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Water Wings

by Terry Howard

Somewhere in the North Sea

The line arcing off the boat kinked between deck and water. Eric, watching for just that, yelled to the crew uncoiling the stiff hose, "Hold it! Back it up!" Then the kink swelled a bit. Eric screamed, "Back it up! Back it up now!"

Before the offending line could be pulled back up onto the deck, the kink burst.

"Shit!" Eric yelled. "Get the bell up! Now! Get it up!"

The crew who had been manning the air pump left their now useless post and manned the capstan to raise the bell. Putting their backs into it, they pushed its arms for all they were worth.

Eric watched as the collapsed air line came up out of the water at a fast pace. He had brought the details for a diving bell along with the location of the wreck, due north of Castle Point and west of St. Olef's Bay, back from a strange town in Germany called Grantville and was able to convince a local merchant to fund the salvage effort.

The air line was made of two layers of waxed leather. The book called for rubberized canvas, with the outer layer sewn over the seamless inner layer. No one, outside of Grantville, knew what rubberized meant. It had to be water-proofing. It must really be something because they had absolutely no luck using canvas to make the high pressure air line. Two layers of leather worked. It had to be doused down with hot water before it was lowered away to keep it from cracking and it made a large coil that filled the free deck from rail to rail. The coil barely left room for the air pump and the capstan for lowering the diving bell in the middle.

"Belay that!" the captain called.

"But, sir," Eric protested. "We've lost air."

"I am aware of that, Mister." He turned to the pump crew. "Kyrie Elison, gentlemen," he said, meaning he wanted them to start singing the old church chant and turning the capstan at a slow measured rate. "Bring him up at the regular pace, if you please. We don't need him doubled over and dying on the deck with cramps. That's why we put the valve on the bell."

The line crew lifted the leather hose over the heads of the now chanting men who now turned the capstan. Eric, worried, turned back to the sea and watched the collapsed air line inch up out of the water.

Until now, when a line broke they hauled away with all speed to raise the bell before it lost air. Twice they failed. Twice they succeeded, only to have the man die a painful death from horrid cramps. This was the first time a line had blown since they had installed a shut off valve. The pump had to work harder to push it open but it should hold the air in if the pump failed.

"I can see the bell." Eric called out. Then, without another word, he dove into the cold waters of the North Sea. At the staging platform, eager hands pulled him and the body he had retrieved out of the water.

"I saw him slip out of the bell. He must have passed out. We need a tie off in there so a man stays in if he blacks out."

With the bell up, the capstan was switched over to lifting the cargo cable to see if anything had been loaded.

With five lost to accidents and one lost to illness, Eric wondered if he would be number seven. It was his turn to go down.*Well, if my number is up, my number is up. If I die, at least I die rich.*

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Under the Tuscan Son

by Iver Cooper
November, 1633

Curzio Inghirami had learned a great deal during his visit to Grantville, but he now was back home at Villa Scornello, the family seat. It was a few miles outside of Volterra, a town in the grand duchy of Tuscany.

He beckoned to one of the family servants. "Tell Father that Lucrezia and I are going fishing." Lucrezia, his younger sister, giggled for no apparent reason. "Have Cook pack a picnic lunch for us, and then meet us out back in half an hour."

Curzio and Lucrezia whiled away the time, gossiping about their friends in Volterra. In due course, the servant joined them, basket in hand, and the three began the half-hour walk down to the bank of the River Cecina. The two siblings fished for a while, handing each catch to the servant, then started throwing stones into the river. Curzio reached down for another, then exclaimed, "Wait a moment! Look at this!"

"Oh, it's just an old pottery shard," said Lucrezia. "Throw or drop it, but don't talk about it."

"No, wait, it has writing on it. In Etruscan, I think. And here's a Latin word: 'thesaur'–the rest of the word is lost." He thought about it for a moment. "I am sure it must be 'thesaurus.'"

"I don't think Father Domenico has taught that one to me, yet." Father Domenico Vadorini was the Anghirami family priest, and their tutor.

"It means . . . 'treasure.'" Their servant blinked, but said nothing.

"Treasure?" Lucrezia put her hands on her hips and stared at her older brother. "Well, what are you waiting for? Let's find the rest of the vase. Perhaps the treasure is inside!" They started rummaging about.

"Here it is!" said Lucrezia triumphantly. She turned the broken vase upside-down, and shook it. What came out wasn't a treasure. At least not one which was recognizable as such. It was a lump of what looked like pitch, but with many hairs sticking out of it. "Yuck. Some treasure."

"Don't jump to conclusions, little sister," said Curzio loftily. He was six years her senior. "There might be something inside. Let's take it back up to the house and examine it more closely."

"Very well. I am tired of fishing, anyway." Curzio and Lucrezia tramped back up the hill. The servant, a respectful couple of yards behind them, carried the fish.

Once on the veranda of the family villa, Curzio threw the lump against a stone wall, and it broke apart. "Now we're getting somewhere. Look, there's a folded cloth inside. Some kind of linen. And there's writing on it. Let's go show Father."

Their father, Inghiramo Inghirami, was impressed. At least by the reference to treasure. However, the writing, some of which was in Latin, was not too informative. It suggested that the 'treasure,' whatever it might be, was located in a citadel, and that the latter was set on a hill near where the little stream, the Zambra, met the Cecina. They knew such a hill, and there were ruins of some kind there. Inghiramo told them that if they were interested, they could, on his authority, direct some of the tenant farmers to help them excavate the site.

* * *

"Hello, Curzio," said Raffaello Maffei. Raffaello was Curzio's best friend, and a noted antiquarian. "What brings you and the good Father down to town today?"

"Have a look at this." Curzio proffered the linen scroll. "I think this message might be in Etruscan."

"Come with me. We'll compare it to the inscriptions my namesake found." Raffaello led them into the Palazzo Maffei, where they could inspect the Etruscan inscriptions on a funeral stele and on a statue of a mother nurturing a child. Sure enough, the letters were similarly formed. As a frequent guest, Curzio had, of course, seen these Etruscan exemplars many times before.

"Did you find any more of these scrolls?" asked Raffaello, with the eagerness of a true scholar.

"Indeed, we did. I found this one inside a strange hairy, tarry*offa* ." The Latin word could mean a ball of dough, or a tumor, or indeed any shapeless mass. "But we have others we haven't opened yet. I wouldn't think of doing so without the benefit of your company."

"I thank you. You have them here?"

"A few. Father Vadorini is carrying them."

Curzio, as the discoverer, was granted the honor of the first incision. He took out the new scroll, and read it. "This is astounding—read this sentence, Father."

Father Vadorini read aloud, "I am an augur, a prophet of my people. Yet it is not prophecy which compels Man, but the Great Aesar, who, when he created Man, permitted him to possess his own Will." He crossed himself.

"This is of great theological import! We know that of all the ancient peoples, none were more religious

than our ancestors, the Etruscans. And we know that over the centuries, that the Lord prepared the world for the coming of the Savior by granting inspirations to learned and worthy pagans, such as Homer, and Plato, and Virgil. Here then, is proof that he moved among the nobler of the Etruscans."

His companions immediately recognized the significance of his comment. This Etruscan divine had apprehended, at an early date, one of the major teachings of the Catholic Church, and one on which the Protestants had grievously erred.

"We really need a more attractive name for these packages than*offa* ."

Raffaello considered the problem. "Perhaps you can call it a*chrysalis* . That is the container from which a butterfly emerges, and these messages, at least to learned men, are as beautiful as a butterfly."

* * *

To His Grace Ferdinand de' Medici, Second of that Name, Grand Duke of Tuscany, Magnus Dux Etruriae:

As you requested, I thoroughly investigated the claims of the Inghirami family to have discovered Etruscan antiquities of great significance in the vicinity of their villa of Scornello. I have heard the testimony of Curzio and Lucrezia Inghirami, the discoverers of the first artifact, and of the manservant who accompanied them. I have also questioned the tenant farmers who carried out the further excavations, under the direction of young Curzio, of the ruined citadel overlooking the Cecina. And I have also considered the words of Father Vadorini and of the noble Raffaello Maffei.

Naturally, we have spoken to scholars. They have not reached any consensus as to the authenticity of the artifacts. However, it does not appear that there is anything in the circumstances of these discoveries that would lead one to suspect that the chrysali are not of great age. The chrysali were found within ancient pottery, or in cracks in old masonry, or even entangled within great tree roots. We have no reason to suspect that someone has attempted to deceive your Grace in terms of their provenance.

Moreover, even the critics have conceded that, according to the ancient Greek and Latin writers, the Etruscans wrote on books of linen. If the artifacts are authentic, then they are the first such Liber Lintei to be found, making this an archaeological breakthrough. It is possible that the dissenting professors are merely expressing their indignation that such a discovery has been made by someone outside the usual academic circles.

Curzio's father Inghiramo is your Salt Inspector for Volterra, and his uncle Giulio is your Postmaster General. Both have urged that this young man be appointed "Defender of Etruscan Antiquities," with certain privileges pertaining to excavation of known and suspected Etruscan sites. Such an appointment would honor Curzio's achievements and also gratify two of your most steadfast supporters.

Sincerely, your kinsman, friend and servant,

Tommaso de' Medici

Provveditore de Volterra

* * *

Curzio and Lucrezia were by their fishing spot. They were temporarily alone, having sent the servant back to the villa to fetch something. "They fell for it!" shouted Curzio and Lucrezia simultaneously, and hugged each other in delight. Lucrezia's long, dark, Etruscan hair bobbed up and down.

For Lucrezia, the whole venture was just a lark. Like most twelve year olds, she was convinced that what adults knew could be written on the head of a pin. She had happily donated her hair to the cause, and had especially enjoyed her little stage role on the day of the "discovery."

Curzio's motivations were of a more somber nature. Curzio had attempted, several years before, to persuade his father to let him study history and classics at the University of Florence, or its counterpart in Pisa. Since his formal education had been limited to weekly lessons with Father Vadorini, the faculty had been . . . discouraging.

In order to prove himself as a scholar, Curzio had spent many hours at the archives of Volterra. He had painstakingly written up his findings on genealogy and local history, in both Latin and Tuscan vernacular, and had sent them to professors at the two great Tuscan universities. He had fondly hoped that his essay would impress the faculty members sufficiently so that they would insist that his father allow him to become one of their number. The only one who bothered to answer had crushingly remarked that he did not have time to tutor country bumpkins in the rudiments of historical scholarship. Curzio's father urged him to forget all the nonsense about studying history and become a lawyer. Curzio was not enthusiastic about this idea.

Then Curzio had gone to Grantville. The grand duke encouraged his trusted noblemen to visit, and study, that eldritch place, and, since the plague had not fully loosened its grip on Tuscany, his father had thought it was a good idea for his heir to leave the duchy for a while.

In the up-timers' libraries, Curzio had researched his pet interest, the ancient history of Tuscany. The saga of the glorious days when the Tuscans were the Etruscans, and Rome was just a village of primitives.

Nor was Curzio the only Tuscan fascinated with the past. The Medici collected Etruscan artifacts, such as the "Etruscan Chimera," found at Arezzo in 1554, and restored by Benvenuto Cellini. They also encouraged their court to speak in "Tuscan vernacular," supposed to be descended from ancient Etruscan, rather than in Latin.

After a few months in Grantville, Curzio had a stroke of luck. One of the Americans owned the "Lost Civilizations" series of "Time-Life Books." And these included one entitled,*Etruscans: Italy's Lovers of Life* . While the owner wouldn't sell it, there were alternatives. Thanks to one of the English-Latin translation services which had sprung up in Grantville, Curzio had been able to obtain a complete Latin translation.

Curzio had figured that over the four centuries which separated the up-timers and the down-timers, surely the former had made some interesting finds. And they had. Unfortunately, the most important ones were located on the property of other noble families. So they would get the lion's share of the glory.

Then Curzio had his brainstorm. He would use his secretly acquired up-time knowledge to plant Etruscan artifacts in his own neighborhood. The professors would reluctantly acknowledge his achievement, and the prestige he would acquire by "discovering" the antiquities could be parlayed into a grant of general authority over archaeological sites from the grand duke. Then he would go to the other sites and uncover them.

He would then lord it over the professors who had mocked him in the past. Yes, it was a perfect plan. And the up-time books had told him what he needed to know in order to fake an Etruscan message. Such as the fact that their books were written on folded, tightly woven linen with black ink.

Summer, 1634

Lieutenant Lewis Philip Bartolli was nervous. He had never expected that his first mission outside of Grantville would be a solo one. But here he was in Florence, the capital of Tuscany. His nearest superior, Ambassador Sharon Nichols, was a good hundred miles away, in Venice.

It was amusing, actually. Lewis' parents had planned a trip to Tuscany, but then the Ring of Fire had changed everything. But thanks to that cataclysm, and the USE Army, Lewis was now in Florence nearly four hundred years ahead of schedule.

The French, the Spanish and Austrian Hapsburgs, and the USE's other foes definitely had the bigger battalions. If the USE was to win the war, it had to maintain its technological edge. In that war, the chemical industry had a vital role to play.

Trouble was, Grantville was just a small West Virginia hill town. Its technical people didn't know all the details of the important industrial chemical processes. That meant that it would have to do chemical research. And to do that research, it needed apparatus which was likewise in short supply.

If you wanted laboratory glassware, you wanted borosilicate glass. It was resistant to acids, high temperatures, and thermal shock. To make it, you needed boric acid, or one of the borate salts, such as borax.

Borax was available in seventeenth century Europe. It wasn't used to make glass, but it was used by goldsmiths as a flux, and by assayers as a reagent. It was imported, under the name "tincal," from Tibet. The Venetians held a monopoly on it and charged dearly for it, around three hundred thousand New U.S. dollars to the ton.

The Grantville encylopedias had revealed that, in 1777, boric acid had been discovered in the*Maremma* of Tuscany. During the nineteenth century, until large deposits had been found in the American West, Tuscany had been the world's chief supplier of boron compounds. An up-time picture book of Tuscany, owned by one of Grantville's many Italian-Americans, had directed the USE's attention to the town of Larderello, founded by Francesco de Larderel in 1827 to exploit the local boric acid.

Lewis' scientific training and linguistic skills had made him the ideal candidate for his current assignment. After his accelerated graduation from high school, he had enlisted in the Army, and was assigned to the Military Research Group. Joining the military didn't keep him out of school for long; they sent him right back to the high school. There, he served as a teaching assistant, and received advanced training in chemistry.

There were only so many young men in Grantville who had chemical laboratory experience . . . and Lewis had grown up speaking Italian. Picked up Latin pretty quickly, too. So he was the logical choice, despite his age.

The plan, as devised in Grantville, was that Lewis would test Tuscan waters for boric acid. He would start in Larderello, and then move to the other sites mentioned in the up-time books. Once he identified the most promising locations, the Cavriani office in Florence would acquire the mineral rights and hire the workers and foreman. Lewis would then, somehow, figure out how to get the production process up-and-running. While a method of recovering boric acid had been described in the 1911 Encyclopedia Britannica, Lewis was sure that he would have to improvise.

* * *

Lewis was welcomed to the Tuscan city of Florence by Niccolo and Lorenzo Cavriani. Niccolo Cavriani was the*capo* of the Cavriani Brothers branch office in Florence, and Lorenzo was his son. The Cavrianis were the USE's informal commercial agents in Italy.

After taking precautions to make sure that there were no eavesdroppers, Niccolo began briefing Lewis on the political situation. "Grand Duke Ferdinand II de Medici is only twenty-four years old, and has been ruling Tuscany for only the last seven years. Before then, his mother and grandmother were co-regents.

"Ferdinand's mother was Maria Magdalena, who died in 1631. That is probably just as well; the Austrians have enough influence in the Tuscan court as it is."

"What was her connection to the Habsburgs?"

"She was the Holy Roman Emperor's sister. After Breitenfeld, she persuaded her son to send a Tuscan contingent to join the imperial army. He promised six thousand soldiers, under the command of two of his brothers. He thought better of it, but allowed Francesco and Mattias to serve as volunteer officers. They are somewhere in Germany now."

"So Tuscany is an Austrian ally?"

"Nominally, at least. More in the hope that the imperials will support their designs on Elba, Urbino, and Piombino, than out of any deep-seated enthusiasm for the imperial cause."

"Does that mean that my venture is doomed from the start?"

Niccolo looked shocked. "Oh, no! Trading with the enemy is a time-honored custom in Europe. Indeed, the war in the Netherlands would not exist without it. When the Spanish merchants enter Dutch ports, they pay special charges, which go to the Dutch admiralties to pay for their warships. And then the Dutch turn around and sell grain, naval stores and even weapons to the Spanish, allowing the war to continue."

Lorenzo spoke up. "And the USE does have the advantage that it is not, strictly speaking, a Protestant state. You even have a Cardinal-Protector!"

"And the Medici are very much interested in trade. Nonetheless," his father continued, "it is premature for the grand duke to accept an embassy from the USE. This isn't Venice! In order to maintain appearances, when you deal with the grand duke, you will do so as the representative of an American company."

"Universal Imports and Exports," Lewis confirmed.

"We, in turn, will hint to the ministers that this company has a quasi-official character, like the Dutch East India Company. That way, you are much more likely to be granted a private audience with Ferdinand.

Yet he may plausibly deny that he is treating officially with the USE."

"Why do I need to see Ferdinand at all? Why can't we just go to the mining region and talk to the local landowners?" asked Lewis.

"The state–meaning Grand Duke Ferdinand—controls all of the rights to extract minerals," said Lorenzo. "Usually it rents them out, but we might be able to negotiate a different arrangement since this venture is so speculative. Not like extracting iron, or copper, or mercury from one of the well-established sources in the*Colline Metallifere* .

"Now, where exactly is this Larderello you spoke of?"

Lewis took a map case out of his backpack. He opened it up and unrolled the map. Lorenzo helpfully pulled a few books off the shelves of the Cavriani study and strategically placed them at the corners, so the map would remain flat.

"Here!" said Lewis. He pointed to an area south of the town of Volterra.

"Hmm," said Niccolo. That is in what we call the*Valle del Diavolo* ."

"And why is it called the Devil's Valley?"

"It is a most uncanny place," Niccolo said. "White vapors rise out of holes in the ground, the*soffioni* . Occasionally, steam gushes out, in great geysers." He sipped some wine. "Even when the*soffioni* are silent, the water bubbles in the*lagone* , the hot springs." To Lewis, the terrain sounded much like that of Yellowstone National Park. Minus the grizzlies.

Niccolo leaned back in his chair. "It is thought that one of the circles of Dante's*Inferno* is based on the *Valle del Diavolo* . It is a most uninviting place. Still, you are better off there than in the lowlands, the true*Maremma* ." Lewis understood. The up-time encyclopedias had made it clear that on the coast and in the river valleys, malaria was rampant.

"So, how do we proceed?" Lewis asked.

"I will present you to the grand duke," Niccolo explained. "Once we obtain his blessing on the project, my son Lorenzo will escort you, first to Volterra, and then on to the Devil's Valley. He will do whatever on-the-spot 'facilitating' is needful."

"If we are successful, Larderello will come into being three hundred years ahead of schedule." Niccolo smiled. "It will have another name, of course. Bartollello? Ferdinello?"

* * *

Lewis was somewhat surprised by how quickly they received an invitation to the palazzo. Niccolo Cavriani told him that Grand Duke Ferdinand was known to be very curious about Grantville, for both political and intellectual reasons. Ferdinand had encouraged his more trusted citizens to visit Grantville as tourists and bring back reports. Spies on the cheap, you might say. However, he was probably tired of hearing secondhand accounts, and anxious to meet one of the mysterious up-timers in person.

The machinations of Niccolo Cavriani had no doubt helped, too. The Cavrianis liked to call themselves "facilitators." Lewis preferred the earthier term: "fixers."

The grand duke asked about Lewis' studies. Ferdinand was something of a scientist himself, with a well-equipped laboratory, and therefore was very interested in the science of Grantville.

Somehow, the conversation turned to Sherlock Holmes, Lewis' favorite literary character. Ferdinand asked many questions about Sherlock Holmes' feats of deduction, and seemed quite impressed by them.

Lewis knew certain parts of the Holmes canon by heart. "So Inspector Gregory asked Holmes, 'Is there any other point to which you would wish to draw my attention?' And Holmes replied, 'To the curious incident of the dog in the night-time.'

"Gregory had no idea what Holmes was driving at. He said, 'The dog did nothing in the night-time.'"

"Can you guess what Holmes said next?" Lewis asked.

Ferdinand shook his head.

"'*That* was the curious incident,'" Lewis quoted triumphantly.

Ferdinand acknowledged Holmes' insight. "Ah. The dog knew the criminal."

Cavriani then brought up the purpose of their visit to Tuscany. He explained that according to their up-time books, Tuscany had become a great producer of boric acid, and that it could be used to make tincal available to Europe at a much lower price than had been the case, breaking the Venetian monopoly. Historically, this had been much to the financial advantage of Tuscany.

This was of great interest to Ferdinand. Tuscany was in economic distress. Florence had gone through a depression in the 1620's. Then the plague had hit in 1630, and only departed, carrying the souls of one-tenth the population with it, in 1633.

The Cavrianis proposed to set up a new company, jointly owned by Universal and by the Medicis. Universal would supply the expertise and starting capital, Ferdinand, the mineral rights. The USE would be guaranteed the right to buy a certain portion of the output at cost plus a fixed percentage, and the company could sell the rest at whatever price the market would bear.

The key point was that the new company had to have exclusive boron compound collection rights for the entire duchy. Otherwise, once Lewis started operations in Larderello, competitors would spring up everywhere there was a suitable fumarole or hot spring.

Ferdinand told them that he was favorably impressed by their proposal, but would need to consult with his advisors. In the meantime, he would have one of his aides give Lewis the grand tour.

* * *

"I shall draw a fiery finger across the lands of the Turingii; a circle of fire I shall draw there. Let all beware the power of the Great Aesar."

–translated by Curzio Inghirami from the Latin inscription in Etruscan artifact number four.

* * *

Lewis and the Cavrianis were invited back to Ferdinand's palazzo for further discussions. Ferdinand agreed to give them a permit to travel wherever they wished in the Devil's Valley, and take samples for analysis. The financial arrangements would be negotiated once Lewis had a better idea of where the boric acid was located.

When they finished discussing the boric acid project, Ferdinand asked Lewis more questions about Sherlock Holmes. After the audience ended, Lewis was not entirely sure whether the grand duke had truly appreciated that Sherlock Holmes was a fictional character. Or that it had merely been Lewis' intent, after college, to go into forensic science. Lewis had said so, of course. But he kept wondering about a remark Ferdinand had made just before they parted. Something about how he was pleased that one of Sherlock Holmes' disciples had come to Tuscany.

* * *

"What do you know about the Etruscans, Lewis?" asked Niccolo. He didn't sound happy.

"They were here in Italy before the Romans. That's all I know." Lewis was only half paying attention to Niccolo. He was applying tincture of turmeric, a down-time spice and dye, to strips of paper. Turmeric changes color when exposed to boric acid.

"Well, it appears that you are going to learn a lot more."

Lewis stopped playing with his indicator strips and looked squarely at Niccolo.

"One Curzio Inghirami, a nobleman of Volterra, found a linen scroll, with both Latin and Etruscan writing, supposedly inscribed by an ancient soothsayer. And this Curzio is from a very influential family in Tuscany, and thus has the ear of the grand duke."

"How does this affect us?" asked Lewis, spreading his hands to emphasize his bewilderment.

"The Provedditore of Volterra was asked to issue a decree that the artifact was authentic, and he promptly deferred to his superior. The case went up the ladder until it reached Grand Duke Ferdinand, and he remembered all the feats of detection which you regaled him with.

"He would like to appoint Curzio as 'Defender of Etruscan Antiquities,' thereby pleasing the Inghirami family. But he is nervous. If the messages are formally pronounced authentic, but later proven fraudulent, it will reflect badly on him.

"Ever since Curzio published his initial findings, there have been escalating attacks on his work from scholars outside Tuscany. So Ferdinand is vacillating on the issue of authenticity." Niccolo sighed.

"He intends to appoint you as 'Consulting Detective to the Grand Duchy of Tuscany,' and instruct you to determine whether there is any cause to deny the requested decree."

Lewis groaned. "Can't I refuse?"

"Sure. If you want to antagonize the one person in Tuscany who can grant us the right to collect boric acid."

"All right, all right. I'll do it. Although it will take time away from our boric acid prospecting."

"It will do more than that. The only reason for bringing you into the matter is to satisfy the scholars who

have cried 'foul.' The Inghirami will see you as being the leader of the opposition, out to prove that Curzio is a fool or a fraud. The Inghirami are one of the principal families of Volterra, and they can make life very difficult for us."

"Why does the duke care about these artifacts?" Lewis put the prepared strips into a vial, stoppered it, and packed it away.

"There are several reasons. First, the Medici united the provinces of Arezzo, Florence, Grosseto, Livorno, Massa, Carrara, Pisa, and Siena. Some of their subjects would rather be independent. Since those provinces were one country, or at least a close confederation, during the Etruscan period, the Medici encourage study of the Etruscans. They think it helps justify their own hegemony.

"Also, Ferdinand is a very religious man, and therefore deeply interested in the prophecies which they make."

"Prophecies?"

"Yes, in Latin. Prophecies of many great events, from the birth of Jesus to the Ring of Fire."

"The Ring of Fire? You must be joking. Curzio*must* be perpetrating a hoax."

"Because of the prophecy?"

"Yes, of course!"

Niccolo looked away. "My colleague in Venice warned me that you up-timers, even the Catholics among you, have a very different view of religion than we do. I can't think of anyone I know, noble or commoner, who would question the possibility that the Ring of Fire could be prophesied. The only point of doubt would be whether it would be foreseen by an Etruscan rather than by one of the Hebrew or Christian priests."

"Well, is there any other evidence of a hoax?"

Lorenzo spoke up. "There is apparently some literary evidence. The Inghirami family has threatened or bribed some of the 'unbelievers,' but they haven't been able to quiet all of the opposition. Still, if no new evidence is presented, they are likely to prevail."

"What do you suggest I do?"

Niccolo smiled. "The safest course of action would be to declare the artifacts to be authentic, and head on to Devil's Valley with the goodwill of the Inghiramis."

"I can't do that. If he is exposed by someone else, then I look like an idiot for having publicly accepted his story! He might even confess voluntarily, so he could brag about having fooled the so-knowledgeable Americans."

"So what would your Sherlock do, in these circumstances?"

* * *

"Your Grace, in order to perform this task, I will need a certain amount of assistance that only you can provide. First of all, I will need to inspect as many as possible of the texts which have already been

'found' by Curzio. And also whatever is left of the material they were packaged in."

Ferdinand nodded. "There are a few chrysali which have been entrusted to me, and you may have free access to them. The others are with Signore Inghirami, in Volterra. I can give you a letter requesting that he treat you as an investigating officer."

"I would also ask that you advise Signore Inghirami that it is your special request that if any of the chrysali remain unopened, or if any new ones be found, that they be sent to you, that you may be the first to open them."

Ferdinand narrowed his eyes. "He will consent to this, but he may reasonably ask that they be opened in his presence, lest he be denied his proper share of the glory in the discovery."

Lewis resisted the urge to roll his eyes. "I can live with that—but it is extremely important that you obtain these unopened capsules before he is aware that they are to be subjected to special examination by me. Indeed, I would ask that you obtain them before you make public that appointment."

After giving the matter a moment's thought, Ferdinand said, "Very well."

"I will need to have access to as many unquestioned Etruscan inscriptions as possible, and I will need the cooperation of scholars who can tell me what the Greek and Latin authorities say about the linen, ink, writing implements, and history of the Etruscans."

"The curator of my collection will show you what I own, and I will give you a letter of introduction to the faculties of the Universities of Pisa and Florence."

Lewis studied Ferdinand's expression. Could he get away with another request? Yes, perhaps. "Finally, I will need a fully equipped laboratory."

"You are fortunate, because the members of my family have been interested in alchemy and optics for several generations. We have everything you could possibly desire."

Except equipment for radiocarbon dating, thought Lewis wryly.

* * *

Lewis had been unable to identify any forensically useful characteristics of the tar, the hairs, or the linen.

The ink. What had he read about inks? Yes, the first inks were carbon-based. Then, in the Middle Ages, Europeans switched to iron gall inks. Curzio almost certainly used an iron gall ink. Given time, it would fade from black to brown. It would also contain iron, which could perhaps be detected chemically. And the gallic acid in the ink would eat at the fibers, and that might be visible under a magnifying glass. Or a perhaps a microscope. Did Grand Duke Ferdinand have one in his laboratory?

Lewis approached the curator of the Uffizi, where the museum, library and laboratory were housed. "I will need access to the grand duke's chemicals."

"That is not a problem."

"Great! I just wish I had a microscope."

"A 'microscope'? I am not familiar with that term."

"It makes small things look larger." Lewis whipped out his magnifying glass, and demonstrated.

"Oh. We have one made by Zacharias Janssen for the duke's father. It has two tubes, one of which slides, and two lenses, one at each end."

"We call that a compound microscope."

"And we also have a more powerful one, built by Galileo. It magnifies, oh, perhaps twenty times. Would you like to use that one?"

* * *

In the grand duchy, Galileo was a hero. Lewis was well aware that an endorsement from him would be helpful. Lewis, after all, was an unknown. The Cavrianis made inquiries on his behalf, but the results were disappointing.

"Don't expect any help from Galileo," said Niccolo.

"Why not? Surely a genius like him, known for his skepticism, would question Curzio's storytelling."

"Galileo is known for more than his genius. His ego, for example. Let me read to you from another of Curzio's Etruscan revelations: 'One of great mind shall come, the like of which the world has never known before, out of Etruria reborn. He shall place ears on Saturn. He shall find the four lost children of Jove. Everlasting will be his glory.'"

"I suppose the children are the four Galilean moons. But ears? Oh—that must be how the rings look in a telescope with bad optics. But what does 'out of Etruria reborn' mean?"

"Etruria was the name given to the land of the Etruscans. And Galileo was born in Pisa, which was once an Etruscan city. But do you see my point? Galileo isn't likely to be critical of a prophecy which praises him so plainly."

"Even though one could argue that it was more likely written after his discovery than seventeen hundred years before it?"

"Even so."

* * *

The librarian showed Lewis recipes for the two types of ink, and Lewis whipped up a batch of each. Cavriani had fetched him several samples of linen cloth, chosen to match, as closely as possible, the appearance of Curzio's specimens. Lewis dipped one quill into the first ink and wrote with it. Then, with a second quill, he wrote with the other ink. He labeled his handiwork, and continued.

Lewis didn't remember the standard forensic tests for inks. But he had plenty of chemicals to experiment with, including weak and strong acids and alkalis. He found that the acids bleached or eliminated the galled ink writing, while the sodium hydroxide changed the color to a dark red.

So now all he needed was to persuade the grand duke to let him surreptitiously carry out some chemical tests on the Etruscan artifacts sent by Curzio. That shouldn't be difficult, given Ferdinand's interest in science. In fact, Lewis suspected that he would be the first American to have a duke as a lab assistant.

Lewis returned to his studies. After some minutes, the curator came up behind him. "Dottore. We have an unpublished manuscript which you should read."
""What is its name?"
"*De Etruria Regali Libri Septum*. Or, in English,*Seven Books on Etruria of the Kings* . It was written by Thomas Dempster, a professor at the University of Pisa, at the request of Cosimo II de' Medici. It analyzes all of the references to the Etruscans in Greek and Roman literature. It even presents a small Etruscan vocabulary."
"Wonderful. Oh. Can you also provide me with access to the laboratory? I will need to carry out some alchemical operations."
"That will not be a problem."

* * *

Lord Bailiff Andrea Cioli called for silence. "This proceeding is convened by the order of His Grace Ferdinand the Second, Grand Duke of Tuscany, to determine whether certain artifacts, discovered by Curzio Inghirami and various persons working under his supervision, are to be receive a writ of authenticity from the Mother Church."

The first witnesses were men whose interest was in classical literature. They knew Latin and the history of Rome; they had studied the Etruscan inscriptions on stone and metal, and had tried to make sense of them.

The strongest points in Curzio's favor were that he was a nobleman with an unblemished reputation, the chrysali he found had been found in an area known to possess Etruscan remains, and, most of all, the messages were written on linen cloth, as only classical scholars would have expected.

Still, the courtroom discussion was heated. The learned scholars of Pisa insisted that the tales told in Latin by Curzio's Etruscan were inconsistent with the histories of Livy and other Roman authors. Their colleagues of Florence told the court that it was a mistake to assume that the Roman version of the early history of Italy was accurate or complete. "Now we are hearing the Etruscan point of view," they explained. Pisa and Florence had been traditional enemies for centuries; their ancient enmities had reasserted themselves in this courtroom.

The*professori* of Pisa also declared that the Latin used by this supposed Etruscan was of an inferior quality, at odds with the high priestly position he claimed. They denounced the writing as that of a schoolboy. No one missed the implication that it could be that of a modern schoolboy, like Curzio.

The Florentines, on the other hand, argued that one could not expect a leader of the Etruscan people, chafing under Roman rule, to write Latin as if he were a Roman patrician. They excused all mistakes as being those of a foreigner, albeit one having some dealings with Rome.

Then there was the controversy concerning the way in which the inscriptions were written. It was accepted by all scholars that the Latin alphabet evolved from the Etruscan one. Certain of the Latin letters look different when flipped to face backward. There were Etruscan counterparts to the Latin letters C, E, F, K, and L, but they all faced backwards on almost every known Etruscan writing . . . save for Curzio's.

Moreover, a few of the inscriptions provided several lines of text. These were aligned on the right side, but had a ragged left margin. In contrast, in the text provided by Signore Anghirami, the reverse was true.

For these two reasons, the Pisans argued that Etruscan inscriptions were clearly written from right to left, and Curzio's weren't.

Still, there were instances, although rare, in which indisputably authentic Etruscan text was written from left to right. And that gave Curzio's defenders an out.

* * *

Eventually, it was Lewis' turn to speak. "I am Lewis Bartolli, consulting detective and citizen of Grantville. I have been appointed by the grand duke to investigate the artifacts in question.

"If the writings are taken at face value, they were authored by an Etruscan more than seventeen hundred years ago. If that be true, then there will be certain*alchemical* signs of the age of the writing. Signs which natural philosophy, as taught in Grantville, can reveal, whether to praise or damn.

"I would like to direct the attention of this court to the ink used on these artifacts. I have consulted with the professors of Tuscany, and hence have determined that the inks of the ancients were described by Pliny the Younger, Vitruvius, and other authorities. The principal one was made from soot mixed with water and gum, and I have prepared a duplicate of it.

"The black ink in common use today is made according to a recipe which your schoolchildren learn as a rhyme:*Una due tre e trenta / A far la bona tenta* . It means one part of gum arabic, two of green vitriol, and three of galls in thirty parts of water. The galls are soaked in rainwater to liberate what we call tannic and gallic acids. They react with the green vitriol, which in Grantville is called iron sulfate, to form the dark iron tannate and gallate. I have prepared this galled ink, as well.

"I wrote with both inks, using a quill pen, on both paper and linen. I then had to find a way of differentiating the two. I experimented with different reagents, and found several which caused a change in color in the modern ink, but affected the ancient one not at all." Lewis demonstrated that this was the case.

"So, there is clearly a detectable chemical difference between the two kinds of ink.

"Now, I can carry out the same tests, only with the inks on the linen messages brought to us by Signore Inghirami."

Curzio was quick to complain. "I must object, Your Grace. These are priceless artifacts. They could be damaged irretrievably by this foreigner's chemicals."

Ferdinand was unimpressed. "I fully appreciate your position, Signore Inghirami. However, it is you who have to come to us for a decree of authenticity. Either you must consent to such tests as we authorize, or you must withdraw your request."

Curzio conferred hurriedly with his supporters. "We withdraw the objection." Ferdinand motioned to Lewis to continue with his alchemical operations. He took out one of the fabrics, read out for the record the text which he was going to treat chemically, and with what, and proceeded accordingly. He then displayed the results triumphantly.

"As you can see, Your Grace, the behavior of the ink on this linen is that which would be expected of the iron-based modern ink, not the Plinian one."

Curzio turned to one of the people behind him, dressed in the formal robes of a member of the faculty of the University of Florence. They whispered to each other, and then Curzio addressed his ruler. "Most wise grand duke, Pliny the Younger has described several inks which were in common use by the

Romans his day. However, that does not mean that his list was exhaustive. I am told that he actually described an experiment in which he soaked papyrus in an infusion of galls, and showed that it was blackened by vitriol."

Lewis bristled. "If he knew that it blackened paper, and still did not list it in his chapter on inks, then surely that means that no one in his day used it for that purpose. It was merely a curiosity."

"But what was a mere curiosity in his day might have been a standard ink of the Etruscans." Curzio paused. "Please assume, for the sake of argument, that this was the case. Would you then have any reason to doubt the authenticity of the chrysali?" Curzio beamed triumphantly at his buddies in the courtroom. For someone who professed to have no interest in law, he certainly seemed to enjoy playing lawyer.

Lewis gave Curzio a long stare. "Yes, I would." He turned to face the grand duke. "I have been asked to assume that the ink used by the Etruscans was the gall-green vitriol ink with which we are all familiar. It is only in this way that the Inghiramis can explain the chemical behavior of the supposedly Etruscan ink.

"But let us now consider the physical characteristics of the two types of inks. If it is a carbon-based ink, then the black matter of the ancient ink remains on the surface, where it can readily be scraped off. Indeed, that is why you can use ancient manuscripts as palimpsests.

"On the other hand, if it is a gall-based ink, then that is not so easy. The acid from the galls bites into the paper, carrying the black matter with it. Hence, after sufficient passage of time, the writing cannot be readily removed. That is why this ink is preferred for official documents.

"So, let us make trial of the ink on the first message exhibited by Curzio, as it is known to been on the cloth for several months." Lewis took out a knife, and scraped at the linen.

"Aha! It does not come out easily. But let me do the same to the samples I prepared before. Examine the scraped areas with the magnifying glass, and it is manifestly evident. Curzio's ink penetrated deeply, like a modern galled ink, and unlike an ancient ink formed from soot.

"But, wait! I was instructed to*assume arguendo* that the Etruscans had a ink made from green vitriol and galls. That assumption leads us down a path which Curzio would have been wiser to leave unthought of.

"One unfortunate problem with these galled inks is that, because of their acidic nature, they corrode away the writing surface. I have ascertained experimentally that linen fabric is just as vulnerable to acid damage as is rag paper. The curator of the collection here has shown me rag-paper manuscripts which were a mere four hundred years old, and in which the ink had chewed its way entirely through the leaf, leaving a hole. Only inked portions of the paper were so affected.

"I was also shown a map, perhaps two centuries old, which was folded so that the heavily inked compass rose was brought into contact with an area which originally was blank. The vitriol from the rose left a scorch mark on the latter.

"But the young gentleman would have us believe that a linen could be written upon with a galled ink sixteen hundred years ago, yet show not a iota of damage. This is beyond belief."

Curzio was not ready to concede that the ink could not be Etruscan. "The papers were not exposed to the elements, but rather were sealed within a protective bubble of tar. Perhaps that curbed the acid."

Lewis had anticipated this argument. Indeed, he suspected that Curzio, when "designing" the chrysalis, had used the tar specifically in order to provide a ready excuse for the survival and fine state of preservation of the "Etruscan" writings.

"The tar would have protected the cloth from the air, and thus from normal aging. But the acid was already on the cloth, brought in by the ink, and it did not require air to function. Indeed, alchemists will acidify materials inside a hermetically-sealed retort. I have placed flax fibers inside a stoppered test tube and demonstrated that they are attacked by acid."

Murmur, murmur. Curzio turned to speak quietly with one of the scholars hired by his family. Finally, he came out of this huddle and said, "we believe you mentioned that the soot-based ink was the principal one used in ancient times. However, that implies that there were other inks. My venerable colleague here informs me that one such ink was that of the cuttlefish, in Latin,*sepia* . Have you tested that ink?"

"No, but if I am provided with the cuttlefish, and shown how to remove the ink sac and extract the ink, then I will test that sepia ink in the same way that I did the carbon ink." Obviously, Lewis didn't trust Curzio not to tamper with the sample.

Curzio coughed. "Is it not possible that the Etruscan scribe wrote with an iron stylus, rather than a quill or reed? If so, could there not have been an alchemical contagion of the ink with the qualities of the stylus? Could your reagents, then, have been quivering in sympathy with that accidental iron, rather than with green vitriol in the ink proper?"

Lewis bit his lip. "An iron stylus is hard; very few atoms of iron would be released into the ink and fabric. The color change I observed was too pronounced to be the result of that trivial sort of contamination."

"But since you did not carry out your test with an iron stylus, you don't know that."

"I can modify the test and find out."

"But are there not other problems? We know from Pliny's*Historia Naturalis* that some ink was made from charring bones which once lay in the earth. Who knows what metals could have been absorbed before these bones were converted into ash? Or whether the presence of those metals could have affected the alchemical properties of an ink made from that ash?" Curzio spread his hands, as if to emphasize the vast number of possibilities still untested by Lewis.

"Proving a negative is very difficult," said Lewis drily. "But it is your burden to prove to us that these artifacts are authentic, and I don't think you have succeeded.

"Indeed, let us look us look closely at this Etruscan of yours. He is a high-ranking priest, living at a time when the Etruscans were Roman subjects, yet he speaks Latin like a schoolboy. He also has trouble remembering his history lessons.

"He demonstrates his individuality by writing Etruscan from left to right, as if he were Roman, or Tuscan, rather than in the traditional Etruscan direction.

"According to my chemical tests, his ink is of the modern kind, which contains iron and acid, yet the linen is undamaged by the vitriol. To explain this, Curzio first suggests that the Etruscans had in fact used galls and green vitriol to make ink. When I showed that a modern ink, over the course of nineteen hundred years, would eat great holes in the linen, Curzio changed his tune.

"The ink was of an ancient kind, after all, but the iron was imparted by the Etruscan's iron-tipped pen or by some iron implement lying in the earth.

"So have these mysterious Etruscan iron-tipped pens been referred to by the Roman and Greek authors? Have any been found by other excavators? And how could iron in the soil have affected chrysali which weren't actually buried?"

Lewis turned to face Curzio directly. "So, Signore Inghirami. In view of the evidence presented, are you willing to concede the possibility that you have been deceived by some forger, and withdraw your request for a decree of authenticity?"

Curzio conferred with his family. "The evidence you have presented is inconclusive. It is insufficient basis for overturning the finding of the Provedditore of Volterra, Tommasso de Medici."*Bit of name-dropping there* , thought Lewis.

Lewis approached Fredinand. "As your consulting detective, I would like to discuss with you privately as to how best to proceed from here." Ferdinand nodded.

"It is already late in the day," declared the grand duke. "We will recess until tomorrow." The crowd filed out of the courtroom.

* * *

Lewis was closeted with Ferdinand. "Do you presently think these artifacts are authentic?"

"I am not sure what to think. You have built a strong case against them," Ferdinand admitted. "And if they are false, then Curzio would be the most likely culprit. It could not be one of the tenant farmers; they wouldn't know how to write Latin and they wouldn't know about the Etruscans' linen books. It couldn't have been a stranger; his presence would have been noted, sooner or later. And it could not have been buried many years ago by one of Curzio's ancestors, as they would not have known of the Ring of Fire.

"Still, it is difficult for me to believe that Curzio Inghirami, a young gentleman of a distinguished family, would stoop to forging an antiquity."

"Perhaps it was a*beffa* , a practical joke, which got out of hand," Lewis suggested.

Ferdinand winced. "I have only ruled Tuscany for five years. Inghiramo and Giulio are Knights of the Order of Saint Stephen, and Giulio is one of the more influential nobles in my realm. They cannot, without losing honor, admit that a member of their family, whose cause they have strongly espoused, is a forger. And thus far they are unwilling to even concede that Curzio has been deceived. What would your Sherlock Holmes do?"

Lewis mulled over the many Holmes stories he had read over the years. There was*A Scandal in Bohemia* . And*The Norwood Builder* . Both times, Holmes used a false threat to panic a criminal into doing something unwise.

Could Lewis bluff the Inghiramis into accepting the lesser offense of having been deceived by person or persons unknown? Curzio didn't know what up-time forensic science could do, or which of its tools Lewis could duplicate here and now. Or did he? Since coming to Volterra, Lewis had heard rumors that Curzio had visited Grantville.

Of course, it was not enough just to claim, say, that up-timers could date the linen. Mere words would not be enough. There had to be a dramatic demonstration of some kind, so the Ighiramis could visualize how the courtroom scene would play out in the end.

When Lewis explained what he had in mind, Ferdinand was delighted. Lewis went off to collect the necessary materials, and then sat down with Ferdinand to prepare the first part of the "demonstration."

* * *

The next morning, Lewis told the court about a new way to test the authenticity of the Inghirami artifacts. "In 1686, 'old time line,' your fellow Italian, Marcello Malpighi, reported that on our fingers, we have minute ridges and valleys which form distinct patterns. He recognized three basic configurations which we now call ridges, spirals and loops." Lewis paused for a moment, wondering whether Malpighi had been born before the Ring of Fire had changed the flow of time and, if so, what he would do with his talents in the new world which it had created.

"Hundreds of years later, it was recognized that, if these patterns are examined closely enough, they are distinctive to a particular individual. Even identical twins have different patterns.

"Now, it turns out that when we touch something with our fingers, our sweat leaves an impression of those ridges. The resulting fingerprint may be obvious, as when a dying man, his hand covered in blood, touches a wall, or it may be cryptic. Up-time police forces have found that with certain powders or vapors, they can render a latent fingerprint visible. I am prepared to offer proof of this, should this court desire it.

"Fingerprint evidence was routinely accepted in up-time courts, throughout the world, as proof of identity. Or lack of identity."

Curzio rose to his feet. "Setting aside the alleged practices of the future, this evidence has never been accepted as proof by the most Holy Church, or by any prince of this world. Is that not true?"

"Actually, I would direct the learned nobleman to the Second Epistle to the Thessalonians, which says, 'The salutation of Paul with mine own hand, which is the token in every epistle: so I write.' That is a clear reference to the use of an entire hand print for identification. There are patterns on the palm, not just the fingers. The Book of Job says, 'He sealeth up the hand of every man; that all men may know his work.' That means that men can know each other just by properly examining their hands.

"I have also read, admittedly in up-time books, that the Chinese emperors have used fingerprints for identification purposes for a thousand years."

"Very well, but I don't see the relevance of fingerprints to this proceeding."

"It is implicit in this proceeding that there is a possibility that the artifacts, rather than being Etruscan, are a fabrication. If they are a fabrication, they must have been created by a person, or group of persons, who can write Latin, has seen some Etruscan inscriptions, and has access to sites where the artifacts were found. Moreover, the fourth artifact must have been created after the Ring of Fire, in 1631.

"Conceivably, that person is a stranger. But in our quest to determine the truth, we must entertain the possibility that he or she is a member of the Inghirami household, or of one of their tenant families. Consequently, I intend to take the fingerprints of every one of these individuals and compare them to the fingerprints on the Etruscan writings."

"But of course we have fingerprints on the cloths!" Curzio exploded. "I broke open the chrysali; I held the ancient writings in my hands. I gave them to my father, and Father Valdorini, and my friend Raffaelo, to hold and study. Many others, even perhaps the grand duke himself, have done the same."

"That is true for most of the chrysali. But there were several which you were kind enough to offer to the grand duke so that he could open himself. The contents of those chrysali will bear the fingerprints only of your Etruscan. Or, if they are false, the hoaxer.

"His Grace magnanimously offered to set an example by letting me take his prints. So, too, did Niccolo and Lorenzo Cavriani."

Ferdinand recognized his cue. "All three were different in some way. Even though the Cavrianis are father and son."

"I will then take the prints of every individual known to us who could possibly have participated in the hoax. From the Inghiramis down to the meanest laborer." What Lewis didn't tell them was that the art of classifying fingerprints required great skill and experience, in order to find all the distinguishing minutiae. Skill and experience which Lewis didn't have.

"Once this information has been collected, and I have classified the prints according to their patterns, I propose to have His Grace slice open those virgin chrysali. He and I will, together, examine with a magnifying glass the fingerprints found on the sticky inner surface of the tarry container, as well as those on the linen itself. It is finely woven, so that it can be written on, which means that it is more likely than a coarse fabric to bear a clean impression."

This was the most delicate point, Lewis knew. It was in fact extremely difficult to detect a latent impression on fabric. Prior to the hearing, Lewis had experimented with various powders, unsuccessfully. He could sometimes develop a latent print on linen by placing it in a container with iodine crystals, laboriously extracted from seaweed. The crystals sublimated, and the vapor then marked the print. But it was very hit-and-miss.

"We will then compare them to the fingerprint file. If there is a matching set of prints, then we will know definitively, who the hoaxer is. And if the prints on the artifacts do not match the prints taken, then we know that those people were not hoaxers."

"And if there are no prints to be found on the artifacts? Or they are too indistinct to be useful?"

"Then we have lost nothing but time."

Ferdinand rose. Everyone in the hearing room did the same. "I think this is too great a matter to be resolved in the little time remaining to us today. We will recess until tomorrow morning." Lewis, Niccolo and Lorenzo left the hearing room.

* * *

"Uncle, we need to talk privately." Giulio Inghirami raised his eyebrows, but agreed. Once they had found a suitable place, and barred the door behind them, he motioned to Curzio to continue.

"Do you remember that boating accident I had, about five years ago?"

"Vaguely. What of it?"

"My thumb was cut badly. I still bear the scar."

"And so?"

"I fear that the scar would be visible in my thumb print. It would be quite distinctive, would it not?"

"All the better for proving that you did not forge the Etruscan documents." Uncle Giulio frowned. "Unless, of course, the thumb print of the Etruscan has the same scar."

Curzio said nothing.

"Curzio, you idiot, what have you done to us!"

Curzio slumped. "I meant well, uncle. I thought that since the cause of the Church was just, that it would not be sinful to create a false Etruscan artifact which would serve the greater cause of supporting it in its struggle with the Protestants.

"Also, I found descriptions of truly great Etruscan remains in the books in Grantville."

"You should have studied less history and more natural philosophy, it seems."

Curzio shrugged off this dig. "Those remains, unfortunately, were not on our land. The only way I could hope to get access to them was to first be accepted as the authority on all matters Etruscan. And for that to happen, I had to make a dramatic find. I was on the horns of a dilemma."

"How noble of you to tell a little lie for the greater good of the Church and your ruler. Rather than, say, to show up the*professori* who had a low opinion of your academic abilities." Guilio sighed. "It is going to be very difficult to extricate ourselves from this imbroglio with our honor intact. And that is going to depend very much on what Lewis Bartolli will agree to."

"Do you think he can be bribed to accept the authenticity of the artifacts?"

"No. Too much of his own prestige is now invested in challenging them. But we may be able to persuade him to take you off the hook. He is interested in the*soffioni* south of Volterra, I have heard. I will make sure that he knows how much we can help or hurt him in that regard."

* * *

Andrea Cioli addressed the assembly. "I put it to this court that the nobleman Curzio Inghirami has been the innocent victim of a vile deception, practiced by another. A person of his tender age could not, of course, have been expected to recognize the artifacts as fraudulent, and because he was himself beyond reproach, those who considered the artifacts later did not given them as thorough an examination as they would have had they come by a different channel. None, then, is to blame, but the true forger."

"And can you put a name to this forger?" Ferdinand asked.

The councilor turned to Lewis. "Lewis Bartolli. Are you presently aware of any evidence which would suggest that the forger was one other than the vile and despicable Michel Ducos?" The question had been most carefully worded.

Lewis fought to keep a straight face. "No."

Cioli turned to the grand duke. "As I am sure you are aware, Michel Ducos was the mastermind of the plot to assassinate the Holy Father. And I have been informed that his agents planted false documents in attempt to implicate others in the plot.

"Thus, forgery is a technique which the infamous Ducos had used before." Cioli shook his head sorrowfully. "We can only wonder how he intended to exploit these faux Etruscan artifacts. No doubt, we would have eventually found a capsule which contained, in Latin, some subversive utterance, once he had convinced the populace that the writer was a true prophet. Be that as it may, his plot has now been foiled."

Next month they'll be blaming Ducos for stillborn calves and sour milk, Lewis thought.

Niccolo Cavriani whispered to Lewis. "I know that you would rather have denounced Curzio as a forger, but don't forget what we are getting out of this. The Inghirami family has agreed to supply the labor and materials for the Larderello operation. In return for letting Curzio off the hook."

The grand duke, in the meantime, was whispering to Cioli. At last, Cioli called the audience to order.

"Thank you for your report," Ferdinand said. "These are my decisions.

"Signore Curzio Inghirami, I regret any embarrassment which these revelations may have caused you. Be assured that as a scion of the family Inghirami, you remain in my affections. I believe that your affection for history is so great that you acted imprudently in the matter of the dissemination of these inscriptions. Perhaps a course of study at one of our great Tuscan universities would remedy the lacunae in your knowledge which led to this outcome.

"Signore Inghiramo Inghirami, it is not for me to intervene between a father and his son, but it is clear that your Curzio was misled because he did not have the knowledge of Latin, or of history, which one of his calling should acquire. May I ask that you permit him to study those subjects at the University of Florence? If so, I will permit him to list me as his patron.

"Dottore Lewis Philip Bartolli, I have heard that according to your history books, my brother Leopold and I started a famous scientific society in 1657. Having witnessed first the great experiments of our own beloved Galileo Galilei, and now your own rational investigations into the truth of this Etruscan mystery, I have decided that there is no reason to wait more than two decades to establish the*Accademia del Cimento* . Galileo, of course, will be its first member.

"The word '*cimento*,' as you know, means 'experiment.' My*cimentisti* will disdain the sterile attempt of the Aristotelians to deduce everything; they will insist on the experimental proof of each hypothesis. I would like to invite you to join their ranks."

*Me? A member of the same scientific society as Galileo?*thought Lewis. "Your Grace, as you know, I am in Tuscany for a particular purpose."

"Indeed. But since that purpose requires scientific investigations, I do not see a conflict."

"Also, I must answer to my superiors as to where I am stationed. I don't know how long I can remain in Tuscany." Lewis carefully avoided any references to his superiors being in the military. Ferdinand knew, but it was not for public release. "However, provided that they have no objection, and that you have no problem with my being a non-resident member, then, of course . . . with the utmost thanks . . . I accept!

Historical Note

There really was a Curzio Inghirami, and in November 1634, he "discovered" Etruscan artifacts, which he called "scariths," which were definitely fake and almost certainly fabricated by him. His big mistake was that he had his Etruscan write on rag paper rather than on linen cloth—a mistake which "my" Curzio avoids thanks to his research in Grantville. For the history of Curzio's scariths, read Ingrid D. Rowland, *The Scarith of Scornello: A Tale of Renaissance Forgery* (U. Chicago Press: 2004). Note that my chronology differs, thanks to the "butterfly effect" of the Ring of Fire, from the historical one.

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Wings on the Mountain

by Terry Howard

The regulars left the table nearest the fire when the strangers came in. At the base of the Matterhorn summer nights are chilly, so a fire is welcome starting in the late afternoon. Strangers paid much higher prices for everything and the whole village, not just the innkeeper, profited. Everyone made strangers welcome.

The four outlanders were barely seated before a jack of beer was set in front of each of them. "There is soup tonight," the innkeeper said, "and clean linen for pallets in the loft. I am sorry but the village has only one sleeping room for travelers and it has already been let.

"Tomorrow would you prefer beef, pork, or fowl?" The village would enjoy what the travelers paid for but did not eat. It was hoped they would want beef.

The guests were taken aback. "You presume we are staying."

"Good sirs, the trail does not lead through the village. When you leave you will go back the way you came. You are not passing through."

A man who, by his dress, did not fit in spoke from the darker back of the room. When he quit paying for meat the village quit making room for him by the fire. "Until Grantville came to the Germanies, only those born here ever came. Most who leave never return. You came to climb the mountain. You will not leave until you have tried."

The four men were clearly astonished.

"Did you think you were the first to try?" the man asked. "Sir Edward Whympel, will, would have been, the first to climb this mountain. If he can do it in 1865, you can do it now and be remembered forever."

A very disappointed traveler asked, "Then we are too late?"

"Too late to be the first to try. You could be the first to succeed."

"Who else has tried?" one outlander demanded.

"Who remembers those who only tried? I can get you the names of the others still in town if you wish."

This caught the attention of the adventurers. One asked, "Other climbers are in town?"

"They have already tried? We must talk to them," demanded another who was clearly noble from his voice. He would have his way. No one would tell him no.

The man in the dark shook his head, "The priest will not allow it."

"What does the priest have to say about it?"

"Raising the dead takes a witch, and the priest will see any known witch burned. None will raise the dead for you, no matter how much you pay."

"How many have tried?"

"They say the first ones came early last year. We were the fourth group, you are the fifth. There are four men in the church yard and three more on the mountain. Others have gone back down the pass. I decided to wait for another group and try again. I'll be happy to tell you everything I know, and act as a guide, as long as I can join you in your climb."

The innkeeper asked, "Would you gentlemen like bread and soup now or later? I can add cheese and some pickles. We will do better tomorrow."

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Pocket Money

by John and Patti Friend

Kloee glared at Emery, as Dakota held up a dried cob. "So this is the big deal you found to get us some extra money?" Kloee and her kin were meeting in Papaw Murray's barn because it was the one place they could go without some adult looking over their shoulders. Kin in this case meant her brother Emery, her sister Dakota, little brother Zackie, and sort-of-cousins Freddie Bates, Franz Meyers-Bates, Wilhelm Engling-Bates, called WB, and Sybella Doebling-Bates, who everyone just called Sybie. Some up-timer, some down-timer, but all family.

