protect the asphalt.

It later became possible to achieve a course in which broken stone and asphalt were mixed together throughout the entire thickness, resulting in a "penetration tar macadam," or "penny mac." This was not a trivial procedure; R.G. Taylor, in 1919, referred to the "many errors" made in the attempt to construct such surfaces. (R&P, I:53).

The third stage was the "hot mix" or "hot rolled" sheet asphalt, also known as "black top."

The 1911 EB describes two methods of preparing the asphalt for street use. The "European" method was to pulverize the European rock asphalt, heat it in revolving ovens to 220–250 deg. F., and then compress and smooth it. The heating reduces the moisture content without, hopefully, much loss of petroleum. The compression "reconstructs" the original rock, although with a more desirable composition.

In contrast, the "American" method used the purer asphalt ofTrinidad . It is similar to the methods described in the modern encyclopedias, and so I will turn to the latter for particulars.

Rock "aggregate" and asphalt are mixed together at a high temperature*(Collier's* says about 350 deg. F., and EB, 300–400 deg. F.), and the mix is rolled while hot and therefore fluid. The aggregate may be graded sand and fine rock dust (*Collier's*), or broken stone less than 1.5 or even less than one inch in size (EB). It is perhaps worth mentioning that since it was already 88–94% limestone, there was no need to add rock aggregate to the European rock asphalt.

In 1911, the asphalt was laid at a temperature of 150–200 deg. F., spread with rakes, compressed with light blows, and finally smoothed with a steam roller. Modern methods are similar. The asphalt is spread and compacted by specialized tamping or vibrating machines. Usually two to six inches will be laid at one time, and the total thickness ranges from two inches to a foot or more. (*EncyclopediaAmericana*).

Road Design:

Modern Concrete Roads

Instead of a flexible pavement made of asphalt, the road builder may lay a rigid pavement formed from concrete. The first successful post-classical use of concrete in road-building was, depending on who you ask, in Grenoble, France in 1876 (*Collier's*) or in Inverness, Scotland in 1865 (modern EB).

Concrete can be thought of as a mixture of cement, sand and stone. The 1911 EB comments, "Rocks like granite and syenite may be used in combination with Portland cement. The ingredients are mixed in about the proportion of four parts of broken stone that has first been well wetted, one and a quarter or two parts of clean sharp sand, and one of cement put on in two layers, the second being rolled by hand to the required shape and to a good surface. It should remain for two or three weeks to dry and set. Want of elasticity may be urged against concrete macadam, and it is productive of dust, but in some cases it has proved satisfactory."

The modern formula provided in*Collier's Encyclopedia* (which is the source of the remainder of the information in this section) is similar: one part cement; two parts sand; and three to four parts gravel or stone. The concrete may be mixed at a central facility, en route (this requires a specialized vehicle), or at the construction site.

The concrete may be of a uniform thickness (typically eight to ten inches), or it may be several inches thicker at the edges, relative to the center, to increase edge strength. Wire mesh reinforcement may be used, and, if so, is typically laid above the bottom two inches of the concrete.

The concrete is usually laid in widths of 20–30 feet (equivalent to two lanes of traffic), with a "contraction joint" running down the center. Laying involves depositing the wet mix, spreading it out, compacting it, leveling it, and finally imparting a rough texture to it by dragging wet burlap over it. The concrete is kept moist for at least a week by spraying it with a protective compound or (a more likely expedient in the 1632 universe) covering it at all times with wet burlap.

* * *

Asphaltic concrete is a combination of the two roadbuilding materials, and is made by mixing crushed stone, sand, rock dust and asphalt at a temperature of 350 deg. F. The asphalt serves as a cementing agent.

* * *

Concrete may also be used as a base for asphalt or asphaltic concrete (resulting in a so-called "flexible over rigid" pavement). Base course concrete contains less cement than pavement concrete.

Road Design:

Roadside Trees

John Evelyn, in*Sylva* (1667), was the first writer to use the word "avenue" to refer to "the chief approach to a country-house, usually bordered by trees." (OED) It came to refer to any broad, tree-lined thoroughfare.