"You know that me and Emery go with Papaw Murray when he goes out," Dakota said proudly. "Well, Papaw's friends, the Knapps, kind of pick up something for him. And that got me an idea how to make some money." A conspiratorial look appeared on Dakota's face. When no one asked her what the Knapps bought for her grandfather, she blurted, "Tobacco! Papaw smokes when he ain't home and Granny Murray can't catch him."

Kloee laughed. "Like Granny Murray don't know everything Papaw does. Papaw ain't half as smart as he thinks."

"So what does a dried-up, broken corncob have to do with anything?" Franz asked.

"Well, how do you think Papaw smokes his tobacco?" Dakota responded sharply. "Ain't you heard anyone complain about no paper fit to roll cigarettes or how expensive pipes are?"

Freddie tugged at the skull-and-cross-bone earring he wore. "Sure," he mumbled. "I hear that sorta thing from Frau Meyers. She has bugged Papa about finding a way to make paper for cigarettes."

"Okay, Dakota, go ahead and tell us how a no-good, broken corncob's going to make us some spending money," Kloee ordered. She was rewarded with an icy stare from Dakota.

"Well, Papaw says that down-timer pipes is too expensive and he just holla's out an ol' corncob and a elderberry twig and makes his own pipe. Don't cost nothin' to make and lasts awhile."

"I don't think we can make money that way," said Sybie.

"Sure we can," WB interjected. "Papa says that there are lots of people smoking tobacco 'cause the English, French, Dutch, and Spanish is all growing and selling it right now and ain't a lot a people saying it ain't good for you."

"I don't know," Kloee said. "How we going to sell them if we do make them? I don't know no one that smokes and I sure ain't gonna stand on a corner in Grantville and sell them." Becoming a street vendor would be very undignified and spoil her image in school. After all, she was fourteen now and had an image to maintain. She wasn't like Dakota, who kept her hair cropped short and dressed like a boy. Besides, selling pipes at school would be a quick way to get expelled. That wasn't happening, either. She could just see her friends buying corncob pipes and smoking. How gross would that be?

"We make them and my grandmother can sell them," Franz said proudly.

"Sure; and the Hun will take all the money and save it for us, too," Freddie added scornfully. Frau Meyers showed each of them the money she put into their own accounts every month—accounts they couldn't touch. She even put half their allowances into the bank for them. Mama Margaretha thinking it was a great idea and Papa not wanting to go against Frau Meyers on the matter of banking didn't help, either.

"Don't call my grandmother 'the Hun,'" Franz snapped. His peevishness drew snickers from WB and Sybie.

"I don't want old Frau Meyers managing my money or anything else," Dakota spoke up. "I don't care if she is Franz's granny, she's a nasty old woman."

"We need something we can make and sell ourselves so we can buy some things we want." Kloee commented in order to head off a battle between Franz, Freddie, and Dakota and because she could think of a bunch of things she wanted that no one would buy for her or give her the money for right now. It seemed she would have to make the money to buy them herself.

Her comment had been too little too late. The meeting broke down when everyone started yelling and arguing. Freddie and Franz were near blows over comments about Frau Meyers. Sybie and Dakota were arguing about the way a girl should act at school—nothing to do with money at all. WB was just sitting off to the side, looking irritated and ready to leave.

"Enough!" Kloee yelled. "Let's just get back to the stupid pipes." If the bickering kept up, Granny Murray would be out here, giving all of them grief.

"Good. I'm tired of this squabbling," WB said. "Go ahead, Dakota."

Kloee's sister smiled at the fourteen-year-old boy. Dakota had a nice smile and it wasn't lost on WB.

"Okay, this is how this works," Dakota began. "You have to have a good corncob to start with. Just any old cob ain't gonna do."

"Papaw says it needs to be from something like the corn Granny Murray and Auntie Phyllis grow, not from some of that big fancy stuff that everyone else likes to raise. Anyways, the corn has to be barely ripe, not full yet. You gotta get the corn off the cob, dry the cob good, and then holler it out like this." For the purpose of demonstration, Dakota broke out her pocket knife and started removing the pithy inside portion of the half cob.

"Papaw told Emery that all the soft stuff had to come out. Course, you can't get all the soft stuff out; that's why someone's gonna hafta smoke each pipe a couple of times to burn it out."

Kloee felt herself turn green. She and Cherie had tried a cigarette and both had become violently sick, possibly because the cigarette was yellow with age and had come from an old pack one of the other girls had found; but whatever the cause, her experience had convinced her that smoking wasn't cool.

"I can do that," Freddie volunteered.

Trust Freddie Bates to do something gross, Kloee thought. Of course, Freddie was almost sixteen and no one was going give him any crap about smoking.

Dakota held up a piece of wire and a thin branch from an elderberry bush. "This is the part that's tricky. You have to get the wire really hot and push it into the stem. The branch has to be the right size with enough of a soft inside for the wire to burn out.

"You can burn yourself real good if you pick up the hot wire. Emery sure did when he made his own pipe. Just wait 'til Papaw or Mama Melodie catch him with it."

Kloee didn't think that would take long for Emery to get caught.

". . . the stem down so it fits tight in the hole in the cob," Dakota was saying. "Papaw says you don't want smoke leakin' 'cause the pipe won't draw right if the stem don't fit tight."

The meeting's discipline broke down again when everyone pushed forward to see the finished pipe Dakota had put together earlier. Maybe her sister wasn't so dumb after all, thought Kloee. Dakota had put the presentation together as neatly as a science demonstration at school.

As much Kloee hated to say it, Dakota might have something with her pipe. It sure wouldn't cost anything to make and there were six of them to do the work in their free time. The only problem was how to sell them.

The answer kept coming back to Frau Meyers; and Freddie was right, Frau Meyers wasn't a good person to get involved with. Maybe she could get Helene away from her job and boyfriend long enough to talk to her grandmother and fix it so Frau Meyers didn't mess them up.

"We have to get the cobs pretty quick," Dakota said. "If we wait much longer, the corn will be too ripe and the cobs won't be any good. "

Acquiring the corn would be another job for her, Kloee realized. They would have to have Granny Murray's or Auntie Phyllis' permission to harvest some of the corn early. She would have to negotiate some sort of work trade with them. After all, the corn not only fed everyone, it was also one of their major cash crops. She was the only one who would be able to work this out. Maybe she could catch Helene Monday after school. She could talk to Granny Murray today. Tomorrow wouldn't be a good time. After church, Granny Murray would be all religious and set in her ways worse than normal, making her down on anything dealing with tobacco.

The discussion went on for another hour before Granny Murray called them in to lunch. They wouldn't see each other tomorrow. Everyone would be at their churches.

* * *

Kloee helped Granny Murray wash the dishes from lunch. The other members of the infant Murray-Bates Pipe Company, except for Freddie, had taken off to play "What Time Is It, Mr. Fox." Freddie had taken off to help Uncle JJ work on his water wheel. One of these days, the thing would work the way he wanted it to. He had another car generator he wanted to hook to it. The old one had burned out for some reason.

"Grandma Murray, can I ask a big favor of you?" Kloee began.

Doreen Murray smiled. "So that's why you volunteered to help me clean up after your sister and friends."

Kloee wanted to protest her innocence but knew better than to fib to Granny Murray. Granny had no tolerance for fibbing. "Grandma Murray, we want to make money besides our chore money and we have a way. We need help from you and Auntie Phyllis, though. We want to make corncob pipes and need permission to harvest some of your corn."

Kloee braced herself for Granny's tirade about the evils of tobacco and the hell fire and damnation that accompanied its use. That lecture rated right next to drinking moonshine and listening to non-religious music.

Kloee wasn't disappointed. Granny Murray filled her ears with how those who smoked and chewed were accepting the Devil's temptation, and that led to worse things. Things a girl her age shouldn't be exposed to.

After twenty minutes of Kloee pledging not to ever do any of the things she was condemning, Granny Murray agreed to allow them to harvest a little of the corn early. But they were not to use the pipes themselves. Well, Freddie Bates could; but only because he was a godless heathen like his Papa JJ. It was bad enough they were helping sinners go to hell and burn in eternal fire, but they didn't need to accept temptation.

Granny Murray smiled. "Make sure you have someone sell plenty of pipes to them godless heathen that hang around the bars and taverns in Grantville," she said. "They can't get no worse. They're already on the road to ruin. Don't none of you go around them places though."

Granny Murray was on a roll again and Kloee braced herself once more. She was relieved to finally dry the last dish and head for home.

Monday Afternoon

Kloee shifted the backpack to make it more comfortable. She was trying to work up the courage to enter the exchange. She peeked through the large window of the building and saw Helene putting out the lamp on her desk. It looked like she was getting ready to leave for the day, so Kloee waited by the door for her oldest cousin to exit the building.

"Howdy, Helene," Kloee said as her unofficial cousin stepped through the door.

Helene looked surprised. "Good evening, Kloee. "

"Can I ask you for something, Cousin?" Kloee asked sweetly, ignoring the airs Helene was putting on.

Helene seemed to think for a minute as she stood in the doorway of the Exchange. "Depends on what it is. I have to meet Anton at Cora's for dinner, then I have to get home before my grandmother starts asking questions."

"I can walk along with you," Kloee volunteered. "We can talk on the way to the restaurant."

Helene looked at her in irritation. "I have a date with Anton, and I would appreciate some privacy. It's hard enough getting any time with him without my grandmother getting wind of it."

"No, no. I don't mean I'll go into Cora's with you," Kloee responded rapidly. "I just need you to talk to your grandma for me. I need to get her help with something."

"Well, explain it to me, but be quick. Anton is waiting by now," Helene snapped.

Kloee bit her tongue and explained about the her small group of friends going into the corncob pipe business.

By the time they arrived at Cora's, Helene had volunteered, for a cut, to help them set everything up.

There was no need for bringing her grandmother into it.

Kloee agreed wholeheartedly. Frau Meyers hadn't been anyone's real favorite; but having Helene take over the business and sales part of their little endeavor relieved a large burden from Kloee's shoulders. Kloee hurried on down the street. She had to get home and take care of the chickens. It was her turn and Mama Melodie didn't like it when chores didn't get done.

Saturday

Kloee turned the meeting of the newly formed Murray-Bates Company over to Helene. She threw side glances at Anton, who had come out with Helene—not to get involved in the meeting, but to just spend a little time with her

"First thing you need to do is get your product into a limited production," Helene told the group. "Just enough for a few trial sales pitches. I can arrange for Anton to try to sell a few pipes as soon as you have them made." Helene smiled at Anton. He beamed back at her. "If the trial pipes sell well, we will go into production of enough to make a real profit."

Kloee watched Helene watch the kids for their reaction.

Freddie was the first to say anything. "We ain't startin' no big ol' business, Helene. No way. We just want to earn some money the Hun ain't goin' to put into the bank for our futures."

Dakota and Sybie loudly seconded Freddie's statement. They just wanted a little money, not a full-time job making pipes, or any of the hassle that went with it.

The arguing started and Kloee sat and listened. Freddie, Sybie, and Dakota took one side; and WB, Franz and Helene took the other. She wasn't even getting involved in this one. Both sides made some excellent points. Before she made her final decision, Kloee would have to do some hard thinking about everything she had heard.

By the end of the first meeting of the Murray-Bates Pipe Company, it had been decided to see if the pipes sold. After the trial sale, they would decide what to do next. Only WB, Franz, and Helene thought they were going to do more than make a few pipes, sell them, and be able to buy the little extras they wanted.

No one wanted Helene to go crazy like Frau Meyers and turn their little idea into another one of her big enterprises.

Kloee watched while everyone went their own way. Things didn't look as good as they had last Saturday when Dakota had described making corncob pipes. She was getting a bad feeling about this.

Late August, 1635

Kloee looked over the dried cobs that were cut in half and ready to be cleaned of their pithy centers. Papaw Murray had made them tools for the job from pieces of old hacksaw blades from which he had

removed the teeth and sharpened to an edge on one side. The handles were made of leather wraps around the upper end of the tool.

The elderberry branches they would use for the pipe stems had been trimmed and hollowed with a hot wire. Four pipes were assembled and ready to go. Helene was supposed to stop by with Anton to take them out.

Helene and Anton entered the little workshop Granny Murray had allowed them to build in her barn. "Are the first pipes ready to take?" Helene asked.

"They sure are," Kloee chuckled. "They were even pre-smoked to burn out the residual pith in each pipe bowl and stem."

Freddie Bates had turned positively green from the first bowl of tobacco he'd smoked through a pipe. She hadn't thought he would ever quit gagging and coughing.

Now, he seemed to have no problem smoking the two bowls of tobacco required to pre-season each pipe. Of course, he had made off with pipe number five, claiming it was his for all the hard work he did getting the pipes ready for sale.

So far, they had invested money out of their pockets for the tobacco to season the pipes with and hadn't earned one miserable dollar. Now, the four pipes they had ready to sell were going for what Helene called advertising start-up expenses.

At this rate, they were not only not going to earn enough for her to buy a couple of new dresses and those shoes that were being sold at the Kurger Emporium, but she would be lucky to have enough chore money left to buy a glass of iced tea at the City Hall Coffee Shop.

* * *

Anton Droesseler set down the Barney lunchbox Helene had given him. A couple of up-timers had called it "the purple puke" when they had seen the pink plastic box and the faded picture and writing on it. It was lunch time and he was in the smoking area.

He opened the box and took out a smoked sausage and the thermos of beer. The lunch box was distinctive. But the small thermos bottle was still good and no one else had a lunchbox like his. For now, no one—except for Freddie—had a pipe like his, either.

He prized the ugly lunchbox, not because it was American pre-Ring of Fire, but because Helene had given it to him.

When his fellow workers finished up their lunches and broke out clay pipes Anton took his new corncob pipe from the lunch box.

An up-timer had come out to have a smoke. Few of the up-timers smoked; it had something to do with an up-timer belief that smoking was bad for you. Anton packed his pipe carefully and lit one of the Red-Devil phosphorus sticks and held the flame over his pipe. He drew in a drag and felt the rich smoke from the tobacco fill his mouth. He rolled the smoke around and let it out.

The next drag was cooler and the flavor very satisfying. He inhaled only a small amount and felt the mild euphoria.

The up-timer came over. "Where you get the pipe?"

"Some of my fiancées family are making them," Anton said. He smiled as he exhaled smoke and took another pull on the stem. The pipe was burning smoothly; he had used it twice last night and once this morning to make sure he could use it without messing up. After all, it wasn't his clay pipe, it was one of Helene's families creations.

The man looked longingly at the pipe Anton was smoking, then at the fragile clay pipe that had gone out in his hand. "They wouldn't have a few to sell would they?"

Anton opened his lunchbox and brought out one of the samples. "Here. Have one of the spares my fiancée gave me." He passed the pipe to the man.

"Thanks," the worker said gratefully. Anton struck up another Red-Devil and relit his pipe.

Some of his co-workers now watched as the up-timer dug the tobacco from his clay pipe, put it away, then packed the bowl of the corncob.

His friend, Ernst, moved to the bench across from Anton. The two had started their apprenticeships at the same time. "How is that pipe? Is it American?"

Anton pulled out another sample pipe and gave it to Ernst.

Ernst receiving a corncob pipe started a rush on him, more out of curiosity than anything else. After he passed out the last two pipes, he explained they had come from Fraulein Helene Meyers-Bates and she was the one who knew were to get them.

By the end of the day, he heard some of the smokers talking about the new style of pipe. He even heard Ernst say how much more durable it was and how he wasn't going to use a clay pipe anymore.

Anton smiled. He would let Helene know her idea was working. She would be such a good wife and bring much to a marriage with her business skills; and he would soon be a journeyman, if he kept learning about steam engines.

Saturday Meeting of the Murray Bates Pipe Company

"I have orders," Helene crowed. "I need twenty-seven pipes. Half of those are going to the Tobacco Shop on consignment. The rest are sold for fifteen dollars each. Don't expect to keep getting that price, though. I used the old supply and demand rule they teach you in school. Charge what the market will bear. "

Kloee noticed that while Helene spoke she reminded her of Frau Meyers. Had Helene changed and become a money-grubbing capitalist like*Frau Meyers?*

Money-grubbing capitalist is what Uncle JJ called Frau Meyers, along with the Hag, the Old Witch, and Scum Sucker. However, if Frau Meyers caught a cold, Uncle JJ was the first one to panic. For all his show of dislike for the old woman, he really cared for her deeply.

A whoop rose from the other members of the Murray Bates Pipe Company.

"Where's our money?" became the main question.

"There is no money yet," Helene explained. "First, you have to deliver the pipes to me. I will deliver them to the customers and bring you your money next Saturday. Now, everyone get to work."

With grumbles and moans Freddie, Dakota, Sybie, and Kloee trudged toward their part of the pipe assembly line.

WB and Franz moved right to their jobs. The two boys didn't see anything wrong with turning out pipes in bulk. They actually thought all the work Helene was making for them was good.

Kloee lit the small charcoal stove and set up her burning wires. She started removing the bark from the dry elderberry branches, the first step in her work.

Beside her, Sybie drilled holes in pipe bowls, matching them to stems that had already been hollowed out.

Dakota was farther down the line, next to Freddie, using a piece of the down-timer made sandpaper to put a finish on the bowls and a piece of deer horn to polish the outside of the bowls.

Freddie hollowed corncobs and scraped out most of the pithy insides.

WB and Franz had already gone out to where the stripped corncobs were drying to select the best of the cured cobs. After they had selected the best cobs, they would go to one of the elderberry trees to gather suitable branches for stems. They had to be careful with the trees, though. If they damaged Granny Murray's elderberry trees, there would be the dickens to pay.

It looked like things were going to start paying for themselves; but it was going to be a lot of work, and their Saturdays would be gone—spent making pipes.

Kloee heard Dakota and Freddie grumbling about child labor and slave driver Helene. Well, they had agreed to start this up; now, they were going to have to find away to live with it.

Helene might be able to sell the pipes, but they had to make them. None of them had planned to make the Murray-Bates Pipe Company their life's goal.

What good was money if you had no time between school, chores, church, and making pipes to enjoy it?

Kloee decided she would talk to Papa Donnie about it. He would know how to remedy the situation. Helene would just insist they spend more time making pipes to make money. That wasn't going to work. She wasn't happy and she knew Freddie and Dakota would talk Sybie into walking out.

* * *

Saturday dinner was at an end. It was Dakota and Zackie's turn to do dishes and Emery was off with Papaw Murray.

Mama Melodie was taking DeePee over to Granny Murray's house, which gave her a chance to speak to Papa Donnie without Mama Melodie getting involved. Besides, Papa was much freer with what he

said when Mama Melodie wasn't around.

Kloee found Papa Donnie out in his combination workshop/office in the barn. She also caught him pouring himself a plastic tumbler of 'shine.

Papa Donnie looked over at her as she entered his private space. "Well, Kloee, you ain't telling Melodie about this, are you?" he asked nonchalantly.

"No, Papa Donnie."

"What can I do you for, Sweetie?"

"Papa Donnie, I have a problem and I need your advice."

"What's the problem?" Donnie put the bottle behind the old lawnmower engine on the shelf to conceal it.

Kloee explained the deal they had with Granny Murray, Auntie Phyllis, and the Knapps. She told him about the kids just wanting to make a little pocket money and all the rest of it.

Donnie listened while he sipped from the tumbler. "Well, let me tell you a little story, Sweetie. Now this is not to get around or I will warm the seat of your pants, and don't ever think you're too old for that."

Kloee nodded and listened.

"Used to be I followed everything your Uncle Ronnie wanted me to do," Donnie said with sadness in his voice. "I quit doing that, but I made the mistake of thinking I didn't need any help planning things—that I could run the show on my own."

Donnie drained the tumbler and set it aside. "Well, I came up with this wiz bang plan to get rich. Everything just kinda fell apart. After that, I made sure to have people go out and look around real good before we did anything, I learned to listen to them, too; and if I didn't like what I heard, I changed my plans.

"Another thing I learned was just a few folk weren't enough to do the job. I had to recruit a whole bunch of folk to get what I wanted done or we would have been in deep kim chee.

"Well, the thing is, Sweetie. " Donnie smiled. "Don't try to do everything yourself. Get more help. Hell, girl, hire some people and train them if you have to.

"Use the ones that want to work themselves to death—like Helene, WB, and Franz—to run things. You and the rest just kind of keep an eye on the workaholics and make sure they don't get too carried away. If you let them run wild, they could cause more trouble than they fix."

Kloee nodded as she sorted out in her mind what Papa Donnie had told her.

"Look, if you don't want to be all burned out, let others do the hard work. You just kind of get together with the ones that think like you and don't let Helene take over the show and order you around. You asked her to help, not take over. Make sure that you all get together and let her know who is boss." Donnie's smile was like a cat about to eat the canary. "Remember you are my daughter and I don't want you being a door mat for no one, Sweetie."

Kloee had a bunch of questions to ask yet. She needed clarification on some of the things her father had said. By the end of the day, she saw what had to be done. Murray Bates Pipe Company would expand, but it was going to hire some people to do the work.

Helene Meyers Bates was going to get one-seventh interest in the company with no voting rights or they would find someone else to do her job.

Papa Donnie had said "use her ambition against her. Build up the possibilities. From what you've told me, Helene already sees big possibilities in the company. Threaten to exclude her and she'll settle for less. If that don't work, find someone to replace her."

Papa Donnie had some pretty good ideas. She wondered where he had gone to school to learn how to control people like he'd been outlining for her. She knew teachers that couldn't control a class very well; and here was Papa Donnie, telling her how to make other people do all the work and like it.

"A few deserved compliments and rewards go a long way," explained Papa, "in keeping people happy and keeping them carrying most of the load, if you do it right. Delegate the responsibilities, but do it in such a way as to not lose control."

The way Papa put it sounded pretty simple. But he also said, "Never think things are as simple as they seem. They ain't. It will blow up in your face like a firecracker with a short fuse if you aren't prepared for something to go wrong. So you need to have backup plans. Just in case everything starts to fall apart."

She could do that. Freddie could be rather sneaky when he wanted, Dakota had smarts, and Sybie knew WB and Franz better than anyone; so between the four of them, they could have a main plan and then look at all the things that could go wrong and plan for them.

It was too bad Papa Donnie was going away tomorrow. She sure would like to be able to ask his opinion about what they came up with.

* * *

Kloee, Freddie, Dakota, and Sybie met at Marcantonio's Pizza. Kloee had told the other three to meet her after school to discuss important business. Now was the time to get things started—before the Saturday meeting of the Murray Bates Pipe Company when everything was taken over by Helene again.

They had scraped enough money together to buy a small pizza to split and a glass of juice apiece.

"Well," Freddie said—with tomato paste and cheese leaking around the corners of his mouth—"why did you want us here today?"

Kloee was prepared, had been preparing since last night. With a dazzling smile she started her speech. "We started our pipe making business just to get a little more spending money than we have been getting . . ."

A sour look gathered on Sybie's face.

Freddie shrugged. "Tell me something new."

Kloee backpedaled in her head. No one had interrupted her while she had been practicing. She improvised for a moment. "Well, that's what we were going to do, originally." Then she hurried back to her prepared speech.

"No one intended to do a lot of work and get caught up in it like we have been. Everything was supposed to be simple. Make a few pipes, collect some money, split it and everyone would be happy."

Kloee watched her companions give her unpleasant looks, as if she was some sort of simpleton telling them things they already knew. She hurried on. "Well, Helene has made the Murray Bates Pipe Company into a job that is eating up our free time and we have to put a stop to it."

"By Gnu and Yater," Freddie swore, causing Kloee to cringe. "I'm ready to quit the whole thing." Mama Melodie and Granny Murray both said Freddie's idea of a curse was sacrilegious. Kloee wasn't sure what they meant.

She listened as agreement came from Sybie and Dakota. Now was the time to reveal the plan she had worked out from Papa Donnie's advice.

"There is a way we can take back our company and not have to work ourselves to death in the process," Kloee began with a sincere smile. She had practiced the look half the night in her mirror. She was going to make sure her speech was perfect. "Do you want to hear my idea?"

"What the heck, let it fly," Freddie said.

"First, we need a written agreement that says six of us started up the business," Kloee said. "That means we need to get WB and Franz to sign it. But we don't want Helene to know anything 'til Saturday."

Freddie gave his best impression of his adopted father when Uncle JJ was pissed. "They'll do it and not say anything. Besides, Helene comes home late from meeting with Anton and thinks her story about working late is fooling everyone. So then what?"

Kloee continued, "I'll get Uncle Slater to get the paper drawn up tomorrow then. He knows a shyster or two."

"A what?" Sybie and Freddie both chimed.

Dakota laughed. "A shyster—what Papaw Murray calls lawyers."

Freddie grinned. He'd have to look it up in the dictionary, but shyster didn't sound too nice. Maybe he would add it to his vocabulary.

"Oh," Sybie responded.

Kloee cringed inside. "Uncle Slater can get a lawyer to draw up a legal paper for us. Here are copies of what I think it should say." Kloee grinned conspiratorially at her companions and gave each of them a handwritten copy of her statement. She had spent all of her eighth-grade study hall period working on the start of a contract for forming the Murray Bates Pipe Company.

Kloee noticed that Freddie did read the proposal himself but he waited for Sybie to go over the thing, "Well, Sybie, is it okay?"

Sybie smiled. "It looks good, Freddie. But I don't know all that much about things like this. It says we will all own stock and we will vote on the management of the company. It looks okay to me, but I don't want to waste time managing the company. There are better things to do."

"Well, I don't want all my time tied up, either," Freddie growled.

Before Dakota could voice her opinion, Kloee took over again. She was beginning to see what Papa Donnie had been talking about. Maybe she could get things done the way he said. It was starting to all come together. "All this voting and control of the company has to do is place Helene in a position where she can't take over but can still sell the pipes and make sure the money comes in. We'll be able to tell her what we want done, not her telling us what to do."

Before anyone could interrupt, Kloee put on the "I know what I am saying" face she'd practiced. "See? As a board of stockholders, the four of us could outvote anything WB and Franz might want if we stick together. And we can give Helene stock to keep her helping us, just not voting stock; so even if WB and Franz sided with her, we could still outvote them."

"But we would still have all that work," Freddie interrupted.

Kloee was ready for that. "Well, we hire people to make the pipes. They do all the work and we just sit back and get our money. It's even better than what we intended to do." Kloee flashed her best smile and continued. "On top of that, we elect one of us as boss. They have to watch things, so the rest can just kick back and enjoy their money."

"I won't do it," Freddie grumbled. He was echoed by both Dakota and Sybie who could also see it as a much bigger job than any of them wanted.

"Well, I guess I could do it." Kloee looked at her companions, her eyes filled with disappointment. This may not have been what Papa Donnie had meant for her to do, but she had watched Mama Melodie and Mama Marlene get things their way in the past and had incorporated it in her spiel. Let them think they were forcing the job on her.

A few minutes of token arguing on the part of the others put the job on her shoulders.

"Well, if we're going to do this, I'll see Uncle Slater on the way home," Kloee said. "Are we going to try this?"

She smiled when the other three agreed.

Saturday Meeting of the Murray Bates Pipe Company

Freddie pushed Helene aside. He informed her she would have to wait until after the first meeting of the Murray Bates stockholders' meeting to talk.

She glanced at WB and Franz, who looked miserably guilty to her.

Freddie opened the meeting. "Fellow stockholders and employees of the Murray Bates Pipe Company, we are here today to elect our company boss. She will make all the decisions for the company with a majority of stockholders' approval."

Helene started to smile until Freddie said, "I nominate Kloee Baxter-Bates-Murray as boss for the

Murray Bates Pipe Company."

Sybie and Dakota jumped up and seconded the nomination.

Helene realized something was terribly wrong. Franz and WB just sat there looking lost and didn't even recommend her. She should be running things. After all, she was the one who was studying business. She should be CEO. They didn't even have the name right. Where had this sudden change come from anyway?

As the question entered her mind, she noticed Kloee's triumphant smile. The heart shaped face and red hair reminded her of Frau Smith. Helene felt as if a younger version of the hard-driving woman she worked for was looking at her with the same smug and self-assured air.

"I nominate myself!" Helene yelled out.

Freddie smiled at her. "No can do, Helene." He laughed. "You ain't a stockholder. You're just an employee right now."

Helene felt as if she had been set up by everyone. Even Franz hadn't given her an inkling as to what was happening. She sat and listened as Kloee was voted head of the fledgling company by a four to zero vote with two abstentions. At least WB and Franz hadn't voted for Kloee. But it looked like Kloee had Freddie, Sybie, and Dakota firmly behind her.

No work would get done today because by laws and company charters had to be agreed upon. When the meeting got around to her position in the company, Helene was forced to accept the offer Kloee made her. It had already been decided to hire workers and train them, starting this week.

WB and Franz were made supervisors, in charge of training and operations. They seemed happy about their new positions, though how they would keep up with the demands of a fledgling company and still attend school she wasn't sure. But they both had drive and ambition—something Kloee apparently had, too, but hadn't demonstrated before.

When Kloee had presented the proposal for her future employment with the Murray Bates Pipe Company, she had almost walked out. But the future monetary gain from the infant company was too tempting. And while she would receive stock from the company that equaled a seventh of its value, it would be non-voting stock. Where the fourteen-year-old Kloee had picked up so much business information, she didn't know; but Kloee had rigged it so she couldn't gain control of the company.

It wasn't all bad. The responsibilities she had to the Murray Bates Pipe Company would increase. But with the increased work force, more pipes would be produced and sold. Already, they had sixty new orders and the Tobacco Shop was wanting another fifteen. The kids would never be able to keep up with demand. They needed to expand and start up a larger factory and hire more employees. Which, now that she thought about it, was exactly what they were doing.

She was given a copy of the Company charter with all six signatures of the founders: Freddie Bates, Sybella Doebling-Bates, Wilhelm Engling-Bates, Dakota Ockfen-Bates-Murray, and Kloee Baxter-Bates-Murray.

Everything looked legal and binding and was cosigned by a parent or legal guardian. She even recognized the witnesses names.

Helene agreed to continue working for the company. If things went like she thought they would, she would earn more than she ever could working for the Exchange, though she wouldn't be quitting anytime soon. Murray and Bates would be a part-time job when she was not in school or working at her desk for the Exchange records department.

Helene looked at Kloee and saw the girl returning her gaze. She had been outmaneuvered by a girl nearly five years younger and who had never before shown any ambition. She felt respect and dislike for Kloee at the same time. She had been wrong about her. Kloee was not silly and superficial; she had proven she could be someone who warranted watching, not just what the young up-time men called a babe. She also had brains, something she hadn't displayed a lot of before, as far as Helene knew.

* * *

Helene sat at the table in the Gardens with Anton. "So I got made a non-voting share holder." She shook her head. "I still don't know how that little witch did it. But it was staged. Kloee had them all lined up ahead of time. Even WB and Franz were bought off with the fancy titles she gave them."

"Did you take it?" Anton asked.

Helene nodded and gave a half shrug. "I'm still in on the ground floor of company with big potential."

Three weeks later
Mid-September, 1635

Kloee walked through Granny Murray's barn. The company was now paying rent for the old space they had used plus additional rent for the rest of the barn. Much of her adopted grandparents junk had been moved to Uncle Slater's barn or her own for storage. The whole barn was now being used as a factory for making corncob pipes. It sounded like a big expansion and, in some ways, it was. But it wouldn't last. She had let things get out of hand.

The two old milking stalls were gone and the floor had been planked over. Ten men and women were busy in the four parts of the barn that were the work areas for different stages of pipe making.

The first section was used to sort, cut, and hollow out the corncobs for the pipe bowls.

The second section was for sorting, cutting and hollowing out the stems. They were experimenting with different types of branches to make the stems from because Granny Murray claimed they were destroying her elderberry trees. She made elderberry wine, which she used as a tonic for colds and flu. So far, they weren't having any problems, but Franz was arranging for the materials to make stems.

The third section was the assembly area where the stems and bowls were fitted. There were three people working in each of the first three areas.

The forth and last area was the packing and shipping area. Right now they only had one employee working there.

Everything was running smoothly now, although the factory had gotten off to a rough start because one snag after another had cropped up. The company was, as Helene put it, a marginal success.

Today was her turn to walk through the infant pipe factory. She, Franz, and WB took turns spending time after school seeing how things were running. The older men and women working for them seemed to accept the fact that they were working for children. Besides that, Philip Dirst, the foreman, kept everything operating; so she and the others just made a show of doing a daily tour. The workers seemed happier and operations went more smoothly because they didn't have any of the owners around except for an hour or so every day.

The employees were working on a pay system Helene had devised—a small weekly wage with a commission for each pipe they produced. It was something she had learned in her business classes and actually had a fancy name: Gant, or something like that.

Granny Murray and Auntie Phyllis would sell them more of their corn crop this year for pipe bowls. Even Uncle JJ had volunteered to let them have part of his corn crop over Frau Meyers objections. Freddie had talked Uncle JJ into letting them have part of his harvest this year. What she couldn't figure out was how Uncle JJ got Auntie Margaretha to agree with him. She usually sided with old Frau Meyers.

Mama Melodie had volunteered to let them plant some areas farther back in the hollow come next spring. So next year, they would have a good crop to harvest which would ensure they had enough corncobs to operate year around.

They would run out of useable corncobs before the end of winter this year. It was too late in the season to plant another crop. But who would have thought the pipes would be so popular? No one had thought they would be sturdier and hold up better than the clay pipes.

If the corn was fully ripe, the cob wasn't as good and Helene insisted they should sell only quality products. Kloee agreed with her. Like Papa Donnie had told her, "Listen to good advice and always seek it out. You can't know everything and you can use what others tell you if it's good advice without letting them run the show."

Kloee smiled. She was still learning. She had learned a lot from running the Murray Bates Pipe Company. For one, the company wasn't going to make it this year. The company would fold up from lack of materials—namely, a sufficient supply of corncobs. It was a success in that the pipes sold well and there was a growing demand. But they had only planned far enough ahead to get pocket money. The money was being realized—more than realized. They had pocket money and then some, but they had not planned for growth or expansion. Everything had happened haphazardly with little real planning. She thought they had planned well, but it hadn't turned out that way.

In the spring, a new company would be born: Cousins' Genuine Corncob Pipes. A new company charter would be set into motion; and as much as Kloee disliked the idea, Helene would be a voting stockholder in the company. Helene was already arranging for temporary work for their current employees and setting up a share purchasing program for employees of the new company when it came into being. Selling shares to the employees was what Helene called an employee incentive plan. She said they had to have trained employees or lose valuable time and assets retraining. The best way to keep good employees was to keep them happy, and owning part of their workplace helped keep them happy.

Kloee frowned and had to admit she had outsmarted herself by cutting Helene out of the management. Over the last three weeks, she realized how much she had taken on herself. She liked the feel of power, but it was too much for her to handle. Things had definitely not worked out as she had envisioned.

She had picked the wrong allies in Freddie and Dakota. Neither of them had been any help past getting her into the position of control. Manipulating people wasn't all that great if they turned out to be of little or

no help. She had learned from that. It was part of planning for everything that could go wrong. Papaw called it Murphy's Law.

The new company would have a different set of voting stockholders next year. Freddie, Dakota, and Sybie would not be part of the company. They weren't interested and weren't willing to do the work.

The rest of them had to put up seed money, and not for the corn seed. That was being donated by Granny Murray and Auntie Phyllis this time. The Knapps were planting extra corn next year just for supplying corncobs and some money as part of the start up capital for the new company. They would be voting stockholders also. She, Helene, WB, and Franz were setting aside most of their profits from the Murray Bates Pipe Company for startup and initial operating funds. Even Uncle Slater was going to invest money for shares in the new company.

Kloee knew she wasn't going to be the boss next time, but she didn't care. It was a lot more work and headache than she had originally thought. Besides, she had to admit she wasn't a very good boss.

She wasn't sure who she would vote for at the first meeting of the stockholder's convention for the new Cousins' Genuine Corncob Pipes, but she was sure it wouldn't be for herself. She would probably vote for Helene, now that they were starting to understand each other better.

Kloee finished walking through the barn and stopped to talk to each of the employees.

"Good work."

"Going to sell real good."

"Good job."

Say something nice when everything is going okay. Don't be pushy. You get more effort with a couple of nice words than by being pushy. Besides, if anything went wrong, Helene could take care of it. The employees listened to her better, she was older and got more respect.

It was time to head home. Philip would ensure everything was finished properly.

She had earned her pocket money. She had learned more about business than she thought she'd ever want to know and now knew it wasn't enough. She had also learned the hard way that getting what you want didn't always turn out to be a good thing.

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Moonraker

by Karen Bergstralh

The black hull towered above Monsieur De Roche. It was the pinnacle of his dreams and the final blow to his shipyard. Copper cladding gleamed in the late afternoon sun. The loans to buy that alone would sink him. The ship hung above his head, supported for a quarter of its length on the slip. The rest of the great ship completely bridged the estuary stream and the ship's stern was firmly stuck in the muddy bank opposite. The*Moonraker's* stern actually touched the rival ship that was being built on the other bank.

None of the many ships Monsieur De Roche had built nor any that his father and grandfather had built had ever been so large. It had not occurred to him or to any of his shipwrights that the*Moonraker* was too long to launch.

"A beautiful and deceitful woman you truly are," he whispered to the great ship.

"Monsieur?"

De Roche turned and found Henri, his chief shipwright, at his side.

"How badly is she damaged?"

Henri scratched his beard and smiled. "Dry, the bilge is dry. Not a single leak." The man beamed with pride. "Even where she struck the*Giantess* there is little damage. A matter of a splintered rail."

"The rudder? What of it?"

"In place and still sound. I could not see all of it, of course. Once we get her free of the mud and up on the slipway again . . ."

"Yes, and then what do we do? She'll still be too long to launch."

"I've been thinking, Monsieur. Once we have her back we can turn her sideways. It won't be quick, but we can do it. There are pictures in your book of ships being launched sideways."

"Do you think it can be done?"

"Yes, Monsieur. It can be done. Monsieur Leblanc will have to do the same with the*Giantess* . His people are distracted, so I paced her off. She's twenty feet longer than our*Moonraker.* If they try to launch her straight back, her stern windows will end up in your office. Her proportions are wrong, too. He's tried to make her too much like a galleon.*Moonraker* will dance through the waves while the *Giantess* waddles."

"If we can get our ship out of the mud and launched."

"Charles and Louis have finished rigging the block and tackle. We've four teams of horses and one of oxen here and another three are coming. " Henri gestured across the stream. "Monsieur LeBlanc's crew has made good progress digging the mud away from her rudder and keel. High tide is in an hour, we'll be

ready."

"How long to turn her and re-launch her?"

"Two weeks. The minor repairs can be done while we turn her. I'll start some of the finishers aboard, too. She'll be ready to sail no more than a week later than you promised. Then the world will see. Ah, Monsieur, she'll be the fastest sailing ship the world has seen. Three months to China. Imagine. Only three months!"

"A week. I can hold off her owners for a week. It will ruin me financially, but I can do it."

"No, Monsieur, it will not ruin you." Henri was long used to Monsieur De Roche's complaints of financial ruin. He grinned. "I do not think that Monsieur Leblanc's customers are happy with*Giantess* . While I was over in his yard two of his investors asked when you would be able to build another like*Moonraker* . I told them we could start as soon as she's afloat."

Monsieur De Roche looked across at his rival's shipyard with narrowed eyes. "We can start as soon the contract is signed. Perhaps I might make a small profit after all. Say enough to buy additional yard space?"

The two men laughed.

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The Minstrel Boy

by John Zeek

Saturday morning, February 1634

"Well, that's that." Bill Frank lowered the hood of the new rail engine. "Though I have no idea how we're going to deliver it."

Hagen Filss, who had been handing him tools, responded, "Maybe when Sergeant Hatfield and Private Schultz get back they will know, Herr Frank."

Warrant Officer Frank looked over at the young soldier. "Hagen, first off you should remember that

Mister Hatfield is no longer a sergeant, but a warrant officer. And second, there's nothing that says he's going to stop here in Grantville. He might go straight to Wismar to join the rest of the company." Then, seeing the lost look in Hagen's eyes, he added, "I know, son. You think you can talk him and Corporal Rau into taking you with them. Face it, Hagen. You're only seventeen years old. This war is going to last a while, so there's no sense in you rushing into it. You should have let the major send you to school."

"Herr Frank." Hagen drew himself to his full height. "I can read and write. I speak two languages and I know my numbers. What more does a soldier need to know? And I am a soldier."

Bill realized Hagen was trying to convince himself as much as anyone else. It was hard to be the only regular from the train crew to be left behind. Hagen might be seventeen, but he was smaller than the average rail trooper. To top it off, Hagen had the type of face that was going to look boyish into his forties.

After studying Hagen for a while longer, Bill simply nodded his head. "Okay, Private Filss. As a soldier you should know enough to obey orders. And your orders were to work here at the company shop. Is that understood?"

"Ja, Herr Frank."

"Okay. I have a couple of errands for you to run. First I want you to run over to the communications office and have them send this message to the major."

"Ja, Herr Frank. Does that message contain my request to rejoin the train crew?"

Bill suppressed a sigh. "Yes, Private Filss, it includes your transfer request, but the main purpose is to tell her that this engine is ready to go. Second, I want you to go out to Henry Johnson's place and check with Dora Schultz about the coveralls."

"Is there anything else, Herr Frank?"

"Not today. When you finish with those errands you can have the rest of the day off. Relax, take a walk, talk to a pretty girl, or better yet take a pretty girl for a walk. I don't want to see you until quitting time this evening or, better yet, tomorrow morning."

Bill watched Hagen walk to the rack next to the door of the shop, take down his pistol belt and buckle it around his waist. He shook his head. It had taken a direct order to make Hagen hang his pistol on the rack when he was working in the shop. The boy still wore the circle of red cloth on his left sleeve that was the mark of the train crew and not the green square that the shop crew had decided on. Damn, Bill thought, it's going to break that boy's heart if he doesn't find a way to get back on a train crew.

* * *

Hagen followed the original test track from the engine shop on his way to the communications office. It was here that he had first seen a TacRail train. It was just the engine and one flat car, but he had stood and stared, amazed that it was moving without horses pulling it. His first friend, Jim Cooper, had explained it to him. Jim, who hadn't cared that Hagen was short and scrawny and too young. The first person to treat him as an equal, Jim had even convinced Sergeant Hatfield to allow him to enlist.

Thinking about Jim made him think about the other men of the crew. Sergeant Hatfield who had taught him how to shoot and Corporal Toeffel who had sold him his first pistol; Private Schultz, who had trained him to be a brakeman. He missed them, even Corporal Rau, who had always teased him about his age,

calling him "*Der Bub,*" but had also showed him how to use a dagger in a fight and how to walk quietly.

Now they were all gone. Gone to war, even Anton Busch, who was the closest to Hagen's age. No one had even thought of leaving Anton or Jim behind. But Corporal Toeffel had ordered Hagen to stay and help in the engine shop. It wasn't fair. He was as good a rail trooper as the rest. Sergeant Hatfield had to take him.

With a jerk, Hagen realized he been so lost in thought that he had almost passed the building he needed and had to back track half a block to the front entrance.

Katharina Stuetzing was seated at the desk, acting as a receptionist. For some reason Hagen remembered Herr Frank's last comment about taking a pretty girl for a walk. Katharina definitely was a pretty girl, but just looking at her made Hagen blush and stammer. Besides, he still had the second errand to run.

"G-g-good morning Private Stuetzing. I have a message from Herr Frank at the engine shop. Can it go out in this morning's radio traffic?"

"Ja, Private Filss. Give it to me and I will see that it goes to the radio room." Katharina smiled. Her smile just made Hagen blush all the more. And what was worse he knew he was blushing.

"Danke. Uh-uh . . ."

"Was there something else, Hagen?"

Hagen was stunned. She knew his name. He hadn't thought she even knew he existed. "Uh, has there been any news about Sergeant Hatfield's party and when they will be returning from Suhl?"

Katharina leaned across the desk and lowered her voice. "One of the radio operators told me that a message came in from Lieutenant Ivarsson. He and Herr Hatfield left Suhl two days ago. Where they are going and if they are coming here, she didn't know. I asked. I knew you wanted to know. After all, you've asked every day for the past week."

"Danke, Private Stuetzing."

"Hagen, you can call me Katharina."

Hearing her tell him to use her first name, made Hagen blush even harder. He was barely able to say "Danke, Katharina," before he turned and walked into the closed door, giving his nose a rather nasty bump.

"Are you all right?" Katharina started to get up from behind the desk.

"I am fine." Hagen finally found the door knob. "I have to run more errands for Herr Frank." Hagen blushed even harder when he heard her laughter through the closed office door.*Why? I am a trained soldier. I am ready to face men in battle. Why do I blush and lose my wits when I talk to a girl?* Hagen straightened his shoulders and stood erect.*A soldier should always walk proud.*

* * *

Walking to the tram stop he thought about the changes he had seen in the short time he had been in Grantville. Even the tramway was new. The city had taken over the right of way cleared by the rail

company and replaced the light portable track with permanent track. Now horse-drawn and motorized tramcars provided transportation into town from the outlying areas. When the car stopped, he pointed to the train crew patch on his shoulder to indicate he was on military business and should be allowed to ride free.

The driver waved Hagen to a seat as the car started to move. Looking up Hagen could see the notice painted on the front of the car over the driver's head. "Tramcar #4, Built by the 141stRail Company" below the neatly printed notice was piece of paper with the names of the crew who had built it. Hagen was proud to see his own name at the bottom of the list. This was one of the last tramcars the old crew had built before the orders came sending them to Magdeburg.

Just as the tram was leaving town, Hagen's attention was caught by a sign beside the tracks:

Elizabeth's Railway,
Built by the 141st Railway Company, NUS Army.
We Build Them Anywhere—*Wir bauen sie überall*

The day they had put up that sign, General Jackson had just activated the company. The up-time sergeants, Hatfield, Plotz and Torbert, had insisted they needed to commemorate the occasion. First Sergeant Plotz had picked Hagen to break a bottle of beer on the tracks to mark the launching of the then new company. Hagen wanted to rejoin the company more than anything else in his life.

He was pulled out of his thoughts by the tram coming to a stop near the training camp for the Committee of Correspondece-raised regiment. The regiment was gone now, off to war along with the rail company, but apparently the camp was still being used. Hagen saw three people waiting for the tram. At first he thought they were soldiers, from their tie-dyed camouflage coats and rifles, but then he recognized Wendel and Gerd, Private Schultz's sons and their cousin, Susanna Eckhardt. All three were in the Junior ROTC.

"Allo Wendel, allo Gerd, allo Suse," Hagen called. Then he had to return their salutes as they all saluted him. "Why are you saluting me? I am a private, no one salutes privates."

"We salute privates," Gerd answered. "We salute everyone in uniform."

"Ja," his older brother added. "Onkel Henry just finished a lesson in military courtesy, when we are in our ROTC uniforms we are to salute everyone in the military. Army, Navy, Air Force or Marines, it doesn't matter."

"Oh, I see." In the back of his mind, Hagen was pleased. This was the first time he had been saluted. "Why the rifles? Is the ROTC doing guard duty now?"

"*Nein*, though we could. We had target practice on the rifle range in the training camp. " Suse sat down next to Hagen. "Want to see our targets?"

"She just wants to show off." Wendel seated himself on Hagen's other side. "Suse, Hagen knows you are the best shot in the family. Onkel Henry tells everyone."

Gerd sat down on the facing seat. "Not just in the family, but the best shot in the whole ROTC, though if we traded rifles I can come close to matching her."

Gerd's comment caused Hagen to look at Suse's rifle. Where both of the boys were carrying large bore muzzle loaders. Suse's rifle had a bore smaller than his little finger. It made sense. Wendel and Gerd both took after their father and were stocky with wide shoulders. Suse, while she was not a small girl, wasn't close to their size.

"Hagen," Suse asked, "when are you going to start going to school? I know Onkel Henry could have you made an assistant instructor for the Junior ROTC and you would still be in the Army."

"Where did you hear I was going to go to school? I have been trying to get back to the train crew. Why would I want to go to school?"

"I heard Onkel Henry talking to Onkel Anse and Onkel Wili before they left for Suhl. They said Major Beth was going to offer you the chance to go to school here in Grantville."

It all became clear to Hagen. Onkel Henry was Henry Johnson, the instructor for the Junior ROTC program. Onkel Anse was Warrant Officer Hatfield and Onkel Wili was Private Schultz, Wendel and Gerd's father. Major Beth had to be Major Elizabeth Pitre, the commander of the 141stRail Company. Major Pitre had offered to send him to school but he had turned her down, thinking he would be allowed to go with the company.

"I don't need to go to school. I know all a soldier needs to know already," Hagen answered.

"Oh, come on. There is always something new to learn," Wendel commented. "Besides, if you went to school you could finish up in two years with me and we could both go to OCS. Wouldn't it be better to be officers instead of privates?"

"Not me," Gerd interjected. "I am going to study mechanics and become a warrant officer like Onkel Anse."

"Hush, Gerd." Suse frowned at him. "We're talking about Hagen's future, not yours. Besides warrant officers are all people who know how to do something. You'll have to study a lot harder than you are now to become one." She turned to look at Hagen. "And you do need to finish school. There is a lot more than being a soldier. The war will not last forever. What will you do when it is over?"

"I am going to become an engine driver," Hagen asserted. "After the war is over I will work for the railroads they are building, and drive an engine hauling people and cargo. Besides your Onkel Henry says it is going to be a long war. I want to rejoin the train crew to help make it shorter."

"Well, we can talk about it later. Here is our stop." Suse signaled the driver to stop the tram.

"Where are you going?" Wendel asked when Hagen rose to join them.

"I am on my way to see your mother. I am supposed to pick up the coveralls she made."

The two Schultz boys walked on ahead toward the house, but Suse walked beside Hagen. "I hope you are not mad because I think you should go to school. But you should think about it."

"I am not mad, Suse. You're saying what you think. I just don't agree with you."

* * *

"Hello, Hagen. Are you getting enough to eat? You look skinner every time I see you." Dora Schultz looked Hagen up and down. It reminded him of the way a mother would look at her child.

"*Ja*, Frau Schultz. I have been eating at the Thuringen Gardens."

"Bah, you should have came out here to eat and saved your money. With Wili and Anse gone, we have room at the table."

"*Ja*, you should stay for dinner," Suse said.

"Danke Frau Schultz, Suse, but I have to take those coveralls back to the train shop before I can take time off."

"Tomorrow, then," Dora said in a tone that allowed no excuses. "Wili and Anse will be back tonight and we will have a big dinner tomorrow. Now come with me and I'll get the sample coveralls for you."

Hagen followed her toward the back of the house. "Frau Schultz, you said Private Schultz and Herr Hatfield would be home tonight. Are you sure?"

"Ja, Lieutenant Ivarsson came by to tell me just before you got here. They will be here sometime before nightfall."

Hagen felt a burst of hope. With a new engine that had to be delivered and Herr Hatfield coming back to Grantville tonight there was a good chance he could rejoin the train crew. Herr Hatfield was going to need help with the engine. "Are you sure it will be no problem if I come to dinner tomorrow? It sounds like you'll have a house full."

Dora turned to face him. "Hagen, with seven*Kinder* in the house, we always have a full house. Ursula and I like to cook and we like to see people eat what we cook. You will come to dinner and you will eat. Besides, he doesn't know it yet but Wili is now a corporal; the letter came today. So we will be celebrating. As the wife of a corporal, I order you to come to dinner."

"Yes, ma'am, Frau Corporal Schultz." Hagen smiled as he came to attention.

"Ach, you are teasing. Here are the samples for you to take to Herr Frank. Run fast and you can catch the tramcar on its return trip to town."

* * *

Hagen only took time for a quick wave to the Schultz boys and Suse before he headed for the tram tracks. The tram car was just visible as it made its way back to town. He had missed it. It was supposed to wait for ten minutes after going around the loop at the end of the line. And the driver was also supposed to top up the natural gas in the tram's fuel tank at the large tank there before heading back. That should have taken another ten minutes.*Surely I wasn't in the house that long.* Hagen started to trot back to town.

He had only taken a few steps when he heard a voice from behind. "Look, Anse, Wili. '*Der Bub'*came out to meet us. But looks like he got bored and is going home."

Hagen stopped and turned around. Herr Hatfield, Corporal Rau, and Private Schultz were halfway down the slope that marked the edge of the Ring of Fire. Schultz and Hatfield were riding in a wagon and Rau was riding a horse just in front of them. Hagen felt his hopes rise. Here was his chance to return to

the train crew, if he could just make them listen to him.

"Hello, Herr Hatfield, Corporal Rau," Hagen called. "And a special hello to*Corporal* Schultz. I just heard the news from your wife."

Hatfield slapped Schultz on the back. "There you go, Wili, you're a corporal. I bet Dora already has the stripes sewn on your coveralls."

The door of the house flew open and the entire Schultz family erupted from the house. Dora was in the lead, followed closely by the two Schultz daughters, Talle and Esther. Only politeness kept Gerd and Wendel, from pushing their way to the front, but they were close behind.

Watching the reunion of the Schultz family, Hagen was happy for his friends, but was very aware that he was the odd man out. He was an only child and his mother and father had died in Badenberg, when it had been held by Hoffmann's mercenaries.

Rau dismounted and stepped up beside him. "Hagen, walk with me to take this horse over to the shed. We're just in the way here."

"I should be going back to the train shop. I was not really waiting on you. I was supposed to take these to Herr Frank." Hagen held up the package he carried.

"I'm glad to see Bill Frank has got you hard at work." Hatfield stepped up to them. "We're going to take the wagon in and unload it at the shop. So drop your package in the back and come on up to the house. We'll ride into town and you can help unload the toys we bought for the company. Wili can stay here with the family."

Hagen saluted and went to put his package in the wagon. He knew that when Hatfield said "toys" he had to mean weapons. Sure enough, the back of the wagon held a number of long bundles that had to be rifles or smooth bores. Seeing them piled in the wagon gave the thought of joining the rail company a new meaning. There was a good chance his friends would be fighting a war soon. Hagen became even more determined not to be left behind.

Hagen started to get in the back, but Hatfield waved him to the seat. "Come up here. I want you to drive. We've been taking turns pushing these nags the whole way from Suhl and I, for one, am tired of horses."

"Ja, let*der Bub* drive." Rau jumped up to sit on the tail gate.

Hatfield settled onto the seat. "Okay, Hagen. Now is as good a time as any for you to tell me what has been going on while we were away."

Hagen started to tell about the orders coming for the rail company to deploy to Magdenburg and then to Wismar. But Hatfield interrupted, "Skip that. We got a radio message from the major while we were in Suhl. What I want to know is what has happened since the company left."

So Hagen told him about the new engine and the two flat cars that the shop crew had ready to go. And about the delivery problem that Herr Frank foresaw developing.

Hatfield shook his head. "Delivery is no problem. We'll load them on a couple of flatcars and haul them to a barge. The barge will carry us to Magdenburg. They're the major's problem from there. What I

really want to hear is what you have been doing. I know Major Pitre was going to talk to you about going to school. So why is Private Hagen Filss not following his major's wishes and going to school?"

"Uh, er, H-h-herr Hatfield, it was not an order. The major asked me if I wanted to go to school. When I said no, she said it was all right. I would not have disobeyed an order."

"You're lawyering me, son. You knew she wanted you to go to school. Would you have been willing if you knew I was the one who asked her to leave you behind to go to school? I might make it an order and if I do, you will go to school and you will work hard."

Hagen was stunned. He had thought that Herr Hatfield would be the one to save him from being left behind. His shoulders slumped, and he worked to hold back a sigh of disappointment.

"Sir, is that what you are going to do? Are you going to order me to go to school?"

"I don't know. Right now I think that it would be the best thing for you. Not just the best for you, but the best for TacRail. We need trained men, men who can become mechanics. You did a good job working with Jim Cooper, and now you have experience working for Bill Frank, so you seem to be the one to pick. After all, you'll be taking mostly classes in mechanics."

"All I did was hand Jim his tools, and all Herr Frank has me doing is running errands. Anyone could do what I do."

Hatfield reached over and took Hagen's sleeve between his fingers. "You're still wearing a rail crew patch. The rail crew needs trained mechanics. What am I going to do about you? If you go to school, I promise there will be a spot open for you with the company when you finish. Maybe with a nice promotion. How does that sound?"

"I am happy being a private. I feel like I am letting my friends down. I should be with them, not here safe in Grantville." Hagen tried very hard not to beg or sound like a child.

* * *

Hagen brought the wagon to a stop and Hatfield hopped down and went inside the building. He felt Rau moving up to stand behind him. "It's a hard road isn't it, young Filss? You have been getting a man's portion and now you think you are being asked to go back to being a child."

"Ja, but more than that. What if my friends need me? I should be doing something."

"And you feel that you might miss the great adventure of your life." Rau laughed. "I know, Bub. Remember I went for a soldier when I was about your age. Of course, the city fathers of Jena and the night watch helped make my choice for me." Rau patted Hagen's shoulder. "I'll talk to him, maybe I can convince Anse you should go."

"Thank you, Sergeant Rau."

"For that I will be at my most persuasive. I like the sound of Sergeant Rau. It looks like there are going to be three train crews, now that we have three engines. If I get a crew, I'll ask for you as a loader or brakeman."

"Thank you again, Sergeant."

"It is nothing. All you need is a little seasoning. Now head up, act proud, look like a soldier. Here comes Anse."

* * *

With all the men working it didn't take long to empty the wagon and fill the store room. When they were done Herr Frank locked the door and handed the key to Hatfield. "There you go. Don't lose that. If you do, we'll have to break the door down. That's the only key."