Besides beautifying the landscape, "trees furnish shade, temper the atmosphere, absorb water from the roadbed, and act as a shield against snow and wind." (Morrison, 174) Morrison qualifies this praise by pointing out that by blocking out the wind and sun, it reduces their ability to contribute to the drying out of the road after a rain.

Cost of Construction

and Maintenance

Some cost data is presently available in the Transportation Cost FAQ posted towww.1632.org .

Financing

While usually less expensive than railroads and canals, good roads aren't cheap to build or maintain. Insofar as construction is concerned, the basic choice is between private and public financing. The English turnpikes of the seventeenth, eighteenth and nineteenth centuries were built by revenues raised by private subscription, that is, stock purchases in a "turnpike trust." Most major highways nowadays are built with public funds, either out of tax dollars, or, more often, with the proceeds from selling highway bonds.

Building the road is only the first battle; it still needs to be kept in good condition. Several systems have evolved over the centuries to pay for road care.

One is to have each local community maintain the section of road which passes through its area. This could be by direct taxation, or through their own (unpaid) labor (the "statute labor" or "corvee" system).

This involuntary labor was usually not very effectual. In 1844, Samuel Cassidy wrote that the only reason the laborers brought shovels with them was to "support them when they got too lazy to stand alone." (Majewski 6) If the government cracked down, it led to unrest.

The larger problem with local support of regional and national roads was pointed out by Macaulay: "that a road connecting two great towns which have a large and thriving trade with each other should be maintained at the cost of the rural population scattered between them is obviously unjust. . . ." (Gregory 172)

The second strategy was to charge user fees. Numerous turnpike (toll) roads were built inEngland and, later, inAmerica . In theory, it sounded like a good idea for those who used the road to pay for its upkeep. In practice, there were two problems. First, travelers would evade the tollbooths, especially those at fixed locations, taking byways which came to be nicknamed, "shunpikes." (Luedtke; Majewski 5) Secondly, the turnpike trusts do their job. If the revenue from the road was lighter than expected, it was tempting to skimp on repairs. Which, in turn, led to further reduction in traffic and more evasion.

Finally, roads can be financed regionally, or even nationally, not just by the local communities or road users.

Road Construction:

Acquiring the Right of Way

Ideally, the right of way is donated by local landowners who perceive the economic benefit of the new road. If they are not so farsighted, then either they must be persuaded to sell an easement, or the government must have the will and the right to condemn the property under the principal of eminent domain. In theUnited States , the landowner is still entitled to compensation for the lost property.

Roadbuilding

Materials

As a starting point, we can gravel roads using waste from certain industrial processes; for example, mining tailings and blast furnace slag. AndGermany itself has plenty of gravel of Ice Age origin.

We can lay asphalt roads using waste material (thick tar) from oil refining. We can also use liquid grades of oil to bind dirt roads, reducing dust clouds.

To make concrete roads, we need construction aggregate (e.g., crushed stone, gravel, slag, ash or sand), cement (to hold the aggregate together), and water. Portland cement can be made from limestone, clay and gypsum.

Road Construction

Equipment

Pretty much all aspects of road construction can be done manually, with pickaxe and shovel, given enough laborers and time. However, mechanization became significant by the nineteenth century.

Manual clearing of a roadway involved use of saws to cut trees, chains and draft animals to pull out stumps, and picks and shovels to break and remove boulders. Nowadays, these tasks are performed mostly by bulldozers. If a road must be cut through hard rock, this can be done with explosives, or with massive mobile drills and shovels. (The special needs of tunneling and bridging operations are best left to another essay.)

Grading the roadbed can be done with bulldozers, scrapers, graders, and dump trucks. Drainage ditches are dug by backhoes and trenchers. Stone may be broken on site by rock crushers, or rock fragments may be hauled from a quarry by dump trucks. The road base may be compacted by various kinds of rollers. Specialized pavers lay asphalt or concrete pavements over the base.