Hatfield stuck the key on the chain of his pocket watch. "Safe as a bank, I have never lost a key. Bill, why don't you and your wife come by the house tomorrow? Dora is having a special dinner to celebrate Wili's promotion to corporal."

"Sorry, but I'll have to turn you down. Our church is having a business meeting after services, and I have to attend since I'm on the trustees."

"Well, some other time, then." Hatfield pointed his finger at Hagen. "You will come to the dinner, Private Filss. Dora gave me special orders to make sure you were coming."

"Yes sir, Chief Hatfield." Hagen came to attention.

Hatfield wet his finger and drew an imaginary line in the air, "One point for remembering to call me chief." Then he turned and walked out of the shop.

"Filss, it's still two hours until quitting time. So get out of here. I gave you the day off." Herr Frank pointed at the door.

* * *

As Hagen was leaving the church the next morning, he was surprised to realize he had no idea what the sermon had been about. He had spent the entire service lost in thought over how he was going to convince Herr Hatfield not to send him to school. Sergeant Rau was his only hope.

As if thinking about him had conjured him, Hagen saw Rau waiting at the tram stop. Unlike Hagen, Rau was dressed in civilian clothing, rather a mixed style with blue jeans tucked into knee high boots of local manufacture. He had topped off his outfit with a long green coat, worn open to show the lace of his shirt collar that covered the top of his red vest.

Rau waved. "Ah, you make your appearance. Dora Schultz will not have to send us to hunt for*der Bub*. But you don't have to wear your uniform. This is just a dinner with friends, not an inspection."

Hagen thought about making an excuse, but decided that Rau would understand. "Sergeant, all I have to wear to dinner is my coveralls. All my clothing from before I joined the army is worn out."

"Not to worry, young Filss. Come on, here comes the tram."

* * *

Dinner at the Johnson house was interesting. With the four Schultz children, the three Eckhardt children and the four adults left in the household it was already a full table. Adding Hagen and Rau as guests made even the large Johnson dinning room feel small.

After dinner Hagen sat for a while and talked with the Schultz and Eckhardt children. Then, getting bored with watching Henry Johnson's efforts to teach Gerd how to play chess, Hagen started to wonder

where the railroaders had gone. He wandered into the kitchen where Suse, her mother Ursula, and Dora were just finishing the clean up.

"Hungry again, already? There is some chicken left and a little pie," Dora said.

"*Nein, Danke.* I could not eat another bite. I was just looking for Chief Hatfield."

Dora pointed out the back window of the kitchen. "He took Wili and Jochen Rau out to the garage. They are talking railroad business."

Hagen headed for the door. As he approached the open garage door he could hear the three men talking inside. What had to be the voice of Chief Hatfield said, "Okay, I don't know for sure what the major has planned, but if we bring her a complete crew to go with the new engine I bet she will keep it together."

"Ja," Hagen heard Sergeant Rau answer. "You will have an engine, Toeffel will have an engine and who will command the new one?"

"Shoot, Jochen," Hatfield answered, "she just made you a sergeant. Who do you think Major Beth will give the engine to?"

"Ja, Jochen,*und* I will pick from the best brakemen in the company to get you a chief brakeman," Wili rumbled.

Hagen was about to walk away. He didn't want to be accused of eavesdropping. But then he heard his name mentioned.

"I want Filss for one of my brakemen," Sergeant Rau said. "You know he is going to volunteer."

"Jochen, do you really want him? He's awful young," Hatfield answered.

"He was old enough for you to have Wili train him to be a brakeman."

"Yes, but . . ."

"*Und*he is a good brakeman, for someone his size," Wili interrupted. "If Jochen is going to have a lot of recruits he is going to need a trained man. I say take him with us."

"I still think he's too young. Would you say the same thing if he was one of your sons? Would you take Wendel?" Hatfield asked.

"*Ja*. I would watch over him, but Wendel I would let go to war if he was as trained as Filss."

"Anse, I was younger when I became a soldier," Rau added. "And I would bet Wili was even younger when he joined his village militia."

"Ja, fourteen. I was big as a boy," Schultz said.

There was a long pause and Hagen thought that was the end of the conversation. Then Hatfield spoke again. "Okay. I'll talk to Filss. But if he goes, I want him to stay with you. Wili, I'll want you to take good care of him."

Hagen started to back away from the door. There was a chance he might be allowed to join the company! He stumbled over the wood that was piled under the eaves of the garage. The noise caused Chief Hatfield to call from inside. "Who's there?"

"It is me, Chief."

"Come on in, Filss. We were just talking about you."

When Hagen entered the garage he discovered that the three were seated on stools around a stove. Each had a bottle of Herr Johnson's home brewed beer and a small cooler was set nearby that had to contain more.

"Pull up a stool, Hagen. Grab a beer if you like. I want to talk to you," Hatfield said.

Hagen realized this was going to be like juggling one of the grenades Sergeant Rau was so fond of. If he said the wrong thing, Hatfield would order him stay and to go to school. "Chief Hatfield, I don't drink very much beer. I had two glasses at dinner. That's enough for me."

"Probably a wise choice. Hank's brew is not your usual small beer." Hatfield took a sip. "How long were you outside before I heard you?"

Hagen knew only total honesty would work. If he was caught lying, who knew what Hatfield would do to him? "Sir, I was there long enough to know the three of you were talking about me and if I was going with you to Magdeburg. I was not spying, but when I heard my name I had to listen."

Hatfield spoke to the other two men. "Guys, I want to talk to Filss in private. Do you mind stepping up to the house to give us some room? I think we've covered all the bases and we'll be ready to start work tomorrow." Wili and Jochen both made noises of consent and left the garage.

Hatfield turned to face Hagen. "Okay, Filss. I want you to answer a couple of questions and then I'm going to decide if you go with us or go to school. If you're not happy with my decision, I'll cut you loose and you can enlist in one of the regiments the CoC is raising."

Hagen got a lump in his throat at the thought of leaving TacRail. "*Nein*, Chief, I don't want to leave the railroad company. If I must go to school to stay, I will go to school. I am a rail trooper."

"Filss, why are you so set on going with us? It's going to be a long war. Why is it so important to you to get into it right now?"

Hagen sat and thought. Then he gave an almost honest answer. "Chief Hatfield, I want to do my part. My friends are all going to be in danger. I would feel like a coward, like I was letting them down if I was not with them."

Hatfield looked at him for a moment then asked, "Hagen, you lost your family when Hoffmann was in Badenburg didn't you? You know how war can be? Do you want to go to war because of that?"

"Not to get revenge or anything like that, but to prevent it from happening again. So yes, what happened to my family is one reason I joined the rail company to start with. Mostly, though, it is just wanting to help my friends. To do what I should be doing."

Hatfield leaned back against the workbench. "Son, if I sent you to school you would still be helping, maybe more than if I make you a brakeman right now. In a couple of years you'd be more valuable to TacRail than as a brakeman. You'd still be doing your part. Hagen, I wanted to send you to school to help you."

Hagen studied his boots for a moment. "Chief Hatfield, if you send me to school I will work hard, but I am not sure I would ever become a mechanic. But I am a brakeman now. Corporal Schultz has taught me a lot and I'll do a good job."

"Hagen, tell me the truth. How old are you really? I know you and Jim Cooper lied about your age when you joined up last year. I went along with it and I shouldn't have, but I felt sorry for you. And to be perfectly honest I needed an extra pair of hands. The major jumped me about you a couple of times, and I told her you were small for your age."

"I was seventeen last month. I was fifteen when I joined."

Hatfield stood up and walked around the garage. "Hagen, seventeen is too young to be thrown into what we might face. But if I leave you behind I'll feel like I am punishing you. If I take you will you promise to stay close to Wili or Jochen?"

"Ja. And I will do everything they say." Hagen could feel hope building inside him. Please let it happen, he prayed silently. Please.

Hatfield took another walk around the room. "Okay. Report to the shop Monday morning; you're going with us, so you might as well help plan the move. The major is going to skin my butt when she sees you, but I'm not leaving you behind." With that, Hatfield walked out the door and headed for the house.

Hagen watched him go. Then, in a voice only he could hear, he said, "Thank you,*Onkel* Anse. The rail company is my family. You, Wili, and Jochen are my*onkels* . Jim Cooper is my brother. Thank you for letting me go with my family."

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Ultralight

by Sean Massey

Wismar, Germany
March, 1635

Flight had taken hold of Johann Rommel. Since the thirty-something merchant from Wismar first saw the American air force in action last October, he had decided he wanted one of their strange flying beasts, something they called an*air craft* , for himself. After several months of designing, waiting, and building the machine, he stood on a shallow slope overlooking the Baltic sea, waiting for his rendezvous with destiny.

The weather wasn't perfect, he thought. It was overcast. The wind had died down, for now, but it could pick up at any second. After making one final check of his craft, he was satisfied and strapped himself in. The crowd that had gathered despite the cold began to clap. His oldest son, who had helped attack this project with an enthusiasm only found in a teenager, waited to start the engine mounted behind him.

As the engine roared to life, drowning out the crowd's applause, Johann thought back to the beginning of the project. Designing the aircraft had been the easy part. He had used a picture of what the Americans called an "ultralight" to create a similar design with a large triangular wing mounted above a small engine and an open air wicker "saddle" to sit in. He soon learned that most of the materials that the Americans used, like aluminum, nylon, and some material referred to as plastic were no longer available. He would instead have to rely on silk and bamboo, which would have to come through Venice. Those materials hadn't come cheap. Or very quickly. Winter had arrived in full force by the time he had ordered the items, and it took almost six months for the courier to deliver them.

Then there was the matter of powering the flying machine. He made a contact in Grantville who was willing to part with an engine. He had been told that the engine came from an "All Terrain Vehicle" that had been involved in some accident before the Ring of Fire. Johann had been assured that the engine was in working order, but he didn't know enough about the technology to check it out for himself. He would have to take that on faith.

Like the Grantville machines he had seen in operation, Johann knew that he would need a propeller. He had carved a simple two-bladed design from wood, and it was now attached to the engine.

The plane began to inch down the slope, dragging his mind back to the moment.*I don't want to be so caught up in day dreaming that I miss this important moment.* As he picked up speed, he could feel the plane lifting off the ground.

*I'm flying,*he thought.*I can soar with the birds* .

Johann attempted to work the simple controls he had rigged up, but nothing happened. He didn't gain altitude. He couldn't turn. Without any experience designing aircraft and no knowledge of Bernoulli's Principle, he had simply guessed, wrongly, at how the thing would maneuver in flight.

He made one more attempt to gain altitude, pulling back on the simple elevator controls with all his strength. It had some effect, and the elevator swung downward to create more lift. Unfortunately, he hadn't gained enough speed to climb more than a few inches off the ground.

The back of the aircraft dropped out beneath him, and the propeller blade cut through the snow and caught the ground, shattering as if it had struck rock. Carried by the weight of the engine, the plane continued backwards as it performed a cartwheel and landed on its wing.

Johann panicked. He hadn't planned for this.*The machine was supposed to fly.* He could hear the silk tearing, allowing snow to spray up onto his face, as it dragged the plane to a stop. The engine was still running, but the flip had knocked the engine control lose from its mounting, and although he could see it, it was just beyond his reach.

He recognized the distinctive smell of methanol before he had even come to a stop. He made one last attempt to grab the engine control, but it continued to bounce out of his reach.

The right edge of the wing struck a rock, shattering the bamboo edge and sending the plane into a spin, disorienting him. He reached for the knife he had brought with him. With a few quick strokes, he cut the straps holding him into the plane.

Johann landed about five feet from where he had been, face down in the snow. His sense of direction was scrambled, and the only thing he could feel at the moment was a warm dribble in his pants. The knife had somehow remained in his hands, but now that he was stopped, he had let go of it.

He attempted to stand up, but the world was spinning, and Johann quickly found himself face down in the snow again.

* * *

Magda Rommel watched in horror as her husband attempted to rise for a third time. He was a little more successful this time, and she could see that he managed to steady himself enough. If the situation wasn't so serious, she was sure that she would have found his flailing arms very comical.

She set off in a full-speed run down the hill. She could see that the plane had come to a stop, and black smoke was beginning to pour from the rear of the machine. While the other onlookers might just gape and stare, Magda had to make sure Johann was all right. As her feet carried her towards him, her mind became a blur. All the anger she had directed towards him over the last few months for spending almost all their money on this fool's errand had melted away and was replaced by genuine concern.

Thoughts of her family's future also filled her head. She had three kids to worry about feeding. Money was now tighter than ever. And her husband would probably require a few months in bed.*If he's not injured in the accident,* she thought,*he'll need more than bed rest when I get through with him.* She thought about borrowing some money from her father, but she knew that it wouldn't end her husband's ambition to fly.

"We're moving to Grantville," were the first words she said to her husband. "If you want to fly, you'll learn to do it the right way."

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Tool or Die

by Karen Bergstralh

Late January, 1632

Martin Schmidt walked briskly down the Tech Center hallway, his mind full of plans. The thread rolling machine was working well and he was eager to take the next step and build a drop forge.

A drop forge needed a source of power to raise the ram. The thread-rolling machine used a salvaged electric motor and the up-time machinists Martin had consulted all agreed that his drop forge would need another electric motor. Unfortunately, electric motors were very useful—so useful that finding a salvaged one that worked had become nearly impossible. The previous day Herr Don McConnell had given Martin the names of some people at the Tech Center and suggested that they might know of a suitable motor.

Excited yells and cheers distracted Martin. Under and around the cheers he heard an odd chuffing noise. The Tech Center was full of wonders and Martin couldn't resist looking in to see what this one was.

On the floor at the front of the classroom a small steam engine cheerfully chugged away. Attached to the little engine was a windlass device and the rope from that stretched across the classroom. At the room's far end sat a little red steel wagon with two large male students shakily perched on top. An elderly man bent over the steam engine and the windlass began to wind up.

To Martin's amazement the wagon started to move. It didn't move very fast but, once started, it and its load rolled steadily along. The students standing around cheered, clapped, and yelled comments to the two riding the little wagon. Most were begging to be the next to ride. The American steam engine man appeared delighted to show his toy off.

The thought struck Martin that if such a small engine could pull two men maybe a larger one could raise the ram of a drop forge. He moved forward as eagerly as the students did, questions bubbling in his mind. Neither Martin's English nor the elderly American's German proved up to the discussion that ensued. By appealing to several of the Tech Center's teachers, both sides finally managed to communicate. The steam engine man called in some others and the discussion continued until a second elderly American finally smiled.

"You're right, a small steam engine should work. I . . . we've . . ." He nodded at the steam engine man. ". . . got a good idea of just the type and size you need. Heck, I've got most of the parts in my basement and I know which of the steamheads have the rest." His eyes twinkling, the elderly man grinned. "It'll be fun job for us old farts, too."

One of the Tech Center teachers spoke up then, "Can you do the work up here at the Center? We need to capture your knowledge . . ."

"Sure, we could, son," snorted the old man. "but my basement workshop's set up for steam and the parts are there. Send over anyone you want; just let my wife know how many are coming."

The Tech Center teachers seemed confident so Martin took a leap of faith and commissioned a steam engine. He didn't know exactly what manner of steam engine he had just commissioned but if he had understood the steamheads correctly there were other machines the engine could power, too. He asked and the steam engine man replied.

"Son, you can run a whole machine shop off a steam engine. My grandfather's shop ran off steam. My father didn't electrify the shop until 1942."

Martin was confused until one of those interpreting added, "That was probably a good twenty years after electricity and electric motors were available. Lots of machine shops were powered by a steam engine. Changing to electric motors took money and some people didn't see a reason to change."

Martin's hopes flared. The biggest problem in replicating up-time machines was how to power them. Here was an answer. Given a steam engine he would be able to build lathes and mills and . . . Martin gave himself a mental shake. There would be time enough for those thoughts once the drop forge was built and running. Machines needed gears and with a drop forge he could produce gears. Lots of gears.

February, 1632

The up-timers, Herr Reardon and Herr McConnell, worked with him designing and building the drop forge. It was crude compared to the sleek up-time machines but, as Herr McConnell put it, "You can frigging well pretty up the next frigging one."

As the parts of the drop forge came together Martin realized that he had a problem. The hardened steel punches and dies the forge needed were costly and there weren't enough funds left after paying for the rest of the drop forge. He knew that Kudzu Werke's blacksmith shop was doing well but he'd been happy to let Herman handle the financial end. Drop forges were useless without proper dies. Packing up drawings and his list he went to Herr Glauber to ask for money.

Herman Glauber listened carefully while Martin went into detail on which punches and dies were the most important. When Martin was finished speaking, Glauber solemnly asked, "How much will cost to buy all the dies and punches for the parts you intend to make?"

Swallowing hard, Martin named a sum that equaled two good years' wages.

"Ah, Martin. " Glauber smiled. "So much? Well, things are going well. Your fiddly little nuts and bolts sell well and the reclining chair is starting to sell, also. I have money here—just a bit of extra cash, mind you." Glauber reached into his pocket and pulled out some bills. He carefully counted them, folded them over and dropped the wad into Martin's hands. "Top quality work—that's what I expect from Herr Reardon. Be certain you get the best set of punches and dies you can from him." Glauber then excused himself and hurried off, leaving a stunned Martin counting out enough American dollars to buy the full set of punches and dies.

And so, in March, with snow still on the ground, all the parts of the drop forge came together. A group of up-timers, most of them elderly, arrived with the steam engine. For the next two weeks there always seemed to be at least two or three of the 'steamheads' around fussing over the new engine. Several people from the Tech Center floated around, sketching, scribbling, and otherwise recording the steam

engine's installation.

Martin insisted, much to the steamheads' delight, that all of the boys be instructed on the care and feeding of the engine. None of the boys had objected and other shops' apprentices often stood around watching, envy written clearly on their faces.

Herr McConnell made a point of coming by everyday, commenting, suggesting and helping when the pieces didn't want to fit together. Finally they had produced their first forged parts to the applause of Herr Reardon, Herr McConnell, all the steamheads, and two Tech Center teachers. When the cheering died down everyone headed off to the Gardens for a celebration. Herr Reardon pulled Martin aside.

"Most of the damned thing looks like it came out of the Middle Ages. It's crude and ugly but it works. " He paused and looked back at the drop forge. "The next one you make will be better."

April, 1632

Karl Ritterhof grunted in satisfaction. "Okay, Hans, this is how the firebox should look." Stepping back, Karl let the smaller apprentice peer past him.

"A picture of perfection, Karl. As usual." Hans Gehrt gestured back toward the Kudzu Werke building. "Too bad we won't need steam much longer. They've only got a couple of more blanks left."

A heavy thump and a brief shaking of the ground came from the building beside the boys. Kudzu Werke's new drop forge was making its presence known.

"And you know this because Master Schmidt has taken to confiding in you?"

"I've got eyes," Hans grinned, "Besides Max and Carl-Maria were yelling about the steel shipment being short as well as late. Master Schmidt's gone up to the steel works to complain."

"We do have other work. Jakob will be wanting to run more of his rulers."

"Ha! Jakob's not wanting to do anything but go to the Gardens with Heinrich. Rudy's going with them. Besides, Bertha said they've got a month's supply of blank rulers that need etching and painting."

"Tsk, tsk!" Karl stood straight, towering a head above the younger boy. He struggled to assume a stern look. "Remember your place, Apprentice Gehrt. Journeymen Ohl and Tausch may allow you familiarity but you must address Fraulein Klepsch properly."

Hans grinned slyly. "Which Fraulein Klepsch should I be so formal with? Elise who teases me when I'm cleaning flashing from ruler blanks? Or Bertha who gives me apples and sticky buns because she thinks I'm too skinny?"

Karl tried to think of a suitable retort on the way back into the shop.

* * *

Journeymen Max Ohl stood to one side and watched Jakob Betche direct the other apprentices. The boy had come a long way from the gangly, shy refugee child of six months ago. Frau Kunze's good food

and work at the forge had transformed Jakob. Max realized that the boy had put inches on along with muscle and weight.

Something must have shown on Max's face because Jakob paused.

"Sir, did I forget something?" Jakob asked.

"No, Jakob. Everything is in order. Go on," Max replied.

"Come on, Jakob." Heinrich Glauber called cheerfully. "Hurry up or there won't be any good tables left."

"Yeah," Rudy Neder chimed in. "We don't want to be stuck sitting with a bunch of mommas and little kids."

Max coughed. There wasn't much he could do to rein in Heinrich's enthusiasm. The boy wasn't one of Master Schmidt's apprentices or journeymen and he was the son of the owner of Kudzu Werke. Rudy, however, was a different matter.

"Keep your mind on your work, Rudy. " Max waved at the drop forge. "This must be done correctly."

Rudy's grin faded a little and he turned back to check the steel blank he was heating.

Heinrich took the hint, too, and slid off the workbench he had been sitting on.

Rolf Ackermann prodded Rudy. "The color's right. The blank is ready."

Max coughed again and Rolf looked at him.

"This is Jakob's lesson, Rolf." Max said. "I know that you have already mastered this. I want to see how well Jakob understands."

"Yes, sir."

Carl-Maria Tausch grinned at Rolf. "Let the boys do the dirty work, Rolf. We men have better things to do. " He leaned easily against a bench with his arms folded.

Rolf smiled and copied the older journeyman's pose.

Jakob stepped over to the forge and looked through the heat shimmer at the steel blank. He stepped back and he grabbed the drop forge's drive belt lever. All signs of humor left the young blacksmith's face and he carefully nudged the drive belt onto the pulley. With a groan the drop forge's ram rose. With equal care Jakob set the drop lever and disengaged the drive belt.

"Rudy," Jakob called, "bring the blank."

Rudy fished the white-hot bolt blank out of the forge's fire with a pair of long tongs. He placed the blank on the drop forge's die plate and stepped back. Jakob took the tongs from Rudy and poked fussily at the blank. Satisfied, he also stepped back.

"Everybody clear?" Jakob asked.

Each blacksmith answered, "Clear."

Max held his breath and waited. Herr Reardon and Herr McConnell had stressed one last step for "safety." Jakob reached for the drop lever and hesitated. He turned away and walked once around the drop forge, checking that everyone was standing well back from it. When he reached the drop lever he glanced around again and called out, "Dropping!"

KATHUNK! The floor shook as the ram dropped. Tools lying on workbenches jumped and added their clinks and clanks. A carelessly placed bar clattered on the floor.

Jakob re-engaged the drive belt pulley and the ram groaned upward again. Setting the drop lever, Jakob waved theatrically at the exposed die. Left behind in the die was the newly forged bolt blank.

"Wow!" Heinrich yelled. "That's great! And so fast! Can you do more than one bolt at a time?"

"If they are small enough," Jakob answered proudly. "This one is too big and has to be done alone but we've got dies that do two, four, and six smaller bolts at a time."

"What happens to it now?"

Jakob looked over at Max. Max allowed himself a slight smile. "Go ahead, Jakob. Explain it."

"First we pry this out of the die." Jakob picked up a short pry bar and moved nearer the drop forge. "We'll let it cool off and a lowly apprentice gets to remove the flashing." Jakob pointed with the pry bar. "Then it goes to the thread rolling machine."

"None of the other blacksmiths around here have drop forges, do they?" Heinrich asked.

"No. This is the first. It's also the first to use steam power," Jakob answered with pride.

"Come on, Jakob," Rudy spoke up. "It's getting late."

"Keep your pants on, Rudy," Jakob jibed back. "I don't know why you're so worried. The frauleins prefer Heinrich or me. You're so ugly . . ."

"Journeyman Neder. Apprentice Betche," Max said sternly.

Both boys settled down and Jakob began prying the bolt blank out of the die. It was stuck and he grunted.

Heinrich looked puzzled. "Why won't it come out?"

"If you'd had a ton of iron dropped on you . . ." Jakob moved, prying the bolt head from a different angle.

"They often stick." Max answered for Jakob. "The up-time machines have a device that pushes the blank back out. This is just a simple machine so we have to pry the blanks out."

"Some of them," Jakob panted, "are more stubborn than . . ." His left foot slipped a bit before finding purchase on the drop lever.

The ram dropped.

Jakob's right arm was under the ram as it slammed down and its weight pulled him down and forward into the side of the drop forge. He could hear someone screaming before things got bleary.

Rudy leapt forward and grabbed Jakob, keeping him from pulling on the ruin of his arm. Heinrich joined him in supporting Jakob.

"Carl, Rolf, get a bar. We have to lift the ram!" Max shouted. He grabbed a large pry bar leaning against a bench. Rolf and Carl-Maria seized others turned to the drop forge.

"Ready?" Max asked, his voice tight.

"Ready," Rolf replied and set his pry bar.

"Ready," Carl-Maria echoed.

"Karl, Hans, the wedges, quickly!" Max ordered. "We cannot hold it up long. On three. One, two, three. Huh!" The ram rose reluctantly until it was far enough up for the young apprentices to slip the wedges in a little way.

"Again. One, two, three!"

The ram grudgingly moved up a few inches. It was enough for Karl and Hans to shove the wedges fully into place.

When the ram's weight came off Jakob's arm, the severed artery began to spurt. Heinrich let go of Jakob and stood up. He pulled his belt off and whipped it around the remains of Jakob's arm, tightening it until the spurting stopped. Heinrich tugged on the belt end, thinking to neaten up his improvised tourniquet but it seemed to be caught on something.

"Sorry, Heinrich," Rudy said. "I gave him the end to bite down on. Hans! Get over here and get my belt off."

"Rudy, I think that you can let him down to the floor now." Max spoke slowly and calmly. "Rolf, your English is best. Call the hospital and tell them what has happened. We need their ambulance here as fast as possible."

"Yes, sir." Rolf bolted for the shop office and its telephone.

* * *

"How is he?" Herman Glauber's face was full of concern.

"Sleeping. He woke up for a bit and tried to speak. The doctors say that he'll live. They worked on him—operated—for hours. The right arm is gone below his elbow." Martin's voice shook. He wavered unsteadily toward a chair in the dark living room. "The doctors tell me that they can stop the wound festering. He might even regain sight in his eye. For now Jakob is out of pain and his life is in the hands of God and the American doctors."

"Good, good. Jakob's a good boy, smart, too. Here, just sit and I'll fetch you something to eat and drink. No." Glauber waved off Martin's feeble protest. "Frau Kunze left some dinner in the refrigerator. I

know how to heat it up quickly."

Martin sank back into the chair, suddenly realizing how tired he was. He closed his eyes for just a moment . . .

"Martin, wake up. You need to eat something before you sleep."

"What? Ah, thank you, Herman, thank you." Martin struggled to open his eyes. The steam coming off the bowl of stew brought a loud growl from his stomach, reminding him he'd not eaten for a long time. "What time is it?"

"Just coming up on two A.M. I should say, two A.M. Thursday morning." Herman sat on the couch. "Have you had anything to eat or drink since Tuesday's lunch? Oh, and do Jakob's parents know about the accident?"

"Huh. I'm not sure when I last ate," Martin choked out around a thick slice of bread. "I don't remember eating. As for parents, Jakob's are dead. It was his cousin that signed the apprenticeship papers. I think that they've moved back up to Madgeburg. The cousin is a mason. Frau Kunze will know."

Glauber turned on the lamp sitting next to the couch and settled back. "Yes, she will know. If they are still in town she has probably already told them about it. What happened? Do you know?"

Carefully placing his tray on the coffee table, Martin gathered his thoughts. "Yes . . . I got there after it happened, but soon enough that Max had just sent for the . . ." fumbling for the English word, Martin finally gave up; his mind wasn't up to it. ". . . the hospital wagon."

"Ah, the ambulance."

"Yes, that's it. Ambulance. Max, Carl-Maria, and Rolf got the ram up and drove wedges in to hold it up. Rudy was holding Jakob. He stuffed the end of his belt between the boy's teeth to give him something to bite on. Heinrich was there, too. He, Rudy, and Jakob had intended to go off to the Gardens together. Heinrich bound up Jakob's arm. The doctors said that it was Heinrich's actions that stopped Jakob from bleeding to death."

"Ah, yes. Adolf got some of that out of Heinrich. Not the part about saving Jakob, though. According to Heinrich the accident is his fault. He dared Jakob to do something—load the blank?—in a hurry so that they could leave early," Herman Glauber stated flatly. "If so . . ."

"No!" the volume of his reply startled Martin and he continued in a quieter tone. "No, Heinrich was*not* at fault. That much I got from Max who also tried to take the blame." Martin rubbed his face and sighed in frustration. "It was a silly accident. We were running bolt blanks for the new farm machines and we're behind because USE Steel was late delivering the metal. Everyone was hurrying and we shouldn't have been. You've seen the drop forge."

"I have, but I don't understand it."

"We make up blanks that have enough steel or iron to make the wrench or bolt or what ever part we want. The blanks are heated in the forge and are placed on the die and then the ram and punch are dropped. The weight presses the hot blank into the die. Then the punch and ram are raised and we pry out the formed piece."

"Yes, I remember seeing that when you first installed it. But the part I saw didn't look right." Herman shook his head. "Not right at all. It had the form of a wrench in the middle but was surrounded by a skirt of thin metal."

"Oh, yes, that's the flashing along the parting line—extra metal that squeezes out where the punch and die meet. It gets cleaned off later. The hardest part of the operation often is prying the formed piece out of the die. The Americans' machines have a piece that forces the part out. Of course the American machines also automatically heated and fed the parts. Ours . . . ours is a simpler machine."

"Simpler, and one that we could make. How many years will it be until we can make machines like the Americans' had? Or will it be decades?" Glauber snorted in disagreement. "Herr Reardon himself complimented you on your design. And I've heard Herr McConnell bragging about how cleverly it works. You figured out that a small steam engine was all the power needed. The Americans kept saying it needed a big electric motor—a motor that could not be built yet."

"Well, yes. It might be decades . . ." mused Martin, distracted from his recollection of Jakob's accident and injuries.

Glauber's voice brought Martin back to present. "The ram and punch are the part on top, correct, the part that drops down?"

"Yes, and that is just what happened. Jakob was reaching in to pry out the formed part. Somehow he kicked the drop lever. When it came down on his arm, his face slammed against the ram. The cheekbone broke and fragments went up into the eye. I thought he was dying when we got to the hospital. Herr Doctor Nichols himself assured me Jakob would live."

"The Moor? Ah, I've heard that he does miraculous work. If the Moor says so then the boy will live. What job will you give Jakob when he is well? He's a smart boy and he learns things quickly. Adolf could use a bookkeeper in the furniture shop . . ."

"No, not a charity job—he'd not like it. Jakob is a blacksmith to his heart. Have you seen the steel rulers we made?"

"Seen them? I have two of them in my tool box. They are as good as those the Americans brought from up-time."

Martin smiled in agreement. "Yes, yes, I'm proud of those rulers. Jakob did much of the work. In fact, he built a pair of little machines that we use to make them. He's even trained two girls to paint in the numbers and lines."

"Girls? When did you hire girl apprentices?" Herman chuckled. "Now if word of that gets to Hubner—oh, what a fuss he'll raise!"

"No, no, not apprentices. Actually the girls are part of the cleaning crew. Jakob worked many late nights on his little machines and these two girls kept asking him questions. The painting takes a very steady hand and a fine eye. He told me that he was tired of being the only one of us who could paint the rulers properly so he got this idea . . ."

"And got the girls to do the work." Glauber shook his head. "That boy will go far. Are you paying the girls extra for their work?"

"Yes, they get a dollar for each ruler that passes Jakob's inspection." Sighing Martin leaned back. He was starting to feel the tension ebb from his shoulders and back. "Jakob's young, but those rulers are journeyman level work. I think we should give him his papers and his own little shop. Those rulers sell as fast as we can make them, you know. There are other fine instruments we've been looking at, too. Just a week ago one of the Americans from the school came by with an odd kind of ruler, one they use for drafting. He wants us to try and reproduce it. I've been meaning to talk to you and Adolf about it because it can be made from wood. That small shop, two doors down, is vacant. That's the place for making steel rulers and other fine instruments—away from the dirt and smoke of the forge. By the time Jakob comes out of the hospital, I think we could have it set up. Hubner be damned. I'll hire the girls full time to assist him and get him some likely young boys as apprentices."

"Ah, hard work and new ideas . . ." a beaming Glauber started.

". . . make for wealth." finished Martin, smiling back.

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If at First You Don't Succeed . . .

by Paula Goodlett

"That will never work."

Margaret looked up at her younger brother, Nathan, and stuck her tongue out at him. "Says you. And what do you know, what with all your years of experience?"

"Pa says it won't work. And you've wasted your time. Time you could have been doing something more useful."

Nathan was only six. And kind of a pain in the rear. Margaret sighed. "I worked for the blacksmith's wife for a fortnight to earn these. It's mine and I'll do what I want with it." She kept pushing the tiny pins through the length of leather. She'd marked the leather with a dot in every place it needed one of the pins. She'd already finished the shorter piece that went on the small wooden drum. This length was for the larger drum and she had a thin strip of leather that would make a figure eight and follow the drawing she had. The drawing made sense. She could see that if you turned the crank, the drums would rotate and the

wool would be drawn in and onto the larger drum. It would be nice and straight and let her spin finer thread. That's what the lettering under the drawing claimed, at any rate.

"Pa still says it won't work."

"We'll see then. There, I've finished the pins." Margaret stared at the drawing again. "Now I just have to glue this to the larger drum, tack it down, then put it together. And I'll be ready to try it tomorrow.

"Won't work."

Margaret just glared at him.

* * *

"Hell and damnation!" Margaret glared at the machine she'd built. "It should work. It looks exactly like the drawing."

Nathan wiped his nose on his arm, then peered at the paper. He was terribly short-sighted and usually had to hold anything he wanted to see close to his nose. "Hmm."

"Hmm, what?" The tangled mess of wool just wasn't carding properly. It was straighter than it would have been in the usual locks, but it wasn't as straight and pretty as the hand drawn picture showed it could be.

Nathan peered again. "Well, looks to me like you've done your pins wrong. See this?" He handed her the drawing. "Those little pins? They've all got a bend in them. In fact, it looks to me like the pins on the big drum and the little drum point in the same direction. And it isn't up, like yours are."

Margaret stared at the drawing. Just barely, if she looked really hard, she could see what Nathan was talking about. Then she looked at her homemade "drum carder" and the hundreds of tiny pins. She felt like weeping for just a moment. "Well then. I suppose I'll just have to find a way to bend them, won't I?"

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Waves of Change

by Paula Goodlett and Gorg Huff

"I WANT TO LISTEN!!!" Joseph screamed, making it impossible for anyone to listen.

"For God's sake, girl. Let your brother listen to the damned thing."

"But, Papa . . ." Marie couldn't help the whine in her voice.

Papa raised his hand. Marie decided to let her brat of a six-year-old brother listen to the radio. When Papa raised his hand, you did what you were told. Papa's hands were hard and they hurt when they hit you.

Marie had finally finished the crystal radio last night. She had worked from a set of instructions in a broadsheet, and had gotten the copper wire and the bits of iron from the smith for doing some extra chores for him. She had worked on it for weeks. Thankfully, she'd finished it after the brat had gone whining to bed. If there was a bright center to the world, and apparently there was now, Marie and her family lived in the village farthest from it. At least, it seemed that way to Marie.

Actually they lived in a village about one hundred and twenty miles northeast of Grantville as the crow, or the radio wave, flies. Almost due north of Dresden in Saxony. Grantville was Marie's bright center to the universe. Mama and Papa were not convinced of the central place that Grantville held in the cosmos, though.

With the brat hogging the radio, Marie couldn't listen to the rest of her English lesson. There was just the one earphone and it wasn't either particularly clear or loud. Sort of a scratchy whisper. She pouted quietly, though. You didn't argue with Papa, especially when he had had too much beer the night before.

Her impression that her village was the end of the earth was more cultural than physical.*They were just so . . . primitive.* It had taken her weeks to get the thing tuned just right and now she had to yield to the brat.

* * *

Karl started grousing after the children had gone to do their chores. "I'm tempted to break the darn thing if it's going to be that much trouble."

Greta snorted. "It's harmless enough, husband. And it isn't like the girl has that much to look forward to."

Karl liked to grouse but he was unlikely to do anything that would upset Marie. He doted on the girl, even if he didn't show it well. Part of it was guilt. Marie was not pretty. Aside from a beak for a nose, she had caught the pox when she was ten and her face was permanently scarred. Absent looks or a good dowry—which they would not be able to afford—the girl was unlikely to ever make a good marriage. Not that marriage was going to be a consideration anytime soon; Marie was only fifteen, after all. But even another ten years were unlikely to improve her prospects. Right now, they were happy enough to have her help at home.

Karl nodded. "True." He sighed. "She did build it. We should make sure she gets time to listen. Joseph can't be allowed to just throw temper tantrums to get what he wants."

Greta nodded. Joseph would get the farm, what there was of it. Things had not gone well for the family. Karl was a half farmer, who—truth be told—was not the brightest man in the village. Marie had the brains in the family, which was an awful waste. What would a girl do with them?

"I need to buy bread today." Greta sighed a bit. "It's getting more expensive every day." Greta didn't know why. There was no real way for anyone in the village to understand the economic situation. Unlike Grantville or Magdeburg, their part of Saxony was experiencing a depression combined with inflation. Everything cost more and no one had any money. What little money the area had poured into Magdeburg

to buy all the new products.

* * *

"And on the weekly farm to market report, brought to you by Castelanni Brothers, the price for wheat is up a bit from last week. From $89.67 a bushel to $90.54 . . ."

Greta cocked her head and listened harder. Greta was listening because, well, Karl had a little trouble following that sort of thing. The important point was that the crop report didn't sound that much like what Herr Berger had been telling them. Herr Berger said that prices for wheat were down in Magdeburg because up-timers and their "magic" would be providing the food needed by Magdeburg.

She listened even harder. "In spite of the improved farming techniques that have been introduced, Thuringia will still be importing quite a bit of grain. The increased population in Magdeburg, as the city is rebuilt and new industry moves in, means that prices for the fall harvest are expected to be higher along most of the rivers that feed into that city."

"Did you hear me?" Greta looked up at her husband. "Prices are up, not down. Herr Berger said they were down."

Karl grunted. He took a sip of beer. "We don't know that what's reported is the truth, do we? Berger is the factor. He knows what he's doing."

Greta didn't doubt that Berger knew what he was doing. She just wondered if the village knew what Berger was doing. Berger was in the business to make money, wasn't he?

* * *

"Oh, don't be silly, Greta." Eva Katharina sniffed in scorn. "That useless toy! I don't intend to tell Hans anything about what this so called Farm to Market report said. He's not going to give any credence to words out of the air."

Greta sniffed back. "Well, you'll have to send him to our house this evening, then. Let him listen for himself."

Most of the women had reacted that way. Greta headed back for home, griping all the way. The villagers all knew that Marie was working on some sort of toy based on a broadsheet provided by a peddler. They even knew that it was supposed to produce sound sent from Grantville. Most of them didn't believe it was possible. Those that did—there were a few who had been to a neighboring town that had one—didn't believe that you could make one from a broadsheet. And they certainly didn't believe that a teenaged girl could do it.

* * *

"It's too much mumbling." Hans handed the earphone to another farmer. "I can't make head or tail of it."

It was a less than entirely successful demonstration. While not near the edge of the broadcast radius of the radio station, neither were they sitting in the great stone tower's shadow. There was a storm between the radio station and them that evening, though they didn't know it. That wasn't helping reception at all. They could hear the voices and mostly make out what was being said, but it was scratchy. Which was not helped by the fact that Marie had made the earphone herself and it wasn't very good.

Johan motioned Hans to be quiet. He was listening intently. "In the money markets this week, the dollar is holding steady. It's down only eight cents against the guilder which is slowly recovering after the

Amsterdam panic."

"They buy money? Why would you buy money?" Johan looked around. Everyone shrugged. Why indeed?

"My turn." Another man took the earphone and listened. "Not money this time. Stocks . . . doesn't make much sense. It's not any stock I have ever heard of. How do you milk an oh-pe-em? Can it plow a field? Something called USE Steel . . . ah . . ." He handed the earphone to the next man. "Doesn't make any sense."

The earphone got passed around most of the evening, much to Marie's irritation. She still wasn't getting any listening time and it was her radio. By the time she finally got a chance to listen, a music program was playing. She didn't like it much, but listened anyway. All the while wondering what blue suede was. Still, it was English. Probably.

* * *

So it went until the next week. Marie and Joseph argued over the crystal set. Karl complained about the wasted money for the tiny magnet, though, in truth, it wasn't much money, even for them. And Marie had earned it, running errands for people or doing extra work for others. Greta mostly ignored all the shouting matches. She became interested in the little radio while Joseph was at school and Marie running errands.

"So, you see, the percentage of acidity is very important in vinegar . . ." This was a "rebroadcast" of a "how to" show. The radio had said so. The woman had talked about the techniques and dangers involved in preserving foods. Much of it Greta already knew. She had been making sauerkraut and pickled beets since she was Joseph's age. She hadn't known the why, though. This could be useful. And there was a book on the subject that was available through mail order. It was advertised at the end of the show.

"Mama, can I listen now?" Marie was back from the baker. Greta held up a hand. "Just a moment."

Marie thought this was incredibly unfair, but wisely refrained from commenting on it. It was Greta who heard the sign off for the morning broadcast segment.

"Paper, quickly." Marie handed her mother a scrap of paper and a bit of charcoal. Greta began writing as quickly as she could. The sign off included the present Grantville time, the time of the next sign on and the schedule for the week. The next seven days, to be precise.

"Ha." Marie jumped. Her mother rarely sounded triumphant.

Greta waved the scrap of paper. "They do the Farm to Market report in two days. On the evening broadcast. And Herr Kreger must come to listen. Must. "

* * *

Johan Kreger wrapped the wire around the log. No paper tubes for him. He'd already smashed two of them.*If Beak Nose can make a crystal radio, I can.* He was, after all, theson of the head of the village council. She was just a girl, the daughter of a half farmer. His would be better than hers. He worked steadily, if a bit sloppily, and if wire touched wire every now and then, so what? His radio would be clearer and louder than hers. Poor Johan. While it's certainly true that size matters, bigger is not always better.

"I bet she did something else. Must have." He had hooked everything up right, he was sure of that. "Some girl thing. Secret girl thing." Johan was getting a bit frustrated. As is often the case, he was

convinced that if he wasn't winning the other guy, or especially the girl, must be cheating. She must have done some secret thing. Probably some weird ritual and possibly something demonic.

Pastor Althus looked down his fairly pointed nose at Johan. "Don't be silly. Marie is a good girl. She only followed the instructions better than you have. I asked her about it and got a lecture, complete with details and gestures, on just how it was made. No secret rites, just quite a bit of fiddling to get all the bits just right and a bit of calculation. Calculation I taught her." Pastor Althus paused. "And you."

Johan winced a bit. Telling his theory to the pastor, who was also the schoolmaster, might not have been his best ever idea.

* * *

"I still say it's a useless toy." Johan was the son of the head of the village council. So his opinions carried a certain amount of indirect weight. By the time of the next Farm to Market report, most of the adults in the village were of the opinion that the crystal set was a mostly harmless, but definitely useless, hobby.

* * *

"You should come and listen." Greta had been talking about that Farm to Market report for half an hour. Peter Kreger finally agreed, just so she'd get off his back.

"Enough, Frau Shultz. I will come and listen. But let that be an end to it."

That evening, Peter Kreger found himself listening intently. Much to Marie's dismay, he kept listening. "I guess I'm going to have to build another one," Marie said. "I certainly never get to listen to this one."

Peter held up his hand for silence. Then he looked at her and smiled. It wasn't until the program was over that he handed her the earphone. "Here, child. You're right and I apologize. I really did need to hear the whole report. You did a good job on this radio of yours. It works well. " He glanced over at his son. "Unlike some."

Johan started to protest, but Peter waved him silent. "You should ask Marie for help. I'm sure she'd be willing to assist you."

Johan looked a bit miffed. Peter ignored it. He'd made up his mind. He looked at Greta and Karl. "We must investigate. If the information on this broadcast is correct, we can get a better price for our wheat than Herr Berger offers us. At the least, we'll have a stronger bargaining position when it comes time to sell the crops."

Karl nodded. So did Greta. The fifteen percent higher price quoted on the Farm to Market report would be the difference between being relatively comfortable and barely making the rent.

"So." Peter slapped his hands on his thighs. "I will go to Riesa and investigate. And you. . ." He pointed to Marie. "You will go with me. You know more about the radio than anyone else."

"But, Papa . . ." Johan began.

Peter shushed him. "She does." Peter looked at Karl and Greta again. "Agreed?"

Karl nodded. "It isn't a toy. " He grinned. "Well, not just a toy. I think we need more of them if our house is not to be invaded every night. " Then he winked at Marie. "And if Marie is ever to get to listen."

* * *

Riesa was some twenty miles away. They would take the hay wagon which was pulled by a pair of oxen. The trip would take a day, perhaps a bit more than a couple of days in Riesa and another day back. It would mean almost a week away from home and it was coming up on harvest time. That was why Peter needed to make the trip now. He wanted to be sure, before Berger came to buy the wheat. After thinking about it, Peter decided to include his son on the trip, as well. Johan was, he thought, a bit jealous of Marie. But Peter was convinced that she had the most knowledge about radios. Perhaps she could teach Johan more about them.

Besides, Peter had no intention of wasting a trip. He loaded the wagon with fruits, vegetables and walnuts picked from the trees around the village. If he was going to the big city, he was going to take something to sell.

He was, in his own mind, convinced that the radio was telling the truth. He couldn't see anything for the people who gave the reports to gain by lying about the price of grain in Magdeburg. He could see a great deal for Herr Berger to gain. Peter wasn't even particularly angry about it. It was just business. But armed with the knowledge that the prices were higher, their bargaining position had greatly improved. Still, he needed the confirmation.

"Your mother says that there are a lot of different programs." Peter looked down at the girl beside him. She was a plain little thing.

"Oh, lots and lots." Marie's excitement was obvious. "And someday there will be a lot more of them. I heard them say so. Someday the radio will have programs and music all day and all night long. They had them, back up-time. I heard them say so."

"What sort of things will be on the radio?" Peter knew that the Farm to Market report was useful and was beginning, sort of vaguely, to think that the radio might be a more generally useful device.

"Well, there is an English class and a Latin class. Those are on Tuesday and Thursday mornings. Then there is 'Civics for Children' on Monday mornings. It talks about how the government works and tells little stories to explain how rights work and stuff like that. There's a show on bookkeeping and how to keep your finances in order. Mama likes that one and the one on cooking . . ." Peter let the girl rattle on about all the shows. In general, the morning broadcast seemed to be dominated by education talks. The evenings had the entertainments, though there were exceptions. It might be a good thing if the village had more radios, or perhaps one of those amplifying speaker things. Considering the educational talks in the mornings, perhaps a radio in the school house would be good.

* * *

"I still don't see why we had to bring her." Johan cast a look at Marie, who was walking for a while. Finally. He had had to walk all morning. She was a bit ahead of the wagon.

"Shut up."

Johan looked up at his father in surprise.

His father gave him that disappointed look. "If you had asked her to help, you'd have your own radio working. Think, son. Am I the best baker in the village?"

"You don't cook, Papa." Johan was totally confused by his father's comment.

"No, I don't. I am no good at it nor am I a good carpenter or smith. Have you once heard me suggest that your mother, Karl Vight, or Stephen Schmidt has a compact with the devil or is cheating because they can do things I can't?"

Papa's voice was quiet but Johan still found himself looking at his shoes. He really didn't want to look up and see the disappointment in his father's eyes. "No, Papa." Then it slipped out. "But she's so good at everything. It's not fair."

"That's a good thing, son. It makes the village a better place if people are good at things. You need to stop complaining and see what you can learn from her."

* * *

Marie grinned to herself. She'd heard every word. And was delighted to hear them, especially to hear Johan say she was good at everything. Johan had been consistently unwilling to ask Marie about how the radio worked or listen to any advice she offered. She liked the idea that Johan thought she was better at everything than he was. It wasn't really true. Johan was better at drawing and music and a bunch of things.

There was a certain amount of jealousy involved in their relationship. Though Marie was loath to admit it, it went both ways. They had gone to school together. Johan was handsome and had a marvelous singing voice. He was usually second in the class standings. Marie was generally first. She hadn't been nice about that, she knew. He was a boy. His father was the head of the council. He wouldn't have to go off and be someone's servant. Unlike her.

Marie knew she didn't have much chance at marriage. She wasn't pretty and didn't have a dowry. Wouldn't ever have one, probably. But she didn't want to be a servant. She wanted more.

* * *

Marie and Johan stared around in wonder. Peter's observation had a bit less wonder and a bit more calculation in it, but he had been to Riesa before. Riesa was much, much larger than the village. Much more crowded, too. For a wonder, there were radios in several places. Peter noted the antenna wires. It wasn't hard. Marie was constantly pointing them out.

They had spent the night on the road. Not by preference; they had run out of sunlight and it wasn't safe to travel at night. That brought them into Riesa fairly early in the morning. Business in the market square was brisk. The fee for a stall wasn't all that bad, though it seemed so at first. Peter was surprised at the prices they were getting for the fruits and vegetables they brought into town. They had sold most of their produce by noon and went looking for a likely tavern. Marie pointed out a tavern with a radio wire showing.

* * *

"Magnavox?" Herr Kreger's face creased.

The tavern owner laughed. "First time you've see one? There aren't many around yet; I got one of the first. I got it in Magdeburg. There's a factory there that makes them. I listened to quite a few and I thought this one had the best sound."

Marie stared at the Magnavox. It was beautiful. A very fancy cabinet, with carved wood. Unfortunately, she couldn't see the coil. She pointed to the knobs on the front. "What are those?"

The tavern owner turned a knob. "They call this one a tuner. It's so I can get the Voice of Luther station.

Very uplifting sermons on Voice of Luther. We listen to them on Sunday. Mostly, though, we keep it on Voice of America." He looked around before saying, "The programming is a lot more interesting, most days. " Then after setting it back to roughly the VOA, he turned the other knob. "This is the volume control. My radio has a real amplifier." They could hear the static clearly, but that was all. Neither station was broadcasting this time of day.

"How does the amplufior, ah . . . whatever you said work?" Marie wanted to know.

"Don't know and don't care, girl." The tavern keeper grinned. "It works is enough for me. I just pay the boy from the shop down the street. He comes by once a week and fiddles with the batteries. They also sell a generator set up, but that's more expensive."

"Amazing." Peter shook his head. "Just well . . . amazing."

The tavern owner nodded. "Yes. It cost an amazing amount, too. But it's worth every penny. People come in to listen to the radio shows most nights and buy a beer and maybe some dinner. Besides, I heard a program about brewing that helped me improve the taste of my beer. 'Course, there are some disadvantages. My wife orders powder for baking all the way from Jena. Costs a bit, that does, but it does make quick bread. Biscuits, they're called. And there's that annoying ditty. The Gribbleflotz jingle, they call it. Got sick of that one pretty quick."

Peter nodded. Though the one time he had heard the jingle, he had rather liked it.

"What is that?" Johan pointed. This was a very strange looking machine, sitting next to the radio.

The tavern owner grinned. "It's a record player."

At their curious looks, he explained. "The radios don't broadcast all the time. This plays recorded music anytime we want it. I even have a couple of records of speeches but I'd rather listen to the music. Or the language lessons. When customers pay, I play whichever of the records they want to hear. For twenty-five cents, American." He puffed out his chest. "Brings in a lot of customers. Here, I'll show you. This one is on the house."

He went to the record player and opened a cabinet under it. Then he removed a flat disk. He carefully placed the disk on the record player and then did something with a handle of some sort. Suddenly there was music.

After the music died away, Peter finished eating and checked that Marie and Johan had finished, too. He stood. "Thank you for the demonstration. We'll be off for now, but we'll be back this evening."

* * *

The trio set out to explore a bit. A number of merchants and shop keepers had radios. Some were homemade, like Marie's. Some had been bought. Several appeared to be a combination of both.

The Magnavox was the best, though. But it was obviously too expensive for the village. "It would be good to have that 'amplifying device,'" Peter said.

Marie nodded. "Perhaps we can find a way to build one."

* * *

That evening, when they returned to the inn, the dining area was full. It stayed that way till the VOA

signed off. Then a bit longer, with people listening to and dancing to records. It seemed every customer had a favorite song they wanted to hear at least once. Some were played quite a few times. Marie decided that she liked some of the music, but not all of it. If she'd had any money, she'd have paid for a language lesson.

* * *

Marie woke up already excited about the day. The innkeeper had provided them with the location of the shop that sent the boy to fiddle with his batteries. It specialized in products from Grantville. She was anxious to see them. So was Peter. So was Johan, but he tried to hide it.

"If we can afford it," Peter explained, "one of the amplifying devices would be good for the village. Perhaps some more wire, a better earphone. You can build more radios, can't you?" He looked down at Marie.

She nodded. "I'm sure I can. One for everyone in the village. So nobody has to share them."

Peter laughed. "That's a tall order."

Marie looked stubborn. "I can. I know I can."

* * *

The shop was fun. Cluttered, but fun. There were record players and radios, records and all sorts of interesting accessories for them. There were also booklets, brochures, and the shop keeper could order things. The number and type of doodads was frankly amazing.

Peter pointed at one item. "What's that?"

The clerk shrugged. "It's a carbon granule microphone 'amp' for radios or phonographs. That one has three stages."

"How does it work?" Marie asked.

The clerked shrugged again. "Well, it's a bit hard to explain. No offense meant."

"I built a crystal set." Marie glared at him.

Suddenly the clerk looked interested. "Really? So have I." Then he paused. "I was already working here, though. So I had all the parts. You built one from scratch?"

Marie nodded, not noticing the dark look Johan was giving the clerk.

"The amp works through variable resistance . . ."

* * *

Peter looked on while Marie and the clerk got into an animated discussion of the "amp" and the other types of amplifiers available. They must,he thought, be speaking English. It certainly was no German dialect he had ever heard. Well, part of it was recognizable. But the technical terms they were using were very confusing. From the bits he caught, he gathered that there was more than one type of amplifier available. Plus woven wire for connections, special screws and a variety of other products. Also books on the making of a number of things. Electric and not electric.

Marie and the clerk headed for the rack of books. Somehow, Peter, who had the money to actually buy things from the shop, was totally forgotten. As was Johan. Peter was amused by this turn of event. Johan obviously wasn't.

Peter looked around the shop for a bit, while he waited for the clerk to realize that he had a customer. Aside from the electric radio stuff there were sewing machines, typewriters, egg beaters, all sorts of things. All very expensive, much to Peter's dismay. Well, except for the egg beaters. Those weren't so bad. In fact, Peter decided to get one for his wife. He liked the clever little gadget. With it, at least, it only took one look and you knew how it worked.

After a few minutes, Peter gave up. The clerk wasn't budging from Marie's side. He walked over to Marie and looked at the book she held. "What is that?" He pointed to a picture.

Marie looked up at him. "That's a generator." She flipped a few pages. "That's a battery. And from what I've been able to tell, there's a lot of information on a lot of things I could build, if I had what I needed. Some of the parts might have to be sent for from Grantville or Magdeburg, but a lot of it I could do."

Johan snorted. "You're a girl."

Marie glared at him. "A girl with a working radio."

The clerk snorted a laugh. "From what I hear, the best radio tech in the world is a girl. Well, a woman. The up-timers say," the young man continued as if quoting gospel, "women can do anything men can."

Peter put a hand on Johan's shoulder before he could get in a fight with the clerk. "He has a point, at least in regard to radios. Now, hush." Peter guessed the clerk to be in his late teens or early twenties and clearly enamored of the up-timers everyone talked about. But that was no reason to be rude. He gave the clerk a repressive look before turning to Marie.

"Marie, explain this to me." He pointed at a drawing.

Marie took a moment to read the text that came with the drawing. "A balance beam amplifier, it says. It looks like it would be hard to build." She hesitated. "I think," she emphasized the word, "I could build one, given enough time."

"Ah . . . they work all right for voices," the clerk cautiously interjected—he had caught Peter's look clear enough—"but not so well for music."

Peter made up his mind. He handed the book to the clerk. "We'll take this. Now, Marie, make a list of things you're going to need. Need, mind, not just want. If the list is too long, or the items too expensive, you won't get any of it."

Just before they finished up, the clerk winked at Marie and handed her a ceramic tube. "If you're going to make a lot of these, this will be a big help. It's the form for making your coils."

"But I don't have any money," Marie protested.

"On the house." And he refused to accept it back.

* * *

Peter spent the morning thinking as the cart slowly took them homeward. Marie was reading and Johan

sulking. He would have to do something with that boy. He wanted to wait until after they had sold this year's crop before buying expensive parts for better radios. He also wanted to see what Marie could come up with in terms of making the electric gadgets herself. So, while they had gotten some of the things on Marie's list, they hadn't gotten them all, even though the cost had been surprisingly reasonable. Johan's sulking had a lot to do with that, and perhaps even more to do with the interest the clerk had shown in Marie.

Their village had held together fairly well though the course of the war. Mostly because they took care of each other. Peter was convinced of that. Having an expert in radios would be a boon to the village. Not a great boon, but something that they could supply to neighboring villages, to bring in a bit of money. It would also mean that Marie's family would need a bit less village charity. Her father, Karl, was a hard working man but not a successful one. Everything he touched seemed to turn to mud.

That was the point that Johan failed to see. If Marie could make some money on her radios and whatever else she could find in the electric book, it was that much less support that Karl, Greta, Joseph and Marie would need from the village. At the same time, Peter wasn't entirely sure he liked all the unfettered information flowing into the village. The clerk had made him a bit nervous. There was no telling what sort of problems it might cause. Peter scratched his head. There really was no telling.

When they stopped for lunch, Peter tried, again, to get Johan to see what was going on. He was pretty sure what the problem was. For one thing, there was the way Johan looked at Marie. Peter had no idea whether anything would ever come of it, but clearly Marie had captured Johan's attention somewhere along the line. It was an interest that Johan was unable to acknowledge; was probably unaware of.

Peter was less sure if that interest was returned. Marie was harder to read. Partly, that was because Peter didn't know her as well. Partly, it was because she was so focused on radios right now that nothing else held much interest for her.

Somewhere along the way, Johan and Marie had gotten in the habit of fighting. Of seeing each other as competitors, even enemies, not allies from the same village. That was a bit scary. Marie was a bright girl. If she was permanently turned against Johan . . .

* * *

"You nearly walked into a tree." Peter took the book from Marie's hands and put it in the slow moving oxcart. Marie didn't complain as much as she wanted to. She and Peter were walking beside the oxcart while Johan drove. "When we get back home, I'll let you read it. I'll let anyone read it. But you'll have it the most, because you'll be making more crystal sets for the village. And later, you'll be making them to sell."

Marie looked up at him. He grinned. "Yes. You'll be paid a fair price for them, too." He gave her a severe look. "After you've paid me back for the stuff I bought in Riesa."

Marie grinned. "I can do it. I can make a lot of them. Sell them." She paused a moment. "I'll have a craft. Something I can do, that not everyone can."

The thought made her happy. With any luck at all, she wouldn't have to become a servant.

Marie started skipping. She wanted to get home and get started.

* * *

"It's the up-timers, you see." Ernst Berger was a pudgy man with a red face and a head of

blond-going-to-grey hair. Well, a partial head of hair. His dome gleamed in the sun. "They've made so many improvements that the price of wheat is very low. I can't pay any more than thirty dollars a bushel. Probably won't be able to sell it for more than forty-five, once I've gotten it barged down to Magdeburg."

Peter took a sip of his beer and watched the factor. It was the beginning of their usual bargaining session. But this time, Peter had more information than he usually had.

Herr Berger didn't wait for his answer. "It's a perfectly fair price. It's what I've paid all over this area and what I'll be paying you. Besides, with the up-timers' high yield crops, I might lose money even at that price."

Peter grinned. He couldn't help it. "Let me relieve your mind, Herr Berger. The Farm to Market report says that wheat in Magdeburg is going for $92.03 a bushel."

Berger's face paled a bit. "But I have to get it there. Transportation costs . . ."

Peter interrupted him. "Yes, I know. I've been looking into transportation costs." He smiled again to drive home the warning. The fact that he had been looking into transportation costs meant more than just his knowing how much it would cost Berger. It meant he was getting prepared to arrange other transport if he had to. "I don't expect the full amount that you'll sell it for when you get it to Magdeburg." He smiled. "I'm a reasonable man, after all. Transportation is expensive. And a certain amount of profit for you is your due, I'm aware of that, too. I think seventy dollars a bushel would be fair. Don't you? Especially with the favor I've just done you?"

"Favor?" Berger asked.

"Of course. Relieving your mind about the prices in Magdeburg. Such a horrible rumor, that. It must have cost you many sleepless nights." There was a decided edge to Peter's smile now. "It's all right now, though. Aren't the radios wonderful things? Why, just the other day I heard a program on how to build a barge."

Berger swallowed audibly. Peter barely managed to keep from laughing out loud. Making barges of their own was the next thing to a hollow threat. Between the time and effort needed and the transit fees, they would be charged more than Berger would be charged. Peter doubted the village would clear forty dollars a bushel.

On the other hand, Berger didn't know that Peter knew that. Some of the other villages were mad enough to try building their own barges. If enough if them did, it would ruin Berger. That was another thing that Berger didn't know that Peter knew. Peter was prepared to let Berger bargain him down a bit. But only a bit. If Berger wouldn't see reason, they would just have to build barges of their own.

The bargaining continued. Outrageous lies were told on both sides. All in all, it was a most enjoyable evening. At least, Peter found it so.

* * *

Ernst Berger sat on the barge taking him and the grain to Magdeburg and tried really hard not to curse. He was a religious man after all. It was the damn VOA that had done it. Ernst bought grain from dozens of villages along the*Schwarze Elster*. Over half of those villages now had crystal sets. The Farm to Market reports had cost him a small fortune.

Ernst steamed for a while. The radios. The damned radios. Anyone could make the damn things. It only took a little wire, some bits of iron nails and a cheap magnet.

Peter Kreger had been grinning like a loon all though the negotiations. He'd even insisted on American dollars. Threatened to make some barges and take the grain to Magdeburg himself, he had. "I heard a program on how to build a barge." Karl Junker had been even worse. He hadn't threatened anything. His village had flatly refused to sell to Berger at any price. Junker's brother-in-law had made one of the radios.

If Ernst ever caught the bastard traveling tinker who had been selling those broadsheets with the designs for the radios, he was going to . . . to . . . He didn't know what he was going to do.

He looked at his books again and winced. Between the villages that had insisted on higher prices and the ones that had refused to sell to him at all, he was going to be hurting.

* * *

"I have a letter?" Marie looked amazed.

"Apparently so." Greta handed her daughter the letter but made no move to leave. There was no way she was going let her not yet sixteen-year-old daughter get letters from persons unknown without finding out what was in them.

She watched as Marie opened the letter. "It's Thomas Gerter, the clerk from that store in Riesa I told you about. It's an invitation to join a group of correspondence."

Greta was not reassured. "Robin of the Committees of Correspondence" was exciting to listen to, but not something she wanted her daughter involved in. Which she made clear to Marie.

"Oh, Mama. It's not that sort of committee. It's about radios. Thomas says it might develop into a guild or maybe an up-timer style union. There are people all over who are making radios. And some of them aren't real good at it." She giggled. Johan had finally gotten a working radio, sort of. "Others are less than honest. Selling radios that don't work or claiming that they will do stuff they won't."

Marie handed the letter to Greta. She read it. The plan, as the boy said, was to assure the good reputation of workers in the fields of radios and electronics and to share knowledge and techniques. There were tests of skill. And . . . ah ha . . . there was a fee. It was probably a scam.

* * *

"No. I don't think so, Greta." Peter Kreger smiled at the worried mother.

The village had done all right through Marie's radios. Peter knew of a couple of cases where the villages she had sold radios to had insisted that she wait right there in the village through a couple of broadcasts to insure that the radios worked. Not that that was a problem. Marie flatly refused to sell a radio, or any other gadget, unless she had tested it completely. "This is going to happen anytime something new comes up. The people who can really do it, and do it well . . . they have to do something to separate themselves from the charlatans. Looks to me like Marie is being invited to join the guild."

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Framed

Try, Try Again

by Paula Goodlett

"It isn't right."

Marie lowered her eyes so that her employer wouldn't see the glare she couldn't suppress. "Ma'am, I did what the package said to do. Twice." She picked up the container of Spirits of Hartshorn and tried to get Frau Werrin to look at it.

The Frau ignored her pointing finger. "If these American's can get bright shining white, we can get bright shining white. Try again. Try the other product—the, what do they call it? The bleach."

Marie nodded. Frau Werrin stomped out of the laundry area and slammed the door. Marie shook her head at the retreating back. Damn the Americans anyway. Word of the costumes that had been worn for the ballet had even reached this far and nothing would do but that Frau Werrin*must* have the glowing white fabric the reviews spoke of. No matter that wool—even white wool—tended to be a creamy color.

There was nothing else to try and her job was on the line. Marie heated another cauldron of water, added the Spirits of Hartshorn and the bleach. She stirred the mixture for a moment, then began adding the fabric.

Her eyes watered a bit when she leaned over the cauldron, but she blinked away the tears that formed. "If only I can figure this out," she thought. She stood straight, but her eyes kept tearing. She shook her head and gently pressed the fabric under the water with her paddle.

The fumes kept rising. Marie kept stirring as long as she could. When the gasping started, she tried to make it to the door.

* * *

Frau Werrin stormed into the laundry room. "Marie, where are you?" Then she gasped. Marie was on the floor and the acrid stench in the room made her eyes water. "What is that smell?"

With the door open, the stench began to clear out. Frau Werrin blinked back the tears the stench had caused, then went to check on her fabric.

"Oh. We really can get the glowing white!"

Little Jammer Boys

by Kim Mackey

The terrified servant handed the message to Johnny von Sachsen as he and his younger brother, Augi, entered the elector's palace in Dresden. It was terse and to the point.

Come to my bedchambers. Now.

In their father's handwriting. John George I, Elector of Saxony, was not a subtle man.

"Wonderful." Johnny heard the disgust in his voice. He handed the note to his brother. "Simply wonderful. What have you done now, Augi?"

"Me?" hissed Augi. "Why does it always have to be me that our father is unhappy with? You're the one who got us into this mess, with your record players and American radios."

Johnny looked at his rotund brother and shook his head. "It can't be that. Maybe he's heard about your indiscreet comments to the French ambassador. Calling him a drunken pig and a disgrace to Saxony was just too much."

"Wait a minute. You started it with your comments about how ashamed you were of him. I was just following your lead!"

The two young men continued their bickering all the way to the elector of Saxony's bedchambers.

* * *

When they entered there were only three people in the room. A bad sign. Worse was the presence of their father's personal guard dogs, Fang, Dagger and Granite. The boar-hounds were each two hundred plus pounds of dark gray fur and muscle. Granite growled at them as they entered and the elector clouted him on the head.

"You can't eat them just yet, Granite. Shut up."

John George the First looked at his court dwarf, Maximilian, and motioned him out the doors. Johnny felt the boom of their closing like a knell of doom.

The elector's blond hair and beard were beginning to gray but his broad shoulders were still firm and muscular. With the toe of one foot he pushed a jumble of wire and wood in the direction of his sons. "Do you know what this is?"

Johnny took the initiative. "Wood and copper wire?"

The elector snorted and took a swig from his beer mug. "Tell them, Benedict."

The other man in the room stepped forward. Benedict Carpzov was one of the Elector's most trusted privy councilors and an expert in German and Roman law. "Crystal radios, as I am sure you both know. Confiscated right here in the palace."

Carpzov looked at John George, then back at Johnny and his brother. "The elector is not amused. You were responsible for stopping the influx of radios into this area. Yet you cannot even keep them out of the palace!"

"We tried!" Augi threw his hands in the air. "But they are too easy to make! Everyone wants to listen to the broadcasts. Every time the soldiers capture or confiscate radios, the parts, or those pamphlets at one point on the border, they pour through at another. It's impossible!"

"Bah," spat the elector. "Tried my sainted ass! I'm tired of your useless whining! Benedict will now be in charge of this task, and you will assist him in any way you can. We may be at war with the fucking Swede and his pet Americans by next spring and we don't need our people listening to the enemy's mindless blathering. Get this done, and do it quickly."

John George turned to Carpzov. "You have my authorization to call on whatever resources you need to stop this plague of radios. I'm not that worried about the nobility, but we have to stop the lower orders from listening to the Voice of America. Understood?"

Benedict Carpzov nodded. "I understand, Your Excellency. Your sons and I will accomplish what you command."

When the elector waved in dismissal, Carpzov motioned for them to follow. They left the bedchamber.

"We really have tried, Benedict. Honestly," Augi said. "But the border is just too porous."

"Not to mention that the Committee of Correspondence is involved," Johnny added. "Even if we could close the border, it wouldn't do any good. They're printing the pamphlets everywhere, we're sure of it. We don't have the manpower to do a house-to-house search of every village."

"Then we will have to look for other solutions," Carpzov said. "Now where is my half-brother?"

"Gus?" Augi asked tentatively.

Benedict's smile was a thin angry line. "Yes, that's the one. August Carpzov. The person who is selling radios to all the nobility in Dresden. The one you are in league with, making money when you are supposed to be limiting the use of radios. The person who supplies the records for your parties in the country estates."

Augi blanched and Johnny was pretty sure he did, too. Benedict laughed. "No, I have not told your father. Yet. My honor is involved here as well. But you will take me to him. Now."

* * *

"So how did you get started in all of this?" Bernard Stoltz was one of Dresden's more prominent goldsmiths.

Gus Carpzov smiled his best genial smile. "I was going to school in Jena when the Americans first came

through to stop one of Tilly's regiments after the battle of Breitenfeld. I was intrigued by their CB radios and decided to investigate. I spent almost two years in Grantville before coming home."

Gus motioned at a radio on the shelf. This one was mounted on polished wood and stone. "Your daughter might like this one. It was designed to appeal to a woman's vanity."

Stoltz took the radio down and admired it. "Nicely done. Helmholtz did the inlays? I think I recognize his style. "

Gus nodded. "You have a fine eye, Herr Stoltz. Yes, that is Helmholtz's work. For someone like yourself, I will offer a discount. Only twenty guilders. I manufactured the inner workings myself using a real up-time transistor. I will guarantee the radio for six months, no charge for any repairs needed. " That wasn't true, but it let Gus sell a radio that cost him a guilder to make—including the case—for twenty guilders. No one was going to pay twenty guilders for something peasants could make from a broadsheet.

"Excellent," Stoltz said. "Done. But she also wants one of the . . . record players, are they called?"

"Yes, record players. " Gus nodded. "Right this way. I have them in a side room under lock. Since we cannot manufacture them yet, they are considerably more valuable, you understand."

Stoltz nodded. Mentally Gus rubbed his hands. He would discount the record player, as a sign of respect for Stoltz, but mark-up the records he had. If he could impress Stoltz, that would open up a whole new clientele among the richer merchants in Dresden.

Gus Carpzov's workshop was in an old stable and store room behind the Golden Swan Tavern. The Golden Swan catered to the higher orders of society in Dresden and the location had allowed him to make contact with a number of successful merchants. As for the patricians, his life-long friendship with the sons of the elector had paid huge dividends. It also kept the elector's soldiers off his back.

* * *

When Johnny and Augi walked into his store, he greeted them enthusiastically. "Hello, boys. Guess who I sold a radio and record player to today? Bernard Stoltz, the goldsmith, he . . ." Gus stopped cold when he saw the expressions on the faces of his friends. "What's wrong? You both look like you just lost your best horse or something. What's happened?"

Johnny shook his head. "We're really sorry, Gus. We had no choice."

"Yeah," said Augi. "He forced us to bring him here."

"Him? Him who?"

The bell on the front door blinged again and Gus froze in horror when his elder brother entered.

Benedict Carpzov smiled. To Gus it seemed like the smile a wolf would give a lamb just before devouring it.

"Hello, August. I think we need to have a talk."

* * *

After Benedict Carpzov had left, Augi patted Gus's shoulder in sympathy. "Well, at least you've got a

week to come up with something."

"Come up with what?" Gus raised his head off his arms. "If I could build a transmitter so the elector could have his own radio station, that might be one thing. But I just don't have the expertise to put it together in a week. And the people I knew in Grantville aren't exactly my friends any longer. Considering the radios and other things I, ah, borrowed when I left. What the hell am I going to do?"

"Do you think your brother was serious? Would he really put you on trial as a warlock?"

Gus nodded. "Count on it. The family honor is at stake. And that's likely to be where I wind up, burning on a stake. Unless I can think of something. Sorry, guys. I have to do some serious thinking. Come back in a few hours?"

The two Von Saschen brothers nodded and left the store, shaking their own heads. It would be a shame to lose Gus. He had the best contacts with smugglers bringing in records from the USE.

Augi looked over at his older brother. "What are we going to do?"

"Well," said Johnny, "if Gus comes up with something, help him the best we can. If not, I guess we'll have to look for a new supplier."

* * *

Gus Carpzov spent an hour trying to convince himself that he could build a transmitter for the elector. But he knew his own limitations. There were too many variables, too many unknowns. Plus he knew there had been a lot of difficulties getting Voice of America and Voice of Luther operational. The elector would not be satisfied unless his own radio station rivaled Voice of Luther, at the least.

But what else could he do? He could probably stretch out the pretense for months, which would be vastly better than being tortured into a confession of witchcraft in the dungeons of Dresden. He could just imagine his half-brother enjoying that.

Start brainstorming, Gus.

He decided to put some Christmas music on the record player. It was soothing enough to calm him down and maybe his mind would remember things from his time in Grantville. It really had been the best time of year there.

Our finest gifts we bring, pa rum pum pum pum . . .

That's what he needed, a fine gift for the elector. But he doubted the elector would be pleased with just a record player. He needed something to address the problem of the lower orders having radios. But what?

I have no gift to bring, pa rum pum pum pum, that's fit to give our King . . .

Right, a record player or even an up-time radio wasn't a fit gift for the elector. He wanted to*prevent* people from listening, not necessarily listen himself.

Then He smiled at me, pa rum pum pum pum, Me and my drum.

So how to make the elector smile?

Gus chuckled. If I had a big enough drum I could drown out the Voice of America and the Voice of Luther combined. He sat up. Wait a minute . . .

Suddenly eager, he began to make sketches in his notebook.

* * *

Benedict Carpzov blinked in astonishment after Gus finished demonstrating his device. "It really works. And even against an up-time radio."

Gus laughed. "Of course it works. As my old radio instructor used to say, it was simple dimple. Battery, buzzer, capacitor, and a few dozen feet of antenna. Coverage will be only a few hundred feet, maybe two hundred yards maximum. We'll have to do experiments. But with limited coverage we can make sure that the nobility isn't bothered by proper placement in the appropriate parts of town. And then there's the export market."

"Export market?"

"Sure. " Gus grinned. "There are lots of villages and towns in the USE that aren't too happy about the Voice of America and Voice of Luther programming. And a porous border works both ways. So we can start shipping jammers to people in the USE who want to jam the signals. They can even tailor the jamming to certain programs by turning it on and off as needed."

Benedict shook his head. He hadn't really believed his half-brother would actually come up with a viable solution, but he had. What was more, it would delight the elector to ship jammers into the USE to disrupt his enemies.

"So tell me. How did you come up with this idea?"

Gus grinned. "Let's just say a little jammer boy whispered in my ear."

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Safe at First Base

by Mark H Huston

"I tell you, I saw it in the movie. Plain as the nose on your face. And you have a large nose, Johan. The up-time device looked just like this—"

"Heinrich. Listen to yourself. Movies are like dreams; they are not real.*This* is reality." With that, Johan pointed over the edge of the precipice, a two hundred fifty foot drop, straight down. He backed away slightly. Johan was so focused on talking his brother out of testing his homemade copy of this absurd up-time device, he didn't realize his proximity to the edge. He could see the dirty brown ribbon of the river in the bottom of the valley. He swallowed and tugged at his nose, edging backwards. Heinrich was speaking again.

"—I tell you it was just like this. A harness that supports the man, ropes fastened to a harness, and the ropes attached to the cloth canopy above. I tell you, I will float down like a feather. A parachute, it's called."

Logic was not working. Johan knew that he had to try something stronger. He now tried screaming the obvious. "HEINRICH. YOU WILL DIE. DIE! COLD-DEAD-IN-THE-GROUND-DEAD!" He glared at his younger brother. Heinrich glared back, unyielding.

Time for the best argument.

"Heinrich," Johan said with a voice as smooth as sweet cream, "what would Mother say?"

Heinrich snorted, and looked at the ground. "It is not fair of you to bring our mother into this argument." He made a pensive, slightly confused face, but only for a moment. There was a pause, then he then turned, resolute. "But I am sure that she would be proud. I will be the first person on the world to "base jump." Think of the fame, and notoriety that will come with this feat. Yes, she will be very proud. I am certain." The steadfast and unyielding glare returned.

"I cannot let you do this, brother."

"You have no say in the matter,*brother* . I am old enough. I am no longer under your charge. I have tested it once with bags of rocks, and it worked—mostly. Stand aside." Johan was caught off guard when Heinrich pushed him out of the way. He stumbled and fell hard onto his backside. He then watched in helpless horror as Heinrich took three paces back, then ran forward and flung himself out into the air, his patchwork quilt of a canopy trailing behind. The last thing Johan saw was the cloth canopy sliding over the edge, dragging some dust and pebbles along with it. Johan held his breath. He listened for the deadly thud of a body bouncing down the cliff face.

Instead, after a pause, he heard a long series of curses. Very coarse cursing. Colorful and sincere cursing. Johan eased himself up, crawled to the edge of the cliff, laid down flat and peered over. He knew his brother had picked up new words since their visit to Grantville, but these. . . .

Below him, no more than ten feet away, was the colorful top of the parachute. It was caught on a protruding tree that had taken root below the cliff face. Heinrich hung helplessly, kicking his legs and twisting, completely and solidly snagged.

Johan felt a great smile begin to beam on his face. "Brother, it looks as if you need a rescue, which can be arranged. But only on certain conditions."

His brother looked up, twisted around, and began cursing again. Eventually, he stopped struggling, and hung in the air, feet dangling and arms folded, disgruntled. He swayed slightly in the breeze.

"Heinrich, are you finished with your tantrum?"

Heinrich nodded.

"Good. Here's my deal. I will go and get help and pull your idiotic ass up here onto solid ground on two conditions, and only two. Otherwise you can hang here until the cows come home. And much longer. It will be cold tonight at this altitude."

He watched as his brother mentally reviewed his limited options. Finding none, Heinrich simply said, "Conditions?"

"First, the parachute and all of the clothing sewn into it goes back to the tailor. Second, you no longer jump bases." Johan looked down at his brother, who looked back. Heinrich struggled to look dignified, and failed.

"Is that all?"

Johan smiled. "Yes, that's all."

Heinrich twisted around in the harness again. Paused again, and then sighed. "Agreed. I will not base jump again. Shake on it." Johan nodded in agreement, and stuck his hand over the side of the cliff, miming shaking hands. Heinrich did the same thing from ten feet below. Johan edged his way back from the cliff edge to get help, and a voice came from below.

"Johan? What do you know about rocketry? There was this other movie I saw . . ."

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The Order of the Foot

by Richard Evans

Grantville Police Department Offices
A Monday morning, early winter 1634

"We've had another complaint about Bigfoot, Chief. This time over by the fairgrounds where the locals store their flocks before they can be sold and then processed at the slaughterhouse." Officer Ralph Onofrio looked up from his cup of coffee with a smile. "A farmer is saying that it switched his flock with another farmer's this time. He wants a guarantee that he won't suffer a loss when they finally go to sale; he

wants what he was bid at auction."

"Now that's a new twist." Chief Preston Richards sat down in his seat, not before checking his inflatable ring pillow for pudding or another surprise. He'd learned his lesson last April Fools Day. Always check your six. "That real coffee?"

Ralph nodded and pulled his cup in protectively. The office budget had been so tight this quarter that they had to bring in their own coffee if they wanted some on duty.

"Well?" Preston raised an eyebrow.

"Hey! This is my own stash!"

"That you brewed with office equipment, Ralph. Police equipment. Do I have to remind you who's boss?" Preston tapped the shiny badge on his jacket for emphasis.

Crossed eyes and a stuck-out tongue that would have done a three-year-old proud showed Officer Onofrio's opinion on where this conversation was going.

"Oh, that's real pretty. Didn't your mother ever tell you that your face might get stuck like that? Half a cup? Please?"

"That's better, Chief. Until the next pack train gets in with another load of coffee beans, this is it."

"I'll authorize an armed escort to guide the merchants in this time. Think they'd recall me if I abused our position to guarantee we got first crack at a bulk purchase? I know the merchants will appreciate the escort. I can't believe we missed the news of the last caravan's arrival. I barely got enough to last a month myself."

"Don't see why they would, Chief. We could put it under 'essential police material needs.' Just like doughnuts. And maybe even hot dogs, too."

The grin was back, but Preston ignored the jibe. "I'm not getting fat, and I resent any such implications. Mel's got me eating better these days, anyways. No more sausages or hot dogs for me and definitely no doughnuts."

With a cup of precious coffee in his hands, Preston took a look at the stack of reports that until recently had been filed under "H for Huh?," that being real close to the File 13 cabinet. A piece of peanut brittle disappeared as he flipped through the reports. Melanie never said he couldn't have peanut brittle and it went well with the coffee.

"There seems to be more and more Bigfoot sightings during the winter." He counted the reports and set them aside. "Where did these farmers learn about Bigfoot?"

"Dunno, Boss. But I put it off to cabin fever. That and the number of babies born every fall seems to indicate that there's not much else to do with the snows falling. That and counting sheep," Ralph offered as a cause for the increased number of sightings.

"Any actual sightings? Or just footprints as usual?"

"Footprints. I took castings again, and I've asked the beat cops to swing an extra patrol where the

farmers can see them. Mostly to keep the farmers and locals happy. I can't believe people still believe in Bigfoot. I've told them and told them it's just kids fooling around with fake feet. Superstitious fools."

"Interesting. I'll have a look into it, maybe I can figure out who's behind this. And we don't call our charges fools, Ralph. At least not to their faces or in the reports. " Preston took another sip of coffee and decided he could feel his toes again. Time to get new boots and new socks. Might even spring for some of the new Brillo Wool Socks, the ones without the little sheep on them of course. Not that anyone would be able to see them, but just in case.

"Could just be that we brought a real Bigfoot back with us after all."

"Weren't that common in West Virginia that I was aware of. " Preston deadpanned.

"Not like the Pacific Northwest."

"Nope. Not like the Northwest."

Unnoticed, the duty dispatcher slipped back into the cubicle that served as his office and made a very quiet phone call. His non-stop snickering also went unheard.

A Tuesday Night, Several Weeks Later
Grantville, USE

"I gotta make water, don't move." Signore Ascanio Lante slid off his horse right into a slush-filled hole. He cursed when the ice cold water seeped through the cheap boots. He wasn't dressed for slogging through the snow; his hunting and travel clothes along with his dogs had been stolen two weeks before his arrival here in Grantville. "Sons of pox ridden whores!" His cursing wasn't directed at anyone in particular and at everyone at the same time, but mostly at the thieves that had joined his caravan and then disappeared with his personal luggage.

His unfocused eyes glanced about the street and then back at the group of hangers-on that had joined his group when he'd started buying drinks. He stumbled towards the alley behind what he assumed was a corner smithy from the hammer and anvil on the sign. The words were too blurry for him to read properly.

"No hunting permits! Hah! I'll show them!" Ascanio waved his newly-purchased, double-barrel pistol about and then shoved it back into his jacket. "I, Ascanio Lante, will find the beast and kill it! Its head will decorate my mantle!" His rented horse tugged impatiently on the reins, reminding him why he'd dismounted and moved into the alley in the first place.

At least his horse still served its master, not like those cretins back in Rome. He'd managed to pull out with most of his belongings and all of his personal fortune. Most importantly, he'd gotten out with all of his shipping contracts and ship ownership documents, and the money had been converted into letters of credit. Those had been secured in his very thick money belt and never left his ample waist.

His brother's secret departure from Rome to attend to some ecclesiastical business with unnamed Spanish parties to the south hadn't remained secret for long. There were simply too many spies in Rome for that. Without Cardinal Marcello Lante's protection, old business rivals had decided that it was an

opportune time for revenge.

Ascanio had then decided it was a good time as any for a grand tour of Europe and to extend his business contacts to the north, war or not. That was something he believed only he could attend to properly. It was that attention to business that had made him a rich man. Well, that and his brother's influence.

It would have been a perfect opportunity to take in some hunting along the way, although the hunting had been disappointing so far. One undersized boar, two wolves and that was it. Not even a bear to shoot at. Then he'd heard the fantastic stories coming out of Grantville and had directed his tour here.

A beast of enough cunning and skill to remain unseen near a populated area? That was worthy of his time and effort! The article and photograph of this beast were safely tucked away with his letters of credit.

His group was starting to sing that annoying song they'd learned at one of the bars again. Something about a lumberjack, a woodman who dressed in woman's clothing, of all things. He didn't understand why they found it so funny and he'd matched them drink for drink like a true Lante could.

Damn Germans. Ascanio carefully positioned himself in front of the gate. The reins looped over his arm, he fumbled with the lacing of his pants. He was bursting to go when suddenly, the gate crashed open to reveal a giant beast.

The beast roared, and Ascanio hurriedly backpedaled out of the alleyway, hauling at horse. Nothing he'd ever seen was that big, except for the great brown bear one of his uncles had in his library.

"*Jesu Cristo!*" Ascanio fumbled for his pistol. The jacket he'd recently purchased to replace the one that had been stolen was overlarge and caused more fumbling. He finally cleared the pistol and cocked both hammers back. The Americans could refuse him a permit to hunt the beast in their territory, but if he was attacked by one in the middle of their town there was no way they would begrudge him his trophy!

The horse, upset at Ascanio's behavior, tried to pull free, upsetting Ascanio's aim. The first shot missed. That shot was too much for the horse. It bolted, dragging Ascanio off his feet. He lost his grip on his pistol as he flailed about.

Terrified, Ascanio fumbled around in the dark alley for his pistol. "Dear God! Help me! Help! Somebody!" He reverted to his native Italian in his panic. The singers didn't notice his calls for help or the discharge of his pistol.

Heavy footsteps approached him. Ascanio stopped hunting for his pistol and struggled to his feet.

"Run," he thought, but his legs refused to obey him.

The nearly seven foot tall beast advanced on him. Its red face promised death.

"I'm a dead man," Ascanio thought just before he passed out.

Wednesday Afternoon

Darke & Nelson Law Offices

"Yes, I can get Herr Lante a set of the footprints. But I must ask. Why?" Frank van der Darke flipped a piece of imaginary lint off his ruffled cuffs.

"You know of the curio cabinets that many nobles keep, do you not?" Raised eyebrows indicated that the Dutch merchant and lawyer did indeed know of the hobby. "Well, the cardinal's brother is an avid hunter and, well . . ."

"He was denied a hunting permit to go after a trophy in this case?"

"Yes. " The small courtier fidgeted as Frank leaned forward feigning interest. "He was most displeased. He wanted the trophy very much. He's read all the books and pamphlets and he is sure that he and his dogs have the skill to track this legendary beast down once and for all. If he still had his dogs, that is."

"And the plaster footprints?"

"They will show his equals that this hunting trip to Grantville wasn't without success. He could say that the body was claimed by the local lord."

"Or corrupted during transport?" Frank suggested.

"Exactly."

Frank coughed. He'd received a few calls only minutes before Lante's seneschal had finally found his office. The servant had tried three other lawyer's offices downtown before settling on his practice. Although, in truth, the servant hadn't settled, he had just been laughed out of every other practice when he'd made similar requests at each stop. It must have been a very long and cold walk for the small man before he found the Darke and Nelson Law Offices.

Luckily Frank's partner, Richard Nelson, wasn't in town this week. He was a dour Englishman known for his lack of humor as much as he was renowned for his ability to unravel contract disputes down to their basics and keep all parties involved happy.

Their practice served both the rich and the poor alike, though lately they'd been doing more pro-bono work as word got out that they'd represent folks who normally couldn't afford to pay for a lawyer. Thus, some of the cases they got were ones no other lawyer would touch. Then there were days like this. Rich clients, with no common sense, who got deeper into trouble with every footstep once they fell afoul of the law and the un-bribable officers of the law.

"So I secure some of these . . . footprints. You do know that they will be considered evidence and be locked up, do you not? These creatures are very clever, shy and hard to locate. Or so I've been told."

"Expense is not an issue." A pouch of coins landed on the desk. When Frank didn't reach for it, a second—heavier—purse landed next to it. "That's all I'm authorized to offer at this time."

"That is, if you wish to bail Herr Lante out of jail, too." Frank pretended to examine the court documents the servant had brought with him.

"Yes. That is true."

"Tell me, how did Herr Lante end up in jail?" Frank knew the story, but wanted to hear the servant's own version more than the one that his employer would have instructed him to tell others.

"We had just toured three machine shops that afternoon and then visited several establishments to sample the local cuisine and beverages." It had actually been another grand tour, consisting of every bar, pub and restaurant in Grantville, but Frank knew better than to interrupt.

"When Signore Lante went to admire the architecture of a building behind some shops we'd just visited . . ."

"Herr Lante broke statute 214," Frank read silently. The yellow snow was a clear bit of evidence listed on the papers. Frank amended the list of possible charges he'd have to get reduced if he took the case.

"Next thing he knew, he was being attacked by a giant fur covered beast and had to defend himself."

"I believe Signore Lante shot at this . . . beast, even before it attacked him. " Frank slid the police report over to the seneschal and tapped the relevant section. Why Lante had brought his household manager along with him on such a long trip, Frank didn't know. Perhaps there was more going on back home than either was willing to admit to.

"In fact, this beast was one of the Swedish smiths who works in the area. It was his home and shop your master was relieving himself behind. Your master and his drunken friends woke him and his family up with their singing and carousing."

"I saw it. It was like no man that I've ever seen."

"He is big, I'll give you that. But he is no wild beast. Perhaps Signore Lante was a bit tipsy and confused this citizen with this legendary Bigfoot he was here to hunt for?"

"Perhaps. Not that we're admitting to anything, but it wasn't like he was trying to kill anyone important."

"Signore, I will caution you once about that mindset and hope you take this to heart. There are no racial or birth lines enforced here in Grantville. You're lucky that your master was too drunk to aim straight."

"The man struck Signore Lante! He demands recompense!"

"I don't think so. You are aware that your master might end up facing charges of attempted murder on top of the public defecation statutes he broke, aren't you?" Frank held up his hand to forestall any further interruptions. "I think I can get those charges reduced or eliminated to just a fine along with public service and time served . . . but only if he is willing to plead guilty to lesser charges."

"Signore Lante can't stay in jail like a common criminal! He would not agree to pleading guilty to anything. What would folks back home think of him?"

Not much differently than they do now, Frank thought. "I will speak with the judge and the chief of police when I'm next at court. But I will not try to bribe them or ask for favors. That would cost me my license to practice law. Would tomorrow morning be fast enough for a meeting with Signore Lante? I do have other engagements this evening, so tomorrow morning would be best. I also have other engagements to attend to tomorrow afternoon and evening, so you and Signore Lante will be on your

own. I trust you can keep him out of any further trouble? I suggest staying at the Higgins Hotel." Poker night at the General Store was the event the next evening, but Signore Lante's attendant didn't need to know that.

"I will put out feelers to see how the prosecution is standing on this case and if they are amenable to a deal. That's all I can promise at this time. Then, we'll have to see if Signore Lante is willing to plead to lesser charges or is willing to go for a more expensive and lengthy trial. I do warn you that the jury will consist of twelve of his peers, but not those that Signore Lante would consider his peers. They are just as likely to consist of the common people he holds in such high regard."

"If the charges . . . No. If all of this could disappear, his gratitude would know no end. You are a man of business; you understand these things."

Frank shrugged. "I focus on the law and my client's needs. I do not worry if their business would affect my interests in any way. We here at Darke and Nelson serve the poor and rich alike."*But the fees are quite different, my little man.*

"Well, Signore Lante owns many ships, too." The weasel grinned and paused for emphasis. Subtle, he was not. "Many, many ships. Perhaps, if he were treated well, he might overlook the current situation between the crown of Spain and the Swedish Emperor. Thus new business investments might come to light?" The weasel looked like the last words had tasted like a sour bug in his mouth. "Overlook it enough to perhaps guarantee a share of the next ships coming back from Mexico and the West Indies as a show of good faith. At a modest investment, but a with guaranteed return?"

"Go back to your master and tell him I'll take the case. I'll see about getting him his trophies and I'll go down to the court tomorrow and see about his bail." Frank subtracted the bail charges from his retainer and made notes to charge his client for that again when he presented the final bill. The transparent attempt at a bribe annoyed him. "As for the rest . . ." Frank shrugged.

"Would it be possible to arrange for his hunt, too? Once bail is met, that is." The man paused as if mentally counting coins. "Signore Lante will need to arrange for new dogs and a new horse for a proper hunt, the one he rented doesn't have the proper temperament and it was a mare too." The face soured even more. "And perhaps you could also share the name of your tailor? Signore Lante wishes to replace the inferior clothing he was forced to purchase after a slight accident on his trip here to Grantville."

"One thing at a time, please." Frank thought a moment, then suppressed a grin. This man—and his so-called master—deserved a little treat. A little treat Frank could arrange.

"Will you be needing a ride? I do have a carriage."

The look of relief on the small man's face was almost comical. Frank's offices were far from the bustling center of town and nearer to those who needed his services.

Thursday Night
The General Store

"Raise you two." Robert Butcher tossed two white chips into the growing pile in the middle of the poker table. "And, Cyrus, if you know what's good for you, you won't try that trick Preston taught you last

week when he was playing poker with us." The old Sea-bee glared across the table they had set up in the back room of Butcher's General Store. "Though someone of your stature would never stoop to cheating, now would they? Even if their nickname was 'Snake.'"

"Heh." The palmed card landed on the ones he laid face down on the poker table. "Had crap anyway. I'm out."

"I'll see you two and raise you five." Well-manicured fingers painted to match this evening's outfit tossed the required tokens onto the pile and Frank van der Darke smiled like a cat that not only got the milk, but also the mouse.

"I don't buy that 'I don't have a poker face' act no more, Frank. I call." Robert groaned when he saw that the Dutchman's full house trumped his own.

"Damn it. Got me again, Fancy Pants."

* * *

Frank glanced around the back room again to make sure that all the uninitiated guests for the evening's poker game had indeed departed before he raked in the final pot. Satisfied, he slid his chair back and changed his boots. Others around the table did the same.

"Fred, Dennis, Snake, and, of course, Robert . . . Honored Knights of the Order of the Foot. You have all heard about my latest client and the purpose of his visit to Grantville." Frank raised his hands to forestall the objections to bringing official business into the back room after the shoes came off. "Not court stuff, though I think that Judge Tito did come down hard on him. Harder than I expected. Five thousand dollars bail."

"Well, I bet that Spaghetti-head pissed them off mightily," Cyrus "Snake" Guffy muttered. "I would've thrown the book at him were I a judge. I heard the Swede's not pressing charges. Guess knocking him into a puddle of muddy ice water was enough to satisfy his honor."

"Okay, Frank, we forgive you for bringing up business after the boots were on. Yer still new to this prank thing. Not many rules here, but talking business ruins all the fun." Dennis leaned forward and gathered up the cards and began to shuffle.

His grin promised that the group would pay close attention to this visitor to Grantville. "We each have our own secret networks of information, now don't we? We'll think of something appropriate to make Mr. Ascanio Lante's trip here memorable. Won't we, boys?" Everyone chuckled except Frank. His eyes glazed as his mind raced over the details the seneschal had shared with him earlier that day. He already had a plan forming.

Everyone's eyes watched Dennis's hands, especially Robert Butcher, who was regretting letting Preston Richards show all the other old farts in the back room some of his best card palming tricks last week. Who knew that they'd pick up on a new way cheating that fast?

"We're going to have to do something about his insisting on hunting for Bigfoot, though. With the latest sightings others might jump on the bandwagon and we'll have another incident." He tapped his size twenty-five furred shoes to emphasize his point. "Fred almost got caught last week."

"Luckily it was only rock salt," Fred added.

"Sure sounded like a Bigfoot scream when you hightailed it out of there though." Robert chuckled.

"I have a possible solution for that. Well, a suggestion, anyway. I still have to prove I'm worthy of filling these big shoes," Frank offered. "Does Duncan's wife still have those dogs he was breeding?" He bit back his smile.

"Old Pete's get?"

"No. Not those big dogs. The small annoying ones." Frank grinned. "I think they'd be the perfect dogs for a hunt for up-time legendary critters such as Bigfoot."

"That's evil."

"Oh, not so much evil, as an opportunity for some great fun. That's why we meet, yes?"

Laughter filled the back room. This group was all about having fun at the expense of others, usually in very subtle ways, though. The recent rash of Bigfoot footprints had been an old fall back prank that they'd been doing every winter for well over forty years.

Frank put his size twenty-two Bigfoot over-boots up onto the poker table and the rest of the fellows followed suit. The size of their furred shoes indicated the person's rank in this secret club. His were the smallest, but hopefully by next week he'd be wearing bigger shoes.

"So we, the Order of the Foot, are agreed? This next weekend, after his trial, we take Signore Lante on a hunt he will never forget? Then we sell him his trophy footprints and that trophy of the Bigfoot he keeps on insisting he must have."

"I'll do you one better, you damned peacock," Robert Butcher drawled. His shoes were the biggest in the back room.

"And how would you do that, Robert?"

"We don't just take him hunting with the little yappers. We entice him to buy them."

"How?" Cyrus asked.

"We go looking for Bigfoot, but that's not what we'll go after."

"No?"

"No. Saturday night after this one, we take him snipe hunting. I hear them lil' doggies are perfect for snipe hunting."

"Things breed like rabbits." Fred chuckled.

"Dangerous, unless you have the right dogs and right gear."

"Bet they've even reached Italy and Spain by now. He'll have to take the dogs with him all the way home, won't he?"

As the full intent of Robert's plan filtered through the group, looks close to awe were turned onto him.

"Vote?" Everyone around the table raised his right foot into the air.

"The Feet have it. So, think we can get Birdie to go along with this one? We're gonna need some outside help this time," Snake added.

Two weeks later
Saturday evening at Birdie's farm

"Snake, hell, I've got a farm to run here."

"Look, all we need you to do is follow behind us and toss our camp while wearing these special boots—after we move out on this wild goose chase."

"I heard about that nut case. He shot someone he thought looked like Bigfoot. No way, Cyrus. I ain't doing it. Normally I'm all about putting one over on folks like him, but this sounds too dangerous."

"You owe me, Birdie."

"Yeah, I do. But that don't pay the bills."

Snake narrowed his eyes. Time to up the ante. "He's willing to buy that Jackalope trophy you got, too."

"How much?"

Cyrus named the figure and watched Birdie's face change. It had been worth holding that bargaining card close to his vest.

"Well, why didn't you tell me that in the first place? Wife's been after me to get rid of old Fang-face for years."

"I was hoping to appeal to your sense of civic duty first, Birdie."

"Screw civic duty. Cash on the barrel is what gets things done."

"Thought so." Cyrus counted over a small fortune in silver and gold into Birdie's hands. "But there's one more thing. We need you to leave Boojum marks on his gear and around the camp too."

"What the heck is a 'Boojum,' Snake?"

Snake grinned. "I hear they're small and nearly invisible and leave marks that only show up under a black light . . ." Cyrus passed over a pair of newly made boots as well as a wood stamp and a bottle containing a chemical that Robert's grandson had guaranteed would fluoresce under a black light, but be invisible in normal lighting. "Don't ask what this stuff is and don't get any on your skin."

"Can I ask who made this stuff?" Birdie pocketed the coins before Snake could change his mind.

"Best you don't know any more details, that way you won't have to lie if you're asked about it. Okay,

here's the plan." Cyrus Guffy laid out the map he'd copied and marked with a route that was guaranteed to move through every bog, over every ridge, and through some of the most difficult terrain on this side of Grantville. He pointed out locations that he needed Birdie to set up and make Wookie, snipe and boojum calls and lay scents for the dogs, and where the base camp would be located.

As more and more details fell into place, Birdie's grin grew bigger and he offered up some suggestions of his own.

"You're an evil, evil man, Cyrus Guffy. I think I'm glad I'm on your list of friends."

Snake chortled and grinned in response.

The next Sunday morning, a few hours before dawn

The hunting dogs, if the small hybrids could be called that, had charged into the campsite, full of excitement. They were running around yapping, alternating with their noses to the ground and excited leaps into the air. It was obvious that they were on to the scent of something.

Lante looked up from the dogs to Robert Butcher. "More snipes?" He eyed the way the gear had been tossed and swallowed hard. "Maybe a Bigfoot?"

"Nah, the dogs don't react like this to snipes." Robert waved the rest of the group back into the camp with the shotgun-blasted snipe-net-on-a-pole he carried. "Dennis, you got that device with yah?" Dennis Haygood pulled out a three-way flashlight with a dark purple tube along one side and showed it to Robert.

"By the way the dogs are behaving this has the look and smell of . . ." Dramatic pause. "Boojums!"

"What's a Boojum?"

"Well, the thing of it is, we're not sure. No one's ever really seen one."

"Seen and lived to tell that is," Frank finished. It was all in the timing.

"How then do you know that these 'Boojums' are about?"

"The dogs, Signore Lante, the dogs. Otherwise, you don't know until it's too late. I've heard stories that my Grand'marm told me when I was a whippersnapper, oh, so high." Robert Butcher moved his hand parallel to the ground just below his waistline. He leaned the long pole against a nearby tree. "Once they mark something, they'll follow it until they or that person dies. They got a great sense of smell. Track anything anywhere they can."

"Then how do you . . ." Signore Lante stopped when Dennis lit the light and panned it about the camp. In the weird light, glowing prints of small clawed feet left a spiral pattern around the camp. The spiral circled all the gear and ended up on Lante's gear. The same place the small dogs had finally congregated.

"The prints, they go nowhere after?" The voice cracked with every other word. Dennis followed the tracks back to Ascanio Lante and stopped.

"Boojums are like that, Signore." The light turned onto Lante and he looked down onto his new safari shirt. The scream that echoed through the hills would have done horror movie scream queens proud.

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The Transmitter

by Gorg Huff

"But the article says that Monsieur Bell's selenium cells had a resistance of one hundred to three hundred oms!" Piair La Corrian pointed imperiously at a pile of papers on his desk. "That's a variation of two hundred watts. With one positive and the next negative, four hundred watts. If we run four mirrors on the same turntable with each mirror hitting its own cell so we have four cells running in parallel, that's eight hundred watts positive on the up tick to eight hundred watts negative on the down tick."

"Fine. Build the silly thing. But it won't work." Oliver De Champaign had actually been to Grantville and seen the difficulty they were having in building the Voice of Luther radio station.

* * *

Ten months and several hundred thousand royals later, Oliver wished he had kept arguing, in spite of the fact that the cardinal had insisted they try every idea, even the most hare-brained. He looked around the room. It was circular, about twenty-eight feet wide, and painted flat black. In the center was an electric motor that he had had bought in Grantville and shipped here to this small estate outside of Paris. On top of the motor was a turntable, on top of the turntable was a reflective pyramid made of four triangular slightly concave mirrors. Above the mirrors, a long black tube went up through the ceiling to a complex collection of reflectors that La Corrian called his light gatherers.

"We are ready for the alignment test," La Corrian shouted. "Open the light vent." A moment later there was a bright light shining down from the black tube in the ceiling. When he had been in Grantville, Oliver had watched a detective show about a little Belgian detective. Though La Corrian didn't look a thing like Hercule Poirot usually, at that moment he sort of did. He made finicky adjustments to the mirrors so that each of the four beams of light was pointed at one of the hundreds of selenium photo-resistors. "See." La Corrian wiggled the four sided reflecting pyramid a little and the four beams each shifted over one photo-resistor. "Now the current flow would be through the other electromagnet, producing a field in the other direction. All the odd numbered cells go to one electromagnet and all the even numbered cells go to the other one. As the strength of one increases, the strength of the other decreases, producing an alternating field in the coil and alternating waves in the air. "

* * *

Three months later they tried it for real. The pyramid spun so fast that as far as the human eye could see there was a strip of light around the black painted room. And, well, not much else. They did get transmission and within the required frequency but it was very weak and they couldn't figure out why.

Author's note: Neither can I, frankly.

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CONTINUING SERIALS

The Essen Chronicles, Part 3: Trip to Paris

by Kim Mackey

Chapter One

October 1632 was an eventful month for Josh and Colette Modi. Their first wedding anniversary prompted Colette to make an appointment with Doctor Adams for her first ever gynecological exam, but it was early Ocotober of 1632 before the doctor could fit her into his schedule.

"So," Doc Adams said after the exam, "everything seems to be in working order. Any questions?"

Colette nodded. "If everything is in working order, why have I not become pregnant?"

"Have you ever been pregnant before?" Adams asked.

"Yes," said Colette, "about seven years ago. My son Jacques. He died when he was six months old." Colette's face took on a momentary sadness.

Doc Adams patted her arm. "I'm sorry, Colette. I know that happened frequently down-time. Were there any complications with the birth? Any fevers or infections?"

Colette nodded. "Yes, I had an infection as well as a fever that lasted several days. But it was gone in less than a week. Why?"

"You may not be able to have children, Colette," replied Doc Adams gently. "Before we learned about the relationship between bacteria and infections, most doctors didn't understand the importance of washing their hands when dealing with their patients. This is especially important when dealing with the

birth of children. Many women died because of infections they got from the dirty hands of the doctors or mid-wives assisting with the birth."

Seeing the look of devastation on her face he put his hand on her shoulder. "Colette, it's just one possibility. It may be that Josh has a low sperm count. Sometimes it's just a biological incompatibility between partners. There is no way to tell without diagnostic equipment we don't have right now. All I can tell you is to keep trying."

Colette gave him a wan smile. "Thank you, doctor."

That night she cried as she told Josh.

He hugged her to him. "It's okay, Colette. I didn't marry you because of the children I thought you could bear me."

Colette sniffled and hugged him closer. "Then why did you marry me?" She knew the answer, but she needed to hear him say it.

"I married you because I love you, sweetheart. Not for children, not for money, not even for sex. For you. Till the stars grow cold and we grow old, I will love you. Forever."

Colette rubbed her eyes with the sleeve of her nightshirt and smiled at him. "I had no idea you were such a poet."

"You bring out the best in me, darling," Josh said. He looked down at himself. "Speaking of which . . ."

Colette laughed and pulled the nightshirt over her head. "We must do something about that!"

Later, when Josh was asleep, Colette got out of bed to pray.

Dear God, she thought.*If this is a punishment for my sins, then I accept it as your will. If it is not, please give me the strength and the courage to persevere. Amen.*

For several minutes she remained on her knees, repeating the prayer several times. When she crawled back into bed Josh mumbled, "cold feet, cold feet."

She laughed quietly and found herself at peace.*Thank you, God* .

* * *

It had taken some time for the Crucibellus Manuscripts to filter their way back to Grantville from France and England, but when they did reporters began inquiring at the Inn of the Maddened Queen, the address given in the Manuscripts. At first Colette was amused, but it quickly turned annoying and to get rid of the reporters she finally gave Joe Buckley an exclusive interview. Joe Buckley sensationalized the story, even including the dream that Colette had unwisely told him about, but eventually the furor died down and the press moved on to other issues. It was toward the end of October when her authorship of the Manuscripts brought her into contact with Henning and Regina Kniphoff.

As Colette passed through the common room of the inn, a man and a young girl rose from a table.

"Madame Modi? My name is Henning Kniphoff." The man standing in front of her was tall and well-dressed. "And this is my daughter Regina." Henning waved his hand in the young girl's direction.

Regina Kniphoff was dressed in a dark brown ankle-length skirt. Her eyes were alive with energy and intelligence and she seemed in awe of Colette when she shook her hand.

"Are you really the author of the Crucibellus Manuscripts?" whispered Regina.

Colette nodded. "Have you read them?"

"Oh, yes," Regina said, "but only the first two so far. My stepmother keeps throwing out the new ones I purchase," she said matter-of-factly. "She doesn't believe women should concern themselves with mathematics."

Henning Kniphoff winced. "Could we talk to you in private, Madame Modi? I would like to discuss my daughter with you."

Colette escorted Henning and Regina to her office.

"I believe my husband has met you? You are the chairman of the city council in Erfurt are you not?"

Henning Kniphoff nodded. "Yes. How are those four young men that your husband hired doing? I believe I heard that they are still working for him."

"Yes. They are journeymen now and doing quite well. I believe two of them even have fiancées." Colette smoothed her skirt. "How can I help you?"

Henning Kniphoff cleared his throat. "Well, I was wondering . . ."

Regina Kniphoff suddenly broke in. "Oh, Daddy. Just ask her." She turned to Colette. "I would like to come live with you in Grantville and be your*kammerjungfer* . My father wants me out of the house because my stepmother and I do not get along."

Regina rubbed her nose vigorously. "Excuse me. Itchy. We do not get along at all, and she is pregnant. Again." Regina rolled her eyes.

Despite herself Colette laughed. "And exactly why should I let you come live with me?"

"Because I'm smart," Regina said. "And in a world like this one I will not be educated unless I do it myself or find a good mentor. Like you."

"Bold, too, I see," murmured Colette.

Henning shrugged helplessly. He was clearly embarrassed by his daughter. "I apologize for my daughter, Madame Modi. But ever since she discovered you were the author of the Crucibellus Manuscripts, she has talked of nothing else but meeting you. I thought perhaps by coming to Grantville we could talk to you and dispense with this dream of hers. I thank you for your time." Kniphoff began to rise but stopped when Colette waved him back to his chair.

"Let's talk about this," she said. She turned to Regina. "Tell me about yourself."

As Regina chattered, Colette began to identify with the young girl. Like Colette, Regina thought differently. She was highly intelligent and seemed to have a gift for mathematics, if not quite as strongly as

Colette. She also spoke several languages fluently. Regina's intelligence was clearly causing difficulties within the home of Henning Kniphoff. For the daughters of wealthy and powerful men like Henning Kniphoff, it was customary for young women Regina's age to be placed in the homes of noblemen or powerful merchant families so they could receive an education and perform duties similar to that of a page. The difference here was that Regina wanted more control over who she was placed with.

She looked at Regina as the young girl finally fell silent. A strand of Regina's blonde hair had escaped from under her cap and she played with it absent-mindedly. For a second a flash of loneliness sped across Regina's face.

Colette recognized that look. She'd seen it enough times in the mirror when she was Regina's age. The look of a young girl with no friends because she was different. Colette made up her mind. "Let's discuss the terms of your service." When she saw the sunburst smile on Regina's face she knew she'd made the right decision.

* * *

As October turned into November, the last two events of a hectic month dropped into place. It was a Thursday evening and Josh decided to attend the weekly meeting of the Grantville Chess Club. It was his first chance to go in over a month and he was pleased to see that Greg Ferrara had made it as well. When he caught Greg's eye and motioned to a corner table, Greg nodded and came over.

"You been busy too, Greg? Seems like I haven't seen you in months."

Greg laughed as he helped set up the chessmen. "Yeah, busy as hell. What about you? How's the crucible steel plant coming?"

"We're at full production now, two tons a week. I'm glad we did some advertising and free samples in the summer time, though. It's hard to break into a market with a new product. Everyone wants the other guy to try it first in case it's no good. But we've got some contracts now with several cutlery makers and inquiries from Solingen. Since the machine shops are starting to buy quite a bit we broke ground on the second plant last week. It's been a busy month."

After playing several games Josh asked Greg about the chemical plant.

"We're doing okay, but the big holdup is the lack of stainless steel. It's pretty critical if we want to produce large amounts of nitric acid. Not to mention antibiotics, DDT and sulfa drugs. Right now we are barely at the bucket stage."

Josh shook his head. "Well, if you can get me some chromite I could probably come up with some chemically resistant steel. Wouldn't be as good or last as long as stainless, but it might be good enough to break through your production bottlenecks for awhile."

Greg nodded. "We're going to ask Gustavus Adolphus to send an expedition to Finland to look for chromite at Kemi. But Kemi is going to require a lot of work even when we do find it."

"What about Maryland?" Josh asked. "From the information Vince had it looked like it would be pretty easy to spot and not difficult at all to mine."

Greg smiled. "But like you said at that first meeting, three thousand miles of ocean. Might be kind of a tough sell."

Still, thought Josh, *both the Dutch and the English are in that general area.*

Maybe Louis De Geer could be convinced to mount an expedition. It wouldn't take more than one or two hundred tons of chromite to get things rolling. He resolved to write De Geer the next day with a proposal.

Two days later Josh came home from work to find his wife sitting at the kitchen table with a letter in her lap and a stunned expression on her face. Regina was running about the room like a madwoman. She dashed up to Josh and gave him a hug. "Josh, wait till you hear the news! It's so fantastic!"

"What?" Josh asked. "What is it, sweetheart?"

Colette waved the letter at him. "I've been invited to give a lecture in Paris at the Petit Luxembourg on the Crucibellus Manuscripts. Apparently Marie de Gournay told her patroness I was the author."

"That's great! When are we going?" Josh said.

Colette laughed. "Josh, we have commitments, obligations! We promised my uncle we would help with the iron and steel plants in Essen next spring. The earliest we could get to Paris would be August."

Josh nodded. "August is fine with me. I'd love to go to Paris. Besides, don't you want to meet Marin Mersenne? And Pascal? And Roberval? You've talked about them often enough. I bet they'd love to meet the author of the Crucibellus Manuscripts. Write this patroness back, whoever she is, and tell her you can't be there until August of next year. She'll understand."

Colette laughed, but her laugh seemed a bit hysterical. "Will she? We are talking about the marquise de Combalet, Josh!"

"So?" Josh looked puzzled.

Colette sighed. *Men* . "She's the niece of Richelieu."

"Oh," said Josh. "THE Richelieu? As in the-de-facto-ruler-of-France Richelieu?"

Colette nodded.

"Oh, my," said Josh.

The next day Colette sent her apologies and explained that the earliest she could arrive in Paris would be August. The reply came back several weeks later. The marquise de Combalet would be delighted to offer her and her family rooms to stay at the Petit Luxembourg in August.

Chapter Two

Louis De Geer received Josh Modi's proposal for an expedition to Maryland early in 1633. After reading over the proposal he smiled.

Already on it, nephew-in-law, he thought, *already on it.* He chuckled to himself. Some of these

American phrases were addicting.

* * *

When De Geer had toured the crucible steel plant in April of 1632, Josh Modi had explained that steel was simply a carbon alloy of iron, as was cast iron. Changing the percentage of carbon combined with proper heat treatment would allow the steelmaker to tailor specific steel for specific uses, from cutlery to cannon.

"It's all just a matter of understanding the chemistry," Josh said.

De Geer staggered.

It was as if a lightning bolt had run through his body from head to toe.

For almost thirty years he had been involved with blast furnaces, gun foundries, and cast iron cannon. He owned iron mines, tin mines, calamine ovens, brassworks and numerous foundries. But never had there been an adequate explanation for the different kinds of iron that he dealt with every day. All the questions and thoughts he had ever had about iron coalesced suddenly into a coherent whole.