Thanks to that WVDOT garage, Grantville has an assortment of modern heavy equipment. In the post-RoF world, this equipment has two functions. First, it can be studied by up-timer and down-timer machinists with a view toward either duplicating it outright or, if need be, constructing a "geared-down" version. Secondly, it can be used for actual road maintenance and construction. My guess is that the latter use will be restricted to roads close to Grantville.

According to canon, in spring 1632, Boris Ivanovich Petrov observed a "horse-drawn device" in use outside the Ring for road improvement. (Huff and Goodlett, "Butterflies in the Kremlin: Part 1, A Russian Noble,"*Grantville Gazette* , Volume 8). That description was a little vague, but the authors tell me that Boris had observed a "Fresnoscraper" in action.

This was an 1883 device for smoothing out a road. It had a blade which could be tilted down to scrape up soil, pushing it into a bowl. The blade could then be raised so that the load could be slid without excessive force. Finally, the bowl could be rotated to discharge the soil. The rotation was limited by an adjustable crossbar, thus controlling the thickness deposited.

Except where the "legacy" equipment is in use, we can expect to see a gradual progression from manual to mechanized roadbuilding, and from use of a few general purpose machines (like tractors with various attachments) to the proliferation of specialized equipment. Equipment like scrapers will at first be hauled by draft animals. However, they will ultimately evolve into self-propelled vehicles.

Conclusion

There is no doubt that the USE needs to expand its road network. The first roads will necessarily rely heavily on local materials; and therefore may be macadam if they are traversing rocky country, and plank roads if they are piercing forest.

The Catch-22 of building asphalt highways is that we need the asphalt to make the highways, and we need the highways to transport the asphalt to the construction site. So we will probably start with graveled, stabilized soil, macadam, wood plank and concrete roads. Once we have road, rail or water links to an asphalt source, we can "tar" the macadam roads so that they last longer, and ultimately upgrade the primary routes to asphalt.

While concrete roads don't require exotic materials, it may be desirable to defer building them until we have significant motor traffic. Rigid pavements are better suited to autos and trucks than to horses.

Roadbuilding isn't "high tech," but it is nonetheless of tremendous military and economic significance. Of course, road improvement is not going to be limited to the immediate vicinity of Grantville.Magdeburg is the chosen capital of the USE because of its superior location. Once it is serviced by modern roads, it will be the economic and political center of the USE. I would not be surprised if, a century after the Ring of Fire, people were wont to say, "All roads lead toMagdeburg ."

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THE FEAST

by Anette Pedersen

Guildmaster B in a fair-sized northern European town is giving a party to celebrate his second son's engagement to the daughter of another guildmaster. Come and let me show you what's going on.

The Street

The street leading past the house is not one of the main streets through the town, so it's paved with un-cut cobbles. On each side of the street the pavement slopes from the foundations of the houses toward the gutters to catch the runoff from the roofs, as well as any refuse thrown out the windows. The traffic—walking, riding or driving—follows the single row of big, flat stones down the middle.

For the past few days—and all morning today—the local people going about their daily errands have often been forced to step aside for wagons and riders bringing food and other goods to Master B's house. At the moment, chopped tree bark is being spread across the street to dampen the noise from passing wagons during the feast, while another wagon with milk, cream and other last minute deliveries is trying to get past.

The House

The house itself is one of the bigger and newer houses in town. It has two floors plus an attic and cellar, is half-timbered, and is build of mortared red-painted bricks in a frame work of tarred timber—also painted red. There's no roof gutter or drain pipes, but each floor of the house slightly overhangs the floor below, keeping the rain away from the walls.

The Kitchen Yard

At the right end of the house a gate leads to the backyard and kitchen entrance. Master B has no need for a horse, thus there is no stable by the house, and the guests arriving by horse or in wagons must stable these with Master B's neighbors.