"And red shortness?" De Geer asked.

"Too much sulfur," Josh replied. "Any time you get poor quality iron, it's due to some contaminating element. The two major ones are sulfur and phosphorus. Even then, if you add just the right percentages you can get a different alloy steel with properties you might want. It's all just a matter . . ."

"Of understanding the chemistry," finished De Geer.

Josh nodded and smiled. "Correct. The interesting thing of course, is that the chemistry will change with different types of alloys and different percentages of alloys, as will how you need to heat treat the steel or iron. Up-time it had become pretty much of an exact science, whereas down-time everyone is still groping in the dark and doing all kinds of strange things, some of which waste a lot of time and money."

"Besides carbon," De Geer asked, "which types of alloys are most important for iron and steel?"

Josh stopped to ponder the question. "For steel right now I think tungsten and chromium are the most important. Tungsten would allow you to make a steel close to what was called 'hi-speed tool steel.' With proper heat treatment it allowed you to machine metal and parts at high temperatures. It was at least six times as good as regular carbon tool steel. Chromium would give you a better structural steel and at high percentages provides a lot of corrosion resistance to the steel. With around twelve to twenty percent chromium, if you could get the carbon part of the steel down low enough, say below two tenths of one percent, you would have what we call 'stainless steel.' But this will be pretty difficult until we can build induction furnaces and get pure chromium metal. Not impossible, just very difficult. Four-forty types of stainless actually contain from seven-tenths up to one percent carbon.

"For cast iron," continued Josh, "silicon is the most important alloy, I would say. Higher silicon content makes for a more homogenous cast iron that is less likely to crack and have holes and gaps, especially if you heat treat it properly."

As they continued the tour, De Geer motioned to De Vries who had been standing nearby. "Find out everything you can about steel alloys, especially tungsten, chromium and silicon. Locations, uses,

everything."

On the day before their departure from Grantville, De Vries met with De Geer to go over what he had discovered.

"So tungsten can be found in the tailings of tin mines?" De Geer asked in surprise.

De Vries nodded. "The mineral is called wolframite and will be found in ores in combination with another mineral called cassiterite."

"And chromium?" De Geer asked.

"Easiest to use form would be chromite. The Americans have identified the locations in general terms: Kemi in Finland, Bursa in Russia, the Ottoman Empire and Maryland in North America. Kemi may be difficult because of the rock overburden. Maryland was the world supplier of chromite for many years in the up-time early 1800's. The formations occur in what are called 'Serpentine Barrens' which will actually be easy to find because they have a different ground cover than the surrounding forest. One of Josh Modi's friends, Vince Masaniello, showed me a copy of a brochure with a simple map of an area called Soldier's Delight where some of the chromite was mined. While it was used as an alloy for steel eventually, most of its early use was for producing a yellow dye."

De Geer grunted. If chromite in the up-time universe was used for a dye, he might be able to use that fact to enlist Amsterdam dye makers in an expedition. But something nagged him. "Maryland? Where have I heard that name?"

De Vries smiled. "I looked up the history. Does the name Lord Baltimore sound familiar?"

De Geer snapped his fingers. "Of course, Lord Baltimore. George Calvert."

Late in the winter of 1631 De Geer had attended a meeting hosted by Philip Burlamachi who had been the financial agent in Amsterdam for the English Crown for almost twenty years. As usual they gossiped about the kings they represented and Burlamachi had told him about Lord Baltimore's latest land venture.

Despite the fact that George Calvert was a Catholic, he was a favorite of Charles I. In 1625 Charles had given George Calvert the title of Baron of Baltimore in the kingdom of Ireland for services rendered to the crown. Due to the pressure Calvert felt because of his Catholicism, he kept founding colonies or obtaining land grants in the New World, hoping to persuade the king to legalize the practice of Catholicism in the colonies. His latest attempt was a charter granting him palatine rights to millions of acres north of Virginia. He had wanted to call the colony Cresentia, but Charles I insisted, said Burlamachi, on having it named after his Queen, Marieland. In order to interest people in coming to Marieland, said Burlamachi, Lord Baltimore intended to offer a variety of rewards, including large land grants, government appointments, and noble titles. Those who transported sufficient numbers of colonists could have their tract designated as a manor.

De Geer smiled. "When we return to Amsterdam, remind me to send you to England to see Lord Baltimore. I'll offer to supply a ship with colonists. Miners, of course."

De Vries laughed. "Perhaps you can be the count of Soldier's Delight?"

* * *

But the Maryland expedition had been complicated by the fact of George Calvert's death in London on

April 15, 1632 while De Geer was in Grantville. De Geer waited until he had heard that Cecil Calvert, the new Lord Baltimore, had obtained another charter which had gone into effect on June 20, 1632. He then dispatched De Vries to London along with Dirck Graswinckel to negotiate a land grant in the northern part of the colony that contained the serpentine barrens.

"Tell him I will transport a ship full of colonists on the Dragon," De Geer told them. "Attempt to get at least one hundred thousand acres in the area we want."

Chapter Three

For Louis De Geer, the spring of 1633 was a boom time for his armament business. Everyone seemed to be buying. The French, the Danes, the States General, even the English. The Spanish too had approached him, but he had never knowingly armed an enemy of The United Provinces, unlike Elias Trip. It was the English purchases that surprised De Geer the most. Rumors in the winter of 1632 had indicated that Philip Burlamachi was close to bankruptcy and that there had been a serious disagreement between Burlamachi and his brother-in-law and major creditor, Philip Calandrini. Then, as if by magic, Burlamachi seemed to be as wealthy as Midas. Longstanding debts going back as far as a decade had been paid off and Burlamachi was purchasing war material and recruiting mercenaries. A lot of mercenaries.

The question was, where was the money coming from?

There was only one reasonable answer.

France.

The question then became, what did Richelieu get out of it? What did the English have that Richelieu would want? And who would know the answer?

There was one major source of information that De Geer could count on. Jean Hoeufft. Through his brother, Mathieu Hoeufft, Jean Hoeufft was one of two agents that Richelieu used to obtain credit and purchase war material in Amsterdam. Earlier in the 1630's Jean Hoeufft had been the conduit for French money sent to Gustavus Adolphus through De Geer. If anyone would know what Richelieu had received for pouring silver into the hands of Charles I, it would be Hoeufft. De Geer sent for Jan de Vries. "I want you to go to Paris. Talk to Jean Hoeufft and see if you can discover what the French got for the money they're pouring down the English rat hole."

De Vries nodded. "By land or by sea?"

De Geer smiled. "By sea. It will be quicker."

Five weeks later De Geer received three separate dispatches from Jan de Vries over the space of a week. Clearly, De Vries wanted to make sure the message got through. Each had been encoded using the cipher system given them by Colette, and each had the same message once decoded.

NORTH AMERICA.

Oh ho, thought De Geer when he read the message.*Lord Baltimore is going to be unpleasantly*

surprised, if he doesn't already know.

De Geer shook his head. No, if Cecil Calvert knew then the news would have leaked by now. So both the English and the French were keeping this a secret. Which, given the nature of the royal courts in both countries, astonished him. In fact, it made De Geer uneasy. If they could keep something this momentous secret, what else might be going on?

But the most immediate concern was what to do about the Dragon and the expedition to Maryland.

De Geer smiled. The French and Dutch were allies, were they not? It should be a simple matter to negotiate for the land grants needed to mine the chromite in the Baltimore area. Perhaps Colette and Josh could leave early for their trip to Paris.

Then De Geer remembered who they would be staying with. Richelieu's niece, the marquise de Combalet. Perfect!

But they would need legal advice. He sent for Dirck Graswinckel.

Graswinckel was enthusiastic. He had enjoyed his stay in Paris with Hugo Grotius and had numerous contacts there.

"You will be arriving early, so I will arrange some funds with a bill of exchange sent to Jean Hoeufft. Be careful. We don't want the French to know we are looking for chromite. Just ask for a general mining concession in the area. Better yet, ask for several mining concessions and let them negotiate you down to the ones we want. Explain everything to Josh and Colette. If they impress the marquise de Combalet it would ease the way for a meeting with Richelieu if that is needed."

After Graswinckel left De Geer sat back in his chair. Every business instinct he had told him there was something deeper going on. But what?

* * *

The first ten days of their stay in Paris were a whirlwind of activity for Colette and Joshua Modi. They arrived at the Petit Luxembourg on a sunny afternoon. The ride through Paris had been disconcerting for Josh, with constant déjà vu flashes as he caught glimpses of street patterns or buildings.

The marquise de Combalet waited for them in the foyer of the Petit Luxembourg having been warned of their arrival by the courier they had sent ahead on reaching the gates of Paris. She wore an elegant green dress and had a string of pearls around her neck although she wore very little make-up. She had black hair and black eyebrows and a small receding chin. She was not very pretty, but to Josh she seemed to exude a presence of serenity and confidence.

She knows who she is, thought Josh,*and she's happy with herself.*

To her right were two old women, one dressed in serviceable brown and white clothing and the other in black. Both women had canes and were watching him and Colette with intelligent intensity. They were so much alike that they looked like bookends.

After the initial introductions, the marquise, who insisted they simply call her Lady Marie, turned to the two old women. "Colette, I believe you know Marie de Gournay?" She motioned to the woman in black.

Colette smiled and moved to hug the older woman. "I am so happy to meet you at last, Marie! But you

weren't supposed to tell on me!"

Marie de Gournay laughed. "I was too proud of you, my dear. And I couldn't stand the men at the salon going on and on how Crucibellus was obviously a man and how no woman could possibly write in such a concise and intelligent manner. Ha! Weren't they surprised!"

Marie turned to the woman next to her. "This is my friend, Louise Bourgeois. She insisted on meeting you and Josh. She was the royal midwife for many years and teaches at the school for midwives at the Hotel Dieu across from Notre Dame Cathedral."

Louise smiled. She too seemed to exude the same serenity and confidence exhibited by Lady Marie. "I hope you can tell me something about the medical practices in Grantville. We have heard many rumors here in Paris but very few facts."

Colette shrugged. "I do not know much, but my husband was born in what we call the 'up-time universe' where Grantville came from. He may be able to help you."

Inside Josh cringed.*Oh boy* , he thought,*I wish I had paid more attention in biology now.* "I don't know if I can be of much help, Madame Bourgeois, but I will do what I can. My major at Ohio State University was business history."

Marie de Gournay suddenly poked him with her cane. "And how has this husband of yours been treating you? With the respect due your intelligence and education, I hope!"

Colette laughed. "Oh, yes. He has been an excellent husband!" She patted him on the arm affectionately. "But he does spend too much time with his business."

The two old women scowled at him.

Great, Josh thought,*now they look like two little pit bulls.*

"Life is too short, young man!" said Louise Bourgeois. "Your wife is more important than any business!"

Next to him Colette grinned.

"And who is this young lady?" the marquise asked, indicating Regina.

"This is my*kammerjungfer* , Regina Kniphoff," Colette said. "The nearest translation in French would be that of a young lady-in-waiting. She is also my business assistant."

The marquise smiled as Regina curtsied.

"I am very pleased to make your acquaintance, Lady Marie," Regina said.

"Since I knew you would have a young girl with you, Colette, I asked Louise if she would be willing to have one of her granddaughters act as a guide and companion for Regina. Catherine?" A young girl Regina's age came shyly forward. "Regina? This is Catherine Luynes. Catherine, Regina Kniphoff, Colette's . . .*kammerjungfer* ?" She looked at Colette, who nodded.

The two girls moved off to the side and began chatting with each other.

"I knew you would be tired from your trip," the marquise said, "so I scheduled no lectures until the day after tomorrow. But I must tell you that many people are very jealous of me." She motioned to a corridor and they all began walking down the hallway.

"Why is that?" Colette asked.

"We have had very few people from Grantville come to Paris. Oh, there was the diplomatic delegation recently, but they spent very little time here and did not participate in any salon meetings. All of Paris was rather disappointed."

"Really? Why?" Josh asked.

"The salons of Paris are where many women learn about new events in science, art, literature and mathematics Josh," said the marquise. "Grantville has been on everyone's lips for months but most of what we hear is outlandish rumor." She smiled. "I am afraid you will be as much in demand as Colette for giving lectures. I hope you don't mind."

Time to be diplomatic, thought Josh. "I would be delighted to assist you in any way I can, Lady Marie."

This time when the marquise smiled it was as brilliant as the sun. "I hoped you would say that!" She chuckled. "The marquise de Rambouillet will simply die of envy!"

"Marquise de Rambouillet?" Colette asked.

Lady Marie seemed to wave her hand in dismissal. "The marquise de Rambouillet began the tradition of the salons of Paris in the early 1600's. Hers is still the most famous. She tends to focus more on art and literature, while I try to attract those of science and mathematics." She laughed. "But she will try to steal you away soon enough." She stopped in front of a doorway. "This will be your room. The windows look out towards the garden."

The room was huge, with a large bed, fireplace, and elegant furniture stylishly placed. A connecting door led into a smaller room that would be Regina's.

Colette smiled. "This is lovely, Lady Marie. We will be quite happy here."

Lady Marie smiled back. "Dinner will be at eight. My cook is Lorenzo Stornato from Florence and I asked him to prepare something special tonight. I think he is planning either goose or swan. I invited a few guests, so Marie and Louise will be there, and Vincent de Paul. Until then."

She swept out of the room, closing the doors behind her.

Colette flopped on the bed. "Paris!"

Josh laughed and flopped beside her. "I think this is going to be fun. I hope Dirck and Jan can take care of the Maryland business on their own. I'd hate to have to spoil all this by having to get involved in negotiating a business deal."

Then it hit him. Vincent de Paul. Saint Vincent de Paul? "Oh my God."

* * *

Despite Josh's apprehension at meeting a real saint (Josh had to keep reminding himself that Vincent de

Paul had not been canonized yet), the dinner was quite enjoyable. Colette and Josh found Vincent de Paul's stories about his time as a slave after being captured by Turkish pirates in 1605 particularly fascinating.

"So you and your master both escaped?" Colette asked.

Vincent de Paul nodded. "Only after I converted him to Catholicism. He was a simple but good man."

It was at that moment that an unexpected guest walked into the room. The marquise hurried over and kissed the man on the cheek. "Theo, I thought you said you couldn't come!"

The man's voice rumbled deep in his chest. "I finished this week's issue of the*Gazette* early just so I could meet your new guests."

The marquise brought the man over and Colette and Josh stood to introduce themselves. As the man came closer Josh tried not to stare.*Now if that isn't the perfect description of butt-ugly,* he thought*, I don't know what is.*

The man approaching them on the arm of the marquise was not just ugly. He was enormously ugly. He had huge, misshapen hands. His nose was short and squashed and his sunken eyes and narrow mouth made his face into that of a monster. His thin hair revealed and accentuated the ugliness of the face rather than softening it.

But then you looked into the eyes and you forgot the face, for the eyes burned with curiosity and intelligence.*Like lasers* , thought Josh,*they burn right through you. Laser eyes.*

"Colette, Josh, this is my good friend Theophraste Renaudot. Theo, Colette and Josh Modi, from Grantville."

Renaudot shook their hands gently. "A pleasure to finally meet people from the mythical town of Grantville. You must tell me all about it."

Renaudot seated himself next to Josh and Colette. "Will you be with us long?"

Josh smiled. "The marquise has us booked for at least two weeks of lectures. We had planned to come in August but things went very well with our business and we were able to come to Paris earlier than we expected. We hope to be able to stay a month."

"Excellent," Renaudot said. "May I interview you for my newspaper? I am the publisher of the weekly *Gazette du France* . The latest issue is at the printers, but I am already looking for stories for next week's issue and it would be a pleasure to interview you and your wife." Renaudot looked over at Colette and smiled. "It would be especially delightful to interview Crucibellus. Was Joe Buckley's story true? Your pen name came to you in a dream?"

Colette blushed. "Yes. I had asked Mr. Buckley not to publish that part of the story, but he did anyway."

"And you felt you were touched by God, did you not?" Renaudot's voice was soft and low.

Colette nodded.

"And He has touched you before, hasn't He?" Renaudot asked.

Everyone around the table was silent, listening.

Colette nodded again, jerkily, and a single tear began to drip very slowly down her cheek. Renaudot reached across and gently wiped the tear away.

"I only ask, Colette, because I too have felt the hand of God on my soul, and He changed my life as much as I believe He changed yours. Perhaps someday you can tell me your story." Renaudot grinned, breaking the spell of the moment. "Not for publication of course. I am not Joe Buckley."

The conversation continued for another hour before the marquise laughed and said it was time to let her guests rest.

"What happened to Theo?" Colette asked as the marquise escorted them to their room.

"You mean why did he say he had been touched by God?"

Colette nodded.

"You noticed that Theo is not the handsomest of men?"

"Yes," Josh said, "But his eyes . . ."

"Women are not attracted to men's eyes, Josh, especially at first. And Theo's father was a handsome man. So Theo always felt alone and ostracized, especially as a young boy. It was when he was ten that he came across an old man lying in the street, clutching a loaf of bread. People began to gather around the old man, screaming and beating him, accusing him of theft. Theo could see that that the old man was starving, that he had stolen the bread to survive, not to sell. But the crowd had no empathy. No mercy. For one brief second God connected their souls. He showed Theo what he must do if he was to relieve the suffering of the poor." The marquise smiled sadly. "From that day forward, Theo dedicated his life to helping the poor. Both my uncle and Father Joseph support him in this endeavor, as do I. In addition to publishing the*Gazette du France* , he is the commissioner-general to the poor. He is trying to organize an information center where the poor can find out about jobs. He is also attempting to recruit doctors to provide free clinics for those who are sick."

The marquise smiled at them. "He is a very good man. And he loves to hear about new and interesting things. He seems to absorb new information like a sponge, nothing is forgotten. If you could talk to him in the next few days, I would be very appreciative."

"We will, Lady Marie. I promise," Colette said.

The marquise left and they entered their room and prepared for bed.

"They are not what I expected," Josh said, cuddling with Colette in the bed.

"What do you mean?"

Josh nuzzled her neck. "I don't know, I thought the niece of Richelieu would be more, more . . ."

"Evil? Machiavellian?"

Josh nodded.

"People are complex creatures, Josh. Everyone has good and bad qualities. From what Marie de Gournay has written me, Lady Marie has many more good than bad qualities. I like her."

"So do I. Since we are her guests, let's try to be as diplomatic as we can in the weeks ahead."

They fell asleep in each other's arms.

* * *

A week after their arrival they were able to watch the latest play by Pierre Corneille,*La Veuve* . When Colette expressed her enthusiasm for the play, the marquise encouraged them to use her box at the Hotel de Bourgogne where Corneille's tragedy,*Clitandre* , was still playing.

"I've already seen it twice, but it is excellent. It closes in three days, however, so you should plan on seeing it soon. Perhaps the evening after tomorrow? I have finally scheduled a night off for you." She chuckled. "You have been wonderful guests, hardly any complaints at all."

"It has been great, Lady Marie," Josh said, "no complaints here. Except for breakfast, of course."

Josh and Colette had been trying for days to convince Stornato to experiment with waffles but without success.

Lady Marie laughed. "I am sure Stornato will succumb eventually."

* * *

Their presence, of course, was discovered by others shortly after their arrival.

"So, Cazet," Cardinal Richelieu said, "the Modis have arrived early?"

Cazet de Vautorte, one of his most trusted intendants along with Etienne Servien, nodded. "Yes. They arrived with Dirck Graswinckel, who is an agent for Louis De Geer. Graswinckel is staying at other lodging, however, with a second agent of De Geer's, Jan de Vries, an ex-artillery officer in the Dutch Army. Your niece has the Modis fully occupied. It is what Graswinckel and De Vries are doing that is disturbing and which prompted me to report."

"And that is?" Richelieu stroked the cat in his lap. It purred and rolled over on its back. He smiled and began rubbing its belly gently.

"Apparently," Cazet said, "they wish to negotiate for mining contracts in North America. In Maryland."

For a second Richelieu stopped rubbing the cat's belly. It batted at his fingers and he resumed his stroking. "So, apparently Louis De Geer has discovered part of our plans. Do we know how?"

Cazet shook his head. "Not positively, but I suspect Jean Houefft revealed something. He and De Geer have extensive business dealings since we often purchase war material in Amsterdam. And De Geer has agents or connections all over Europe. It is difficult to hide anything involving armaments or troops from him."

"True," Richelieu said.

"Do you want me to take care of them?"

Richelieu waved his hand. "We were bound to be discovered, Cazet. At this late date I hardly think it matters. And I certainly don't want De Geer's focus to shift to other issues in the weeks ahead. So it would be best, I think, if negotiations were delayed, don't you?"

Cazet smiled. "As Your Eminence wishes."

* * *

It was upon their return from watching*Clitandre* at the Hotel Bourgogne that Josh and Colette found a depressed Dirck Graswinckel waiting for them.

Dirck waited until the doors had shut on their room before venting his frustration over the negotiations. "Which aren't even really negotiations," Dirck complained. "Jean Hoeufft is being singularly uncooperative. No minister will talk to us. Those who do talk to us tell us to go to some office where another minister is busy or has already left. Noblemen that I knew when I was here with Hugo Grotius simply shrug and say they can do nothing without permission from Richelieu."

"Have you tried getting an audience with Richelieu?" Josh asked.

Dirck nodded. "Of course, but it is impossible to cut through all the layers. I did get to speak to one of his intendants, a Cazet Vautorte, but he told me that Richelieu was ill and could not be disturbed. Whether that was true or not, I don't know, but it seems we are being thwarted at every turn. Do you think perhaps . . ."

"What, Dirck?" said Colette.

"Perhaps you could speak to the marquise? Appeal to her? Get her to arrange a meeting with Richelieu? She is his favorite niece."

Colette shook her head. "I think that would be inappropriate, Dirck. We were invited to give lectures, not to negotiate business deals."

Dirck sighed. "I know that, Colette. But we may be here for months at this rate."

"He has a point, Colette," argued Josh, "The sooner we get the chromite, the sooner we can get some chemically resistant steel. Remember what I told you Greg Ferrara said. Without some kind of stainless steel no sulfa drugs for infections, no DDT, no chloramphenicol to cure diseases like typhoid and typhus. Or at least not enough to do most of Europe any good."

"We must not presume on our friendship with the marquise, Josh," replied Colette. "Perhaps if things have not changed in two weeks, then we can discuss it again." She turned to Dirck and smiled. "I'm sorry, Dirck. But you'll just have to keep trying on your own for now."

Dirck sighed and shrugged. "All right, but don't be surprised to see me back here in two weeks begging you to reconsider."

* * *

There the matter would have rested but for the sneaky curiosity of two little mice who went by the names of Regina and Catherine.

In the ten days since her arrival, Regina and Catherine had become the best of friends. They had explored every room, hallway, and closet of the Petit Luxembourg. They had eavesdropped on dozens of adult conversations, giggling behind their hands as they did so. Catherine's grandmother took them on tours of Paris by carriage and Regina saw the sights that Josh had told her so much about: The Louvre, Notre Dame, and the Palais Royale. She was disappointed there was no Eiffel Tower, however.

The night that Josh and Colette went off to see*Clitandre* she had invited Catherine to her room for a slumber party. "The bed is big enough for both of us," Regina told her friend. "And your granmama is staying the night at the Petit Luxembourg as well."

When they had heard the adults returning they scampered under the covers just before Colette peeked her head in the room to check on them. Giggling quietly, they snuck up to the partly open door and listened as Dirck Graswinckel complained about the negotiations.

"Who is that?" whispered Catherine. "He's handsome."

Regina snickered behind her hand. "Dirck Graswinckel. He works for Colette's uncle."

When Catherine heard the part of the conversation about stainless steel and drugs she turned to Regina, her eyes wide. "Can they really do that?" she whispered. Like her mother and grandmother before her she was interested in being a midwife.

"What?" Regina said.

"Stop infections and cure diseases with chloro whatsits."

Regina giggled again. "Chloramphenicol. Yes, the Americans are wonderful chemists."

The two girls tiptoed back into bed when Dirck Graswinckel left. Regina was soon asleep but Catherine lay awake, thinking about infections and disease.

As wonderful as her grandmother was, she could not cure many infections. Oh, there were poultices and different medicinal plants that seemed to help, but often they did nothing. And as for typhus . . . Catherine shuddered. Her grandmother had told her stories of what plague and typhus epidemics could be like. With sudden resolve, she got out of bed quietly so she would not wake Regina. She moved silently down the hallways of the Petit Luxembourg on her bare feet to her grandmother's room.

Louise Bourgeois was a light sleeper and smiled when her granddaughter slid into bed beside her. "What is it little one, a bad dream?"

Catherine snuggled up to her grandmother. She always enjoyed sleeping with her. It felt so warm and safe. Catherine told her grandmother about the conversation she had overheard.

Louise Bourgeois frowned. "Eavesdropping is a sin, young lady. Shame on you."

Catherine lowered her head to her grandmother's shoulder. "I am sorry granmama. Forgive me?"

Louise sighed. "Yes, my dear, I forgive you. But do not forget to confess your sin in church. Now sleep."

Louise stroked Catherine's head and thought about what she had said. So Grantville could cure diseases with chemicals, but they needed material from some mine that the French owned. She would have to talk to the marquise.

* * *

The next evening Josh and Colette dined at the Petit Luxembourg with the marquise, Louise Bourgeois, Marie de Gournay and Theo Renaudot. The after-dinner conversation quickly turned to the morning conference at Renaudot's mansion in which the main subject for discussion had been the admission of women into universities.

"I must admit," Theo said, "that I took a great deal of pleasure in your response to the Comte de Avignon."

Colette laughed. "He just made me so angry! 'Women are too delicate.' 'Women are not the intellectual equals of men.' Ha!"

Josh smiled. "It was Marie I was worried about. I thought for sure she was going to march over and start beating him with her cane."

"That man has been an insufferable bigot for a decade," sniffed Marie. "I just pity his poor wife."

The marquise laughed. "I wish I could have been there. But I did have an interesting conversation with Louise this afternoon." She turned to Josh. "So tell me, what is chromite?"

Oh, oh, thought Josh. *Now how did she find out about that?*

"Who told you?" Colette asked. She seemed embarrassed.

"Let us just say that the walls have mice," the marquise said, smiling. "Little girl mice with big ears."

Josh explained what chromite was and its importance for making stainless steel and the importance of stainless steel for manufacturing large quantities of drugs and other chemicals.

"Would your government allow you to sell such drugs to France?" Theo asked.

"If we could produce the drugs I've mentioned in large quantities, I'd bet Mike Stearns would be willing to give them away at cost," Josh said. "The only way to prevent epidemics is to vaccinate if you can, and control the disease at the source if you can't. If Paris had the plague or typhus, it would be in our own interest to send the drugs to combat them if we could. You can't put up a steel wall against disease, it just won't work."

The marquise looked thoughtful, then smiled. "So tell me, how does Louis De Geer feel about women as business associates?"

* * *

"Uncle, it is so good to see you again!"

The marquise de Combalet approached Richelieu and gave him a quick peck on the cheek. Behind her Cazet de Vautorte seemed to shrug helplessly. Obviously he had been as surprised as Richelieu to see that she had brought additional guests for her visit.

"You know Theo, of course, and Marie de Gournay and Louise Bourgeois, but may I introduce Colette and Josh Modi? They have been the talk of Paris all week. Josh and Colette, this is my uncle, Cardinal Richelieu."

Colette curtsied deeply and Josh bowed. "Your Eminence, it is a pleasure to meet you," they both said.

Inside Richelieu sighed. This would be an interesting meeting. "Cazet, would you have Desbournais bring some extra chairs for our guests?"

* * *

Richelieu's fingers were steepled as he pondered what he had heard. There were many advantages here for France. And in the end, what did it matter who helped to develop North America so long as control was maintained by France?

"So you, my niece, will assume the same palatine rights for Maryland as Lord Baltimore had? And you agree to finance its colonization?"

The marquise nodded. "In addition, I will contact Lord Baltimore. Why waste the ships which were being prepared if we don't have to? According to what we were told by Dirck Graswinckel, Lord Baltimore was prepared to spend almost five hundred thousand livres in support of the colony. So long as the colonists are willing to swear allegiance to France, why not make use of them? Any replacements we need can come from France. We should have time to make the arrangements; the expedition was not supposed to sail until November, anyway."

"And you will grant Louis De Geer the mining concessions he wants?"

The marquise smiled. "Yes."

"Think of how this can be used in the*Gazette* , Your Eminence," Theo said. "Through the benevolence of Cardinal Richelieu, the people of Europe will be saved from disease."

Richelieu smiled. Theophraste Renaudot had always been good at finding ways to praise his patron. "Do you wish a title to go with this, Marie? Perhaps the Duchess of Maryland?"

The marquise gave him a brilliant smile. "If you can convince the king, I would not reject it."

* * *

Two weeks later Josh and Colette Modi said their goodbyes and left for Essen.

As they rode through the streets Josh could see that Colette was in a pensive mood. "Guilder for your thoughts."

Colette laughed. "I thought it was supposed to be only a penny."

"Well, I don't want you to think I don't value your thoughts you know. Anything you want to talk about?"

They were approaching the final gate leading out of Paris and Colette motioned around her. "I think I've fallen in love."

"With Paris?"

Colette nodded.

"Well," Josh said, "we could always move to Essen. That would put us much closer. Besides, then we would be close to Amsterdam as well, and I loved that city up-time. Something about the canals . . ."

Colette's eyes sparkled. "You would do that? For me?"

Josh smiled. "For us, darling. Always for us."

Side by side, they rode out of Paris towards their future.

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At the Cliff's Edge

by Iver P. Cooper

Friedrich Adelsohn, Captain of the Third Company of the Mounted Constabulary of the State of Thuringia-Franconia, stared at the ox. The ox stared right back. After a moment, it lowered its gaze, and resumed its attempts to convert the roadside into a nicely trimmed lawn. Friedrich wished that, like Siegfried in the Volsunga Saga, he had tasted Fafnir's blood, and could understand the speech of animals. Could the ox tell him what had brought it to this deserted spot, miles from the town? And why it, and its fellow beast of burden, had been abandoned?

The ox stolidly ignored his musings. Clearly, it was what the American movies called, "the strong, silent type." So it was up to Friedrich to figure matters out for himself.

The two oxen had been unyoked and left to graze. The wagon itself was in excellent condition, although empty. If bandits had slain the teamsters, why hadn't they slaughtered the oxen for food? If the wagoneers had fallen sick, where were their bodies? If they were hale and hearty, why had they not simply ridden the wagon into nearby Wurzburg?

The wagon was abandoned on the flank of a great sawtooth-shaped hill, with a cliff brooding over the road. Friedrich remembered, suddenly, that there was an ancient watchtower, half in ruins, near the cliff's edge. Could bandits have taken it over? Was the wagon ferrying supplies to them?

Friedrich pointed at the forested slope beyond the wagon. "Herman, Wolfgang, scout that area. See if there's a trail that looks like it might go up the hill. And if there are signs of recent use."

They didn't have to search for very long. While there were no footprints—if any had been left, they were

obliterated by a rain shower earlier that day—there were plenty of broken branches to indicate that men had passed that way.

"All right, looks like we may be near a bandit lair. Bring the horses into cover, and tie them down. Jakob, and Gerhard, stay on guard here. The rest of you, we're going to have a climb. If there are bandits at the top, it will probably be fighting at close quarters, so have your swords and pistols at the ready. But Hans, you're our best marksman, you hold your rifle, in case we need distance fire. Ready? Let's go. And don't make noise."

They started hiking. As they snaked up, they caught occasional glimpses of the crest.

"Captain, there's something smoking up there!" whispered Herman. Clearly, there were people above them. It reinforced Fredrich's suspicions.

As they neared the top, Friedrich signaled a short halt. He wanted his men rested before they clambered up, and exposed themselves. Finally, he judged them ready for action.

"All right, let's be about it. Hans, hold back and give covering fire if we need it. The rest of you, come along!"

What they discovered was not what they expected. There was a group of herdsmen and farmers at the foot of the old watchtower. Some were gathering wood, while others were looking intently upward. Friedrich naturally looked up, too.

A wooden boom extended from a machiolation of the tower, and a cable hung down. It ended with a hook, and a man dressed in black was suspended from it, facing downward. The fire, which was more smoking than flaming, was built beneath him, and he was flailing about and yelling at the others.

"What in God's name is going on here?" Friedrich yelled.

One of the shepherds turned. "We caught a witch, and we're burning him."

"Oh? By what authority? Has he been tried by an ecclesiastical court? Are you bishops in disguise, perhaps?"

"You can see for yourself that he's a witch! He's dressed like a bat, which is a creature of the devil, and he's clearly trying to fly to a witch's sabbath."

"So you didn't hang him up there yourself?"

"No, that's how we found him."

"And that's how you're going to leave him. Damp out that fire!"

The locals muttered angrily.

"Your last chance. Do as I say or we'll cut you down where you stand." Friedrich's men raised their swords.

The would-be witch hunters were armed only with knives and cudgels. Sullenly, they complied.

"Off with you, now." The herdsmen dispersed, with Friedrich's men keeping an eye on them.

* * *

"Thank you, Captain! I would bow, to honor your timely intervention, but it is a trifle difficult right now. Do be so kind as to lower me down, gently of course," said the hanging man.

"What, precisely, are you doing up there?"

"I am emulating Daedalus, he who flew on feathered wings from the Palace of Minos."

Friedrich didn't have much occasion to think about Greek myths. "Come again?"

"I am trying to learn how to fly, but I am not a witch. I am a natural philosopher."

"And why are your wings black, and like those of a bat?"

"Surely it is obvious." The German Daedalus spread his arms and legs. "Bats, like birds, fly, and we humans have more in common with bats than we do with birds. Bats have teeth and hair, just as we do. Birds don't. Ipso facto, we should imitate the bats, not the birds, if we wish to achieve dominion of the air. That is the fundamental error of my predecessors, they used feathers, not flying membranes. One was even so foolhardy as to use chicken feathers, can you believe it? Have you ever seen a chicken soar through the air? But look at me now!" He flapped his arms, and wobbled about.

Friedrich covered his mouth, smothering an impolite chuckle. "But you aren't exactly flying, right now."

"I am daring, not daft. The purpose of suspending myself in this fashion is so I can test the wings, know how the air moves over them, feel how best to spread and flap them. Without having to make an actual landing. When I am satisfied, I will use a longer cable, and hang over the edge of yon cliff. Finally, I will dispense with the safety line entirely, and fly off!"

"Like a rock," said Friedrich.

"Your skepticism is unjust, sir. And again, I ask, can you haul me down?"

"Just one more question, Herr Batman. How did you get up there?"

"The lads I hired, they carried up the wood and rope, and so forth, and constructed the support according to my instructions, then hauled me up. But when those country bumpkins came by and accused me of witchery, the wretches fled and left me to my fate."

I suppose they decided they could make better time to safety if they ran, than if they rode the wagon, Friedrich mused.*Oxen are not noted for their speed.*

In any event, Friedrich was satisfied that the man was neither a witch nor a threat. Except perhaps to himself.

"Very well, men, help our flying friend down." They complied. Herr Batman sighed with relief once he was standing on the ground, unhooked.

Friedrich was suddenly conscious of a faux pas. "Forgive me, what is your name?"

"I am Herr Doctor Johann Boehlen, formerly of the faculty of the University of Heidelberg." They bowed to each other.

"And what led you to adopt this particular site for your aeronautical exploit?"

"I liked the look of the watchtower, and the cliff. I didn't want to conduct my experiments in town, where everyone could see them, just in case they were unsuccessful."

"You are lucky that the rain shower made it difficult for the 'bumpkins' to get a proper fire going. Otherwise you would have been less a bat, and more a bird. A well-roasted one."

"I suppose. I will have to find a better place to conduct my experiments."

Friedrich sighed. "Tell me Doctor, have you heard of Grantville?"

"Of course. Who hasn't?"

"Well, in Grantville, they already have machines that fly. Perhaps you should learn how they work."

"I have actually seen one of those machines in the air. An inspiring sight! And indeed I intend to go to Grantville one day. But I will not be a mere supplicant. I will perfect my batsuit, and then I will go to the tallest building in Grantville, and jump. That will give them proof of my genius, and then the builders of the flying machine will treat me as a true colleague."

Friedrich bit his lip. He was quite sure that all that the doctor would prove was that what the Americans liked to call the Law of Gravity applied to everyone, including natural philosophers.

"Doctor, I believe that they already have found out how men can fly, it is just that the machines do it so much better. They don't have muscles which tire. Surely your genius is better spent building on what they already know rather than what they call, 'reinventing the wheel.'"

The doctor's expression was one of suspended judgment.

Friedrich pressed his case. "I am sure you will fit in well. Why, you have what they call a 'scientific mind.' You didn't just jump off the cliff, you built this test equipment. They like that sort of thing. I am sure that you will be an honored colleague."

Boehlen fingered his beard. "There is something in what you say."

"Grantville lies only about eighty miles to the northeast of here." Friedrich smiled. "As the bat flies."

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Butterflies In The Kremlin, Episode 2
A 'Merican in Moscow

by Gorg Huff and Paula Goodlett
Spring, 1633

"Home," Boris sighed then waved at the white stone walls of the Kremlin which stood sixty feet tall and dominated the mostly wooden city of Moscow.

Bernie Zeppi, after the long trip, didn't care if it was home or not. Didn't care about the view. He just wanted in out of the wet. And, judging from what he'd seen so far, Muscovy just wasn't . . . well, wasn't much. Not that there wasn't a lot of it. Lots and lots of what amounted to log cabins, all crowded together. "Where do we go first?"

Boris pointed toward a street. Well, river of mud masquerading as a street. "My townhouse. I must make a report and get instructions."

* * *

Boris burst into the house roaring, "I'm home." His arms were raised in a dramatic pose, in full conquering hero mode, as though he had just returned from being the first man to reach the North Pole. Which, come to think of it, wasn't that far from the truth.

"Yes, dear," a short, plump woman said and lifted a cheek to be kissed. From her response, it seemed that Boris had gone to the corner store for milk. You'd think that after being gone for a year a guy would get a livelier reception than Boris had, Bernie thought. Mom had always run to greet and hug Dad when he came home from a trip. But not this lady, presumably Boris' wife, Daromila. Bernie shook his head. How formal could people get?

Boris deflated and gave the woman a kiss on the cheek. She looked to be about forty, maybe forty-five. She was wearing blue, mostly. Her overdress anyway. Sarafin, they called it. Reddish brown hair, with a sprinkling of gray, and twinkling blue eyes. It was almost like a game of some sort. Bernie had no clue as to the rules but Boris had lost this round. Then he saw the woman's half grin. Maybe not.

The townhouse seemed to be pretty typical. Log, like almost every building. Small windows that weren't made of glass, but he didn't know what they were made of. One corner had several of the religious cartoons that were called icons, and the other had about the biggest stove he'd ever seen.

"Come in, come in." Boris waved at him, expansive again. "My wife, Daromila. This is Bernie Zeppi. He'll be staying with us for a day or so, until I can get in touch with Natalia Yaroslavicha." Boris spoke English and Bernie was surprised when she answered in that language. It must have shown on his face.

"Boris taught me a little years ago." Daromila smiled at him. "And there is Julia, the wife of Captain Johnson. Learning English has become quite the rage since we learned of Grantville." She lifted her cheek

again, this time for Bernie to kiss. Not really sure what he was supposed to do, Bernie kissed her cheek.

"You owe me a kopeck." Boris said it like it was a normal comment. Then, receiving a hard look from the little woman, Boris hastily said, "A ruble. At least."

Bernie just stood there confused. "Huh?"

"It's the custom," Daromila explained with that twinkle in her eye. "When a man enters another man's home as a guest, even just for dinner, he pays to give the wife a kiss." She laughed. "Come. I will make you tea." She turned toward that gigantic stove, where it looked like she had all the makings of a meal ready. "Sit, sit."

Bernie sat where Boris indicated. Damn, it felt good to get in out of the wet. He listened, letting the sound of the Russian language and the strangeness of it all roll over him.

It sounded weird, that bit with the kopeck and the ruble. Some weird custom or other. There were a lot of those around. This might be a joke of some kind. Bernie had no way of knowing where the custom came from, but he had plenty of time to think about it. Boris and Daromila had switched almost entirely to Russian.

* * *

Boris looked at Daromila, feasting his eyes. "Vasilii said I was to report directly to the patriarch. Otherwise I would have taken the outlander to the Yaroslavich townhouse. Vladimir, I wrote you about him, has arranged for his sister to house him rather than putting him up with the other outlanders."

"Is that wise?" Daromila busied herself at the stove. "The bureaus are in an uproar. " At Boris' curious look, she explained. "They didn't want to believe that the miracle was real. Even after all this time and the letters and books you have sent. They were arguing that it was a fraud right up until Vasilii arrived to say you were on your way. Some still are."

Boris shook his head. "I didn't want to believe it either, but after over a year to get used to the idea, I would have thought—" At his wife's look, he hesitated. "I guess it is an unbelievable story. But you can't not believe after you've seen the glass smooth cliffs of the ring wall."

"Is it really that special?" Daromila sounded a bit wistful. Unlike her husband, she had never been out of Muscovy. "I got your letters but . . ."

"Yes and no." Boris tilted his hand back and forth. "In some ways it is the most miraculous thing you could imagine and in others quite everyday." He shook his head. "Enough of that for now. I will tell you all about it later. Now I need to know what is going on in the bureaus." So they discussed the different factions that were shifting around the miracle in Germany. The fraud faction, the work of the devil faction, the God's will faction. Which bureau chiefs were leaning which way. How the great families were lining up. The most common reaction was "wait and see," then "how can my family benefit or be harmed," followed closely by "how will it effect my bureau?"

"From what I hear . . ." Daromila lifted the pot of water. ". . . the czar wants to see the outlander as soon as he can but the bureaus want a chance to talk to your Bernie first so they can formulate policy. They have managed to fill the czar's schedule for the next week or so to give them a chance to do so."

They went back to English to explain to Bernie that Boris had to go see the patriarch.

* * *

Half an hour into the conversation and Boris felt wrung out. Patriarch Filaret apparently remembered every fact he'd read about Grantville, not to mention every bit of the history he'd read. They'd already been through the butterfly effect and every bit of Boris' knowledge of the spies in Grantville. Now, Filaret changed the subject.

"So this Bernie, he has come to work for us?"

"Ah . . . not quite." Boris twitched in his seat. "In fact, he has come to work for Prince Yaroslavich. Who has paid—and is paying—his salary so far. And there is a personal contract." Boris produced the contract for the patriarch's perusal. Filaret took it and read through it rapidly. Several times during the reading he gave Boris sharp looks.

His brow creased. "A rather large salary. Do you feel it will be worth it?" Boris was surprised at the choice of first question. By custom, outlanders were always hired to work for the czar, not members of the court or the bureaus.

Boris raised his hands. "I can't say for certain. The up-timers knowledge is worth a thousand times that salary. Patriarch . . ." He paused. ". . . They could fly up-time. I have seen the movies, heard the stories . . . they could fly. And I have no doubt they will again . . . if they survive another five or ten years."

* * *

Filaret leaned back in his chair. This was the reason he'd called for Boris Petrov to see him. He wanted to hear, first hand. "Yet they don't fly now. None of the machines, the airplanes, was it? None came with them."

Boris nodded. "True. It was a poor village of peasants that was sent back to us. Yet even there they have miracles in every art and philosophy and in things we had not even dreamed of. Undreamed of wealth, Patriarch. The products of mass production, they call it. Everything identical, made by machines. If we can make the machines, well, we should be able to do the same."

Filaret raised an eyebrow. "Yet you say you're not sure?"

Boris sighed. "You know the problems with hiring outlander experts. If they were really experts they would be getting rich where they were. What we get are the second raters or the ones no one is willing to hire for some reason. You and I have seen that, time after time."

"Your outlander is a second rater?"

Boris squirmed a bit. "You must remember that there were only around three thousand people brought back in the Ring of Fire. That includes babes still at their mothers breast and those so . . . sick that they could not survive without constant intervention from their medical practitioners." Boris had, Filaret was sure, almost said "so old" but caught himself in time. Filaret hid a smile. He was over eighty and Boris was afraid to offend. "By their standards, it was not a particularly educated group. Most adults had high school diplomas . . . never mind." Boris clearly didn't want to get sidetracked.

"The point is," Boris continued, "that anyone who had much in the way of special skills or unusual talent was already employed by their government, getting rich right there in Grantville, or both.

"Berna is friendly, willing, and doesn't lie about his abilities. That, above all else, Vladimir insisted on. I agreed. We have had too many master cannon makers who were more familiar with gold than bronze."

Boris paused and Filaret considered. Boris was good at his job and Vladimir was clever. He didn't think that Vladimir was planning anything against the czar, partly because Vladimir was a good lad and a friend of the family, but mostly because he was staying in Grantville. Manipulating court politics from such a distance was almost impossible. Not entirely impossible; Filaret had done it from imprisonment in Poland. But that was a special case and hadn't actually worked out the way he had wanted.

"Then," Filaret leaned forward with his fingertips steepled, "if he is so unskilled, what is he doing here? And why did Vladimir hire him into the Yaroslavich family's service instead of the czar's? Why agree to pay him so much?" He motioned toward the contract. "This is what we would pay for a colonel of artillery."

* * *

"His salary is the least of the expense of this project," Boris admitted. This was one of the most important parts of the plan. "Vladimir had an idea. He will be having copies made of the books in Grantville. They will be sent here. But they are only copies, Patriarch, not translations. Not even Latin translations, much less Russian. He doesn't have the staff, or the cash on hand to pay to have it done. The books will have to be translated here."

"I still don't understand what we need this outlander for. Not that I object to his presence. The czar has been anxious to meet an outlander from this miracle and I am curious myself. That, however, doesn't justify this salary, or this change in our traditional ways." The Patriarch waved a hand at the contract again. "Contracts like this . . . well, I suppose I can understand the idea. But it's not the way we have done things and I don't like the precedent it sets."

"I speak the English of England in this century quite well," Boris said. "The American English of the tail-end of the twentieth century is full of words that I don't even have the concepts for. What is an excited atom?" Boris used Russian for excited and English for atom.

At Filaret's look, he answered his own question, sort of. "Had someone asked me that before I went to Grantville, I would have had no idea. Even if I had looked up atom in a dictionary from Grantville, I would still have thought it a nonsense phrase. The dictionary would tell me that an atom is the smallest piece of material. A piece of material cannot be excited.

"Berna would probably say he doesn't know, but won't see it as nonsense. He will look it up and tell us enough of what it means that we can make something approaching an accurate translation. As for the contract, Bernie insisted on it. . . . Patriarch, it's hard to explain unless you have seen what they can do and how freely they give out their knowledge. I am convinced that if we don't have someone like Bernie, if we don't gain this knowledge and do it now while the door is opened—" He paused and took a deep breath. "Russia, without the knowledge—the up-timers knowledge—facing a Europe with that knowledge, will not survive a hundred years. "

"Why is Vladimir paying for this?" The patriarch was nodding. Good, Boris thought. He understood why Berna was needed.

"He wants to set up a think tank." Boris spoke entirely in Russian but the concept didn't translate well.

"A gathering of minds." Boris tried again at Filaret's expression. "Also a research center. A place where concepts and devices from the books and notes he is sending can be tried. Tests can be done to see what will and will not work. A place where the knowledge from the future can be combined with the talents of Russians to make both the things he sends us designs for and new designs of our own."

The patriarch nodded, his mind jumping ahead of Boris' explanation. "Where?"

"The Yaroslavich family has a large and comfortable dacha and hunting park a half-day ride from Muscovy. Close enough to Moscow for convenience, yet far enough away so that it can be kept fairly private. He promises not only its use but money for the materials needed for the experimentation. Some thousands of rubles a year."

"That explains what he wants to do, Boris Ivanovich Petrov. It does not explain why the contract with this Bernard Zeppi is with Vladimir Petrovich Yaroslavich, not Mikhail Fedorivich Romanov, Czar of all Russia."

"Vladimir is willing to commit the Yaroslavich family to the primary funding of the project."

"And he wants what in exchange?"

"The exclusive rights to produce and sell the products of the dacha." This was common. One family might have exclusive rights to mine iron ore in a certain area, rights they had purchased from the government. Another might have exclusive rights to sell the furs of another area. And Filaret was no babe in the woods when it came to that type of negotiation.

"No, that won't work," Filaret said. "The Yaroslavich family is rich but not that rich."

"He plans to sell the rights to produce individual products," Boris explained. "The research center will make a working model of, say, a reaper and designs for the parts to it, then sell the rights to make reapers to another clan or to a set of villages."

The patriarch nodded and considered. "Exclusive except for the government. I'll not have the government giving the Yaroslavich family the rights, then paying for the research as well." That too was standard. The government of Muscovy maintained first call on everything. If a family gained exclusive control of a mine what that family got was what came out of the mine beyond the government's share. The extra.

"Of course, Patriarch." Boris nodded. As each new device was made both the government and the Yaroslavich family would have the right to produce it if they chose. In the case of the reaper, the government would be able to either make reapers itself or have them made; so would the Yaroslavich family. The Yaroslavich family might want to sell its rights to make the product but that would not affect the governments rights. "Of course, the research center will need experts from some of the bureaus."

Filaret nodded thoughtfully. "That can be arranged. And the church?"

"Vladimir would prefer not to make an open grant to all the church." Boris' answer was delicate. "There have been abuses of such grants in the past. I am very much afraid the bureaus would not like such a blanket grant either." The Russian Orthodox Church was neither monolithic nor free from corruption. Monasteries vied for power and wealth with the great families and each other.

The patriarch grinned rather sardonically and nodded. "The patriarch's office, then." He laughed at Boris' expression. "Not even that?"

Boris steeled himself. "Who will be the next patriarch?"

Filaret nodded, but lost his smile.

"Vladimir did wish me to convey his warmest personal regards to you, Patriarch Filaret. His concern, and frankly mine, is that the next patriarch may not share your concern for the czar or for Muscovy as a whole. Do you remember mention of Patriarch Nikon from the histories we sent?" Boris really wished he could avoid this part of the conversation. He was used to bureaucratic infighting but not at this level.

Filaret grimaced but nodded. "However, I am patriarch now."

"As long as that happy situation remains, the patriarch's office will receive anything the dacha can provide."

Filaret's fingers made a drum roll on the desk as he thought about it. "It is a great risk for young Vladimir. He could ruin his family if it doesn't work." Then he stared at Boris. "What about you, Boris? What do you gain in this? What do you risk?"

"It has been suggested that I would make an excellent candidate for the head of the Grantville section of the embassy bureau." He shrugged. "That is both the reward and the risk. If it doesn't work, well, my position in the bureau would become untenable."

"Yes." Filaret's eyes glittered. "It would." Another pause while the patriarch's fingers continued to tap out a strange beat on the desk. "Very well. I will talk to Fedor Ivanovich Shermentev, then. I'll even do what I can to get the appropriate people assigned to your section and loaned to the Yaroslavich dacha." He paused a moment. "You understand what you're risking?"

"I think so, Patriarch."

* * *

"And with that he sent me on my way." Boris took another sip of the tea Daromila had made him. He felt exhausted and at the same time, jubilant. Also a bit frightened.

"Let me get this straight." Daromila sat down. "If this 'think tank' doesn't produce results—good results—inside a few years . . . say five at most, you will lose the Grantville section. You will also lose any hope of ever again becoming a section chief. If it succeeds—but not extraordinarily well—you will end your career as a relatively minor section chief. If it succeeds extraordinarily well, then section chief of the Grantville section will become a plum job."

Boris nodded. "It's a risk. Section Chief is a nice promotion but the important point is section chief of which section. If the Grantville section becomes like the Bristol section—just the section chief and a clerk—well, I'll spend the rest of my life sitting there growing mold. If Grantville and the research center become as important as I think they might be, then the Grantville Section will rival the Polish Section. More than a hundred jobs to hand out. Favors to other section chiefs. It will be the job everyone wants. That will have it's own dangers but also opportunities. It will become a stepping stone to still higher positions, which could work well for us. Patriarch Filaret said 'I'll do what I can for you, if it succeeds.'"

"If he's still here," Daromila pointed out. "The man is eighty." Daromila had helped him negotiate the waters of the Moscow bureaucracy all the years of their marriage. She knew the risks and rewards as well as he did.

"Positions for the boys," she murmured. Their four sons were of an age to begin government service. The eldest, Pavel, was already working in the bureau of posts, although as a minor clerk. The middle two,

Boris Borisovich and Vasilli, were currently overseeing the villages. Only the youngest, Ivan, remained at home.

"Ah, yes." Boris hesitated a moment. Daromila was a mother. Mothers worried. "We should send each of them to Grantville, you know. They will gain experience there." Boris knew that Daromila wasn't entirely happy with the idea that her sons would follow in his footsteps, as least as far as being a spy was concerned.

Daromila frowned. Boris held his breath. He didn't really like it when she frowned, but this wasn't directed at him. She stood, went to the stove and moved a pot to a cooler spot. "You're probably right. " She turned back to him. "The prince you went with, Vladimir? Will he be careful of them?"

"He's an honorable man."

Daromila nodded. "We must do what we can. Pavel first."

"Ivan, I think," Boris said, "should join the dacha. In a minor post, of course."

"That should work." Then she smiled the smile that had always tugged his heartstrings. "He and Bernie have been talking all the time you were gone."

Boris groaned a bit. "He'll be ruined. Ruined."

Daromila smiled again. "Now, dear. Don't worry so. Bernie is a nice boy." Her eyes grew distant. "The first thing we should do is go and see Natasha Petrovna Yaroslavicha."

Boris nodded. "Yes. I have letters for her. First thing tomorrow morning, I think."

* * *

Boris had sent a message and he knew Vladimir had corresponded with his sister. She should be aware that he was coming. He thought it best not to spring Bernie on her as a surprise. The Yaroslavich townhouse was large and palatial. To a young, protected princess (the great families tended to keep women sheltered) Bernie Zeppi might come as an unwelcome surprise. Best to make her acquaintance first, Daromila had said.

His first surprise came at the door. The tall, young woman who answered it wasn't a servant. She was the princess in full court dress. "I've been looking forward to meeting you. Vladimir speaks very highly of you." She was looking around curiously like a like a child looking for the clowns to arrive. "But why did you not bring Bernie? Vladimir says he's to stay at the dacha."

This girl—well, young woman—was not shy. Not in the least what he'd expected. "Well, I thought I might prepare you a bit." Boris stumbled over his answer. "Bernie is . . . well, Bernie. Rather unusual. Not like us."

A cackle from the other end of the room surprised him. And a tiny old woman rose to greet him and lifted her cheek for his kiss. "Sofia Petrovna. Vladimir's aunt. We've both been looking forward to meeting the outlander." Her black eyes sparkled with intelligence. "Letters?" It was not a question. Boris handed them over, while the princess told a servant to bring tea.

Both women made sure he was comfortable and began to skim their letters. After a moment or so, the princess looked up at him. "Forgive me." She was even blushing a bit though it was hard to tell with the

makeup. "I enjoy my brother's letters so much." She set them aside, reluctantly, he thought. "Tell me about this miracle from the future. The rumors would have it that they are all devils on the one hand, and all saints on the other."

Boris felt the grin breaking out. "Not devils or saints. Just people. Though they are different in culture and belief." The girl was a cutie even if she was unusually tall and thin. She bubbled like a brook or a laughing child still some how anxious for the next existing treat the world would provide her.

Sofia and the princess "Call me Natasha; everyone does," kept him busy answering questions for an hour. Boris finally broke away, swearing to return the next day with Bernie.

"Oh, and your wife." Natasha smiled. "I'm quite anxious to meet her."

* * *

As promised, Boris delivered Bernie the next day. Natasha had decided, again, that since the outlander was visiting today she would greet him in full court dress. Then, as they often did, things had come up. She rushed through the last of her preparation, took a deep breath and made her entrance. Boris—as custom dictated—kissed her on the cheek. However, though Boris seemed a nice man, he was inconveniently short. The customary kiss entailed her leaning down and Boris standing on tiptoe.

Natasha had worn a gown that was mostly black. She had heard that the Protestants had the oddest notions about somber clothing being a mark of virtue of some sort and she did want the outlander to feel comfortable. By custom, her makeup was pure white with red lips and cheeks. The outlander's face was turning the oddest shade of red. Then he started to laugh uncontrollably. She thought he might be apologizing as he laughed—which just made it worse.

* * *

Bernie couldn't help it. He had been nervous all morning after the lecture Mrs. Petrov had given him on how important the Yaroslavich family was. And suddenly it was like he was in a Rocky and Bullwinkle cartoon with Boris and Natasha. He cracked up. He almost had himself under control. "Where's Bullwinkle?" slipped out he lost it again.

Things were getting tense by the time Bernie got himself under control. "I'm sorry. I'm away from home and nervous about the new job. It was just that you two right then happened to look like Boris and Natasha."

Now the princess was looking confused again. "But we are Boris and Natasha?"

"I know." Bernie almost lost it again. He shook his head. "I think that's what really did it. Not like you, Boris and Natasha; like the cartoon Boris and Natasha. Natasha was tall and slinky, ah, beautiful with a very pale face and red lips, Boris was short and stocky. They were spies." Another giggle. "Spies who were constantly trying to blow up Rocky, the Flying Squirrel and Bullwinkle J. Moose. I used to watch it on Nickelodeon when I was a kid."

"What is a cartoon?" Princess Natasha was apparently much mollified by the notion that this other Natasha was beautiful. Bernie was less confident of her reaction to slinky, though you never knew.

"It's a simple drawing." Bernie tried to explain.

"Something like an icon but without the religious significance," Boris clarified.

"Except the ones with Boris and Natasha moved."