The backyard is usually a fairly spacious place with a few outbuildings and storage sheds around the edge, but still enough free space in the middle to turn a wagon. Today, however, it's packed with bundles, baskets, tubs, crates and barrels, and servants are jostling each other as they carry items in and out of the house.

To the left of the gateway along the backside of the house are the big, lidded water barrels. They are filled from the fountain at the nearby street junction every morning. Next to them is the handcart used to transport the water and other heavy objects needed in the household. Then comes the door leading to the kitchen via the scullery, and—below the kitchen windows—sturdy benches and bins used to temporarily store vegetables and other items that don't mind the damp. Then there is the slanted door down to the cellar, and at the end of the yard, a small chicken run and the washhouse.

In many smaller houses the washing must be done in the kitchen, thus greatly disturbing the routine of the household and dampening the walls until the lime wash runs in streaks, but in Master B's house there is a separate building for this. Normally the washing woman comes for a week four times a year, but for the feast she has been hired for four extra days to wash, iron and repair all the fine linen usually stored in the great cedar chests. Mistress B still isn't happy; the linen should have been bleached by being spread out in the sun, but, alas, the weather did not cooperate and her best white tablecloth is slightly yellow along

one side.

In the corner, as far away from the door to the house as possible, is the small midden and the latrine. Usually the night man comes to remove the refuse once a week, but as with the washing, Master B has paid for an extra removal yesterday. Still, it's piling up already.

Right across from the kitchen entrance is a lean-to with peat and firewood beside the wood chopping block. Finally—on your right when you enter the gate—is the shed where the rushes to spread on the floors are usually stored, along with big bundles of gorse used for baking. But today they've been displaced by an extra load of the expensive charcoal used in cooking the many delicacies planned for today's menu.

In addition to the permanent structures the yard today features:

A tub of live eels and one of carp over by the water barrels. The displaced rushes and gorse are piled almost completely across the gateway.

Hooks on each side of the kitchen door hold the linen-wrapped cured and smoked meats delivered last week.

A big basket of cauliflower with big bundles of dried lavender on top (to mix with the rushes spread on the floors) and three smaller baskets with peas, spinach and raspberries leave little room on the bench below the kitchen window for one of the two maids borrowed from the neighbors. She is plucking the feathers of two big geese, while the youngest of the two cats that keep the house free from mice and rats twines around her feet and bats at the feathers. The older cat has climbed on top of the hand cart, and is staring at the eels that are being killed and cleaned by the old porter, who's usually in charge of water, firewood and other rough jobs.

By the open cellar door is Master B, carefully carrying a hay-packed crate with six big clay bottles down the steep steps to the cellar. All the wine and beer barrels have been in place ever since the old guildmaster died—just in case—but the best quality Sack (Sherry) had to be ordered especially and it wouldn't do to seem too sure he'd get the position.

In the washhouse, two fires have been lit and two big iron cauldrons are bubbling under the supervision of the second of the borrowed maids. Because of the crowding, the cook must twist her way around the empty crates and other refuse overflowing the midden. She had prepared several lidded pots filled with rabbit meat, butter and herbs to produce jugged rabbit. She then sealed the pots completely with strips of pastry, and had only intended for the maid to watch the fires under the cauldrons, where the pots simmered half submerged in the boiling water, while she was cleaning and chopping roots and other vegetables. Unfortunately, the fires in the kitchen have no room for cooking vegetables, so nets containing whole cabbage heads stuffed with minced meat, celery and parsnips have to be boiled in the washing room. They must be watched carefully so they don't overcook and split.

The Scullery

Inside the house, in the scullery, the kitchen maid is cleaning carrots and onions on the table below the open window. The scullery is really just a small passageway between the yard and the kitchen and normally just contains a table with three washing basins and a big pitcher, plus some half-empty shelves. But today every shelf is filled to overflowing with cooling cakes and pies, while a big pile of bread loaves

on the table is threatening to tumble into the water basin. The maid has been jostled by the passing people until she has nicked her finger and is crying. That may, of course, also be from peeling the onions.

The Larder

Aside from the door to the scullery, two more doors lead from the kitchen, one to the larder and one to the pantry and the rest of the house.

There's an ash-wood trap-door in the floor of the larder, which leads down into a cool cellar room. The narrow wood ladder down can be tricky to navigate. This lower room is much cooler than the rooms on the kitchen level and is used to store things like eggs, milk, butter, cream and cheese which need the cool to prevent spoilage. At the moment, the cellar is filled mainly with dishes for the third and last course of the banquet, so the trap door is kept closed to allow people to move freely around in the larder above.

Here troughs are lined up, filled with salt-covered meats. As well, barrels with oats, barley, peas, salted herrings and beer are packed as closely as can be on the floor.

On the shelves are smaller crates with anything from dried apples to sago fromMalaya , pots with venison cooked in purified butter, and covered basins with the fresh mutton, salted beef and smoked ham, all boiled yesterday and now waiting for the cook to find the time to dress them for the table.

Under the ceiling hang dried cods, smoked and dried sausages, as well as dried herbs for cooking and tisanes.

The Bakery

On the opposite the side of the kitchen from the larder is a partially screened off area with a three-foot diameter, beehive-shaped, clay-covered stone oven that is built into the wall. The area also contains a big trough made of planks and a big solid table. A short pitchfork, a long-handled peel (spatula) and half-burned broom hang on the wall beside the oven door, various ladles and scrapers stand by the trough, while the table holds a two-foot-long knife that catches the eye. The shelves along the walls hold tin-plated hoops, molds and tins of every size, along with pie dishes, weight scales, metal cutters, and wood stamping devices.

This area has been the center of much activity for the past week, while all the bread now piled up in the scullery was baked. This morning the oven has been heated one last time and the last—most delicate—dishes are being baked.

Baking always starts with waking up the yeast by dissolving the sourdough saved from the previous baking in water, then flour is shoveled from the wheat and rye barrels into the big plank-built kneading trough. Then the yeast water is added, along with more water and either salt or sugar and spices. Rye bread dough is soft enough to be worked in the trough until it is ladled into the tins, but the firmer doughs are just mixed in the trough before being transferred to the working table for beating and kneading until ready to divide and be shaped or molded. While the dough rises, the oven is heated by pitchforking a bundle of burning gorse into the baking cavity. When the wanted temperature is reached, the fire and ashes are swept out and the loaves and molds are slipped inside with the long-handled peel (baking spatula). Finally the oven door—of stone or metal—is sealed with clay and the bread allowed to bake.

After the bread is finished, the last residual heat is used to bake puddings, pies and pastries.

Today, blind-baked pie-shells filled with dried fruit and custard are slowly setting in the last heat, while big, rich, heavily-fruited cakes containing butter, cream, eggs, sugar, currants, ginger and cinnamon that were baked earlier within the tinplated hoops are cooling on the kneading table.

The Kitchen

The absolute center of activity is the big, broad-arched fireplace, six feet wide and three feet deep, which is built into the wall in the main kitchen area. Chimneys have only been common in ordinary townhouses for about a hundred years, but Master B's house is new and a fine brick chimney leads the smoke away from the cooking fires.

In the center of the fire cavern is a big log fire supported by a pair of firedogs (iron log holders) heating a big brass pot that contains four boiling soup hens. Tied to each of the two pot handles is a cloth that contains a big English suet pudding that is stuffed with raisins and other dried fruits.

In front of the log fire, a whole suckling pig, stuffed with dried apples, bread and sage, is roasting on a spit and dripping fat and juice into a tray. The spit is turned by a newly installed air turbine, powered by the draft up the chimney. From time to time the house maid tending the fireplace ladles drippings from the tray over the meat.

On each side of the fire, iron baskets filled with glowing coals are providing the heat for the tinned-copper saucepans in which the sauces are being made. In houses where entertaining fine visitors is a common occurrence, a knee-high stove (masonry bench with iron-sheeted fire baskets in the top and air flues below) is often built beside the fireplace. Once the baskets are filled with glowing charcoal, it becomes much easier to work on a stove than on the free-standing baskets beside the fire. But as it is in Master B's kitchen, both the cook and the maid must keep bending and rising as they move from fire to fire.