"Moved how?" Natasha's forehead creased under the makeup. "Did they shake the paper?" Which lead to a discussion of moving pictures in general and how they were made. By the end of this discussion, Natasha was too interested to be offended.

* * *

"Now I see how it works." Natasha saw something else too. This was why they needed Bernie Zeppi and the dacha turned into a research center. He had not come here to introduce moving icons on a screen. It had just popped out like a chicken laying an egg. How many other eggs were buried in his head and how valuable would they be to the family? Natasha had seen mimes and clowns perform. In spite of his comments, she knew that the movies and cartoons didn't need sound to be a major draw.

* * *

Daromila, who had been fairly quiet during the visit, asked, "Berna, what is all this about the moose and squirrel?"

Bernie jerked a bit. "Berna?"

Daromila grinned a bit. "It is what we do, the names. When someone is close or well liked, we . . . do things to the names. Boris, for instance . . . I call him Boriska, usually. As he calls me Dara. The princess Natalia, you recall . . ."

"Call me Natasha," Bernie said. "Oh. I get it. Nicknames. Like Bernie is to begin with. My real name is Bernard. Always hated it. Sounds like some old grandpa dude's name."

Daromila nodded. "Exactly. Now, tell me about the moose and squirrel," Then, with emphasis, "and the spies, Boris and Natasha."

Spring, 1633

"I think we can use him," General Kabanov said. He was in charge of guns and weapons for the Russian musketeers. "He does seem to know a great deal about guns and their use."

Boris nodded. He saw no need to point out that Bernie's familiarity with the 30.06 was nothing unusual. Bernie had just finished disassembling and reassembling his up-time rifle and then loading it and emptying it into a set of targets. Another thing Boris neglected to mention was how very slow Bernie had been in doing both those things in comparison to some of the up-timers he had seen.

"Why can't we make these repeating rifles?" General Kabanov asked Bernie but he didn't speak English, much less up-timer English, so questions were funneled through Boris. Which was probably for the best, as it allowed him to edit at need.

"Primers," Bernie said. "You can't make the primers. We went over all this in Grantville."

"In the brass cartridges," Boris translated, "are compounds of a chemical that is difficult and expensive to make in quantity—"

So it went. It was the third interview that day and there were three more to go and still more tomorrow.

* * *

"Why did you have to bring us an idiot?" Filip Pavlovich Tupikov was pacing back and forth, scratching furiously at a rather weak beard. "They know how to fly. They can make materials we never dreamed of. And you bring us this? Not a doctor, not a . . . what is the word? Engineer. Not an engineer. Instead you bring us this . . . this . . . barely a craftsman. Why, Boris Ivanovich?"

Boris Ivanovich looked at Filip Pavlovich. The man was a brilliant artisan and a skilled natural philosopher, but had no understanding of how the world worked. Besides, Boris had been getting some version of this from about half the interviewers for the last two weeks. "Ah, how foolish of me." Boris snorted. "I should, no doubt, have asked their president, Mike Stearns, to give up all he had in Grantville and come be a servant in Muscovy? Perhaps the master of machining, Ollie Reardon, would have given up his factory with its machines and the electric to run them? Better yet, I could have tried to persuade Melissa Mailey, a qualified teacher in their high school. Of course, she has been heard to say—more than once, I might point out—that they should start by executing nine out of ten of the nobility of Europe. She then suggests that they go up from there. I'm sure she would have been happy to serve the czar."

Filip Pavlovich flinched a bit. Boris felt he'd gotten his point across. "I brought Berna because he was who I could get. He has graduated their high school. He is a qualified auto mechanic with tools. I should know. I had to arrange for their transport. He speaks, reads and writes their up-timer English. English which is not so similar to the English we know as Polish is to Russian. You can get by with practice but the words have changed their meaning and pronunciation as often as not. Believe me, Filip Pavlovich, there are people I could have recruited that you would have liked less."

* * *

Bernie sighed. "Dude, when is this sh . . . ah . . . stuff going to be done with. Let me get to work, will you?"

"Soon, Bernie, soon." Boris waved at the stairs. "We have the audience today. Natasha will be down soon and we will leave."

"The makeup again?" Bernie giggled.

Boris glared at Bernie, remembering the silly business about Boris and Natasha. "I trust you will be able to control your sense of humor."

"Wish she'd hurry up." Bernie's complaint brought Boris back to the present. Then Natasha arrived, walked to Boris and said in a deep sultry voice—not her own—but which Bernie claimed was a fairly good imitation of the cartoon Natasha, "Welcome, my little Borisky. This time we will capture that naughty moose, yes?"

Bernie cracked up and Boris turned red.

* * *

Bernie tried to suppress his occasional giggles as Boris and Natasha coached him very carefully for his meeting with Mr. Big. Mr. Big, otherwise known as the Czar of all the Russias. Armed with Vladimir's gifts, as well as his own, Bernie followed their instructions carefully.

Boris whispered names and positions while they stood in the line of people waiting to be presented. "Patriarch Filaret, the czar's father, there to the left of Czar Mikhail. On the right, Fedor Ivanovich

Shermentev, he is in charge of the bureau of records. It is an especially powerful post, because he can cause so much trouble for the other bureaus." The list of names went on an on and Bernie quit paying that much attention. Natasha had left them, and gone off to see the czar's wife. When they got a bit closer, Bernie started looking around a bit. Good thing he was farsighted, since the room seemed to be about eighty-feet long.

Mr. Big—no, that really didn't seem to fit—was a pretty ordinary guy when you got a look at him. The czar looked to be in his mid thirties. He also looked like he didn't want to be there. Sort of bored and sad. He seemed like the kind of guy who got stuffed in his locker in gym class. The patriarch guy, his father, was really old, but looked to be a tough old bird. And all these . . .*boyars* , they were called. There was some serious money tied up in their clothes. "Dimitry Mamstriukovich Cherakasky." Boris nodded toward another man. "Not a man to cross, that one." Well, Bernie wasn't going to cross anyone if he could help it.

Finally, they got up to the front of the line. Boris did all the talking, which was just as well. Bernie hadn't had much luck figuring out the lingo, not yet. Boris gave the agreed upon signal and Bernie bowed. "Your Majesty."

* * *

Mikhail Romanov smiled at the obvious awkwardness of the outlander's attempt to bow. He knew from Vladimir Yaroslavich's letters that the people brought back in time by God's hand had no custom of bowing.

"Welcome to Moscow." Mikhail had picked up a bit of English over the years. There were several English merchants and diplomats in Muscovy. He wanted to make the outlander feel at home.*To have been touched by God in such a material way. It must be a blessing.*

The outlander bowed again and Boris Petrovich made a gesture. The outlander presented his gifts. Not the usual gold or silver dishes and artwork. Jewelry, perhaps? Mikhail looked at the thing.

"It is an up-time 'watch.'" Boris Petrovich spoke softly. "If you will press that button there, it will light up."

Mikhail, with some trepidation, pressed the button. This had been made, would be made, almost four hundred years in the future. More, God had seen fit to send it back in time to him. "Very interesting," was all he managed to say. He watched the numbers on the end change. They were a bit blurry, but that wasn't the numbers fault. Mikhail couldn't see very well, close up. The interesting thing was that they changed. Changed at regular intervals. It was a clock in a piece of jewelry worn about the wrist. He wondered for just a moment if it might be some sort of magic. Probably not, he decided. Probably the electric craft that Vladimir had written about. He had said that it often looked like magic at first acquaintance. He looked forward to showing it to Evdokia.

* * *

Evdokia gathered her ladies and signaled Natasha to walk with her. As usual, it was the younger of her ladies who accompanied her. They left the Palace of Facets to return to the Terem Palace. The Terem was the czar's private residence. She, he, the children and some cousins and servants all lived there. It was also often occupied by the wives and daughters of the great families of Muscovy.

"The outlander." Evdokia paused. "I wonder what the future was like to live in."

"I do, too," Natasha agreed. "Not the history so much. But what it was like to live in a world where they

had so much . . . magic. In the future, Boris says, they had carriages that traveled without horses and others that would fly. Plays and music put in boxes and new clothes made in hours. And cartoons. Which sound like fun."

Evodkia refrained from running back to the terem section of the palace with some difficulty. She felt like a girl again, even if she was twenty-four with three living children. Evdokia hadn't been raised in Muscovy. She wasn't that fond of it, either. It was more restrictive than her home and required more subtlety. The cats in the capital could be nasty and had been when Mikhail had chosen her over them and their daughters. This new land of the future offered excitement. It offered new things to contemplate, which was essential. Moscow was not the den of iniquity that her mother had painted it as. At least not the parts of it that she got to see. As the mother of the next czar, her life was somewhat circumscribed. There were parties but they were formal affairs. There were the children and Mikhail, but truth be told, she was often bored. The palace was run by the palace staff, who rarely asked her opinion of anything.

One saving grace existed in all of this. Mikhail was a gentle man. He loved his family and treated them well. He spent more time with them than the cabinet would prefer. No. That wasn't true. The cabinet liked things just the way they were. In all honesty, Evdokia had to admit that the cabinet probably listened to Mikhail less than the palace staff listened to her.

* * *

Later that afternoon, Evodkia found her husband pouring over papers. Mikhail looked depressed, even from the rear. She put her hands on his temples and rubbed them. Mikhail often had headaches and said that helped. He began to relax.

"It's getting more dangerous now." He almost whispered. "The safe course is denied us by the histories from the future." That sent a chill down Evdokia's back. She had been aware that the basic policy of the patriarch had been one of social conservatism, while at the same time trying to upgrade the army and bring in advances of the west. She had also been aware that the reason for that policy was the instability of the situation.

"The cabinet will use any change." Evdokia worried. "As will the church." A pretender to the throne could be tonsured like Mikhail's father. For Mikhail—and for her and the children—a more drastic solution would be needed. Politics in Muscovy were very personal at times.

"God has told us. Given us a miracle. " Mikhail looked at her. "A miracle . . . but what does it mean?"

* * *

"How much longer?" It was the next afternoon and they were on their way to the dacha. Bernie's voice was plaintive.

Natasha looked out the open windows of the carriage she rode in and grinned. "We have been moving for only a few moments since the last time you asked that question, Berna. A bit longer, still."

Bernie sighed. "God, I wish I had my car. I wish I had some gas. I wish . . ." His voice trailed off and he stared into the distance.

Natasha had Vladimir's request that she keep Bernie as happy as she could, within certain limitations. "You wish you could go back? But we have only begun to become acquainted."

Bernie shook his head. "No, not back to Grantville. I wish I could go home, back to the world I came from. This place, all these places, just aren't home. Even Grantville isn't home. I used to do all right, you

know. I had enough money to do what I wanted, for the most part. I dated, I worked my hours. I got by. Now, though, well, it's just not the same, not even in Grantville."

Natasha murmured a sympathetic sound and Bernie kept talking. Natasha could tell Bernie was lonely and feeling lost. Not much of a wonder, judging from Bernie's appearance. He had worn what he called his "best suit" to the audience, but now he was wearing something called "jeans." They were blue but faded, clearly inappropriate for a person of Bernie's station in life. Peasants wore faded clothing.

I shall have to help him with his wardrobe, Natasha thought. He needs to grow a beard, as well. Else no one will take him seriously.

* * *

Bernie looked at the girl. She seemed nice enough and she hadn't gotten pissed at the Boris and Natasha bit. On the other hand, she was Vladimir's sister and Bernie had finally picked up on just how rich and powerful Vlad was after he had gotten to Moscow. This girl was the daughter of a great house. She was pretty, dark haired and slim. Slimmer than a lot of the Russian women, with black hair that hung down to her b . . . past her waist. She spoke some English. Funny sounding English, but English. Mostly, though, she was someone to talk to.

"So," he said, "tell me about you."

Natasha was a bit surprised. It was a fairly forward question, it seemed to her. She had little experience with men not part of her family or sworn to it. Members of her family would already know such things. Retainers would never have the gall to ask such a question if not invited. Her aunt, Sofia, tittered a bit. Natasha cast a glance her way and the sixty-year-old Sofia pretended innocence, staring out the windows on the other side of the carriage.

"Ah . . ." Natasha stopped. What about her? "What do you wish to know?"

"Oh. . ." Bernie hesitated a moment. "Like, what do you figure on doing with your life? Do you have any plans to become a doctor or lawyer? What's it like in the winter here? Do you like parties?" He snorted. "What's your sign?" Natasha had no idea what that meant.

Bernie stopped suddenly. He even blushed a bit. "That's probably too many questions, isn't it?"

"Perhaps," Natasha acknowledged. "In any case, I didn't understand what all of them meant. I don't know what my sign is. Unless you mean the family crest."

"Never mind." Bernie said hastily. Then he scratched his chin. "Why do all the men wear beards?"

Natasha found herself suppressing a giggle. Didn't this outlander know anything? "Men wear beards because the church says that it is a mortal sin to shave them. God did not create men beardless, only cats and dogs."

"Not to mention rats and mice," Bernie said. "Cattle. Sheep. Well, sheep are sort of bearded all over. Goats, though. Goats have beards."

Aunt Sofia was suppressing laughter, Natasha thought. Her shoulders were shaking, at any rate. And her black eyes sparkled a bit.

"Perhaps so." Natasha felt a grin trying to break out. "But I'm not sure the church would like hearing that

. . ." She searched for the word. "Ah . . . compare?"

"Comparison," Bernie said. "Yeah. Churches up-time didn't like it when you pointed out that sort of thing, either. Whatever. So, anyway, what do you do?"

The question threw Natasha into a bit of confusion. What did she do? Did he mean how she spent her time? "I take care of the family properties while Vladimir is away. Someone must."

Bernie shook his head and shifted his weight on the saddle. Natasha envied that he was riding a horse. It had to be more comfortable than the jolting carriage. The carriage hit a rut and she bounced a bit, grabbing onto the edge of the seat. "Uff."

"That's one of the things we gotta do." Bernie made a tsking sound, staring ahead at the road. "These roads are the pits."

Yet another word she wasn't sure of, Natasha thought. Pit for hunting? Pit of Hell? Thinking about it, she wasn't sure that the latter wasn't accurate. "Pits?"

"Really bad. But that's one thing I know how to fix. Some ditches, some drainage and some gravel. Easy."

The carriage jolted again and Natasha suppressed a groan. Fix the roads. What a good idea.

* * *

Berna was moved in and settled. It had been a busy three days, but Natasha was at her desk, at last. There were several letters to write. She, as was her nature, started with the hardest.

To the Up-timer Citizen of Grantville, United States of America, Miss Brandy Bates,

I make free to write to you at the suggestion of your fellow up-timer, Bernard Zeppi. I hope that this missive finds you in the best of good health.

Natasha hated this part. She was a regular correspondent with several women of Muscovy and even a few men. But writing to someone new was always a challenge, especially someone from a foreign country. Worse, in this case, because the up-timers probably thought of everyone from this century as barbarians. But she really did need an answer to this question.

Let me apologize if I have failed to include the titles appropriate to your station. It is not with the intent of insult but from simple ignorance. Goodman Zeppi informs me that you are a woman of great accomplishment and considerable status among the up-timers, being a professional researcher at the research center. Also that you are of good family and possessed of a Ged.

I gather that the Ged is a title? But I confess my ignorance in how it is to be applied to a salutation. Mr Zeppi professes ignorance of your other titles, not being a student of heraldry.

The talk Bernie and Natasha had on the road to the dacha and the talk Natasha had with Sofia led to other talks with Bernie. He had made a very strange comment. When Natasha had asked about it his face had gone red and he had refused to answer. He suggested that she write Brandy Bates. When she had asked why, he had said that Brandy was a better person to ask and insisted that she was an expert and a person of high status. Natasha suspected that he might have overstated the woman's importance and wasn't at all sure she liked the way Berna had waxed effusive on Brandy Bates' accomplishments. Still, if she wanted to know this was the only way to find out.

I fear this may be a delicate matter to broach on first acquaintance, but what is a bra and why should one burn it in the grand market square?

Princess Natalia Petrovna Yaroslavicha

Natasha knew she should be saying more, introducing herself more clearly, but she was uncertain of what degree of formality she should use in writing to an unknown up-timer. She set the letter aside and started working on the next. It would go to Vladimir and discuss the Grantville Section of the Embassy Bureau and the agreements reached between the family and the government.

Fall, 1633

The Grantville Section was, so far, not doing all that well. Boris was having organizational problems. Pavel Borisovich, his eldest son, shook his head at him. "They won't authorize it, Father."

"Why not?" Boris felt he was asking the question with considerable restraint.

His son shrugged. "The official reason or the real reason?"

"The official one, I know the real one." The real reason was resentment. The patriarch had gotten Boris the Grantville section and a reasonable budget. That only fueled the resentment. There were other people who were in line for the promotion; people with better family connections. That would normally mean that if a new section was established they might reasonably expect to be tapped to head it up. Assistant section chiefs—in and out of the embassy bureau—were pissed that Boris had been jumped a rank.

"Priorities." Pavel squinted and hunched over as though he expected a strong wind.

"I was given to understand that we had a rather high priority?" Boris tried to keep his voice calm. Perhaps too calm.

"I'm just passing on what I was told." Pavel waved the report, then began to read. "Because of the requirements of the grain shipments to Sweden, Yuri Petrovich Gorbochov is desperately needed to expedite the harvest in the Gdansk region."

"They picked one that has a higher priority than we do." Boris had to give that section chief credit. It was cleverly done anyway. There might even be some truth to it.

"Father, I'm not sure you do know the real reason. At least not all of them. I was talking to Petr Somovich. He said that a lot of people are starting to be afraid that this is a nowhere job. Not that much has come out of the dacha yet and we have all these books that mostly don't make sense, not even to people who do speak English. Who cares that Audubon painted birds? Russia has real issues to deal with."

"I know, son. " Boris had to concede that some of the objections to working with the dacha crew seemed to be valid. Among the other things that Boris had brought back was a down-time copy of the first book of the Encyclopedia International, 1963 edition, that had been in someone's garage. They had refused the outright sale of the books but had rented them to Vladimir for an outrageous sum. "But you never know what might combine with something else to solve a problem. We saw it again and again in Grantville. There would be an article on something that they needed but it would be missing some vital bit. Then the vital bit would show up in the biographic blurb about the guy who discovered it. Something like where he was when he found the first deposit of some rare earth."

"So you decided to send a copy of everything. I know. Father. I even agree." Pavel's face was serious, his dark eyes intent. "That doesn't change the fact that spending the next ten years of their lives translating minutia about people who will never even be born seems a pointless, career-ending job to most people."

Boris sighed. "I had hoped it would be more popular. It is a secure position, doing important work, if not the most exciting. A safe place in the bureaus."

"That's the problem, Father." Pavel shrugged. "It's not secure unless the Grantville section becomes secure."

Boris was left with an office and a budget and not nearly enough people who read and wrote English and Russian. The budget . . . for the moment he had plenty of money. Well, lands. The government of Muscovy ran on a formalized barter system because there was not nearly enough money to support the economy they had. That, however, was about to change.

* * *

Ivan Nikitich Odoevskii didn't look like a book worm. He was tall and as richly dressed as a prince and a member of the boyar cabinet ought to be. He rode, he was a skilled falconer, but he did love to read. He read anything. Account books. Treatises. Stories. Anything he could get his hands on. His fierce black beard was twitching and his blue eyes squinted as he thought. "It's complicated, Patriarch. Yes, the up-timers use paper money but their system is a tortured mix of the government and . . . well, anarchy."

"Anarchy?"

"They have something called Federal reserve banks . . ."

Patriarch Filaret was a man of no mean intellect, but his eyes were trying to glaze over within a paragraph. He tried to follow the salient points for a while, but finally gave up. "Enough. Can we use it, Ivan Nikitich? Can we use it?"

Ivan Nikitich sighed like the wind gusting from the north. "Yes. But it is dangerous. The books made that clear, even if I could only understand one word in three without talking to that idiot Bernie Janovich." Ivan Nikitich snorted. "And only one word in two after talking to him. The danger is more than the simple temptation to print ever more and more as it loses it's value. That's a danger, true enough. It is made worse by the fact that failing to print enough can hurt the nation even more. That is one thing the books on economics taught me. Half of Muscovy's troubles are caused by not enough cash."

"You needed a book from the future to tell you Muscovy is not a wealthy nation?" Fileret snorted in exasperation.

"No!" Ivan Nikitich almost shouted, then visibly got hold of himself. "Patriarch, what I needed the books from the future to tell me was that Muscovy*is* a wealthy nation. A wealthy nation with a cash flow problem. That Muscovy has everything it needs to have a booming economy, except the economy."

Filaret glared a bit. "Speak sense!"

Ivan Nikitich sighed. "We have grain. We have timber. We have pitch, not to mention furs of all sorts. We have rivers that in summer give us clear roads from China and India to the Baltic sea. In hard winter, the sleighs are more efficient than wagons are. What we lack is a means of tying all those things together. Much of our trade is just that. A peasant trades a bushel of grain to another peasant for bit of cloth. It happens that way because neither peasant has any money. Did you know that over ninety percent of the up-timers purchases were made with money? Everything from their homes to a piece of candy for their children. Everyone had money, even the very poor. That—along with their transportation system—made the manufacturing of goods in one place to be sold in another much easier."

Ivan Nikitich spoke with passion. He even stood and began pacing the room. "The raw materials are here. The trade routes are here, mostly. Even the skills are here. Every peasant in holy Rus spends half the year at some craft because you can't farm ice." Ivan Nikitich shook his head. "The only thing really missing is some practical means of letting the people in one place buy the products from another. Buy them, Patriarch, not trade for them. Because barter simply won't work for what we need. The things we must have are: Money, ways of transferring money from one place to another without bandits robbing the caravan, banks where bureau men and even peasants can save money or get loans. As I said—everything we need for an economic boom but an economy."

"What you're saying is we're rich in goods but not in money?"

Ivan Nikitich nodded. "What we need is cash and the books of the up-timers explain how to do that without silver or gold. The idea is to have just a little more money available than there is product for it to buy. That encourages the peasants to work harder to get the last bit. It's like hanging a carrot in front of a mule. Too close and he eats it. Too far and he gives up. Muscovy's carrot is hanging off the mule's ass."

"So, you think Vladimir is right." This was the test. The Odoevskii didn't get along all that well with the Yaroslavich family. If Ivan Nikitich could find a way to say Vladimir's report was wrong, he would.

"No, absolutely not," Ivan Nikitich said by reflex. Then he laughed. "Well, perhaps a little bit. The way the boy proposes to go about it is all wrong. We are not some barbarous western nation. It will need to be the Czar's Bank and all the little banks part of the Czar's Bank. The Yaroslavich boy's proposal will just make the Yaroslavich family richer than they already are."

Filaret gave the Boyar of the Exchequer a look.

"Very well. The Yaroslavich family and many others," Ivan Nikitich conceded. "But the czar should reap a greater benefit if the government owns all the banks, not just the Czar's Bank."

Filaret considered. "What bureau would control the Czar's Bank?" he gave Ivan Nikitich another hard look.

Ivan Nikitich gave him back look for look. "The bureau of the exchequer is the obvious choice," he acknowledged.

In some ways Filaret really preferred Vladimir's plan. As chaotic as it was, it had the advantage of not putting the power of a central bank in the hands of one of the great families. On the other hand, having the Romanov family in charge of the central bank would strengthen them considerably.

* * *

The discussion continued for several hours that night and then broadened over the next several days. Eventually, it included every member of the cabinet and many members of the Assembly of the Land. It was pointed out that the institution of this system would probably mean fewer taxes would be needed, at least for now. Which made it quite popular.

Fall, 1633

The Fresno Scrapers left Filip Pavlovich Tupikov wondering what they really needed Bernie for. It wasn't that he was unhelpful. "Yes,*da* ," Bernie said. "The handles let you control the depth of the cut. Push down for a shallower cut, let them rise just a bit for a deeper cut."

Filip translated.

"How deep can you cut?" Petr Stefanovich asked.

Filip translated.

"It depends on the ground," Bernie explained. "If you loosen the earth with a drag board, you can usually cut a couple of inches. You get a feel for it with practice. You start to notice when the scraper is pushing up hard. Then you have to push down and shallow the cut."

Filip translated. Bernie had indeed been of help to the blacksmith and carpenters in making an iron reinforced wooden version of the scraper in a matter of days. That wasn't the reason Filip wondered why they needed Bernie. Filip had seen the design for the scraper, the drag board and a couple of other pieces of road construction equipment. They were all quite clear. Written and drawn to make it easy for a village smith and carpenter.

The horses, small steppe ponies, were hitched and Filip followed along as Bernie demonstrated. A cut, about half an inch deep grew quickly to a length of about twenty feet.

"Whoa." Bernie pulled the horses up. He turned to Petr. "You want to give it a try?"

Petr Stefanovich took Bernie's place. At first the scraper slid along the ground. "Lift the handles." Bernie gave directions as Filip translated. Filip stepped between Bernie and Petr Stefanovich to see. Petr Stefanovich lifted the handles about three inches.

"Gently," Bernie shouted. The next thing Filip Pavlovich Tupikov knew he was being jerked back by his collar. He saw a blur.

He turned on the uppity outlander but Bernie wasn't there. He was checking on Petr Stefanovich, who

was holding his arm and looking surprised. The scraper was turned over and the ponies were looking back in confusion.

"Look, dude." Bernie's voice was harsh. "This stuff is heavy equipment even if it's run by horses, not a motor. Gentle does it. At first, until you get to know it. I don't give a fuck how big you are, you're not stronger than two fucking horses working together with leverage on their side. You empty the bucket by lifting the handle, too." Then Bernie turned to Filip Pavlovich, eyes flashing. "Dude, the handles on the scraper are like the end of a lever. You just came within an inch of getting your head busted, big time."

Filip Pavlovich looked at the scraper, remembered the blur and decided that perhaps Bernie wasn't totally useless after all.

* * *

Bernie wasn't sure whether to be elated or scared shitless. He had just repeated almost word for word the two lectures he had received the first day he worked with the scraper after he joined the road crew. The combination of his wrenched arms and the fear in the supervisor's eyes had impressed the lecture on him. Petr Stefanovich was a big mother, and proud of it. Bernie should have figured that he would push it, but he hadn't. Worse, Bernie hadn't even considered that Filip Pavlovich, the Russian nerd, would stick his head in the way of the handles. Somehow, it hadn't occurred to him that someone could get killed using the stuff he helped the Russians build.

"Look, dudes. This stuff can be dangerous. I guess most of the stuff we brought back in the Ring of Fire can be dangerous, even the medicine." Filip was looking at him funny and Bernie sort of ran out of steam, not really knowing how to say what he wanted to say. He really didn't want to be responsible for getting someone killed.

"I understand, Berna." It was the first time Filip had called him Berna like Boris did. "You came to help us, not to get people killed. It's all right. People get killed using shovels to smooth a road or dig a canal, too. Believe me, this will help."

* * *

As soon as the test was finished, Filip sent a message to Boris in Moscow. He also sent one to his cousin who worked in the bureau of roads. Boris didn't know it but by the time he arrived at the offices of the bureau of roads, the place was abuzz with the news of the scraper. Boris was surprised at how easy it was to arrange a meeting with an assistant to an assistant bureau chief. Still, things have to go through channels. It was almost a week before they could arrange for a viewing of the scraper and the drag board.

In the mean time, both devices had been put to use. The primary purpose of that use was to familiarize the crews with the equipment. But the still small dacha team also wanted to show off.

* * *

Boris was riding beside the assistant underchief of roads. Yuri Mikhailovich was in charge of assigning crews to specific roads in the area around Moscow. When the man suddenly pulled up his horse, Boris pulled up, too. Yuri was staring at a ridge in the road—path, rather—they were riding on. About a hundred yards from the dacha, the road suddenly rose about six inches and became quite smooth. There were bare sections on either side, where the grass and an inch or two of top soil had been scrapped away, clearly where the new surface of the road had come from. Slowly, Yuri approached the road. He paused again and gave Boris a look. Evaluating.

Boris looked back and shrugged.*I tried to tell you,* the look said, as plain as words. Boris had seen

roads like this before, near Grantville. Truthfully, he hadn't expected to see one here. Not this soon, anyway. There was no way he was going to admit that, though. Not even with his expression.

Yuri snorted. They rode on, carefully getting a feel for the road. "Where is this scraper, Boris? I would have expected it to be working on the road."

Boris shrugged and they continued on.

* * *

They were greeted at the dacha by Filip Pavlovich. And Berna, who clearly wanted to be somewhere else.

"Come, come." Filip Pavlovich waved pompously. Then led the way around back, where the scrapper was in use.

The drag board was just a board with spikes sticking out the bottom. It was used to cut the ground and loosen the soil. In combination with the scraper, two men and four small Russian ponies could do a phenomenal amount of work, more than twenty men with shovels could accomplish.

Boris paused and stared. So did Yuri.

"You see?" Filip Pavlovich waved at the project. "You see what can be accomplished?"

The trench was about seventeen feet, just under three scrapers wide. It was a hundred feet long and about three feet deep, not including the mounds on either side of it. It had ramps on either end which allowed the horses to get in and out of the trench, which the team pulling the scraper was doing now.

"It will take planning for proper use." Filip Pavlovich waved at it again. "With that planning, a team can cut a six foot wide trench at a rate of approximately one mile in four hours in this sort of soil. The trench will be approximately two inches deep. The second pass is actually slightly faster than the first because the ground is smoother. Three teams could do the same but with the trench seventeen feet wide. Or a six foot wide trench six inches deep could be cut. As the depth of the cut deepens, it gets harder to do, of course. You need a ramp about every hundred feet."

Yuri nodded, still watching the scraper as it dumped a load along the side of the trench. It had climbed the ramp then gone around to the side of the trench to dump the load. He finally pulled his eyes away from the scraper and looked at Filip Pavlovich. "I am impressed with the scraper, Filip Pavlovich. Considering your comments about planning, why haven't you taken your own advice and planed the placement of this trench to serve some purpose? You could have made a fish pond if nothing else." Yuri was a relative of Filip Pavlovich's and enjoyed twitting him a bit. While Yuri was the more politically astute and of higher rank, both within the family and in the bureaus, Filip was the more intellectual of the two and had never gone to any effort to hide it.

Filip Pavlovich sighed with what he thought was drama. Both Yuri and Boris found it overdone. "It's for the tile field, part of the plumbing system. See the notch half way down the trench? That will be dug deeper for the septic tank."

Boris laughed. "Is Berna still going on about indoor plumbing?"

Filip Pavlovich sighed again, more real this time. "Constantly. Toilets and showers are his constant obsession. When I first saw the design I thought it would take months. Now it seems we will see it begin

to work in a few more days."

"So we are presented with a useful device that is to be used for expensive doodads?" Yuri sneered.

"Not entirely." Filip Pavlovich's admission was a bit grudging. He threw a glance at Bernie, who grinned. "Sanitation, from what I have read, is an essential part of preventing the spread of disease. It is a complicated field and I have not studied it deeply yet."

Boris was trying not to grin. Filip Pavlovich's grudging admission meant that there was another use for scrapers. Which in turn meant that the scrapers were still more valuable in terms of favors.

Yuri didn't bother to hide his scowl. "What else have you got?"

Filip Pavlovich shrugged. "There is a report on something called 'macadam style road construction.' We haven't finished translating it yet. It seems to make for good roads that handle the winter freezing well."

New roads and canals would make trade easier and safer. Boris didn't concern himself with the other blocks on trade; they were above his pay grade.

Boris smiled, as Filip Pavlovich explained. "We used the road out front to practice road work, then we used this to test its use in digging canals."

"Canals?" Boris heard the apprehension in Yuri's voice though Filip Pavlovich apparently missed it.

"The scraper works by scraping a thin layer of soil then putting it somewhere else. By going over the same stretch again and again you can go a little deeper with every pass. " Filip Pavlovich waved at the trench. "Roads, leach fields, canals, even cellars. Anything where large amounts of earth need to be moved."

The underchief of roads gave his cousin a sharp look, which Filip Pavlovich appeared totally unaware of. The bureau of canals and river transport was constantly in competition with roads for resources of all sorts. The families that controlled the bureaus disliked each other intensely.*The bidding war has begun* Boris thought.

* * *

Two years before, the pages of books in the Ring of Fire had started flapping like butterfly wings. Now storms were brewing in far away Moscow. Economic storms, technical storms . . . to be followed, perhaps, by political storms.

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FACT:

Radio in 1632, Part 3

by Rick Boatright

In our two previous discussions of telecommunications in the 1632 series, we focused on radio communications uniquely available to up-timers ("Radio in the 1632 Universe,"*Grantville Gazette,* Volume One) , and to wired communications ("So You Want to do Telecommunications in 1633," *Grantville Gazette,* Volume Two). In this article we will discuss radio options available to down-timers both for transmitters and receivers. This will require a brief discussion of radio theory, which we will restrict to no more than one equation.

As discussed in*Grantville Gazette* , Volume One, up-timers are generously supplied with radio equipment. Various categories include CB radios, FRS handhelds, commercial FM radios for utility and police work, ham radios in a variety of bands and "down-time built from up-time parts" radios including the transmitter for the Voice of America. As well, there are custom military and diplomatic "cw" radios.

Down-timers want radios for a variety of reasons; people anywhere near Grantville want to listen to the Voice of America radio station. Starting in early 1635, its sister station, the Voice of Luther in Magdeburg will go on the air. People, especially governments and military types further from Grantville, want the magic instantaneous communications over great distances that radio gives you.

How can they do either of those things without tubes, or transistors, or the other things we think of when we say "electronics"?

The magic word is "detector."

Take a telephone receiver. In a telephone circuit. current flows through the handset and is stronger or weaker according to the signal sent by the telephone transmitter. So the diaphragm in the receiver moves in and out, attracted to the electromagnet more or less depending on there being more or less electricity flowing through it.

If we have an antenna attached to a handset and then to ground, and we put the antenna near an AM radio transmitter, the transmitter makes its radio signal stronger or weaker, just like the telephone current is stronger or weaker in response to varying sounds. That radio energy is received by the antenna, passed through the receiver, and into the ground. We*ought* to be able to hear it. But we hear nothing . . . why? It's because the radio waves are going BACK AND FORTH, positive and negative, many, many thousands of times per second. The oscillations are so fast that the diaphragm of the receiver just sits there. Nothing happens.

We need a way to DETECT the RF currents. The first detectors used in commercial radios were called "coherers." Edward Branly developed the first workable ones. Imagine a glass tube filled with sharply cut nickel and silver shavings. Hook a battery and an earphone to the tube. The high resistance of the shavings prevents electricity from flowing through the tube, and you hear nothing. But, if we also hook the tube up to our antenna and ground, and there is a strong radio signal in the area, the electric field from the radio signal lowers the resistance of the shavings, and they conduct suddenly. You then hear a CLICK in

the earphone as electricity suddenly runs in. If you rig a small hammer to tap the tube when electricity runs through it, this re-arranges the shavings, and you hear another click as the current goes away. If the radio signal is turned on and off (as it is, when you're transmitting Morse code) then you hear a series of clicks in the ear piece each time the radio turns on. You also can listen to the clicking of the hammer against the glass tube (until it shatters.)

Tesla is famous for inventing a coherer which ROTATED instead of being hit with a hammer. This was considered a big step forward.

But coherers require strong signals, they can ONLY receive Morse code, and only that sent slowly enough to allow the coherer time to reset. For about ten years in the real world, they were the best we had. But they sucked, and everyone knew it.

What was needed was a way to keep the electricity from running through the earphone in BOTH DIRECTIONS. If you could cause the signal from the antenna to be "rectified" and only take the POSITIVE or the NEGATIVE half of the signal, the little pulses would "add up," each one pushing the diaphragm of the earphone a little further out instead of causing it to wiggle back and forth too fast to hear.

Many people attempted to make rectifiers. The most successful was a sharp platinum wire placed JUST BARELY into a pool of weak acid. When the electricity went one way, tiny bubbles formed insulating the tip, and when the electricity went the other way, the electricity would flow normally. It was fussy, and worked well only for wizards, required constant adjustment and so forth, but it did work. Then, in 1906 Greenleaf Whittier Pickard patented a solid state rectifying detector. Pickard (whose name is almost unknown in the real time line, and who deserves far more acclaim than he gets) discovered that a variety of materials—if prepared just right—would rectify a signal. They would conduct electricity easily in one direction while having a resistance hundreds or thousands of times higher in the other direction. Additional benefits included that the crystal detector had no moving parts, no liquids and no glass tube.

The situation down-time is similar to the situation in the US around 1920. In the autumn of 1920, in Pittsburgh, PA, station KDKA went on the air just in time to broadcast the Harding-Cox presidential election returns. In addition to reporting on special events, broadcasts to farmers of crop price reports were an important public service, in the early days of radio.

In 1921 factory-made radios were very expensive. Many of them cost more than $2,000 USD (in 2006 equivalent dollars), and less affluent families could not afford to have one. However, in 1922 the U.S. Bureau of Standards publication*Construction and Operation of a Simple Homemade Radio Receiving Outfit* showed how almost any family having a family member handy with simple tools could make a radio. It became an immediate best seller. More than any other system, this design was responsible for bringing radio to the general public.

Similarly, in 1632 the publication*How To Make and Use a Crystal Radio* will give anyone with sufficient patience everything they need to know to build a simple crystal radio receiver. The parts list which must be purchased is astonishingly short.

- A coil of very fine wire (for making the earphone), about 2 ounces.
- A very small magnet (for making the earphone)
- An iron nail
- A coil of larger wire for the tuning coil and antenna, about 1 pound.
- A piece of lead ore (galena) the size of your little fingernail (the crystal)

Locally sourced materials would include thread, glue, a disk of parchment for the earpiece drumhead, a

wooden cup, a board, and a coil form (toilet paper tube) wound from paper and glue to a size drawn in the printed instructions. (The traditional up-time forms are toilet paper rolls and oatmeal boxes. It is presumed that down-time hand-made toilet paper tubes will be fabricated.)

Home made earphones are possible, as demonstrated by thousands of hobbyists, but commercially prepared earphones especially sensitive piezo-electric sets will be available inexpensively quite early (See "Dr Phil's Aeolian Transformers" in*Grantville Gazette,* Volume Six).

The circuit's sensitivity and tuning ability is improved by the presence of a capacitor, which will require the purchase of a sheet of copper foil. Beyond that, mere careful measuring and careful assembly will almost certainly result in a working radio.

Purpose built coil forms, ceramic forms for wrapping toilet paper tubes, purpose built glass and ceramic antenna insulators, lightning arrestors, pass-through tubes for walls, and such will be available for purchase from electronics dealers soon after VOA goes on the air. But even the poorest village should be able to afford a single crystal radio, the cup forming the earpiece being passed from hand-to-hand as programs change.

Crystal sets as described have several disadvantages. The largest is that only a single person can listen at a time. Also, you can't rig multiple receivers to a single antenna, so a village wanting to have several people listen at once would end up with a forest of copper hanging over their heads.

The solution is an amplifier to make the weak signal strong enough to hear. There are several amplifier designs available which do not require tubes or transistors—which is good, since we don't have any to spare. They are all horrible compared to the cheapest single transistor amp, but they will allow a group of people in a quiet room to hear a radio at the same time.

The simplest amplifier is to place the earphone at the base of a trumpet. If you think about the classic Victrola record player with its flower-like horn, the weak thready sounds coming from the needle were transformed into a room-filling sound by expanding the waves in a hyperbolic horn. This can be done with any earphone and a properly built trumpet. The same company which makes record players will doubtless produce adaptors for earphones.

A more robust solution is the "telephonic amplifier." Take an earphone, glue a telephone microphone to it, and use a powerful battery to power the output into a telephone receiver. A stack of four telephone circuits like that can amplify a crystal radio eight to ten times, the final output going into a loudspeaker or into the base of a hyperbolic horn.

The best non-electronic down-time amp is the selenium photo-voltaic amp. Take a thin foil of selenium (which you will have to find, purify and stretch into thin foils. The more light that hits it, the less its resistance to electricity. Hook a battery and loudspeaker up to the selenium foil (Okay, it's not that simple but it can be made at home if you have selenium.) and then, use a mirror moved by your crystal earphone to focus more or less light on the selenium. A very substantial amplification is possible. Alexander Graham Bell first patented this as a "photophone."

So, almost immediately after the Ring of Fire, every village in the area has gotten a broadsheet with instructions about building a radio, there are radio companies making deluxe sets and amplifiers, and it is the rare tavern which doesn't AT LEAST have a "radio room" for listening to VOA and probably is trying to save up for a "Real Up Time Radio."

That takes care of the receiving part. What about transmitting?

Sadly, transmitting radio is MUCH harder than receiving it. To receive a signal you only have to catch that tiny, tiny bit of a signal that hits your antenna. Sure, your antenna may be 100 feet long strung from house to house, but still, all you're catching is that little itsy bit that hits your antenna. On the other hand, the transmitter had to fill*all of space* with that much power. Your itsy bit, your neighbors itsy bit, the bit over there by the horse corral that doesn't HAVE an antenna in it, the space down by the creek, and so on. You're catching a snowflake's worth of power, but the transmitter must create the snowstorm.

Also, we have to decide what KIND of transmitter we want. Do we need a transmitter to send voice and other sounds, or is it enough to tap out Morse code and send messages? Code transmitters are much easier than voice transmitters, and we'll talk about those first.

Consider a bell. You tap a bell with a hammer, and the bell "rings" for a while. The harder you tap, the louder the initial sound, and the longer the ringing lasts, but eventually the energy from the tap dissipates, partly by heating the bell, and partly by transferring energy to the air making sound. You can send Morse code by tapping a bell. The size of the bell controls the loudness and the pitch or note of the bell. A big bell is louder. A big bell sounds a lower note. You can raise and lower the note of a bell of a given size within limits by making the shell thicker or thinner, and by using stiffer or more flexible materials, but nothing you do is going to make a two inch bell sound like it is a three foot bell.

Radio waves, (and light) are waves with two parts. There is an "electric field" wave, and a "magnetic field" wave. They are related and create each other. When you wave a magnet over a coil of wire, it makes electricity move in the coil. If you move electricity through a coil, it makes a magnetic field. Radio waves are electric and magnetic waves creating and supporting each other as they travel through space. They oscillate up and down, back and forth, similar to sound waves in air. If you take a coil of wire (which you remember causes a magnetic field to be created when it has electricity running through it) and a capacitor—a device for storing electric fields—and hook them together, they form a "resonate circuit" which will ring, just like a bell rings when hit. If you put a pulse of electricity into the circuit, it goes round and round the coil, and makes a magnetic field, then it gets stored in the capacitor, and as the magnetic field collapses it causes another pulse going the other way which bleeds out the capacitor and charges it the other way. Bigger capacitors, and bigger coils change the resonate frequency of the circuit just as bigger walls and bigger diameters change the pitch of the bell. (If you're looking for an analogy for the stiffness of the material, I'm really stretching an analogy beyond all limits here, but you could think of the tightness or diameter of the coil as an equivalent and I wouldn't be upset. This is an analogy, all right? I'm not giving you equations, be happy.)

Back to the bell. If you graph the loudness of the bell after you hit it, the loudness decays away fast at first and then slower and slower . . . the graph tapers to a point, shaped sort of like a ski jump. Similarly if you hit a resonate circuit with an electric pulse, it rings with RF, tapering in a very similar shape. If you hook the circuit up to an antenna, the RF is sent out into space, just like the sound is sent from the bell. It's very loud at first, and then quickly (in much less than a second) the radio energy is used up in heating the coil and transmitting radio waves out into space.

Just like the bell, the harder we hit the circuit, the louder it rings (until we hit it hard enough to make it melt). So, to make a Morse code transmitter, we put up an antenna, we build a big, strong resonate circuit out of a coil and a capacitor, and we connect the coil to a powerful electric power source very briefly so that the circuit "rings" . . . we do that over and over, each "tap" of electricity making a ringing, and we can send Morse code by controlling the timing of the taps. More electricity corresponds to "harder taps."

I can hear it now. "What about the sparks? Don't you need sparks?" That would be "yes and no." The

function of the spark gap is to cause there to be a very high resistance in the circuit which allows the capacitor to charge. When the capacitor is charged "enough," the sparking voltage of the gap is reached, and the spark gap "sparks." This causes there to be a lower resistance in the circuit causing the capacitor to discharge. The discharge through the conducting spark takes the form of a damped oscillation, at the frequency determined by the resonant frequency of the circuit. If you could make a switch that did the same thing WITHOUT sparking, the system would still make radio waves. The spark gap acts as a voltage dependent switch. STOPPING the spark is as important as starting it. The eventual solution was a "rotary" spark gap that broke the spark by pulling the contacts apart as a central disk rotated, and then lined them up again as the disk rotated the next stud into line with an unmoving contact.

So, the parts list for our down-time Morse code transmitter is considerably longer than our crystal radio. We will need:

- An antenna cut for the frequency we want to transmit on.
- A coil wound from heavy wire with careful spacing, thick enough to be self-supporting in air because we don't want anything shorting out the coils.
- A large capacitor to match the coil. Stacks of glass interlayered with gold foil—or better, sheets of mica interlayered with gold foil.
- A large copper rod or copper plated iron rod driven into the ground.
- A source of electricity—a bank of the same type of batteries we use to run the telegraph will do. We will need a large number of batteries (perhaps as many as one hundred gallon sized batteries) to make a powerful signal.
- A "spark coil." This is a pair of coils wound around a common center. The first coil, which is attached to the batteries, has only a few loops (four or five). The second coil, attached to the circuit, has MANY loops, dozens certainly, so that our transmitting voltage is several thousand volts.
- A switch that turns the electricity to the coil on and off. Each pulse through the buzzer makes a pulse into the resonate circuit. A door-bell buzzer like arrangement is fine, but it must be scaled up to handle heavier currents.
- A Morse code key that allows us to turn the electricity to the buzzer on and off as we need to transmit.
- A rotary spark gap.
- A small electric or other motor to rotate the spark gap.

Everything must be very heavily constructed. The high voltages are dangerous and will eventually break down almost any insulation. If the capacitor breaks down, the entire device is likely to melt. Smaller units, with the same basic design can be made semi-portable, but to achieve any distance you need large currents and high voltages. The problem is that the spark transmitter spreads its power over a broad band of radio frequencies. A typical spark transmitter has an efficiency forty to one hundred times less than a modern CW transmitter, so a one-watt portable battery operated CW transmitter made by up-timers would be equivalent to a 100 watt massive spark station in terms of how far away it can be received. Spark stations handling multiple kilowatts of signal were very common prior to the development of tubes. In addition to all that, they are loud, dangerous and give off large quantities of ozone which can damage the operators lungs.

Also, spark stations use up bandwidth. Each one sends out a very wide signal so far fewer can "fit" in a given piece of spectrum.

There is one situation where this can be an advantage. If you are wanting to jam reception of an up-time signal, a spark transmitter close to the receiver can effectively "splatter" over the band and block the

transmission.

So, spark transmitters suck. But they suck LESS than pony express riders or building hundreds of miles of telegraph. They will be used, and "king spark" will have his day until down-time tubes come into production. Once that happens, just as it did up-time, spark will be legislated out of existence.

Of course, in addition to the other disadvantages, spark is only good for sending Morse code. No one is going to curl up by the fireside to listen to the evening news via Morse code. Reaching the mass audience requires transmitting voice. Spark transmitters just can't do that; we need something else.

There are two candidates for "something else": the Poulsen arc and the Fessenden/Alexanderson alternator.

To discuss the Poulsen arc, let's go back to Ol' Sparky. Remember how it works? We present a high voltage to the capacitor, it charges, eventually it is charged, the current rushes out of the capacitor through the spark and the circuit "rings." What if instead, we treated the spark a little differently? Instead of pulsing the current into the circuit, use a very high voltage DC current. As long as the capacitor is charging, there isn't enough voltage to spark the spark. But once the capacitor is charged, the spark goes, and the capacitor drains . . . but this lets the capacitor start charging again, which pulls voltage off the spark, and the spark stops. (Aside to the electronics types. No, I'm not going to talk about negative resistance and LC circuits.)

It is very easy to make a singing arc like that in audio frequencies, but when you try to re-design the system to run in radio frequencies, problems begin to appear. Residual ions stripped of the electrons by the high temperature of the arc "hang around" between the poles of the spark and make the stopping voltage unpredictable, as well as the starting voltage. So, as you try to increase the frequency, the spark's start and stop "jitters" and you can't get a reliable signal. Much above audio frequencies, it doesn't work.

In 1902, a Dane, Vlademar Poulsen realized that he could use a magnetic field to "sweep" the ions out of the way, and if he used a hydrogen atmosphere instead of air in the gap, the ions would be light and easy to remove. Poulsen was able to get his arc up into radio frequencies.

Poulsen arcs are big, messy, complicated devices with moving parts and plumbing. They require a constant supply of high voltage DC current produced by a big generator, generally run by an electric motor, which is ITSELF run by another generator which is run by a steam engine. They require a continuous supply of hydrogen gas (or you can use vaporized kerosene, but it isn't as good). They need large rotating graphite electrodes, water cooled copper electrodes, a bronze chamber to hold in the hydrogen around the arc, and big "sweeping" magnets around the bronze chamber to remove the offending ions. All this, to get a radio signal.

But how do you modulate it? How do you take the signal and make it talk? The most common solution was to put six carbon microphones between the arc and ground. Speaking into the mike would vary the resistance and that would change the amount of current flowing into the ground and into the antenna. If you want to play a recording instead of talking live, you will need to set a speaker in front of each microphone. Actually, that would probably be better for the announcer too, since it would allow him to be at a distance removed from the arc.

The other something else was developed in 1903 by a Canadian, Reginald Fessenden, working with an engineer from General Electric, Ernst Alexanderson. By 1916, Fessenden and Alexanderson had developed a mechanism which allowed reliable voice transmission across the Atlantic. How? Let's go back to first principles.

Take a coil of wire. Attach the coil to a meter. Nothing happens, the coil just sits there. Now, get a magnet. Stick the magnet into the coil. As the magnet goes in, the magnetic field of the magnet pushes on the electrons in the coil and they are shoved around the wire. The meter flicks to the right a little as long as the magnet is moving in.

Now, pull the magnet out. The magnetic field is pushing on the electrons the other way and they are shoved around the wire in the opposite direction, and the meter flicks to the left. It you put the magnet just outside the coil, and wave it from side to side, the same thing happens, as you get closer to the coil, the meter flicks right, as you get further away, the meter flicks left. If the magnet sits still, no matter how big the coil, no matter how strong the magnet, nothing happens. The magnetic field, and the electrons, just sit there.

Now . . . you can make electro-magnets much stronger than any permanent magnet. So, if you replace the bar magnet with an electromagnet, you can make BIG pulses of electricity. This is what is done in an alternator. There is a spinning coil, and a static coil and as they spin the electricity pulses back and forth. Neato! If we could spin them fast enough, we would get radio waves The problem is, the LOWEST frequency radio waves that work well for voice are at 100,000 cycles per second. If you think about trying to spin a large coil of wire 100,000 times per second, you'll realize just how hard it would be. High power router motors spin as fast as 24,000 RPM, but that's only 4000 revolutions per second. If the router motor is 3 inches across, the outer edge is moving at 214 miles per hour, and is experiencing a pull of 513 times the force of gravity.

Take that same motor, and try to use it as an alternator, and spin it up to 100,000 revolutions per second, and the outer edge is moving 5300 miles per hour (far above earth escape velocity, much faster than a speeding bullet) and the outer edge of the coil is being pulled with 321,000 times the force of gravity. The wire will simply fly apart long before. The fastest spinning man-made object (a carving tool similar to a dentists drill) turns at 450,000 rpm, or 7500 revolutions per second, thirteen times slower than we need for radio. The router WOULD give us reasonable power, since it handles 5 hp, around 3700 watts. But it just won't work.

What to do?

Let's go back to our two coils. One is a powerful electromagnet, with a DC current running through it. The other is a coil. They're just sitting there. Nothing happens. Now, place a hunk of iron between the magnet and the coil. As the iron comes into the field, the field seen by the coil decreases, and the meter flicks left. As the iron is pulled out, the field increases, and the meter flicks right. Cool! Of course, we have to build a strong, strong mechanism to spin the iron into and out of the field, and we have to cool it, since passing in and out of a magnetic field like that will heat metal like crazy. But still, we can spin a hunk of iron instead of spinning delicate coils and wires. Cool!

(I am oversimplifying here. Don't shoot me.) Take a big strong iron disk. Drill a series of holes around the edge and fill them with bronze. Now place the disk so that the bronze holes are lined up in the space between the magnet at the coil. Spin the disk. As the bronze window comes between the coil and the magnet, magnetic fields "get through." As the bronze window moves away, the iron interferes with the magnetic field, and the magnetic field "does not get through." We now have an alternator in which the coil and the magnet do not move. The disk can be built VERY strong, encased in vacuum and water cooled by pipes running through the center. Take a disk 4 feet across, put windows every half inch around the edge and you have 300 windows. Rotate the disk 330 times per second or 20,000 rpm, and you'll get 100,000 waves per second of RF power.

This isn't EASY, but it turns out to be within the ability of 1902 mechanical engineering. (Well, not really, they spun it one fourth that fast and used two frequency doublers. But you really don't want to know about frequency doublers.)

Use multiple pairs of magnets and coils spaced equally around the disk to increase your power.

Modulate it the same way you did the Poulsen arc, with six microphones in series between the transmitter and ground.

The Fessenden/Alexanderson alternator was the mechanism for radiotelephone prior to the invention of tubes. One working station remains in service in 2006 in Sweden. It has been named as a world heritage site and is run on special anniversaries.

So, there you have it, radio for everyone else. At least until the research teams manage to start building tubes again. But that, as they say, is another story.

References:

I could give you a long list of reference sites, but frankly the easiest is simply to visit Wikipedia at http://www.wikipedia.com and search for crystal radio, Poulsen arc, and Fessenden. The explanations there are good, and their reference links are constantly updated to working sites.

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The Sound of Mica

by Iver P. Cooper

It is the year 1634, and the Voice of America is on the air. Since the VOA is an AM (amplitude modulation) radio station, speech and music are encoded as fluctuations in the amplitude (intensity) of a radio-frequency carrier wave. The radio waves, emanating from the Great Stone Radio Tower, spread across the German countryside, and enter the long receiving antennae of hundreds, perhaps thousands, of makeshift crystal radio sets.

There, they set the free electrons of the antenna into motion, dancing back and forth in response to the reversals of the electromagnetic field. That is an alternating current, and it is "rectified" into a direct current (flowing in one direction only) by a device called a diode. It is the crystal, probably a galena (lead sulphide) crystal, which serves as the diode.

A capacitor (a device stores and discharges electrical energy) filters out the carrier signal, passing only the electrically encoded audio signal. Finally, an earphone transduces that signal into sound.

The Voice of America is not the only broadcaster, and if you want to hear it, and not the Voice of Luther, you need a tuning circuit. The tuning circuit has both an inductor (a coil) and a second capacitor. (At least one of these must be variable for tuning to be possible.)

Capacitors (also called "condensers") are one of the most basic of electronic components. Their most fundamental electrical characteristic is their capacitance (ability to store electrical energy).

So how do you make a capacitor? The simplest one consists of two parallel conductive plates, and an intervening "dielectric." You can actually use a stack of plates, not just two, but the conductive and dielectric layers will alternate. One wire will be connected to the "odd-numbered" plates, and a second wire to the "even-numbered" ones.

It turns out that mica is probably the best dielectric material which is likely to be available in the years immediately following the Ring of Fire (RoF).

* * *

The Great Stone Radio Tower was built to trick the other European powers into thinking that long-distance radio requires massive antennas. ("Radio in the 1632 Universe,*Grantville Gazette,* Volume One). This bit of*maskirovka* was successful for only a limited time. By March 1634, the Cavrianis had figured out that the Venetian Embassy was in radio contact with Grantville. (*1634: The Galileo Affair,*Chap. 27). It is only a matter of time before the French and other governments realize the American capabilities, if only by inference from the celerity with which the USE acts.

Those powers will quickly appreciate the advantages which would accrue to them if they, too, had radio communications for diplomatic and military purposes. We can expect that collecting information on electronics in general, and radios in particular, is going to be a fairly high priority for the multitude of spies in Grantville and Magdeburg.

The knowledge of how to build crystal radio receivers is being widely disseminated ("Waves of Change,"*Granville Gazette,* Volume Nine), so the focus will be on finding out how to build suitable transmitters. Details appear in another article in this issue ("Radio 3:*Grantville Gazette,* Volume Nine), but the simplest transmitter would be of the "spark gap" type. This can send Morse code, but not music or speech.

Now it turns out that any spark gap transmitter will need at least one capacitor that can handle high voltages. To survive the high voltages, the capacitors*must* use mica as the dielectric.

Mica is less critical insofar as receiver capacitors are concerned, but a receiver employing mica will have greater sensitivity than one using an alternative dielectric. That is important if you are on the fringe of the broadcast area.

* * *

While spark gap transmitters will initially be used by foreign governments, it is only a matter of time before the knowledge of how to make them is passed on to others, such as merchants. The Cavrianis used the American radio to advantage in the futures market, and their counterparts will be quick to perceive the benefits of acquiring their own radio capabilities.

* * *

As the ability to receive a radio broadcast spreads, other political groups—some hostile to the USE—will want to make sure that they can speak to the radio audience. And there will be other broadcasters, whose interests are economic rather than political.

To actually "speak," you need a radio transmitter which can simulate a continuous wave. The Voice of America's transmitter is a rebuilt, high-powered, "ham" radio outfit, while the Voice of Luther will broadcast from a "Fessenden Alternator" constructed with down-time materials ("Radio in the 1632 Universe,"*Grantville Gazette,* Volume One). I assume that the Fessenden Alternator will initially be beyond the capacity of down-timers lacking direct USE technical assistance.