On the big working table in the center of the kitchen, the remains of the servants breakfast of bread, small (weak) ale and scraps of meat is pushed to the side. Normally, there'd be hot gruel or leftover soup or stew as well, but today every fire has been fully occupied with the meats for the feast. Two racks of lamb stand cleaned and ready to go on the spit once the pig is tender, and they must be finished before the geese now being plucked can get their turn.

A bowl with boiled, spiced meatballs for the saffron soup waits beside the carefully measured spices from the spice cupboard. Only Mistress B has the key for those expensive ingredients, so every time the cook needs more of this or that she must first go find the Mistress, who'll then come to the kitchen to taste and decide if the cook is right and the dish needs more seasoning. This does not make the cook less harried!

The Pantry

In the pantry, the dishes are being garnished whenever the cook can find the time. The second of Master B's house maids was supposed to have helped with the decorations, but Mistress B is keeping her in the dining room to arrange the finished dishes.

The pantry is a long, narrow room with tables along each side and shelves below and above. The shelves are filled with tureens, platters, jugs, and all the other service needs for the table.

At the moment, a dish of boiled beetroots is waiting to be garnished with the chopped whites from hard-boiled eggs. Sugar-glazed roots in many colors are arranged in flower-like patterns and wait for the green mint to form the leaves. Radishes carved as flowers wait for the racks of lamb to be roasted and bent to form crowns. A roast sirloin of beef has been surrounded with honey-glazed onions and decorated with swirls of candied lemon peel, and the big platter is due to be moved to the dining room and make room at the table for the next dishes.

The Dining Room

The room the family usually uses for dining is far from big enough for the guests invited, but Master B's house is so new that it has a room especially intended for dining and entertaining. It's on the second story and rather far from the kitchen, but the elegant timber-paneling and the moldings on the plaster ceiling look most impressive. Carved cupboards and side tables line the walls and trestle tables have been set up and covered with white linen damask down the center of the room. The benches and stools alongside it are supplied with fine, red pillows. To soak up any spilled wine and food, as well as to hide any unpleasant smells, the floor is covered with rushes mixed with lavender and southernwood.

The table is set with plates of delftware (biscuit-colored pottery with a white glaze and blue decoration), glass tumblers and polished pewter mugs, while silver and silver-gilt salts, casters and saucers are scattered along the length of the table. Also at each setting is a pointed knife for spearing the food from the serving platters and cutting off the bites. Forks, on the other hand, Master B considers an Italian fancy not fit for a plain man. Fingers are good enough, and there are plenty of napkins.

In the center of the table is Mistress B's pride and joy: a silver epergne (tall table decoration) with flowers and candles reflected in a mirror tray. At the moment, she and the house maid are arranging the bread baskets that will be handed around during the meal, along with saucers of pickles and biscuits. All the while, they are planning the arrangement of the dishes for the three courses. The meal is to consist of three courses of many different dishes from which the guests can choose what they want to eat (like a buffet).

The first course consists of two different soups placed at each end of the table. These are served first. Once the soup is eaten, the tureens will be removed and two fish dishes will take their places. Also on the table for the first course is a symmetrical arrangement of most of the major meat dishes. These are carved and sent around the table by the hostess once the soups and fish are eaten.

After the guests want no more of the first course, the servants clear away the leftovers and carry in the second course of lighter meats, pies and vegetables. These dishes must also be arranged symmetrically, as must the third course of cheese, fruits and sweet dishes, which are displayed on the side tables in the dining room.

Here's the menu for Master B's Feast:

First Course:

Soup á la Reine (chicken soup with minced chicken meat, peas and cream),

Saffron soup (parsnip soup with herbs and meat balls spiced with saffron),

Baked carp on bacon with butter and white wine sauce,

Eels stewed in red wine and herbs,

Roast suckling pig garnished with roasted red apples,

Roast sirloin of beef with honey-glazed onions and candied lemon peel,

Roast racks of lamb bent to a crown with radishes and turnips carved as flowers on each bone,

Boiled cured beef in white horseradish sauce,

Boiled leg of lamb in mustard sauce,

Dutch pudding (stuffed cabbage heads),

Jugged rabbit.

Second course:

Roast geese,

Black-glazed smoked ham,

Boiled cured pork in green parsley jelly,

Venison preserved in butter,

Raised pigeon pies,

Mutton pies,

Sugar-glazed roots in many colors arranged in flower-like patterns with green mint for leaves,

Boiled cauliflower covered with a lemon sauce,

Boiled beetroots garnished with the chopped whites from hard-boiled eggs,

Spinach pie with poached eggs.

The Banquet (third course):

Cheeses with caraway rolls,

Custard pies with fruits,

Marrow tarts,

English suet pudding,

White Pot (Cream and bread pudding),

Honey stewed apples,

Dried figs stewed in sweet white wine,

Jelly with raspberries and sweetened cream,

Syllabubs,

Spiced fruit cakes,

Gingerbread,

Medieval biscuits (slices of rich bread dusted with sugar and spices and re-baked),

Sack posset (hot eggnog),

Sweetmeats.

Bon Appétit

PS: Master B's house may be seen at:

http://www.dengamleby.dk/tvaerstub.htm

Images

Note from Editor:

There are various images, mostly portraits from the time, which illustrate different aspects of the 1632 universe. In the first issue of the*Grantville Gazette,* I included those with the volume itself. Since that created downloading problems for some people, however, I've separated all the images and they will be maintained and expanded on their own schedule.

If you're interested, you can look at the images and my accompanying commentary at no extra cost. They are set up in the Baen Free Library. You can find them as follows:

1) Go towww.baen.com

2) Select "Free Library" from the blue menu at the top.

3) Once in the Library, select "The Authors" from the yellow menu on the left.

4) Once in "The Authors," select "Eric Flint."

5) Then select "Images from the Grantville Gazette."

Submissions

To the Magazine

If anyone is interested in submitting stories or articles for future issues of the*Grantville Gazette,* you are welcome to do so. But you must follow a certain procedure:

1) All stories and articles must first be posted in a conference in Baen's Bar set aside for the purpose, called "1632 Slush. " Do*not* send them to me directly, because I won't read them. It's good idea to submit a sketch of your story to the conference first, since people there will likely spot any major problems that you overlooked. That can wind up saving you a lot of wasted work.

You can get to that conference by going to Baen Books' web sitewww.baen.com . Then select "Baen's Bar." If it's your first visit, you will need to register. (That's quick and easy.) Once you're in the Bar, the three conferences devoted to the 1632 universe are "1632 Slush," "1632 Slush Comments," and "1632 Tech Manual. " You should post your sketch, outline or story in "1632 Slush." Any discussion of it should take place in "1632 Slush Comments." The "1632 Tech Manual" is for any general discussion not specifically related to a specific story.

2) Your story/article will then be subjected to discussion and commentary by participants in the 1632 discussion. In essence, it will get chewed on by what amounts to a very large, virtual writers' group.

You do*not* need to wait until you've finished the story to start posting it in "1632 Slush." In fact, it's a good idea not to wait, because you will often find that problems can be spotted early in the game, before you've put all the work into completing the piece.

3) While this is happening, the assistant editor of the*Grantville Gazette,* Paula Goodlett, will be keeping an eye on the discussion. She will alert me whenever a story or article seems to be gaining general approval from the participants in the discussion. There's also an editorial board to which Paula and I belong, which does much the same thing. The other members of the board are Karen Bergstralh, Rick Boatright, and Laura Runkle. In addition, authors who publish regularly in the 1632 setting participate on the board as*ex officio* members. My point is that plenty of people will be looking over the various stories being submitted, so you needn't worry that your story will just get lost in the shuffle.