The most likely alternative would be a variation on the Poulsen arc transmitter, which combined an arc lamp, a coil, and a capacitor. Like the capacitor of the spark gap transmitter, this one needs to endure high voltages.

* * *

Of course, some folks won't want to broadcast themselves, but will be keen on jamming the transmissions of others. Capacitors can be used in radio jammers, too. ("Little Jammer Boys,"*Grantville Gazette,* Volume Nine).

* * *

It is time now to take a closer look at why mica is so desirable for capacitor construction. Mica, to begin with, is an insulator. All insulators can be used as dielectrics, but they differ in terms of their ability, per unit thickness, to separate charges (and thereby store energy). The measure of that ability is the dielectric constant. The dielectric constant of mica is about 4–9; of common materials, only glass is superior (about 5–10).

Another important characteristic is dielectric strength. If too great a voltage is applied across the plates of a capacitor, the current will force its way through (this is called "breakdown") and may arc-weld the plates together. Higher voltages can be tolerated if the dielectric layer is made thicker, but that reduces capacitance. Hence, high voltage capacitors are usually made of materials with a high dielectric strength (a measure of the ability of a material, per unit thickness, to resist arcing).

Mica has superior dielectric strength (5,000 kV/inch, versus 2,000–3,000 for glass). So a thin mica capacitor can resist a high voltage. Having a high dielectric strength is particularly important if you are constructing a transmitter capacitor.

When a voltage is applied to a capacitor, charges build up on the plates, but some of the electrical energy is lost as heat. Ideally, the capacitor has a low dissipation factor. The dissipation factor for mica is .0003–.0004 for mica, versus .01–.05 for soda lime glass. (Eccosorb)

Thermal stability (how much does the capacitance change if the temperature changes?) is also of interest if the capacitor is being used outdoors or in unusual environments. For mica, "Capacitance will change only -2% at -54°C, and to +3% at +125°C. " (McCloskey)

Mica has other great properties, too. It splits readily into very thin, flat sheets, which are flexible, heat-resistant, chemically inert, and, in some cases, transparent. The latter property led to its use in house windows in Russia ("muscovy glass") and in oven windows in the United States ("isinglass").

Jason Cole of the University of Waterloo writes, "When it comes to modern technology, sheet muscovite

is an indispensable resource. It is used in almost every electronic device sold today as an insulator. Its high resistance to the passage of electricity and heat are so great that no substitute, artificial or natural, have proved to be economically suitable to replace it. No other mineral has better cleavage, flexibility or elasticity. It is possible to roll a sheet of muscovite less than 0.1mm thick into a cylinder 6mm thick and its elasticity would enable the sheet to flatten out again quite easily. Sheet mica is just as important to the electrical and electronic industries as copper wire and now ranks as one of the essential minerals of modern life."

Mica

So what is mica, exactly? It is a group of aluminum silicate minerals. The two most important species for the electronics market are muscovite mica and phlogopite mica.

Muscovite micas are divided into the ruby and green varieties, based on color. The term "ruby muscovite" includes the clear forms.

Phlogopite micas are "rarely found as colorless transparent sheets"; they are sometimes called "amber" micas. Rouse (352) says that they can't be used for capacitors because their power loss is usually over 1%, whereas the maximum permissible losss is 0.04%. They tended to be used in OTL mostly for high-temperature applications. Cole says that "Muscovite mica cannot be used in temperatures that exceed 550 degrees Celsius, whereas, phlogopite can be utilized at temperatures up to 1000 degrees Celsius."

* * *

Commercially, mica is classified according to its thickness, size and appearance. (Paramount; Rouse, 340–1)

The term "block mica" tends to refer to large, thick pieces (at least 7 mils, one mil is one-thousand of an inch) which can be split and trimmed into useable sheets.

Sheet mica is at least 1 1/2 by 2 inches in size, and thinner (say, 1–7 mils) than a block. The thinner sheets, if of high quality, are sometimes referred to as "film."

The term "splittings" refers to pieces which are smaller than the smallest standard sheet, but at least 0.75 square inches in area. They are usually thin, too, perhaps 1–2 mils. Below that size we have waste or scrap mica, sometimes divided into flake mica and mica powder.

It is possible to assemble splittings into what is called "built-up" mica. Also, mica flakes and powder can be be used to make "reconstituted" mica ("micanite").

Micanite was invented in 1892 (Rajgartha, 4). Micanite is described in EB1911 as consisting of "small sheets of mica cemented with shellac or other insulating cement on cloth or paper." That is probably a sufficient description for the up-timers to duplicate it, if need be.

Paramount says that "the dielectric material used in the production of mica paper capacitors is reconstituted mica paper that is impregnated with a polymer resin." Nonetheless, the preferred material for capacitor dielectrics is certainly sheet mica. Chowdhury (257) says that "the highest quality mica, absolutely flawless, is required for radio and wireless purposes." (See also Rouse, 343). And Rouse

(376) says that "the power loss shown by the bentonite films [for built-up mica] . . . is too high for them to be used in condensers . . ."

* * *

The quality rating of mica seems to have gone through many changes. Depending on which references you consult, there are anywhere from twelve to twenty possible rankings. The ASTM presently uses twelve (V-1 to V-7, V-7A, then V-8 to V-10A), which range from "clear" to "densely black and red stained. " I would expect, based on another source, that only V-1, V-2 ("clear and slightly stained"), V-3 ("fair stained") and V-4 ("good stained") are considered "capacitor grade. " (Misc. Diel.) http://my.execpc.com/~endlr/misc__dielectrics.html

We may be less picky in 1632, of course. Especially for receiver capacitors (USGS). The lesser grades of mica can, of course, be used as insulators, and that is a major use of micanite.

Mica Sources Reported in USE Reference Materials

As is too often the case for raw materials needed by the USE, the best known, most prolific sources of sheet mica are far away. We may have to pass through enemy spheres of influence to reach them; they may even be under enemy control.

So where do the encyclopedias direct us? EB1911 "Mica" says that muscovite sheets are found in India, the United States (South Dakota, Colorado and Alabama), and Brazil (Goyas, Bahia and Minas Gerais), and phlogopite in Canada and Ceylon.

The other Grantville encyclopedias don't distinguish between muscovite and phlogopite. The sources they list are:

Encyclopedia Americana: India, Madagascar, Brazil, USA (New Hampshire, North Carolina, South Dakota)

World Book Encyclopedia: India, Brazil, Madagascar, USA (North Carolina, New Mexico, South Dakota)

Modern*Encyclopedia Britannica* : India, South Africa, Soviet Union, Brazil, Argentina, Canada, Madagascar, USA (North Carolina, Idaho, South Dakota)

*Collier's Encyclopedia*notes that "the United States is the largest producer of bulk mica, but the greater part of the capacitor grade mica is mined in India." It adds that two-thirds of the American production was mined in North Carolina.

The encyclopedias provide no quantitative information. However, for the sake of the story writers, I will give a few numbers. The leaders in sheet mica production in the period 1913–1937, ignoring the secretive Soviet Union, were India (236,916,000 pounds, 74.6% of world production), United States (10.1%), Canada (4.8%), Madagascar (3.6%), Argentina (3.5%), Brazil (1.9%), and Rhodesia (1.4%). (Rouse, 349) In 2000, the largest producers were India (3,500 metric tons) and Russia (1,500)(USGS).

* * *

Prospectors are not, of course, limited to the known mica locations. However, without some kind of lead, the discovery of mica will be quite chancy.

Russian Mica

Russia, of course, has mica: the term "muscovite" is something of a giveaway. According to the Oxford English Dictionary, the term "Muscovy glass" was used in English to denote sheet mica at least as early as 1573. In 1604, J. Marston made reference to the ease with which thin sheets could be split off a mica "book" ("She were an excellent Lady, but that her face peeleth like Muscovy glass.") Hooke's *Micrographica* (1665) refers to the unusual optical properties of thin sheets of "Muscovy glass" (sheet mica from Russia).

What practical use was made of it? Mica sheets could serve as the clear but heat resistant panes of a lantern. T. Dekker, in 1606, referred to "a candle in a Muscovy lanthorn." They could also be used in more conventional windows. K. Digby noted in 1644 that the windows of his cabin were made of Muscovy glass.

It is clear from the foregoing that, by 1632, mica had been discovered in Russia, and exported to other countries. I don't have any economic data for the early seventeenth century, but in 1681, Russia exported 92,882 pounds of mica to Holland, 86,400 to England, and 18,000 to North America. (Chowdhury, 178). I have no idea what percentage of this was sheet mica, but the most likely use of the mica was in windows, and that would have required transparent (or translucent) sheets.

The Russians used it mostly as an "upscale" window material. In the late 1660s, Tsar Alexei Mikhailovitch had a summer palace built at Kolomenskoe, near Moscow. It had 3,000 mica windows.

Where does the Russian mica come from? The*Hammond Citation World Atlas* , which most likely made it through the RoF, contains an economic map of Russia and, lo and behold, identifies mica localities. I pity whoever goes to the Atlas' European Russian site; it is a little west of the far northern town of Kandalaksha, in Karelia. There are four mica localities shown to exist in Asiatic Russia, two of which are in the general vicinity of Irkutsk.

Fortunately, we don't have to find the mica ourselves, we just have to trade for it.

Indian (and Ceylonese) Mica

The encyclopedias consider India to be the premiere world source of muscovite sheet mica, so it is reasonable to consider it more closely.

According to Brown (541), "the date of the commencement of mica mining in India is lost in antiquity." However, it is unclear which of the current mica fields were known in the early seventeenth century.

Of course, we can give our Indian trading contacts some hint as to where to look, if need be. EB1911 says that mica is mined in Haziribagh (Bengal) and Nellore (Madras), and a prominent Nellore mine is "Inikurti."

I have also studied the economic map of India in the Hammond Citation World Atlas. To avoid inadvertent bias, I compiled my list of mica localities from the Atlas*before* examining even the encyclopedias, let alone any of the professional geological texts. I would estimate that the Atlas can be used to localize mica sites with an accuracy of perhaps 25–50 miles. The greatest is in Bihar, close to Hazaribagh. A second is also in Bihar, at the same longitude as Asansol, but north of the Ganges River. Monghyr, on the south bank, is nearby. The third is in Andhra Pradesh, near Nellore. That is all that the up-timers will know.

The USGS says that in India, "mica mines are operated in the States of Bihar, Andhra Pradesh, and Rajasthan. In Rajasthan, the principal mines are at Banjari, Barla, Bhojpura, Chapi, Galwa, Ganeshpur, Ghegas, Laxmi, and Sidiras. " An Indian government report says, "the main mica-sites in Andhra Pradesh are found at Atmakur, Ravuru and Gudur of Nellore district. Large deposits of Mica are also found at Tiruvuru in Krishna District, Madhira [Khammam District], and Ankannagudem of West Godavari, all in AP. " (MMPIndia)

* * *

The importation of mica sheets from India will be much easier if, by the early seventeenth century, it was already an article of commerce, something our traders could just ask for. Gathering information on this issue has been something of an exercise in frustration.

Mica (Hindustani*abrak* , from*abr* cloud or*abru* the heavens) was used in ancient Indian medicine. The medical use of mica was probably of mica powder. Those who sell the medicines, or even the powders, may not know how to obtain the mica sheets. So it would be better to identify trade goods in which the mica sheets are used in intact form.

The mineral supposedly has been employed "from time immemorial, for ornaments, decorations and glazing, as well as by artists for their transparent paintings. It finds a place in the tinsel decorations of banners, taziahs and umbrellas at festivals and weddings. Its powder is sprinkled on clothes, fans and toys, as well as being incorporated in the glazes of some forms of pottery. . . ." (Brown, 541). Chowdhury (6) says that the "early" use of mica was in medicines, ornaments and vestries for idols, decorating, glazing or transparent mediums, and as a painting base (ground).

Like Brown and Chowdhury, EB1911 notes that sheets of mica have been used in India as a surface for painting. However, I believe that this began only after India came under British rule. (Swaveda, Chennai). A computer search in the Minassian Collection of Persian, Mughal and Indian Miniature Paintings turned up six mica paintings, all of which were dated as "Company School." Likewise, Swallow, Arts of India: 1550–1900 refers only to "Company" paintings on mica, not to Mughal works of this type.

Still, Swallow offers some hope. He claims that mica was "originally used for festive lamps and the illuminated windows of the*taziyas* , elaborate model tombs carried by Muslims in the Muharram festival processions. . . ." One of his sources (Skelton) says that according to a contemporary account, "artists were employed to paint sheets of mica for the festival lamps at Murshidabad in the reign of Murshid Quli Khan." Murshid was the nawab of Bengal 1706–1725.

I think it is reasonably likely that mica was known to Indian merchants of our period, especially those familiar with the Bengalese towns of Trichinopoly, Patna, Murshidabad and Benares.

* * *

While India is known for muscovite mica, Ceylon is a source of phlogopite. "In Ceylon, the mineral forms irregular veins, rarely exceeding one or two feet in width, traversing granulite, especially near the contact of this rock with crystalline limestone." (EB1911, "Phlogopite") Unfortunately, the Hammond Atlas doesn't reveal the location of the Ceylonese deposits.

New World Mica

In the United States, we can find mica in several states. Mica resources are identified on the Hammond Atlas economic maps for Alabama, Colorado, Connecticut, Georgia, Maine, New Hampshire, North Carolina, South Carolina, and South Dakota. There was low-level collection and trading of mica by the American Indians in pre-colonial times. For example, North Carolina sheet mica, cut into the shape of a hand, was found at Hopewell site in Ohio. The artifact is from AD 1–400.

However, to acquire significant supplies of mica, we would have to rediscover the OTL sites and mine the mica ourselves.

* * *

The EB1911 article on "Phlogopite" adds that "in Canada it occurs with apatite in pyroxene rocks which are intrusive in Laurentian gneisses and crystalline limestones, the principal mining district being in Ottawa county in Quebec and near Burgess in Lanark county, Ontario." The Hammond Atlas map for Quebec shows mica west of Montreal and north of Ottawa.

* * *

In South America, Brazil and Argentina are both mentioned by the encyclopedias. According to the Hammond Atlas, in Brazil it is found northeast of Rio de Janeiro and Belo Horizonte. It doesn't map out the Argentine sites.

African Mica

Madagascar is famous nowadays as a source of phlogopite mica. Despite Rouse's criticism of phlogopite as susceptible to high power loss, if we can't obtain muscovite mica in quantity, we might need to make do with phlogopite.

According to the Atlas, the Madagascaran mica is near Faradofay (Fort Dauphin), in the southeast. I suspect, from the lack of any reference to it in EB1911, that it was not discovered until later in the twentieth century. If so, then the only way to obtain Madagascar mica is probably to send prospectors and, once they are successful, set up a mining operation.

As of 1632, there was no major European presence in Madagascar; there may be scattered missionaries. Control of the island is divided among several small kingdoms.

* * *

There are three mainland African mica sites: near Louis Trichardt in the Northern Transvaal (South Africa), in Tanzania, south of Lake Rukwa, and in Zambia, south of Chipata. The first of these is probably the one contemplated by the modern EB.

Australian Mica

Close study of the Hammond Atlas would reveal that there is mica in the area north of Alice Springs, Australia. Since that is in the hostile Australian Outback, it is unlikely to be investigated (except perhaps as a sideline to gold prospecting somewhat further north).

Mica in Friendly Territory

So is there mica in friendly territory, that is, in USE-controlled Germany, Sweden, Finland, and the Swedish-controlled Baltic coast? Not to the knowledge of the people in Grantville. Sadly, the atlas offers no clues as to the whereabouts of mica occurrences in Europe, other than in Russia.

But yes, there are modest mica deposits in those areas. Rockhound databases (Mindat) can provide a long list of German, Swedish and Finnish localities where muscovite mica can be found. That, of course, doesn't guarantee that sheet mica can be extracted in a commercially feasible manner.

Just so the storytellers of the 1632 universe know where mica could in fact be found, I have consulted some specialist up-time texts. The results appear below.

* * *

Germany. Chowdhury (183) asserts that Germany produces lithia mica (lepidolite) but no sheet mica. And Rajgartha (104) confirms that there is no "primary production" in West Germany. A 1945 U.S. government report agrees that there is no German mica production. ("Non-Metallic Mineral Resources of Germany," p. 27).

That said, you might find a small "book" of mica here and there. Hochleitner,*Minerals: Identifying, Classifying, and Collecting Them* has a photo (150) of a nice little muscovite specimen from Bavaria. Its sheets look like they would work fine for a receiver capacitor.

However, even if sheet mica can't be mined in Germany, there is some evidence of early modern use of it there. Rajgartha (3) says that "very small quantities [of mica] were employed by the toymakers of Nuremberg to serve instead of glass, and the waste flakes of mica were sprinkled over carpets and draperies, which were regarded as fashionable when thus decorated. Mica strips were used for mounting microscopic objects and also for sealing zoological objects preserved in spirits." Any early seventeenth-century German use of mica was*probably* of Russian material, but it is within the realm of possibility that local specimens played a role.

* * *

Finland. The USGS reports that Finland produced 5,591 metric tons of mica in 1994. Rajgartha (93) says that muscovite mica is produced from Kemjawi as a byproduct of feldspar mining, and phlogopite at

Siilinjarvi from an apatite mine.

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Sweden. The USGS adds that Sweden is "known to produce mica." Chowdhury says that Sweden produces mica at Gotenborg, and from the Bohuslan district, and that the United States imported 924 pounds from Sweden in 1928. Rouse (357) says that Swedish annual production is in the 50,000 to 250,000 pound range.

Skow (56) claims that Sweden produces virtually no high quality sheet mica. I think that Skow is sadly mistaken. According to Bowie, while the mica in the pegmatite dikes of central Sweden is "generally of a poor quality" (135), the same cannot be said of all of the Swedish deposits. At Essljung in southern Sweden, "high quality transparent muscovite occurs in large flakes and has been extracted." (142) At Brattas, over the period 1885–1994, 132 tons of muscovite was mined (together with 35,000 tons of feldspar and 19,500 tons of quartz). Munkeby also has "abundant muscovite of high quality," and 215 tons of good quality mica was mined there 1942–44.

Perhaps the most spectacular Swedish mica find was in Northern Jamtland, where a "book" of mica was uncovered which was 55 by 85 centimeters (21.7 by 33.5 inches) in surface area, and 18 centimeters (7 inches) thick. (Bowie, 195).

Until USE-trained geologists map the pegmatite fields of Sweden, the USE and Sweden will presumably import muscovite mica from Russia, or possibly, India.

Mica for Our Enemies

As of 1633, the USE was at war with France, Denmark, Spain, the Holy Roman Empire, and England.

* * *

France. Several up-time sources, not available in Grantville, reveal that modern France is a producer of mica. Newman says that France produced 10,000 metric tons of mica annually in 1998–2000, as a byproduct of kaolin mining in Brittany (at Lanvrian and Kerbrient). Even higher numbers are quoted by Euromines for 2000–2002, the figure including "mica recovered from mica schists and/or kaolin beneficiation." Madhukar says that the French kaolin ore is 10% muscovite mica. What isn't clear is what percentage of the muscovite qualifies as sheet mica. It doesn't much matter, since any French knowledge of domestic mica locations would be purely fortuitous.

But that isn't going to stop Richelieu, if he really wants mica. Under the Treaty of Ostend, France was given England's North American colonies, from "Plymouth Rock" to "Jamestown" (*1633*, Chap. 23). And it sent over a thousand soldiers to the New World, no doubt to make sure that they take control of New Netherlands (New York), too. So, while mica is not one of their principal economic concerns, they certainly can send expeditions to look for it, most likely in Alabama, Connecticut, Georgia, Maine, New Hampshire, North Carolina, or South Carolina.

Actually, there is mica in Virginia (in the pegmatites of Amelia County); this is referred to in the Audubon Society field guide.

* * *

Spain. Bowie says that Spain produced 3,000–5,000 tons of mica annually in 1977–81. There is no

reference to this production in the documented sources.

Hence, the Spanish are most likely to rely on New World sources. Because of the union of Portugal and Spain, the Spanish can develop the Brazilian deposits . . . once they find them. Moreover, the Spanish have certainly seen mica mirrors, and other mica artifacts, in the Americas.

The Olmecs used mica mirrors as early as 1600 B.C.E. (Hoopes). A Mayan king, buried about 350 C.E., was found with an apron of mica mirrors (Hofstetter). At one site in Aztec Teotihuacan, believed have belonged to a jeweler, over half the soil samples contained imported mica (Storey). The trade routes which brought mica to Mexico should still exist, and the Spanish can exploit them.

* * *

Austria. Chowdhury (183) states that there are "extensive mica deposits . . . in Styria and Corinthia in Austria." Madhukar (90) acknowledges the point, but warns that the muscovite is of "very poor quality." It is thus most likely that the Austrians will obtain sheet mica by trade with the Russians.

* * *

Denmark. Eventually, the Danes may obtain mica from Norway. Chowdhury (183) says that there is a pegmatite dike, one hundred feet thick, near Skatterlund, which produces sheet mica. Skow (55) agrees that Norway has small quantities of good quality sheet mica. Of course, the Norwegian sources have yet to be discovered by the down-timers, and the up-timers have no inkling that they exist. In the near term, the Danes are likely to go buy what they need from Moscow.

* * *

England. The English clearly have imported "Muscovy glass" in the past, and are likely to continue to do so in the new future.

Prospecting for Mica

All that the up-timers (or down-timers) know about where to find mica is what is in the encyclopedias or the Hammond Atlas. Nonetheless, they are not without resources.

First of all, there are definitely specimens of mica in rock and mineral collections. The schools will have them to support earth science instruction, and there are certainly a few rockhounds in Grantville, too. That means that we can show down-time merchants and miners exactly what we are looking for. There are also several field guides documented as existing in Grantville (Mannington), with nice color photographs and additional description of both muscovite and phlogopite.

Secondly, the Grantville encyclopedias clearly indicate that muscovite micas occur in pegmatites. EB1911, for example, says that "large sheets of muscovite . . . are found only in the very coarsely crystallized pegmatite veins traversing granite, gneiss or mica-schist."

Popular rockhounding field guides, several of which are available in Grantville, agree. According to the *Audubon Society Field Guide to North American Rocks and Minerals* , "good muscovite mica specimens are restricted to granitic pegmatites." Pegmatites are light-colored, coarse-grained igneous rocks, and they, too, are going to be found in those rock collections and field guides.

Now, pegmatites are famous as hunting grounds for large crystals. If those crystals have certain other

properties, like hardness, then we have another name for them: gems. So we may be able to find a likely mica locality on the basis of mica's association with something the down-timers are more interested in, that is, a gemstone. EB1911 says that the pegmatite "veins consist of felspar, quartz and mica, often with smaller amounts of other crystallized minerals, such as tourmaline, beryl and garnet." The Audubon Society guide mentions associations with quartz and tourmaline. The entry on "granitic pegmatites" has a long list of minerals, which includes beryl, opal, topaz and zircon.

Brown's specialist book on Indian minerals says that "the beryls of the mica-bearing pegmatites of India, in which they often attain huge dimensions, are too fissured and flawed and of too washed-out a colour to be of any value in the gem trade." (598) Still, I would expect that jewel merchants would know something of these giant beryls, assuming that they had in fact been mined at this time.

Beryl is of interest in its own right as a source of beryllium, and Brown indicates that the productive beryl deposits in India are the pegmatites of Rajsthan, Bihar and Andhra, and that it is "recoverable in small amounts as a by-product of mica mining, particularly from the Koderma Forest area of Hazaribagh and the mica mines around Gudur in Nellore." (268–9)

Chrysoberyl is also of interest; Brown says that "transparent yellow stones of good quality occur with beryl in mica-bearing pegmatites at Govindsagar, Kisangarh, Rajasthan." (603).

Another association is with aquamarine (a gem variety of beryl); "some beautiful aquamarines have come from the mica mines, 1 1/2 miles west of Saidapuram, Nellore." (Brown, 598)

Phlogopite micas are found in marbles, and hence it may be productive to question sculptors, and check out the marble localities in the Hammond Atlas. In OTL, the main commercial sources of phlogopite were Madagascar and Canada. (Brown)

Mica Mining and Processing

Mica is split into sheets, trimmed, and sorted, almost entirely manually. Splitting is done with a knife. Twentieth century attempts to make machines which could split mica "books" into sheets of specified thickness were unsuccessful. Trimming and sorting are even less suitable for automation, as they require judgment. It is a good thing that the up-timers are now in a world in which labor is inexpensive! Trimming can be done by finger pressure, or with a knife. (Rouse 244–5).

Mica Mine Productivity

The larger the sheet, and the higher the quality, the rarer it is. At one Indian mine, the workers extracted 123,200 pounds of rock daily, of which 7,500 pounds (6%) was "rough mica." Preliminary sorting reduced this to 5,000 pounds. Splitting and trimming yielded just 1,000 pounds of unsorted sheet. During sorting, some additional trimming had to be done to take out flaws, leaving 932 pounds. (Rouse, 354)

The grade distribution of these sheets was 38.5 pounds clear, 90.95 pounds slightly stained, 26.85 pounds fair stained, and 775 pounds stained. The size distribution was 0.2 pounds of Special (36–48 square inches), 1.3 of No. 1(24–36), 3.9 of No. 2(15–24), 15 of No. 3 (10–15), 30.4 of No. 4 (6–10), 100 of No. 5 (3–6), 61.6 of No. 5 1/2 (2.5–3), and 720 of No. 6 (1–2.5).

Suppose that for a transmitter capacitor, you want sheets 24 square inches or larger, and of quality better than stained. The daily output of such material from that Indian mine was just 0.9 pounds: less than one part in one hundred thousand of the total rock excavated.

USE Mica Demand

In general, for a transmitter capacitor, you will need higher capacitances than for a receiver capacitor. To achieve a high capacitance, you want the dielectric to be as thin a sheet as its dielectric strength permits, and you want to maximize the effective cross section (the surface area of one flat dielectric sheet, times the number of those sheets). A typical thickness for a mica sheet is two mils (i.e., two-thousandth of an inch).

For a mica transmitter capacitor, we want a stack, one to three inches thick, in which a conductive (c) material (gold or silver foil) is interleaved with mica (m) sheets, like so: cmcmc . . . mcmc.

A transmitter capacitor will use perhaps forty square feet of mica, and have a capacitance of around four microfarads (4,000,000 picofarads). This could take the form of a one inch stack of alternating metal and mica sheets, in which there are 250 two mil thick mica sheets, each four by six inches. (Boatright, personal communication). The total mica content is 11.52 cubic inches. The density of mica is about 300 kilograms per cubic meter (0.0108382 pound/cubic inch), so one transmitter capacitor needs one-eighth of a pound of high quality sheet mica.

If there was demand in Europe for 1,000 transmitter capacitors, you would need 125 pounds of suitable sheet mica. That doesn't sound like much, until you realize that you would probably have to process 12,500,000 pounds of ore in order to recover the sheets you wanted.

* * *

A receiver capacitor for a crystal radio only needs 10-20 picofarads of capacitance (Boatright). For that, we don't need mica, just an air gap will do. However, a mica capacitor would increase the sensitivity of a crystal radio.

For the sake of argument, let us say that the receiver capacitor uses a single two mil thick sheet of mica, just a quarter inch on each side. That would have a capacitance of about 40 picofarads.

There are perhaps eleven million people in the USE and Sweden. Let us say 10% eventually obtain crystal radios, and that 10% of those sets are equipped with mica capacitors. If each set has two capacitors, then we need 22,000 of them. The individual receiver capacitors only use 1/100,000th as much mica as the transmitter capacitors. It is clear that the scrap from mining for transmitter grade capacitors will supply our needs for receiver capacitors.

Mica Economics

If the only mica which has economic value is that which was in large sheets of transmitter capacitor quality, then mica would be extremely expensive to mine. If you take only one pound out of every hundred thousand pounds of rock mined, and just toss away the rest, then you are talking about a very

labor-intensive operation. Labor is cheap in the early seventeenth-century world, but not cheap enough.

Pliny, in his*Natural History* , refers to what is translated as "specular stone" or "mirror stone." Translator John Bostock assumes that this is "transparent selenite or gypsum." However, since Pliny says that it "can be split into leaves as thin as may be desired," it seems more likely that it was mica. EB1911 agrees.

The principal use of the Roman "specular stone" was in buildings. This may well have been in windows, in which case it antedated, by many centuries, the Russian use of "Muscovy glass."

Mica, besides transmitting light, is also heat resistant. For this reason, it has been used in more specialized windows; for example, as a stove window ("isinglass"), or in the panels of a lantern.

In pre-electric nineteenth-century America, mica was used mainly for oven windows and gas lamps, and that meant that the demand was limited to sheet mica. The requirements weren't as stringent as for capacitors, but some deposits couldn't be mined because they didn't produce sheet mica in quantity, and what mines were worked produced plenty of waste.

That changed in 1878, when Edison invented the electric motor. Not only did the motor require electrical insulation, that insulation had to tolerate heat. Mica was ideal, and scrap mica did the job. This could be assembled into built-up mica, or ground mica could be used to make micanite. What had once been waste mica had become a commercial product, and that changed the economics of the industry for the better. (Anglin)

The sparkle of mica (which is called "glimmer" in German) also gives it a decorative function. Pliny says that, at the "celebration" of the game, the sands of the Circus Maximus were strewn with the "shavings" and "scales" of the mirror stone, "with the object of producing an agreeable whiteness." The modern equivalent is the incorporation of mica powder into the sidewalks of Hollywood, so they sparkle.

Mica powder also can be mixed into paints and cosmetics. In*Federico and Ginger* (*Grantville Gazette*Volume Six), Adriane's skin has been "liberally sprinkled with twentieth century 'moon glitter' to give her a more celestial appearance." Her "glitter" was nothing more than wet ground mica.

While this variety of uses makes mica mining more practical, large sheets are likely to be disproportionately more expensive than small ones. In 1911, an "average" sheet price was four shillings a pound, while large sheets could cost as much as fifty-four shillings a pound (EB1911, "Mica").

Mining for Associated Minerals

The economics can be improved further if some of the associated rock isn't really waste, but rather can be used for something else.

It is not unusual for mica to be extracted as a byproduct of feldspar mining, or vice versa. Feldspars are aluminum silicates, and the "alkali feldspars" also contain sodium or potassium.

Feldspars are not a "strategic material" like mica, but they have their uses. Alkali feldspars are used as fluxes in the manufacture of glasses and ceramics. The alkalis (sodium and potassium) act to reduce the melting point of the composition. The aluminum makes the glass harder, stronger, and more resistant to

chemicals.

Feldspars are also used as fillers in rubbers and plastics. Since the USE supply of rubber and plastic is limited, that may come in handy.

* * *

Micas may be associated with beryls. Beryls are beryllium compounds, with a beryllium content of about 4%. Gem varieties include emerald and aquamarine. Material which falls shy of faceting quality is mined nowadays as a source of beryllium.

Like aluminum, beryllium is a light metal. Beryllium can be alloyed with copper or nickel.

Synthetic Mica

The Encyclopedia Americana mentions that synthetic mica had been developed, but provides no clues as to how it was produced. Hopefully, one of the chemists in the USE will know that the synthetic mica was not considered a success, so the USE will not squander resources on an attempt to duplicate it.

Conclusion

There are two reasons why it is worth taking a look at how mica might be exploited in the 1632 universe.

First, there is a window of opportunity in which mica will play an important role in radio development. This will be the period in which Europeans rely on spark gap and arc transmitters. Bear in mind that even after the USE shifts to more advanced, vacuum tube- or transistor-based equipment, some of our rivals will still be using the older technology.

Secondly, this study provides a sampling of the problems which the up-timers face whenever they try to get their hands on a familiar raw material. You can't just order sheet mica (or rubber, or borosilicate glass, or gasoline, for that matter) over the phone or internet, and have it on your doorstep a few days later.

* * *

While some might prefer the glitter of gold to that of mica, the latter is precious in its own way.

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A Tempest In a Baptistry

by Terry Howard

The question of re-baptism and the distress it caused in the sixteen hundreds, including what has at times been described as bloody murder, is still with us.

In 1965, President Johnson's daughter Luci was re-baptized into the Roman Catholic Church. While most of the world took no notice of the event, it created a very big ripple in a very small puddle, and generated a great deal of very loud conversation amongst the few who did.

The re-baptism happened at Luci's request. It seems her request, and the resulting baptism, are now generally deemed to have been inappropriate.

Under common high church usage, the only allowable reason for re-baptizing an individual is if the original baptism was improperly conducted. An individual's own judgment and wishes should be completely irrelevant. The matter should be decided by priests and canon lawyers, without regard to the wishes of the person seeking re-baptism. Miss Johnson's request is, mostly, considered to have been out of order and her priest in error.

Why?

Because, re-baptism brings the validity of the first baptism into question.

In an age when many people are not even sure there is a god, the question is not: "why no one cares?" The question is: "why anyone cares?" The few who do are concerned with the hope of church

reunification; this requires a level of reciprocity and mutual respect.

In the sixteen hundreds life was different. Those few who questioned the existence of God, mostly, kept their heads down to keep their heads on. The question of re-baptism was a very serious matter, a matter of eternal life and death, a matter some were ready to die for and others to kill over.

When Christianity was the means of achieving eternal bliss and ease, baptizing a child insured she was going to heaven, probably by way of purgatory. Everyone was happy. Then along came someone quoting scripture and claiming infant baptism isn't worth the water it is written on. If they are right, everyone you have ever known who has died is not going to heaven and neither are you. Suddenly no one is happy. These people must be proven wrong and made to cease the vicious act of spreading their contrarian doctrines that threaten people's happiness and their immortal souls.

Now, if baptism's validity is solely a matter of a properly performed rite, irregardless of an inner experience or lack there of, then baptism is effective by virtue of the performance of the rite itself.

From a Roman Catholic stand point, according to a Catholic priest in my home town, proper form means she was baptized by a supposed Christian, (any Catholic can baptize in an emergency, and any baptized Christian is deemed Catholic even if he or she is also deemed a schismatic or a heretic) using the phrase "in the name of the Father the Son and the Holy Ghost."

If Luther is correct in saying the saving grace of Christ is by faith alone (*sola fide*), then, if one baptizes infants unto salvation, the unconscious response of a newborn must qualify as "faith."

It is a common doctrine that baptism is a once in a lifetime occurrence. This doctrine is found in the Westminster Confession and other like documents. Yet if a person's "baptism" is not valid, then, she is not "re-baptized" but given true baptism for the first time. On this point the Roman Catholic Church in both its orthodox and reformed incarnations and the Anabaptists in their multiple incarnations are, almost, in complete agreement.

The difficulty is: "What constitutes valid baptism?"

The Roman Catholic answer is: "baptism is valid if the rite is correctly administered." If the authority of the baptizer, and the actions performed, are proper then the baptism is valid. There is wide latitude and leeway inside the boundaries of what is acceptable to the Roman Catholic Church.

On the other hand the Anabaptist answer is: "when the person being baptized has not met the prerequisites of baptism (as found in the disputed verse Act 8:37 KJV, and elsewhere) then the baptism is invalid." When the party being baptized has no intention of undertaking the spiritual journey of death and resurrection symbolized in the rite, or when she is incapable of understanding the experience, then it is an empty ritual. Ritual without belief is meaningless.

Baptism, as taught by Anabaptists, is a public act of obedience following repentance from sin and the acceptance of Jesus Christ as Lord and Savior. Please note; this requires the recipient of baptism to have reached the age of accountability.

In the sixteen hundreds, the Anabaptists were condemned for re-baptizing because it brought the validity of infant baptism into question. They did not see it as re-baptism because to them infant baptism lacked validity. Today, even with the strict tradition of some of the Reformed Churches, demanding a communicant undergo confirmation of their infant baptism and make a good confession of faith before they are allowed to fully participate in all aspects of church fellowship, most of the Anabaptists still do not

see any validity in infant baptism.

Of course, the Anabaptists would like all people to become Anabaptists, but this is America, and everyone has the right to go to hell any way they wish. (Insistence on separation of church and state and the right of the individual to serve God according to her own understanding is another troubling idea the Anabaptist held during the reformation.)

Anabaptists are still, by Roman Catholic definition, schismatics and heretics. Also, the mostly Lutheran letter of protest sent to the second diet of Speier in the early fifteen hundreds, which caused the word Protestant to be coined, unequivocally states that Anabaptists should be executed without trial wherever and whenever found. Anabaptists did not and do not commonly practice re-baptism. For the most part they baptize into the body of Christ and are usually willing to recognize the value of valid baptisms other than their own. They baptize according to the teaching of the New Testament as they understand it in keeping with traditions which they claim are subordinate to the word of God.

Yes, that means Anabaptists still question the validity of infant baptism. Their cheerful willingness to baptize anyone who has reached the age of accountability and has made an acceptable profession of faith, whether they were formerly christened with water by another denomination or not, continues to be a contentious subject in the small puddle inhabited by those few who not only understand the question but actually care. It is quite a tempest in a baptistery even today. Thank God, it is no long a bloody tempest.

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The Daily Beer

by Anette Pedersen
The Importance of Beer

Beer was food. Before the potato arrived in Northern and Central Europe, barley, rye and oats were the main sources of nutrients. Of these, barley was the easiest and most robust crop. Barley isn't that good as bread or porridge, so almost the entire harvest was brewed into beer. Beer was—and is—made from boiled water and grain. The unrefined products brewed at the time contained a large part of the grain's nutrients, much more so than the refined products of today.

Most meat and many vegetables were preserved by salting them in various ways, and the salty food meant that large amounts of liquid were needed by everybody. Water, however, was not safe to drink unless it was boiled first, and even boiled water would spoil if it stood around at room temperature for too long. So beer was both a nifty way for getting the nutrients from the barley and for preserving the boiled water with alcohol and various added herbs.

Beer was what everybody drank regardless of their age, sex and status. Not for its alcoholic content—in fact it was barely considered alcohol at all. Whenever people at the time spoke about drunkenness it was wine or spirits such as*Aqua Vita* they talked about. With neither clean water, tea, coffee, milk nor juice available to most people, you could easily drink six pints of beer a day and still be considered a sober teetotaller, by yourself and by your neighbors. For a farm-worker, eight pints per day were the norm, and four pints were the average for children in boarding schools.

Of course, most of the beer drunk was small beer with a very low alcoholic content. Also, beer was often cooked into dishes, which made the alcohol evaporate.

Brewing Beer

Beer may be brewed from any kind of grain. Barley was, and is, merely the most common. Wheat beer would be most common in the southern areas, where this grain thrived, while rye and oat beer served mainly as variations.

Most beer was, and is, flavored with hops. Hops are the dried flowers from a climber related to hemp. They grow in a zone from Italy to Denmark, with northern France and southern Germany as the best areas. If you could not grow your own hops, you could buy them from the itinerate hop-traders, or use various other herbs such as bog-myrtle and juniper berries instead. These additions were not just to help the taste. Most would also aid in preserving the beer. Keeping the beer from spoiling and turning sour was always a problem, so very little beer was brewed without some kind of attempt to prevent this, a task complicated by the lack of knowledge concerning bacteria, fungi and fermentation.

Brewing was done both as home-brewing and by professional brewers, but in either case the basic method was the same.

The first step was to soak the grain in water to make it ready for sprouting. In homes this would be done in a tub or barrel, but in breweries there would often be an outdoor soaking basin for this, where the sacks of grain would stay until completely soft. Usually this basin would be placed close to the wall, just below the malting and drying room in the attic. A pulley system was used to raise the grain directly from the basin and up to the next step in the process.

The second step was to spread out the grain to sprout and become malt. In private homes this could happen on trays placed on the rafters below the roof, but this frequent damping of the rafters wasn't good for the wood. If the household was big enough to have a room set aside for brewing, this might well be the sole room in the house with a floor covered with stone or tiles, just so the malting could take place there. In breweries there would certainly be at least one room with stone or tile floor. This room would often be in the attic, and it would have plenty of shuttered openings to let in fresh air and to control the humidity and temperature, while keeping out the sun.

Once the malt had sprouted to exactly the right stage—that is: root sprouts but no leaves sprouting—it had to be dried as fast as possible. If making white malt, this would happen on the floor with as much air blowing through as possible, often with men throwing the malt into the air to ensure an even drying. A faster and less space-demanding drying could happen in the fireplace, either in a box or on a tray placed above the fire, with or without a stone shielding it from below to keep it from roasting. This method gave the malt a smoky flavor, and it was very important that only the right kind of wood or coke was burned.

Using oak or conifer wood would taint the flavor of the beer. In homes, the last heat in the oven after the weekly or monthly baking could also be used to dry the malt.

The fourth step was crushing the malt or grinding it coarsely, which could be done by hand for a small household. It would more often be done either at the professional mill or in a small farm mill by a local creek.

Next, the crushed malt would be mixed to a mash with warm water in a big tub, and allowed to stand until the "bran" or mash residue sank to the bottom. How much water to each measure of malt would determine how strong the beer would become, and thus how well it would keep. As there was no way to measure the alcohol content in the brewed beer, most towns and nations had laws concerning the maximum amount of beer that could be brewed from each measure of malt. This was partly to prevent unrest caused by swindled customers and partly to make it less attractive for the merchants to import a better quality of beer from abroad.

Once the mash residue had settled on the bottom, the liquid part, the wort—which would now contain the nutrients, starch and sugar of the grain—had to be sieved into the brewing-kettle. Some professional breweries had real sieves for this, but scalded bundles of straw were used just as often. The wort would be boiled in the kettle with hops and whatever else the brewer wanted to add to spice up the brew.

The mash residue would be mixed with water again and sieved to produce a second batch of wort. This was used to brew the weaker middle beer. The process was repeated for a third time, which would produce the weak and easily-spoiling small beer. Finally, the spent mash would be used for animal fodder.

After boiling with hops and the other flavorings, each batch of wort had to be cooled before the yeast could be added and the actual brewing take place. To prevent wild yeast from infecting and spoiling the brew, the cooling had to happen as quickly as possible. Big flat tubs or trays were used in breweries to cool the wort before transferring it to the fermenting tub. In private homes, the wort would usually be allowed to stand until it had cooled on its own. The phases of the moon or a silver coin in the tub was relied upon to preserve the beer from evil influences in these homes. A pair of trousers—especially from a male servant—draped over the tub was also believed to work to prevent spoilage.

Yeast would be saved from brew to brew, often as a yeast-ring made of wooden spikes. This ring would be dipped into the fermenting brew and then dried and kept until the next brewing day. In breweries where new batches might be started several times a week, yeast could just be skimmed from a brew and kept damp in a jar.

When the wort was the temperature that the brewer thought was right, the yeast would be added. Within a few hours a layer of yeast would cover the surface of the tub, and the beer could be transferred to barrels where it would continue fermenting for a day or two.

The barrels could not be closed while the fermenting went on, due to the pressure that would build and to allow most of the floating yeast to bubble out. Once fermenting stopped, most commercial brewers would transfer the beer to fresh barrels to rid it of most of the sediment caused by the fermentation. This might or might not happen with home-brewed beer. The last dregs in a barrel could be extremely thick and murky when the beer was not transferred to a different barrel. At this stage, the beer would contain very little carbon dioxide and be quite flat by modern standards. Usually a bit of after-fermentation would take place after the barrels were closed.

Brewing is a long and complicated process that allows the enzymes of the sprouts to make sugar from

the starch of the grain, and then the yeast cells to turn this sugar into alcohol. It is also a process with many variations and professional refinements.

Types of Beer

Aside from the three grades of beer (strong, middle and small), which would always come from the three different batches of wort, the brewer needed to make quite a few choices to determine the nature of the brew. Different types and amounts of malt, water, hops, spices, yeast, transfers and temperatures all worked together to make a specific type of beer.

The type—or combination—of malt-types would determine whether the beer would be pale or dark. The pale beer would be made from the air-dried white malt, while the dark gained it's color and smoky flavor from malt dried over a wood fire. During the Thirty Years' War, the preference was for dark beer, which also tended to keep better due to the smoked malt. As this was the case, malt would also sometimes be air-dried and then lightly smoked, when labor was cheap but fuel expensive. Malts that were roasted, with or without being smoked, were used in many brews for added color and flavor. The really black beers such as porter and stout were a later invention, as was the pale pilsner beer so popular today. The term white beer would usually not refer to the color, but indicate a beer brewed from wheat, and might not be especially pale.

The amount of malt used to brew a barrel of beer would determine the alcohol content. Most brewers would brew an especially strong beer for Christmas, Easter and Harvest. Most breweries near a harbor would also make something extra strong to sell to far-traveling ships, where the need for the beer to keep would be of utmost importance. A barrel of malt as well as several pounds of hops would be used for a barrel of the strongest beer, while a quarter or less of the raw materials might be considered enough for the common types. This not counting the middle and small beer brewed from the same mash.

The water preferably had to be soft with a low chalk content. Many of today's old European breweries are situated near a spring or other water source with water especially suited for brewing, but many household brewers just used the water from the local pond.

Not all hops are exactly the same. Several European areas were famous for their hops and would grow far more than what was needed locally. The extra crops would be bought by hop merchants, who would then sell them to breweries as well as urban households. A large amount of hops in the brew would make the beer keep better, but also make it bitter. The bitterness could be reduced by adding the hops late in the boiling process, by adding honey after the fermentation, or be disguised by the addition of spices. However, many areas—especially in Germany—had purity laws forbidding this, and stating that only water, barley, hops and yeast could be used in anything sold as beer.

In private households and in areas without purity laws, adding a hint of apples, liquorice, cinnamon, anise or caraway to the beer made for a popular change. In the poor areas, where scrimping on the malt and hops made the beer thin and quickly souring, adding wild herbs such as bog-myrtle, rosemary, sage or, in Scotland, heather helped make it drinkable.

The yeast was extremely important, but without microscopes etc. it was impossible to make a pure culture of a select strain of yeast fungi. If the yeast in a household or brewery went bad, all that could be done was to buy some from a place still making good beer.

No one at the time knew exactly what was going on during the fermentation, but two different methods, top and bottom, were used, as well as several variations with partial fermentation, pre-fermentation and post-fermentation.

In top fermentation, the yeast would float on top of the beer, both in the tub and after transferring to the barrels. This method was fast and could happen in a fairly wide range of temperatures. It was the easiest and most common method, and the result would today be called an ale.

Bottom fermentation needed a low and more stable temperature, but the slow process made better use of the wort and developed a better flavor.

Pre-fermentation is the fermentation that takes place in the tub before the brew is transferred to the first barrels, while post-fermentation takes place after the barrels are closed. Partial fermentation is when a fermentation is started, then stopped, and then started again.

The transfers, which moved the beer to clean barrels during and after the fermentation, mainly determined how clear the final product would become, but thus removing more or less of the yeast residue would also affect the taste. In any case, the beer would seem flat, unclear and murky compared with the modern filtered and carbonated types. On the other hand, modern beer would seem fizzy, thin and flavorless to those used to the thick, unfiltered brew of the time. The difference would have been especially big to people used to the types of beer brewed in the United States. Those are brewed largely or entirely from rice and corn in order to make a brew easy to drink cold in large quantities. Unfiltered beer brewed from barley is something entirely different.

Preserving Beer

The many types of beer were often created by trying various ways to preserve the beer and keep it from spoiling. Most beer—especially middle and small beer—was too low in alcohol to keep for long and had to be drunk before it turned sour. This could actually happen even while the brewing was going on if wild yeast or algae infected the brew. That would turn it sour and filled with long strings. This meant that all the work and grain would be wasted. People would try anything to keep this from happening and to make the process run smoothly.

That some kind of cleanliness in the production could help was known, so at least in some places the outdoor soaking basin would be lidded and perhaps even scrubbed from time to time. The drying floor would be washed between batches, and the barrels scrubbed with worn-out armor sleeves between each brew. Mainly, though, the loss of a brew would be blamed on the yeast—or, in some areas, on witches—and new yeast would be brought in from another brewery. With something on the order of a professional brewery per one thousand people, plus all merchants and craft masters also brewing enough to sell the surplus, plus all the private households brewing for their own needs, there was never any shortage of new yeast.

Once the brewing had turned out right, the next problem was storing the beer. If the beer was intended for a specific occasion, such as harvest or Christmas, an extra measure of malt and hops might be added during the brewing to make the beer stronger. Such beer could keep for almost half a year if stored in a cool cellar. Similarly, with beer intended for ships, where brewing would be impossible and the water situation even worse than on land.

Selling beer to ships as well as private households could be a very lucrative business, and many rulers and town councils tried to regulate the production and sale. Turning the beer of your area into an export, or just lessening the demand for imported beer, was a matter of interest far beyond the Brewers Guild. The area with probably the strictest laws and the most famous beer was Bavaria.

About a hundred years before the Thirty Years' War, a decree was passed in Bavaria that forbade all brewing during the summer months. This made it necessary to store enough beer to supply the entire area for five warm months. For that to happen, the beer had to be very strong, very carefully made, and kept very cool.

When making beer for storage, the malt must be sprouted to exactly the right stage and dried very evenly and quickly. Also, the measures of malt and hops per measure of water had to be high, the wort had to be cooled very, very quickly after boiling, and the yeast had to be as clean as possible. This went on everywhere, but in Bavaria they added further refinements. When mixing the crushed malt with warm water to make the mash, they heated the mix several times to get the maximum amount of nutrients and flavor into the wort. When adding the yeast the entire fermentation process (bottom-fermentation) would take place very slowly—at a very low temperature in deep, cold cellars—to increase the alcohol content and prevent infections. The resulting beer was popular all over Europe. Bavarian methods were tried in many other areas, but usually failed due to lack of cool enough storage.

Cooking with Beer

Beer was not just served*with* all meals, but also*as* all meals. Some version of a warm beer-dish would be served for breakfast in castles as well as cabins—probably with honey, cream and eggs in the castle, and salted herring in the cabin—but the beer would be everywhere. For lunch, a beer-based soup or porridge could serve as a first course, while the cold meat eaten afterward might have been boiled and then jellied in beer. For dinner, the stew would be more likely to be boiled in beer than wine or stock, and for dessert a syllabub of fresh cream curdled in sweet beer was popular with all classes.

The many armies travelling around in Europe during the Thirty Years' War needed beer for cooking as well as for drinking. If possible they cooked the salty and smoked meat, with whatever vegetables were around, in beer. They mixed coarse flour with beer into a bread dough that would be baked in a pot over the fire. And if the beer was young enough and the bread dough left standing overnight, it was even likely that the yeast still living in the beer would wake up and cause the dough to rise.

Recipes

Many of the most common dishes from the time of the Thirty Years' War sound odd to modern people, but these are a few of the most popular.

Bread porridge: soak leftover bread in water overnight, drain off the excess liquid and beat the bread to a smooth pulp. Add enough beer to create a porridge consistency, and bring to a boil. Boil for 10 minutes while stirring constantly, and sweeten. Spices such as cinnamon, cloves and cardamom might also be added. Serve with cold cream.

Fried salt herring: Soak salt herrings in water or buttermilk overnight or just rinse off the salt. Dip it in a

batter made from flour mixed with beer and fry in lard until crisp. Eat with or without the bones either with rye bread, sweet mustard and beer, or as a side-dish for beer porridge.

Beer soup with eggs: bring beer to boil, remove from the heat and stir in eggs beaten with cream. Use about a cup of beer, one small egg and one tablespoon cream per person. Serve with fried bread cubes.

Sour ribs: soak a piece of salted breast of pork if heavily salted, then boil in small beer until tender together with a cleaned pig trotter, an onion and some thyme. Cut the pork into inch wide strips and place in a deep, wide bowl. Reduce the sieved cooking liquid and add vinegar to taste. Pour the liquid over the meat and leave it to jell in a cool place. Serve with rye bread, mustard and beer. A more refined dish could be made the same way with smoked ham, sweet strong beer and imported spices such as cloves. The pig trotter would still be needed to make the jelly.

Beef stew: brown a brisket of salt beef with several onions in lard, add beer and let it simmer for 2-3 hours along with a handful of savory, thyme and sage. Remove the beef and cut it to large cubes. Return it to the pot along with chopped vegetables such as carrots, turnips and cabbage, and let it simmer again. When served, the soup might be drained off and served as a separate course, or bread might be added to thicken the content of the entire pot.

Beer syllabub: the original version of this dish involved nothing more complex than milking a cow directly into a mug of beer. If consumed immediately the mix would be a homogenous frothing mixture, but if left standing the milk would curdle and could be eaten with a spoon before the beer and whey below was drunk. In the more urban versions, the beer would be spiced and sweetened and mixed with whipped cream, but it would still be customary to let it stand until the separation took place.

Despite all the yeast around due to all the brewing, the common bread of the time was made with sourdough. Not that it would be difficult to scrape some yeast off the yeast-ring and use this, but using fresh yeast like that works best with the fine wheat flour used for cakes, and the white bread most common people also called cake. For the coarse rye flour and whole wheat flour most of the population used for everyday purposes, the slow process of sourdough served to make the bread more easily digestible. Soaking the flour in beer or using beer as the liquid in the dough was common, and the yeast remaining in the unfiltered brew would serve as a further rising ingredients.

Beer bread: In the case—such as a travelling army—where the ordinary baking methods could not be used, a camp bread could be made by smearing a pot with a rind of bacon, and letting a mixture of beer and flour fry in this; preferably but not necessarily after rising a bit from the yeast in the beer. If bits of bacon or other meats, onion or cheese could be had, this would be added to the dough, if not, then a few wild herbs or just a bit of salt would add to the flavor. Baking powder, which would have made this a bannock, was not invented yet.

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White Gold

by Kerryn Offord

As the gentle winds blow, you look out from the veranda of your plantation house over the acres of sugar cane. What you see isn't fields of cane. What you see is fields of gold. The white gold called sugar, slowly growing to maturity. In Pernambuco in the early seventeenth century, there was nothing that couldn't be bought with enough chests of sugar.

In the 1630's refined sugar sells at the Amsterdam exchange for about 0.8 guilders per pound (NUS$40). That same pound could almost double in price by the time it reaches the consumer in Grantville. At an exchange rate of NUS$50 per guilder, a pound of sugar that could be bought in Grantville for as little as $0.10 before the Ring of Fire could cost NUS$80 post Ring of Fire.

The people of Grantville will have to find substitutes or quickly lose their sweet tooth.

* * *

Why is sugar so expensive? Well, it's a luxury import. It has to be shipped long distances, and the traders are very protective of their monopoly. For example, dues charged by the Dutch West India Company added about NUS$15.60 to the price of a pound of sugar in Amsterdam [3]. Oh, and of course, there were a few wars going on. Not just in Europe, but also in Brazil where most of the sugar was being grown.

Another reason for the high price was the level of inefficiency in the production. Table 1 shows the relative productivity per acre for the main sources of sugar available to the people of Europe and Grantville. The sorghum entries reflect what might be possible in Grantville with up-time sorghum. Without adequate water (rain or irrigation) plant mass and the amount of sugar recovered can drop to less than a third of the estimates on the table (Appendix 1, table 2, shows the impact of different growing conditions. Hawaii, with plenty of rain fall, produces more than twice as much raw cane per acre as less favored places, but has a similar yield per ton of cane.)

Table 1. Comparison of three potential sources of sugar and the relative per acre plant mass and the expected yield of sugar. Sugar yield is as a percentage of plant mass. Tons are US short tons. The down-time production per acre of sorghum and beet plant mass has been reduced, using the information in appendix 1, table 3 as a guide, to reflect for the impact of the Little Ice Age on the growing season in Thüringia. Sugar cane, being a tropical crop, isn't affected. Note that up-time sugar beets yield is using modern high yield (17%) beets.

Source of sugar	Plant mass (tons/acre)	Sugar Yield (%)	Sugar recovered (pounds/acre)
Sorghum			
Down-time: Single vertical mill	5.6	3.2%	360
Down-time: Single horizontal mill	5.6	6.4%	720
Down-time: Multiple horizontal mill	5.6	12.7%	1,420
Up-time: WV maximum	10.5	12.7%	2,670
Sugar Cane			
Down-time: Single vertical mill	50	2.4%	2,380
Down-time: Multiple horizontal mill	50	9%	9,000
Up-time state of the art: Upper	50	12.6%	12,600
Up-time state of the art: Lower	50	7%	7,000
Sugar Beet			
Down-time: Single vertical mill	13.4	1.0%	270
Down-time: Multiple horizontal mill	13.4	3.6%	1,450
Down-time: Diffusion	13.4	3.8%	1,550
Up-time: Diffusion	25.2	15.8%	7,960

There are five major sources of sugar to consider. They are maple sugar, palm sugar, sorghum sugar, cane sugar, and sugar beet sugar.

Maple Sugar [1]

Maple sugar was harvested in Grantville before the Ring of Fire. Unfortunately, the weather conditions in Thüringia are probably not suitable for production of it. The trees growing in Grantville can be tapped, but the sap is unlikely to produce a suitable product. The climate conditions make a big difference. The right conditions are a deep freeze for some weeks followed by a few weeks of below-freezing night temperatures and above-freezing day temperatures. If there's no hard freeze for weeks, there's no need for the sap to have concentrated sugars at all. If the day temperatures are below freezing, the sap doesn't run. If the night temperatures are above freezing, the sap has all sorts of other things in addition to sugar. When concentrated, those "other things" make the syrup go beyond unpleasant to downright nasty.

In the eighteenth and nineteenth centuries, small sugar maple groves were planted in Scandinavia and Germany in hopes of recreating the delicious syrup. They didn't produce because the climate conditions were wrong. Some areas of Scandinavia are suitable for collecting birch sap, another form of sugar from sap, but only some. It depends on the micro-climate.