4) At that point—and*only* at that point—do I take a look at a story or article.

I insist that people follow this procedure, for two reasons:

First, as I said, I'm very busy and I just don't have time to read everything submitted until I have some reason to think it's gotten past a certain preliminary screening.

Secondly, and even more importantly, the setting and "established canon" in this series is quite extensive by now. If anyone tries to write a story without first taking the time to become familiar with the setting, they will almost invariably write something which—even if it's otherwise well written—I simply can't

accept.

In short, the procedure outlined above will save*you* a lot of wasted time and effort also.

One point in particular: I have gotten extremely hardnosed about the way in which people use American characters in their stories (so-called "up-timers"). That's because I began discovering that my small and realistically portrayed coal mining town of 3500 people was being willy-nilly transformed into a "town" with a population of something like 20,000 people—half of whom were Navy SEALs who just happened to be in town at the Ring of Fire, half of whom were rocket scientists (ibid), half of whom were brain surgeons (ibid), half of whom had a personal library the size of the Library of Congress, half of whom . . .

Not to mention the F-16s which "just happened" to be flying through the area, the Army convoys (ibid), the trains full of vital industrial supplies (ibid), the FBI agents in hot pursuit of master criminals (ibid), the . . .

NOT A CHANCE. If you want to use an up-time character, you*must* use one of the "authorized" characters. Those are the characters created by Virginia DeMarce using genealogical software and embodied in what is called "the grid."

You can obtain a copy of the grid from the web site which collects and presents the by-now voluminous material concerning the series,www.1632.org . Look on the right for the link to "Virginia's Up-timer Grid." While you're at it, you should also look further down at the links under the title "Authors' Manual."

You will be paid for any story or factual article which is published. The rates that I can afford for the magazine at the moment fall into the category of "semi-pro." I hope to be able to raise those rates in the future to make them fall clearly within professional rates, but . . . That will obviously depend on whether the magazine starts selling enough copies to generate the needed income. In the meantime, the rates and terms which I can offer are posted below in the standard letter of agreement accepted by all the contributors to this issue.

Standard letter of agreement

Below are the terms for the purchase of a story or factual article (hereafter "the work") to be included in an issue of the online magazine*Grantville Gazette,* edited by Eric Flint and published by Baen Books.

Payment will be sent upon acceptance of the work at the following rates:

1) a rate of 2.5 cents per word for any story or article up to 15,000 words;

2) a rate of 2 cents a word for any story or article after 15,000 words but before 30,000 words;

3) a rate of 1.5 cents a word for any story or article after 30,000 words.

The rates are cumulative, not retroactive to the beginning of the story or article. (E.g., a story 40,000 words long would earn the higher rates for the first 30,000 words.) Word counts will be rounded to the nearest hundred and calculated by Word for Windows XP.

In the event a story has a payment that exceeds $200, the money will be paid in two installments: half on

acceptance, and the remaining half two months after publication of the story.

You agree to sell exclusive first world rights for the story, including exclusive first electronic rights for five years following publication, and subsequent nonexclusive world rights. Should Baen Books select your story for a paper edition, you will not receive a second advance but will be paid whatever the differential might be between what you originally received and the advance for different length stories established for the paper edition. You will also be entitled to a proportionate share of any royalties earned by the authors of a paper edition. If the work is reissued in a paper edition, then the standard reversion rights as stipulated in the Baen contract would supercede the reversion rights contained here.

Eric Flint retains the rights to the 1632 universe setting, as well as the characters in it, so you will need to obtain his permission if you wish to publish the story or use the setting and characters through anyone other than Baen Books even after the rights have reverted to you. You, the author, will retain copyright and all other rights except as listed above. Baen will copyright the story on first publication.

You warrant and represent that you have the right to grant the rights above; that these rights are free and clear; that your story will not violate any copyright or any other right of a third party, nor be contrary to law. You agree to indemnify Baen for any loss, damage, or expense arising out of any claim inconsistent with any of the above warranties and representations.

THE END