Maple sugar will still be available in North America, and could be collected. However I wouldn't recommend an expedition just for maple sugar as we are not sure what impact the Little Ice Age will have on the sap-collecting season. As well, there's still the war to consider.

Normally a tree will yield up to three gallons of juice a day, and would continue flowing for up to six weeks, giving a yield of about four pounds of sugar [1]. Using the old spout and bucket technique of collecting and open evaporation tubs is very labor intensive. Many modern farmers feed sap directly from the spout to a hose that leads to a central collecting tank, which does away with a lot of the labor requirements. In the 1632 universe, however, there is not a lot of suitable hose. Substitutes could be made, although they would probably be more expensive to make and maintain than just doing manual collections.

Palm Sugar [1]

The palms suitable for this sugar are found in the Ganges valley to the north of Calcutta in India. Tapping is similar to maple tapping and produces up to thirty-five pounds of sugar per tree. The tapping season is October to the middle of February. [1] The longer season and warmer climate contributes to the higher yield.

Because of the distances involved, it is unlikely that Palm sugar will be competitive with cane sugar.

Cane Sugar

Sugar cane can be divided into two similar crops, true sugar cane and sorghum. From harvesting to milling, the two types of cane undergo similar treatment. Other than yield, the main difference is that sorghum is usually reduced to syrup while sugar cane is taken all the way to crystallized sugar. The other significant difference is where they can be grown. Sugar cane needs tropical conditions and cannot be grown in Central or Northern Europe. Sorghum can be grown in Grantville in Thüringia.

True Sugar Cane [1, 2, 4, 6, 7, 8, 9]

Sugar cane has already been harvested in North Africa and the southern regions of Europe for a couple of hundred years. By 1631 it has spread to South America, Central America, and several of the Caribbean islands. Sugar cane likes access to lots of water. The best producing areas are tropical with over twenty-six inches of annual rainfall. On average about fifty tons (short ton) of cut cane can be produced per acre. The down-time varieties contain about ten percent of their weight in sugar. In up-time varieties sugar content can range between ten and twenty-two percent of their weight, with fourteen percent being an industry average.

Sugar cane usually comes to maturity after twelve to eighteen months. This is the optimal time for harvesting. Planting or replanting is done using the top joints of growing canes. This is a labor intensive operation, so replanting is kept to a minimum. Normal practice is to allow the cut stump to throw out shoots or "ratoons. "However, ratooning means progressively diminishing yields season by season, so replanting will occur every few years [8]."

Down-time (and in some areas, even today) cane is cut by hand. (Up-time cutters in Florida were

expected to cut eight tons every eight hour day. [9]). Once cut the cane is topped to give a regular length of cane. Two man teams then bundle the cut cane into manageable loads and carry the bundles on their shoulders either to the nearest vehicle, or straight to the mill. (An average sugar cane stalk weighs about three pounds [7]). At the mill the cane is stacked until it can be fed into the mill. If the cane was "burnt off"—the field is set alight to clear the field and stems of excess leaves and litter—then it must be milled within sixteen hours of it being cut. If it was cut without the burn-off, then it must be milled within twenty-four hours. After these times the sugar in the cane starts to invert (conversion of the desirable sugar, sucrose, into other sugar forms that won't crystallize.). Sugar cane should also be harvested immediately after the field has been fired, as the heat can start the inversion of the sugars.

Milling is the bottleneck in processing sugar cane. Mills are expensive, so owners try to maximize their use during the harvest. This means they often operated twenty-four hours a day, every day, during the season, which can be six to eight months depending on the local conditions.

Milling crushes the cane to release the sap, or juice. The juice is then heated for at least four hours, or until enough water has evaporated that the juice becomes super saturated and the sugar starts to crystallize.

The sugar at this stage isn't the nice white stuff you get at home. It has to be left to drain the molasses (a non-crystallizing sugar) before it is shipped for refining. Refining is done closer to the market (The Netherlands was a major center for sugar refining, supplying refined sugar to the rest of Europe).

From every one hundred pounds of raw cane going into the mill, the down-time plantation owner would expect to recover two to three pounds of sugar (Modern mill operators would expect to average better than ten pounds of sugar per one hundred pounds of raw cane).

Increasing the extraction yield

The existing down-time sugar mill technology uses three grinding rollers arranged vertically. They are usually powered by draft animals walking around the mill pulling a sweep [2, 4]. (A sweep is like a handle on a grinder. rotating the shaft/handle turns a shaft.) Arranging the rollers horizontally makes feeding the mills easier. Solid iron rollers, rather than the current iron-hooped wooden rollers, would be nice, but changing from smooth rollers to "toothed" rollers will produce a more aggressive crush. The closer together the rollers in the mill are, and the more aggressive the crush, the more juice can be extracted. This should increase the yield to about fifty percent of the available juice per pass.

Horizontal rollers support hopper or chute loading which is not possible with vertical rollers. It is also possible to fill a hopper with small slices of cane and feed them through the horizontal rollers. Cane that has been cut into smaller pieces gives up its juice more readily, offering a few percent more yield. Vertical rollers can not accommodate this improvement. The horizontal arrangement does suffer from power transmission losses due to going from vertical rotation of the sweep to horizontal rotation of the mill. Ideally an engine or water wheel should be used to power the mill and reduce that loss.

The next improvement follows on from something the sorghum farmers know; additional passes through the mill improve total yield. If each pass extracts fifty percent of the juice remaining in the cane or bagasse, then two sets of rollers in series will extract seventy-five percent, and three sets, just under ninety percent. More than three sets of rollers could be used, although diminishing rates of return from each set of rollers might make the cost of installing an extra mill prohibitive. Up-time sugar mills usually

have three to five sets of rollers arranged in series, but the energy to power them is cheaper and easier to deliver.

A side benefit of extracting more juice is that the bagasse comes out of the mill sufficiently dry to burn almost immediately. An additional inefficiency of the inferior down-time mills is that bagasse has to be moved to drying areas and then to the evaporation area where it is used as fuel. The new improved model saves in the handling and bagasse can go straight from the mill to the fires of the evaporation kettles.

Yields can be further improved by "washing" the bagasse as it passes from roller set to roller set. This is because, no matter how hard you crush the cane, it will soak up liquid as soon as you take the pressure off. By washing the cane between sets of rollers with hot water, the sugar is washed out of the bagasse. This is worth another three percent of the available sugar content (or sixty pounds of sugar per ton of cane). Washing is much easier to do on the hoppers or chutes used in the horizontal arrangement. In fact, washing of the cane or bagasse will be extremely difficult in the vertically arranged sugar mill.

There are problems with adding water. Unless the water is pure, you risk contaminating the product. And every gallon of water you add is another gallon of water that has to be evaporated. Modern vacuum evaporation can drop energy needs by two thirds, and condensing the water from the evaporators gives safe water for washing the bagasse.

A side benefit of washing the bagasse with hot water is that the waxy coating of the plant can also be recovered. This wax makes up about a tenth of a percent of the mass of the cane, so up to two pounds of wax can be recovered from each ton of cane. As there is almost no additional cost in recovering this wax, the proceeds from its sale can be considered all profit.

With the improvements suggested above, average production rises from the low of two and a half pounds per hundred pounds of raw cane using down-time existing techniques to more than nine pounds using modern crush techniques. It is possible to use diffusion techniques (see sugar beet) on sugar cane, but it isn't usually considered cost effective enough for any but the most productive of sugar canes (Those yielding over seventeen percent sugar by weight).

Sorghum Sugar [1]

Sorghum is a grass similar to sugar cane (An alternative name is Chinese Sugar Cane). High yield sorghum corn (as it is called) is grown in the Grantville area and is known to exist within the Ring of Fire (We have been told that it grows near Mannington by someone who grows it there for the syrup). Up-time, sorghum is usually only reduced to syrup, rather than being further refined to sugar, because the low market price of sugar doesn't justify the additional effort required to produce crystallized sugar. However, things are different down-time. The high market price for sugar makes reducing sorghum syrup to refined sugar an attractive option.

Because of the limited crop land available, farmers near Grantville are unlikely to be growing commercially viable volumes of sorghum. Most likely they are growing the crop for personal consumption (probably no more than an acre). This means they probably mill their own cane using the same mills their grandfather(s) used. These mills are sets of iron rollers powered by an internal combustion engine and yield about half of the possible sugar content and have to be hand fed. This compares favorably with the little better than twenty-five percent yields of the large vertical roller sugar cane mills the down-timers are

currently using. Up-timers will know that they can feed the crushed cane (bagasse) through the mill several times to improve the yield. Three passes through the mill can increase the yield to as much as eighty percent, or 240 gallons of syrup (2240 lbs of sugar) per acre. This is only practical as long as the amount of sorghum being handled is small. The typical small farm mill takes one or two stalks at a time, and hand feeding cane, especially the bagasse, is very labor intensive. If sorghum becomes a major crop, then large multi-stage mills will have to be designed and built.

Sorghum is an annual and seeds need to be planted every year. This is important. Up-time sorghum production in the Ring of Fire area would be limited to less than a dozen acres, and we don't know how much seed will be available. Optimal sugar content occurs*before* seeds mature. For this reason, farmers will have to accept lower yields if they wish to continue raising sorghum from their high yield varieties. Yields will probably drop to less than a quarter of a ton per acre.

Most importantly, sorghum is a sugar type crop that can be grown in Thüringia and there are people in Grantville who are familiar with handling the crop.

Sugar beet [1, 5, 7]

Modern growing data (see appendix 1, table 3) indicates that sugar beet production in Germany is just over twenty-five tons (short) per acre. Down-time farmers will be hard pressed to reach these levels as the conditions are much colder.

Sugar beet is a root crop. That means it grows in the ground, like carrots, beetroot, and potatoes. Modern beet farmers use machines to harvest the beets, but until the late nineteenth century, harvesting was by hand. Anybody raising beets down-time will be harvesting by hand.

Hand harvesting of beets in anything but the lightest of soils is a two-tool job. The green tops have to be cut off (a machete) and the beet dug up (a spade or gardening fork). That means two workers, and double handling. Then the beets have to be put into baskets to be carried to the mill. As an aside, it is easier for two men to carry a bundle of sugar canes balanced on their shoulders than it is to carry the same weight in a basket.

Since the beet has been growing in the ground, it has to be cleaned of earth. The modern method is to put them in a large drum and tumble-wash them. This is possible down-time, but whereas the modern method is a continuous process, down-time operations are likely to be a batch process.

There are two ways to extract the sugar from beets. You can crush the beets. This is very similar to the sugar cane process, but hand feeding would be dangerous, so a horizontal mill is required. Thereafter, the process follows that of the sugar cane. Using down-time beets (4% to 6% sugar by weight [1, 5]), depending on the mill arrangement, between one and six pounds of sugar could be recovered for every one hundred pounds of raw beets crushed.

The other method of extracting sugar from beets, diffusion, is likely to be economically beyond the capabilities of people down-time. Firstly, the washed beets have to be finely sliced. In modern beet mills they replace the blades four times a day to ensure the cutting blades are as sharp as possible. The down-time steels just aren't this good. That means replacing the blades more often.

Next, the finely cut slices of beet are fed into a water chamber where the sugar is leached out. The liquid

is then evaporated off to give sugar. The pulp is, in theory, suitable for use as an animal feed (when mixed with molasses). However, examination of photographs of up-time sugar beet facilities in the US shows large pile of waste pulp. It seems that there may be a waste problem with beet sugar.

A major problem with the diffusion process is that it uses much more water than simple crushing. That water has to be evaporated away. That requires an input of energy. However, the diffusion process does extract about 95% of the sugar in the beet. From one hundred pounds of raw beet, a down-timer could expect to extract between three and six pounds of sugar (Using up-time high yield beets a modern beet mill expects to recover about sixteen pounds of sugar per hundred pounds of raw beet.)

What do I mean by modern high yield beets? Well, here's more bad news for anybody suggesting beet sugar as an alternative for cane sugar. In about 1760 the Berlin apothecary Marggraff obtained 6.2% of the beet's weight in sugar from a white variety of beet. Marggraff probably extracted almost 100% of the available sugar [1]. However, his laboratory techniques are not economic at the industrial level. IENICA [5] suggests that the preferred beet for beet sugar in 1801 was the**white Silesian beet. However, it contained only about 4% sugar by weight. Modern beets can go as high as 20%, but there are** no modern high yield sugar beets in Grantville. The investor can start selective breeding, but it is going to be a long time before the beets approach up-time yields.

With the prevailing high price of sugar, sugar beet might be attempted in Europe. As long as there is the high tax on sugar, sugar beet might be competitive with sugar cane from Brazil and the Caribbean. However, before starting a potential investor should consider that:

1) The capital investment required for processing sugar beets is enormous.

2) Sugar beet is only going to be processed for about 90 days per year compared with 300 days for Brazilian and Caribbean sugar cane. This means expensive capital equipment will stand idle for three-quarters of the year.

3) Sugar beet requires additional resources to heat water for diffusion and evaporating off the water content of the juice. Sugar cane producers can use the spent stalk (bagasse) as fuel and need no additional fuel. Beet pulp might be suitable as fuel, if you can dry it out enough. Crushed beet is going to be 10-50% water. Beets going through diffusion are going to be over 85% water. I suspect only the crushed pulp from the multiple horizontal mills, with its significantly lower water content, would be suitable as a fuel.

4) Historically, sugar beet has only prospered with government support in the form of taxes and duties on cane sugar.

Honey [1,7]

No article on sugar can be truly complete without looking at honey (80% sucrose sugar). The 1630 Amsterdam price of native honey was 45.5 guilders per tun. A tun is a liquid measure of 252 gallons. This converts to a price of about 0.02 guilders per pound (At NUS$50 per guilder, that's about NUS$1.00/lb).

Honey is well known down-time, but there are a few gifts from up-time. First, the design of the man-made hives. Down-time beekeepers have been using something called a straw skep. This is a circular dome structure in which the bee colony makes its own honeycombs. The problem with this occurs when the beekeeper attempts to recover the honey. They are required to remove the whole comb and destroy it to remove the honey. The modern Langstroth moveable-frame design offers a number of advantages.

The combs in the Langstroth hive are attached to moveable frames. These frames can be easily removed from the hive, the honey comb decapped and the honey spun out by using a simple centrifuge. The frame with its honey removed but with the beeswax comb still in place can then be returned to the hive. This saves the bees from having to make so much wax and allows for honey production to be maximized.

A Langstroth hive can be made up of more than one box of frames. This allows a hive to be increased in size as a colony grows. This is especially useful when the hive is placed in a highly productive environment. If for example, it is assumed that each box of frames in a Langstroth hive has the same capacity as the straw skep hive, the Langstroth hive can easily be enlarged four or five fold. Meanwhile the down-time beekeeper has to find a way to encourage the colony to spread out into another three or four straw skep hives.

This usually requires that the colony send out queen bees to start new colonies, something that is unlikely to occur right when you want it to. Also, the new colonies take most of a season to become net producers of honey. For this reason, in the right place, up-timer bee keeping techniques could dramatically increase honey production. And because increased bee activity implies increased fertilization of crops, local crop production would also increase as the bee population increases.

The next place up-timers can contribute to increasing honey production is in the equipment and techniques for handling bees. The use of bee-smokers and the use of protective clothing or at least the use of veils to protect the head will make bee handling safer.

One cannot forget disease when dealing with livestock, and bees are livestock. Up-time bee-keepers will be familiar with the variety of diseases that can afflict their bees as well as the various bacteria that kill off the brood (larva state bees), often called "foul brood." Possible treatments will be known to up-timers. Unfortunately, knowing what the problem is might not help when they can no longer obtain the known solutions.

Wintering over a colony will be a problem. Up-timers will know how to winter over their colonies, but there is a catch. Up-time bee colonies are fed cheap sugar to make up for the honey that is removed. Sugar is no longer cheap. For this reason it is unlikely that the Grantville bee keepers will come anywhere near the forty-seven pounds per colony that they were achieving up-time.

Discussion

A major problem with sugar is the labor requirement. Actually, it's the source of the labor used that is the problem. In Europe there will be "free" farmers who can grow beets or sorghum for sugar. In Brazil and the Caribbean it is almost impossible to recruit Europeans willing to work in the fields in the harsh tropical sun. That leaves plantation owners with a problem. Up-time, a lot of sugar cane is mechanically harvested. Down-time, machines can be designed and built to do the harvesting. Until such machines are easily available and affordable the plantation owners will turn to the one existing source of labor. Slaves.

It has been suggested that the African-American slave trade could be stopped in its infancy if Europe was to produce its own sugar. The lower productivity of European sugar crops makes this difficult to achieve. Boxer [3] reports that in 1630 (just before the Dutch invaded the captaincy) that the Brazilian captaincy of Pernambuco (the area around Recife) produced 22.4 million pounds of sugar from 9,500 acres (Great Britain alone consumed this much sugar in 1700, By 1885 they imported over 1.1 million tons a year). Using the best modern extractive technologies on the sugar beets of the period and the up-time sourced sorghum, Pernambuco's 1630 production can be matched by planting 14,500 acres of beets, or 15,800 acres of sorghum. That's a lot of land to take out of production of other crops. It is even worse if we assume they try to replace Pernambuco's production using the existing vertical mills (Nearly 83,000 acres of sugar beet or 62,500 acres of sorghum). Now, if we add the labor component needed to harvest that much land. . . .

Conclusions

There is no way Europe can produce sufficient sugar from beets or sorghum to significantly impact the demand for cane sugar. Cane will be king for many years to come.

Sugar cane producers will grab the new innovations available from Grantville as they strive to maximize profit. There are simple changes that can double and even triple current yields (It is possible to almost quadruple production) from the cane they are already processing.

Sugar beet is only going to be economical while there is a high import tax on sugar and some form of government subsidy or price support. Without this price support, production of sugar from sugar beet production is doubtful. (In 2000 the world price for sugar was US$0.09/lb. USA government support to growers in America was US$0.18/lb for cane sugar and US$0.23/lb for beet sugar [9].)

Appendix 1.

Table 2. Commercial sugarcane production in the United States and Puerto Rico

State/Territory	Tons cane/acre	Tons sugar/acre	Sugar recovery rate (%)
Florida	34.5	4.16	12.05
Hawaii	86.7	10.65	12.28
Louisiana	22.7	2.52	11.09
Texas	31.8	3.18	9.99
Puerto Rico	19.2	1.54	8

Adapted from USDA/ERS publication #SSSV20N2, June 1995; estimated production, 1995-1996.

Table 3. Sugar Beet production in Europe,1997

Country	Yield (t/acre)
Austria	25.1
Bel-Lux	23.9
Denmark	21.5
Finland	11.9
France	33.1
Germany	25.2
Greece	29.9
Ireland	18.0
Italy	20.7
Netherlands	24.4
Portugal	20.8
Spain	23.1
Sweden	18.3
UK	24.1

Source:IENICA. (Adapted from the FAO 1997 table)

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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."

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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.

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Grantville Gazette-Volume IX

My, oh, my. Just what is going on in the never-ending soap opera that is Europe in the years of our Lord 1632, 1633, 1634? There's almost more activity than a person can keep up with.

Grantville Gazette Volume Nine has it all, from the young men who are trying to learn to fly—without engines—to a young Tuscan who got a sneaky idea on his visit to Grantville. Even more, for that matter, since the spread of crystal radios is addressed—right up to the time someone figures out how to block transmissions, that is.

A near revolt in the dining hall, a murder in Magdeburg, somebody speeding—speeding?—industrial accidents, corncob pipes . . . you name it, we've got it.

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Assistant Editor's Preface

Wow. Here we go again. Grantville Gazette, Volume Nine.

Who knew, back a few years ago, just how many people would be interested in the continuing soap opera of Grantville, WV, United States of Europe? I certainly didn't, but I spend part of every single day being happy that I picked up that book with the pickup truck and hillbillies on the cover.

In this issue, as usual, we continue telling the "little" stories. By that, I mean the stories about the regular, everyday people who wound up in a situation they never could have anticipated, even if they'd been science fiction readers in the first place. The everyday sort of young man who misses speeding on the highway—as many young men would, I suspect. Read about him in Mark Huston's "Gearhead." The everyday sort of young soldiers, who always complain about the food in the dining hall on base. You can read about them in Kerryn Offord's "A Matter of Taste." Terry Howard's "Anna the Baptist" looks at religion in a manner that Pope Urban just might not appreciate all that much. And Richard Evans'

postulates a "super secret" organization of up- and down-timers in "Order of the Foot." "Pocket Money" by John and Patti Friend shows us just how determined kids can be . . . if there's something they want badly enough.

For European everyday sorts of people, try "Mail Stop" by Virginia DeMarce—although I must admit that Martin isn't the sort of guy you run into just any day of the week. He's a touch unusual, what with that newly acquired hillbilly accent of his. "NCIS - Young Love Lost," by Jose J. Clavell shows us a grittier side of the coin, while Iver P. Cooper's "Under the Tuscan Son" takes us to Italy and a young man with ambitions. John Zeek's "The Minstrel Boy," tells us about the desire and longing for family, while Karen Bergstralh's earnest blacksmith faces misfortune in "Tool or Die."

What changes will having crystal radios cause? Gorg Huff and I explore a bit of that in "Waves of Change," while Kim Mackey's "Little Jammer Boy" presents the more, ah, reactionary side of that argument. We're still talking about Russia in "Butterflies in the Kremlin, Part 2," and Kim brings his "Essen Chronicles" to a close in Part 3 of that story.

Non-fiction this issue covers the usefullness of mica, from Iver P. Cooper's "The Sound of Mica," while Rick Boatright's "Radio, Part 3" tells us one of the uses. Food—and yes, it is food—is covered in Anette Pedersen's "The Daily Beer," while Kerryn Offord explains sweeteners in "White Gold." Terry Howard discusses just why the Anabaptists were so unpopular in "A Tempest in a Baptistry."

Finally, we have a new feature in this issue. For lack of a better term, we're calling them "European Interludes." They began with a multi-part challenge: Write me something that doesn't use a single up-timer. It can't be set in Grantville or Magdeburg. Tell us what starts happening in the rest of the world, when all the knowledge that Grantville has starts leaking out. The characters don't have to succeed, they just have to try.

We had a lot of takers. Quite a number of challenge stories are included in this volume and more have been written. Those will be included in future volumes.

We hope you enjoy it.

Paula Goodlett and the Grantville Gazette
Editorial Board

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FICTION

Mail Stop

by Virginia DeMarce

Home, Sweet Home
Frankfurt am Main, March 1633

Martin Wackernagel drew up his horse, first looking back at the route he had just completed and then forward toward the walls of Frankfurt am Main.

Via regia. Die Reichsstraße. There would never be anything to equal the Imperial Road. Sure, if you wanted to be prosaic, it was just one more trade route, a commercial connection between the great cities of Frankfurt and Leipzig and their fairs. It had been for centuries.

But it was more than that. He hoped that it always would be. Merchants, teamsters, journeymen looking for a new place to demonstrate their existing skills and acquire new ones. Crowned heads, princes of the church, pilgrims on their way to the great shrine of St. James of Compostella, Santiago, in Spain. Victorious soldiers who had triumphed and beaten soldiers in retreat. Unemployed soldiers looking for work, entertainers looking for audiences, peddlers, and beggars. Sometimes it was hard to tell them apart, but they all used the road.

Martin loved the road. He had been riding it as a private messenger for fifteen years, ever since he finished the apprenticeship that his father had forced on him and refused to go ahead and become a journeyman in the trade. Not that he had anything against Uncle Reichhard. He had been a good master, but he was a belt-maker. Belts were necessary, of course, but not very interesting.

So, then and now, he carried messages from Frankfurt to Erfurt via Hanau, Langenselbold, Gelnhausen, Wächtersbach, Soden and Salmünster, Steinau an der Straße, Schlüchtern, Neuhof, Fulda, Hünfeld, Vacha, Eisenach, and Gotha to Erfurt; then back again. Sometimes he had covered the further stretch to Weimar, Naumburg and Leipzig if there was no one available in Erfurt to pick up the rest of the run, but Frankfurt to Erfurt was his regular route. Or had been, until he started adding the leg that took him to the new city of Grantville, which sent out a truly amazing amount of correspondence.

He knew that all of this caused his mother a lot of distress. She recited with some frequency—every time he got back to Frankfurt, in fact—a lament that she was beginning to wonder if he would ever settle down and get married.

It wasn't as if, being a widow, she needed him to marry and make a home for her. She lived very comfortably with his older sister Merga and her husband Crispin Neumann. She just wanted him to settle down and marry. No special need for it—just a want.

She just could not understand why he loved the road so much.

Good Lord, Mutti, he thought.*Do you suppose you could let it go just this once* ?

Mechanical Ingenuity
Bonn, Archdiocese of Cologne, March 1633

Arno Vignelli had something to sell. Of course. He was an Italian engineer. Most engineers were Italian. They made incredibly ingenious machines in Italy. Italians produced clever devices and then crudely set out to make their fortunes by selling them to that portion of Europe's population that lived north of the Alps.

Evrard Holmann's job, at the moment, included investment in new technology on behalf of Duke Ferdinand of Bavaria, Archbishop of Cologne. He shuffled through the papers on his desk. The man now standing in his office was the student of someone famous. Holman shuffled again. He had the information here somewhere, he was sure. He moved the pile in front of him to the side and snagged another one which should have the letter of introduction. Vignelli had also been to Grantville. He had built this particular device on the basis of something he had observed there.

Vignelli ignored Holman's paper shuffling and went on running through his spiel. "Then, at this 'museum,' I saw the machines which lie at the basis of my new invention."

"Museum?" Holmann raised his eyebrows at the unfamiliar term.

"It is, ah, like a cabinet of curiosities, but the size of a building. It is devoted to the history of the region where this Grantville came from. And since it was a region where people used many various and different technical devices, it is full of them. That is where I saw the 'mimeograph.'"

"They let you come and examine this freely, with no restrictions?"

"Well, not freely. There is a charge to visit the 'museum,' but it is really a quite small one. I could afford to return for several days in a row. They had a placard posted that indicated the costs. The fee is reduced for visits by groups of school children. Otherwise, as to 'with no restrictions,' yes. There were guards, but to prevent damage and theft. Not to prevent visitors from examining the exhibits closely."

"Very well. Go on."

"I saw this 'mimeograph.' It is not a press. It works on a very different basis, using 'stencils.' I thought that I could make one. With enough time and money and workmen. It would be difficult and very expensive to make, with much hand-fitting of metal parts, especially teeth, and the need for several springs, but it could be done."

"Expensive?"

"If I had tried to copy the 'mimeograph.' There was a lever to partly open the 'drum' so that it could grasp the 'stencil' for example. If the grasping foot did not come together precisely, the stencil would be torn loose and ruined. Many other complications. But I did not copy it. There was another machine, a 'hectograph' it was called. Much simpler, but calling for more complicated inks. I thought—if there were some way to combine these. That was when I saw the 'washing machine.' More precisely, when I saw the 'wringer' attached to the washing machine." Vignelli smiled.

"Wringer?"

"Two wooden rollers, fastened together and cranked by gears. The laundress feeds the wet clothing through them. The movement of the turning rollers moves the cloth through them; the pressure of the two rollers forces the water out of the cloth much more effectively than it can be wrung out by hand."

Holmann nodded. He could visualize how that worked.

"So," Vignelli beamed. "I thought. Take a tray, like the 'hectograph.' Run it through two rollers, one above and one below, as if feeding the cloth. But how to ink it? One more day, two more days, I came back and looked at them again and again. Then, on the third day, when I came in, I looked at the counter where the girl who took the fee I paid was standing. She gave me a receipt. She 'stamped' the date on it, with a mechanical device. It is quite delightful, and simple. I will have to make one some time."

"You are wandering from the point."

"Not really. To get the ink on the stamp, which transferred it to the receipt, she had a little tray, with a pad in it. Not something alchemical. Just a cloth pad inside the little metal tray, soaked with ordinary printer's ink. Boiled linseed oil and carbon black. She had that in a bottle. There was a hinged lid, so the pad could be closed at night so the ink did not dry out. When I asked her, she showed me how to ink the pad, just using a swab and letting it sink in. And then I knew. The hectograph tray, the inked pad—a thin silk covering is best, but fine linen such as is woven for ladies' handkerchiefs and collars will do—the stencil, the piece of paper on top of the stencil, another waxed sheet to protect the rollers from becoming inky, the whole thing moving back and forth between the two rollers of the 'wringer' until the paper is inked. Simple. Cheap. Anyone could make one—any decent craftsman, at least. It was like a divine revelation."

"Show me," Holmann said. "Archbishop Ferdinand invests in results, not concepts."

"See," Vignelli said after he had finished the first demonstration. "The operator can release or tighten the tension on the rollers. He can make a second pass if the ink is getting dry and the paper does not become dark enough the first time."

"I don't think that I believed you," Holmann said. "But it is clear. How many of these machines do you have available?"

"I have already completed ten. At least, my shop had completed ten at the time I began this journey and that was several weeks ago. I have five more almost finished and my assistants are in the workshop even as I talk to you here. I sold two—well, received orders for two—in Frankfurt on my way to Cologne. The eight available, I can deliver as fast as the parts can be transported, unless, of course, my head assistant, who left for Vienna the same day that I started north, has received orders there."

"Tell me about the 'stencils.'"

"They are not durable. You cannot print a large number of copies from a single stencil. The best ones that I have made, waxed silk, allow a hundred pages, perhaps. With good fortune, if the stencil does not wrinkle. Waxed paper will not make more than twenty-five copies, usually, before it begins to deteriorate."

"That doesn't sound good," Holmann complained.

Vignelli suspected that a skilled operator could get many more copies from a stencil—perhaps as many as a hundred from a paper stencil and a thousand from a silk one. But not all operators were skilled and

presenting inflated claims to the dukes of Bavaria tended to have permanently fatal consequences for the businessman who presented them. The archbishop was a younger brother of Duke Maximilian. Much better that he should perhaps receive a happy surprise rather than an unhappy one.

"But think. They are simple, even if not durable. Once a traditional print shop somewhere—such as in Cologne—has created the form for cutting the stencil, it can make as many stencils as may be needed. If the shop producing the pamphlet or placard will need to make five hundred copies, then make five stencils. Make a couple to spare. They aren't that expensive. If you want the item copied in ten different towns, if it should be the case that the archbishop has bought ten of these copying devices, then make ten stencils. They are lightweight and easy to distribute. Why, they can even be sent through the mail, properly protected and packed."

"Better, but . . ."

"At need, it is even possible to make a stencil without a print shop. Just to copy words from a manuscript."

"How?"

"It is best done for large placards, but this way." Vignelli opened a box and tumbled a batch of multi-colored letters on the table. "The up-timers use the Latin letter forms as we prefer them in Italy, not the German*Fraktur* . These, I understand, were for children in their earliest years, so they are large. Such a treasure, but possibly not surprising. I was highly gratified to discover how many Italians reside in this Grantville. The letters had magnets in the back and could be arranged and rearranged on a magnetic board. I have removed the magnets, of course, for safe-keeping. They are in my shop."

"Which is where?"

"I have established myself in Bolzano. Bozen, you may call it, in the Tirol. The duchess has created a very favorable business climate."

"No wonder. The regent, Duke Leopold's widow, is a Medici," Holmann griped. "Damned family of Italian pawnbrokers, even if they have clawed their way up to Grand Dukes of Tuscany and given two queens to France."

"Not to mention a couple of popes," Vignelli answered mildly. "Let me show you how to use these letters to make a stencil. Of course, any craftsman can make such letters from thin wood. There is no need for them to be of this up-time material."

"You just carry them around to impress potential customers, then?"

"Of course. Now. First draw around them on the piece of paper you intend for your stencil. Then cut them out with a razor blade, quite carefully. Only then wax the paper. Otherwise, no matter how careful a craftsman may be, the wax cracks and the ink seeps through. If the wax does not coat the stencil completely, the paper remains permeable to the ink. We are experimenting with hand-stenciling smaller letters by pricking the paper with a needle, but . . ."

Holmann had made up his mind. "Hold that for my workman," he said. "You can explain the rest of it to him. The archbishop will take four of your machines. Is it possible to deliver them, ah, inconspicuously?"

"Certainly," Vignelli said. "They are easy to assemble and I have prepared a sheet of directions. When

they are disassembled, no guard at a town gate will give them a second glance. If there were a need for easier passage through tolls and customs or other inspections, the parts can even be shipped separately."

"A need?"

"If, for example, there were some need for the archbishop to ensure the preparation of literature in such a city as Magdeburg, or if a partisan of the emperor who is residing in Nuernberg might need discreet access to a way to provide information to the people. I call it," Vignelli said proudly, "a 'duplicating machine.'"

News of the Day
Frankfurt am Main, March 1633

Martin delivered the bags he was carrying, saw to the stabling of his horse, and picked up the latest newspaper, fresh off the presses. Originally it had appeared weekly, but it came out twice a week now. You could buy it in every post office in Europe, of course, even those outside the CPE, but you got it first in Frankfurt, since that was where it was printed.

He stood there, looking absent-mindedly at the sales rack.

There were a lot of other newspapers, of course. You could buy those at the Frankfurt post office, too. Nuernberg, Augsburg, and Leipzig. Berlin, even. Since the beginning, since the day a baby*avisa* grew up to be a regularly circulated commercial newsletter, post offices and newspapers had gone together. Before the war, there had been four or five real newspapers—not just occasional broadsides—in the Germanies, all weeklies. Five years ago, there were a dozen. Before the war, all of them together had printed perhaps five hundred copies per week. Five years ago, perhaps five thousand copies per week. Now, since the Ring of Fire—especially since the main theater of war with its plundering and marauding armies had moved away from the central cities of the Germanies—there were probably two dozen weekly papers and a half dozen that appeared more than once a week. Twelve thousand issues per week, perhaps.

The rumor was that the new paper in Magdeburg might try to publish daily. He had picked up that gossip, as well as a newspaper, in Erfurt. Gossip was still usually a bit ahead of the printed news, especially when it came to things that might affect your job, so he dropped it into his conversation with Max Leimbacher who ran the newspaper concession. Someday, Max would return the favor. Then he headed for home.

* * *

Martin tossed the local paper on the table in his brother-in-law's print shop. "Saved you a trip," he said to the general direction of the back room and sang out a vendor's call. "All the latest news, guaranteed fresh. Notice, relation, and timely information concerning what has happened and occurred in Germany, France, Spain, the Netherlands, England, France, Hungary, Austria, Sweden, Poland, and Silesia, with items from Rome, Venice, and Vienna. Antwerp, Amsterdam, Cologne, Frankfort, Prague, and Linz,*et cetera* ." He tossed the Erfurt paper, and any others he had collected on his route, onto the table after it. The men sitting around picked them up. That was the way it went with newspapers. They went to city councils, to monasteries, to subscription clubs in small towns, and even to village taverns. Well, occasionally to village pastors who tempted their parishioners to more diligent attendance at the weekly sermon by the bribe of getting to read the newspaper afterwards, but more often to village taverns. And,

of course, to schools and libraries. Most Latin schools expected their students to keep up with the current news.

One of the men started to read the items in the Frankfurt paper aloud. Not that the others couldn't read, of course, but if someone read aloud, everyone else could join in the discussion.

The Frankfurt paper, as was now usual in the CPE, had the Roman god Mercury in the woodcut in the header. Personally, Martin preferred it to the Thurn and Taxis logo, which showed a regular courier from the imperial postal system, wearing an armband, riding a well-fed horse which he could change at each post-house, blowing a horn and overhauling a hang-dog private messenger on a worn-out nag.

Martin thought defensively that he was not hang-dog and he took good care of his horse. One of the up-timers in Fulda, the young soldier named Garand whom he had met at Barracktown while turning over some things to Sergeant Hartke's formidable wife, the Dane named Dagmar, had explained a joke to him, caused by a person saying, "I resemble that statement" rather than "I resent that statement." Martin felt strongly that he did not resemble the Thurn and Taxis statement about private couriers.

Merga, who doubled as the saleslady, came thumping forward from behind the counter to hug him. Merga was not only settled down but settling down. Much of the settling was landing on her thighs, which, as she laughed, were safely hidden under her skirts and petticoats, but some of it was also arriving in the vicinity of her chin and waistline. Crispin had been a good provider and she was starting to show it.

"Go upstairs and talk to Mutti," she said as she let loose of him. "Her rheumatism has been bad. She hasn't been down in the shop for a week."

Martin groaned. If Mutti had been sitting upstairs by herself for a week, thinking, rather than down in the shop working, where things happened that distracted her, he was going to get the whole drama, from prologue to epilogue.

No use putting it off.

* * *

After a few days home in Frankfurt, Martin started to realize that he might be forced to settle down whether he wanted to or not. Now wouldn't*that* make Mutti happy. The minute he did, she would start on the marriage end of the theme.

"I never wanted to be a mail carrier for the imperial postal system," he said to Crispin. As if Crispin didn't already know, but sometimes it was a comfort to be able to complain. "I don't want to be a courier for the Swedes. Or for the CPE, the way things are developing."

"Why don't you just keep riding on your own, then?"

"I'm not sure that I can. It will be one thing if they let the private messenger system die out naturally. It will be a lot different if the reformed CPE post offices attack the private couriers, physically, by force, they way they attacked the municipal messengers who worked for the city of Cologne, back when the Thurn and Taxis post office was set up there."

"Yes," Crispin agreed. "If the new CPE post office system turns out to be anything like the way the Thurn and Taxis run the imperial post, it won't appreciate competition. A monopoly is a monopoly, after all."

"If I have to work for the postmaster, being nothing but one little cog on a huge set of gears grinding away to move the mail all over the CPE, what kind of a job is that? What would be the joy in that?" Martin lamented to Crispin. "Riding back and forth, at top speed, over the same stretch of road, day in and day out? Never seeing anything but the inside of the postal station. If that happens, I might as well have stayed in Frankfurt and made belts for Uncle Reichhard."

"You don't have to ride a short route. Frankfurt is certainly one of the largest*officia* in the Germanies, if it isn't the biggest of all by now. It's not just a station for changing horses; it receives the mail, re-sorts it, distributes it out to a half-dozen different routes. If you could get on here, in central . . . ?"

"I don't want to, Crispin. I just don't. I want to be on the road. A man might as well be stuck in Frankfurt making belts as stuck in Frankfurt sorting mail."

* * *

That evening Martin sat on his bed. No use wasting the candle; he blew it out.

Thinking. Reminding himself of all the reasons why he didn't want to do what Crispin so clearly thought was the sensible thing.

For a century, already, the imperial postal system had emphasized speed and efficiency. "Public, regular, reliable, and rapid" as the advertisements read. Most post routes ran once a week—a few of the busier ones twice. The ideal span from one post stop to the next—from the perspective of a horse, at least—was from eight to ten miles (a mile being, of course, a quite variable concept from place to place). In the real world, where budgets were a factor, the routes of the imperial post, governed by the terms of a 1597 imperial proclamation, had post houses every fifteen miles or so where the rider handed the bags over to a new messenger and fresh horse. The rider stayed there overnight, picked up a set of bags that came in from somewhere else, and went back where he came from.

This distance was so set that people referred to it as "*una posta*." The main route from Rome to Brussels had ninety-six post stations; the one from Antwerp to Nürnberg not quite so many. Customers could buy printed schedules and maps of the routes, as well as fee schedules, at any post office. They were posted on placards in the offices, as well.

The point was that the businessmen in any town could rely on the regular arrival of the postal courier, blowing his horn to announce that he was there. It was scheduled. "Mail day" structured the life of the towns that had post offices. Learned men, merchants, bureaucrats, clergy, and ordinary people had all become accustomed to being able to send out their correspondence on time, carried by someone whose actual job was to get it where it was supposed to go.

The imperial post and the Swedish field post were built on the assumption that horses and riders could maintain the desired speed for only a limited distance without damaging their future usefulness. Wearing out a horse was fine for emergencies, when speed was of the essence. The military field post that van den Birghden ran out of Frankfurt for the Swedes now could get a message from Frankfurt to Hamburg in five days. Reliably. On the Imperial Road as far as Eisenach. Five days for two hundred fifty miles; twenty post stops where the letter was passed off from one horse and rider pair to the next. And a lot of tenacious negotiation between the postmaster and the rulers of all the various territories along the way to get the routes established and the stations set up, but now the mail left each city regularly, twice a week, in addition to the special letters that were carried by Swedish dragoons.*Der Postschwede* , people called those men. The "mail Swede."

That was an amazing achievement. Martin could see why a Swedish general might want to get a message

from Frankfurt to Hamburg fast. Once it got to Hamburg, after all, it could go out to Stockholm by boat. Although now, with the famous up-timer radio, maybe they could transmit the essence of the matter that way and let the post riders proceed at a more reasonable pace. But a lot of urgent things still had to be on paper—documents with signatures and seals, bank drafts, commissions for military officers.

If there wasn't any emergency, however, it was a bad idea to wear out a good horse. Martin admitted that changing horses at a postal station was all right. A fresh horse was a good thing for any courier. But changing riders did not appeal to him. He wanted to keep going.

* * *

"Oh well," he said to Crispin over breakfast, "I'm riding out again this morning, so I won't have to worry about it for a couple of weeks."

"Do I need to smile nicely at your future bride while you're gone?" Merga asked.

Martin shook his head. "I'm escaping free and clear one more time. Mutti had a little list, but I managed to avoid meeting any of her candidates."

He jogged off toward the livery stable. Merga shook her head as she watched him go. Marty was nearly thirty-five, after all. It was time for him to think of settling down.

On the Road Again
Gelnhausen, late March 1633

Martin Wackernagel's mother had often predicted that the boy's curiosity would be the death of him. She had predicted it regularly, frequently, all the years that he was growing up. She still predicted it.

So far, it hadn't been. It was still with him, though. It caused him to try to learn everything he could find out about the towns and cities through which he rode along the Imperial Road.

Coming up from the valley of the Main River, through Hanau and Isenburg territory, he reached Gelnhausen. According to the histories, in another world—a world in which Gustavus Adolphus had been killed in November 1632—Gelnhausen, in the summer of 1634, had been so devastated and destroyed by raiding Croats sent by the imperials, that it became uninhabitable and uninhabited for a time.

In this spring of 1633, with the king of Sweden alive, the town sat here, safely tucked within the well-defended borders of the Confederated Principalities of Europe—the CPE. Martin's mouth quirked. *Ambitious name, that—Confederated Medium and Small Principalities of North and Central Germany would be more accurate.* Nonetheless, the trial Croat raid sent toward the miraculously arrived city of Grantville the previous fall had been so effectively turned back by the king of Sweden that it now seemed unlikely that the emperor's commanders would try any such large-scale*razzia* into the valleys of the Werra, the Main, and the Kinzig, even if they could place their light cavalry in a position to begin one. Martin wondered if any of Gelnhausen's city fathers had studied the up-timers' records and realized their good fortune.

In that other world, there had been a boy of eleven or twelve years old whose name was Johann Jakob Christoffel Grimmelshausen. He had grown up to write a novel, perhaps the most famous one written about these wars. Martin had asked, unobtrusively. Yes, the boy was here. What would he write now, if

not the*Adventures of Simplicius Simplicissimus* ? Would he write anything? It was as if all the foundations of the world were melting under him, Martin thought sometimes, and he could not predict the shape they would take when they became solid again.

One thing that he could still rely on in Gelnhausen was that David Kronberg would be hanging around the post office. David had been hanging around the post office for the past ten years—maybe a bit more. Whenever the mail came in, no matter what frantic efforts his parents made to keep him away, he managed to elude them. David did not care if it was a Thurn and Taxis imperial post rider or a Swedish dragoon or a private courier such as Martin himself. He loved the post office. He wanted to know what was in the news; he wanted to know the gossip.

Kronberg. Or Kronenberger, depending upon the mood of the clerk recording the event in question. Or David ben Abraham. He was a son of parents who were prominent members of the Jewish community in this small imperial city. It wasn't a ghetto, really—not a separate miniature town within a town such as existed in Frankfurt. A neighborhood. Distinctive, but a neighborhood.

Martin, curious as always, had asked questions. There had been a Jewish synagogue in Gelnhausen for at least three hundred years. The current building was fairly new, built only thirty or so years ago. David's uncle, a man named Meier, had worked on it. He was now a builder in Frankfurt. Curious, Martin had looked him up; had even gotten to know him, in a way. It was easier for him than it would be for most Gentiles. His brother-in-law Crispin's grandfather had been a convert. Convert, as the Lutherans saw it; apostate, as the Jews saw it. But Crispin still knew people in Frankfurt's ghetto—he had been able to direct Martin to Meier Kronberg, Meir zum Schwan.

Unlike Meier, David's parents had not left Gelnhausen for the big city of Frankfurt. They would not leave Gelnhausen; would not think about having their son leave Gelnhausen. They definitely did not want to think about their son becoming a postal courier. Even in the atmosphere of the new CPE, Aberlin Kronberg, otherwise known as Aberlin ben Naphtali and Aberlin zur Lilie, and his wife Bessle Zons were having a lot of trouble thinking new thoughts about employment opportunities for their son.

Martin had offered to talk to them; to tell them about the wonderful world of the Imperial Road and all of its possibilities. David had said rather glumly that he did not think it would do much good for a Gentile to talk to them. It might even make things worse.

Today, David was even more melancholy than usual. He was being fenced in, he protested. His parents were arranging for him to marry. They were friendly with the bride's parents. Samuel Wohl—Samuel ben Aron, Samuel zur Leuchte—and Hindle Kalman had contributed a lot of money for the beautiful interior furnishings of the synagogue, the splendid, modern, baroque cabinet in which the Torah was kept. They had contributed, like the Kronbergs, to the purchase of the land where the community had its cemetery.

They were, unfortunately, just exactly the kind of people whom David's parents hoped that his parents-in-law would be. And the Wohls would never, never, never accept his wish to become a postal courier. They would never even understand it.

"I'm doomed," David said.

"Married?" Martin Wackernagel asked. "You aren't old enough to get married. You can't even be twenty yet."

"For us," David said, "that's old enough. Old enough for our parents to bind us so tightly that we will never get away."

Up and Down
The Imperial Road, early April 1633

After going past the Fulda enclave of Salmuenster, Martin had stopped in Steinau for a couple of days. He usually did. Then, past Schluechtern, he looked up at the Drasenberg, which was one of the main causes of what the Grantvillers called "traffic jams" on the Imperial Road. A rider could climb it easily enough, although, if he was considerate, he would get off his horse and walk. Freight wagons, though, had to pause and let the local teamsters attach a*Vorspann* , an additional team or horses, to the vehicle. Single teams could not master the steep rise.

The first thing that travelers coming from Frankfurt learned about Fulda was that the abbey's teamsters, who provided the extra horses and collected the "escort fees," had a very crude vocabulary. So did the Hanau teamsters who often accompanied commercial wagons this far. The counts of Hanau thought that their employees had a right to bring the wagons across as far as Flieden, or at the very least up as far as the*Landwehr* , a border fortress that was protected by ditches, a wall, and impassible thorn hedges. Fulda's teamsters, at least when there were enough of them on the spot at the foot of the Drachenberg, disputed that. The constant arguments about just who had a right to pull freight wagons up this steep spot in the road were pretty typical of what went on at any territorial crossing in the Germanies. The Grantvillers planned to get rid of this in the CPE, someone had told him. He wished them luck. No matter how many lawyers tried to negotiate complicated treaties, in daily practice the issue was decided by the number of heads, the boldness of the local men, and their bodily strength. Even in the presence of high-born lords, teamsters rarely hesitated to enter into physical contests.

Oh, well. Up the hill, finally. Across some cattle meadows and into the forest. Past the dark ravine called the "murder grave"—Martin wasn't sure why. He had asked, but had only gotten legends. Top of the hill at the thorn field. Stop while a few wagons changed teams again. Across the "ass bridge" over Flieden Creek, past Neuhof following the old military road, and then climbing through forests again. Finally the view into the valley opened up. The road led down, crossed the Fulda River near Bronnzell, and led into the city on the right side of the river.

Martin had ridden this way so many times that he knew almost every rock in the road bed. Past Fulda, he came up to Vacha—one more crossing that was a bone of contention, this one protected by a castle and this time between the abbots and the landgraves of Hesse-Kassel. To get there from Fulda, a rider rode uphill and downhill to Huenfeld, with its walls, towers, establishment of secular canons, and a Gothic fortified church. Then up the Haune Valley to the top of the pass between Huebelsberg and Stallberg (extra teams required once more) and down to Rasdorf, where wagons traded the*Geleitsknechte* of their Fulda escort for a bunch of Hessians. Down hill to Geisa. Buttlar, and then up the valley of the Ulster. This was so steep that anyone could see the scrapes on the stony roadbed made by the skidding wheels of braking wagons and carriages. Then, following the little Suenna River, travellers crossed the Werra.

By the time he got to Vacha, he was really glad to see it. He stopped for a couple of nights. He didn't have any urgent deliveries this time. The same for Erfurt. Nobody had any deliveries for the new Grantville leg of the trip, so he turned around and headed back to*Mutti* and her complaints.

Round and Round
Fulda Barracks, late April 1633

Derek Utt, the military administrator for*Stift* Fulda, the abbey of Fulda and its subject territories, who had been installed by the government of the New United States, or NUS, when it assumed the administration of Catholic Franconia under the aegis of Gustavus Adolphus the previous fall, looked up from his consultation with Sergeant Helmuth Hartke. They were sitting on a picnic bench under a tree, just inside the gateway to the Fulda Barracks. He was thinking*what on earth?* The voice sounded like Nashville, Tennessee, but the rider certainly was not a veteran of the Grand Old Opry.

I've got heartaches by the dozen
Troubles by the score,
Every day you love me less,
Each day I love you more

"It's the courier," Hartke said. "He comes back and forth through here every couple of weeks. He'll be on his way back toward Frankfurt now."

He waved, shouting, "Anything for us?"

Martin Wackernagel turned his horse off the road. "Not a thing." He grinned. "Your paymasters use the official post office, but I can tell you that the payroll arrived safely and has been deposited with your*Herr* Stull in Fulda. I have newspapers from Grantville and Erfurt for those willing to pay. If you will just give me a few minutes to tether the nag and get him some water, I would not say no to a beer."

Sergeant Hartke performed the introductions.

Wackernagel had learned the song "from an old fiddler I met in Erfurt." Who had to be Bennie Pierce, Derek thought; there weren't any other old fiddlers from Grantville wandering around central Thuringia as far as he know. Wackernagel had been happily spreading it throughout the intervening towns and villages. Up-time, Derek thought, any politically correct anthropologist would have charged him with acutely negligent cultural contamination, at a minimum. Where would*Grimm's Fairy Tales* come from if, before someone like the Grimm Brothers got around to collecting them in the towns of the Kinzig Valley, they had been replaced by Hank Williams?

Frankfurt am Main

"How's business?" Martin asked.

Crispin came in from the work room, tossing a batch of pamphlets and placards onto the table next to the newspaper. "Wretched, wretched. One cat that gave birth to a two-headed kitten; two political satires in verse, both short; a new hymn; six advertising flyers, and a 'wanted' poster. How to make your own back-yard sundial. That's all the new orders that have come in since you left. The gossip is all about the new 'duplicating machines' that the Italian sold. Escher already has his running and Freytag is

assembling the one he ordered.

"A lot of the guildsmen would like to see the 'duplicating machines' prohibited, of course." Crispin started to thumb through the packets that his brother-in-law had brought in. "But if you ask me, that's hopeless."

"Why?"

"They're simply too small. Even smaller than a normal press, and that can be loaded onto a wagon easily enough. What weighs us down as printers, if we need to move from one place to another, is transporting the lead type to set up a new shop—all the different fonts and different sizes; storage bins, everything. With these stencils, you can have the little machine anywhere and if a printer somewhere else makes the stencil and sends it to you, you don't need the type in your shop. Myself, if I could get hold of one, I'd develop a sideline in producing the stencils and selling them. It's a lot less weight when you ship one out than a bale of pamphlets or placards. Let the shop at the destination pay the freight for bringing in the paper and ink."

"They still need paper, don't they?" Martin asked.

Crispin gave him the same kind of look he would give a two-headed cat. "Of course, but paper is no problem. You can get paper anywhere. Just about every town in the Germanies has a paper mill. Think how much paper is just carried through the mail, for goodness sake. And used for newspapers."

Bonn, Archdiocese of Cologne

"Here are the stencils for your pamphlet and placard. I have drawn boxes where the woodcuts go, in the proper size. The woodcuts are separate; each one will have to be stamped into each copy separately. I couldn't get good enough resolution when I tried to include them in the stencils. That will take more time than all the remainder of the production put together. Each box that I have drawn is numbered. Each wood block is numbered. If your contact in Fulda messes up the production, that is his fault and not mine."

Cornelis van Beekx, formerly of Antwerp, forger of magnificently authentic documents and maker of extraordinarily filthy etchings, was now, at the request of Felix Gruyard, expanding into the production of stencils. It had taken him a couple of weeks to master the stencil technique in full, even with Vignatelli's personal guidance, but he was now confident that his print shop could produce as many as anyone chose to order from him in a quite timely fashion.

Gruyard smiled.

* * *

"You are sure the machine will be there in time?" Gruyard asked.

"As well as one can every predict anything," Holmann said. He pulled out his copy of the most recent edition of Aitzinger's*Itinerarium Orbis Christiani* , which visualized the European road system for people who planned to travel. For the past half-century, nearly everyone had recognized the Cologne reporter's atlas as a very handy book, especially when it was paired with his week-by-week summaries of current events. In a lot of ways, these had been predecessors of the modern newspaper of the 1630's. From Aitzinger until the present day, Cologne had become a center for the publication of aid-books for

travelers, which meant regular employment for a lot of full-time map makers. The most popular travel guides were those which laid out the routes followed by the imperial post riders and the couriers employed by the imperial cities and various territorial rulers. By taking these as far as possible, as close to one's actual goal as they ran, a traveler could be sure of a comparatively well-guarded route, even in the middle of all the disruptions of war.

Drawing his finger along one of the routes, Holmann indicated the path that the duplicating machine could be expected to travel from Tirol to Fulda. "At the moment, there are no major obstacles to commerce. Through Switzerland as far as Basel; then down the Rhine as far as Mainz; then up the Imperial Road to Fulda. He shrugged. "If the machine is delayed, then the pamphlet will appear a couple weeks later than planned. Otherwise, fortune has been with us."

Gruyard nodded. "It was truly fortuitous that Hoheneck received the feelers extended by von Schlitz when he did. The connection with Menig at the paper mill is good. The one thing that I worried about, that might allow the authorities of the New United States in the*Stift* to trace the pamphlet to its origins, was the need for anyone who was to use the duplicating machine to purchase so much paper. How many people other than printers buy more than a quire at a time? But where is there naturally more paper than in a paper mill? They will tear apart every printing shop in Fulda searching for the plates or indications that the plates were there."

He smiled.

"So don't worry about your stencils." Holman waved his hand. "I have contracted with a private courier with a good reputation for their delivery. That will be more discreet than entrusting them to the Swedish-run postal system. His name is Martin Wackernagel."

Youthful Restlessness
Gelnhausen, late April 1633

"David Kronberg," Jachant Wohl said, "looks like a rabbit."

Her younger sister Feyel looked at her. "That's a horrible thing to say. You are probably his future wife, at least if our parents and his have anything to say about it."

"He does look like a rabbit, though." The third Wohl sister, Emelin, at ten, was young enough to announce that the emperor had no clothes on and still get away with it. "He would still look like a rabbit even if Jachant liked him."

"I've never seen a rabbit with black hair," Feyel pointed out. She was determined to play the part of a fair and impartial witness. She was even more determined to do this since her own marriage was already satisfactorily arranged and her betrothed husband did not resemble a rabbit in the least.

Emelin was not going to give up. "His nose is long. His cheeks twitch when he chews. He is short and round and has big ears."

"There aren't all that many people available for you to marry, Jachant," Feyel pointed out practically. "If the Kronbergs aren't rich, they are far from poor, and David will inherit from his uncles as well, since neither has children. '*Der dicke Meier*' has to have quite a bit of money. He is master builder for the

whole Jewish ghetto in Frankfurt."

Jachant rested her chin on her hand. "Fat Meier looks like a rabbit, too. It runs in the family. I doubt that our parents would want me to marry a man who looks like a rabbit if his parents were poor. David Kronberg would give me children who look like rabbits."

"Papa and Mama are concerned about your well-being," Feyel said. "There is nothing wrong with David Kronberg."

"He wants to be a postal courier. Who ever heard of a Jewish postal courier?" Emelin asked.

"Everyone in Gelnhausen has heard of the idea, at least, since he said that he wants to be one. Don't worry, Jachant. His parents will make him give it up." Feyel patted her sister's shoulder.

"They can make him give up doing it. Can they make him give up wanting to do it?"

Feyel frowned. "Jews do travel around. Think of famous families, like the Nasis. Or the Abrabanels."

"Sephardim. They don't count." Jachant tossed her head.

"Even if David ben Abraham Kronberg doesn't become a mailman," Emelin said, "he'll still look like a rabbit."

Barracktown bei Fulda, late April 1633

Derek Utt was doing his best to sound wise and fatherly. This was something of a trick, since he certainly wasn't old enough to be Jeffrey Garand's father. Maybe he could try the older brother ploy instead. However, he was the senior NUS military man in Fulda as far as rank went, and . . .

Maybe he could get Gus Szymanski, the EMT, to have the fatherly chat.

Cowardice in the face of . . .he thought.

Maybe the direct approach would be best. Straight to the point.

"What in hell do you think you are doing boinking Sergeant Hartke's daughter?"

"Gertrud?" Jeffie looked at him.

"Does he have any others?"

"Not alive. Gertrud had a sister, but she died when she was a kid."

Derek winced, remembering the little girl he had left up-time. Hannah had just started to toddle a few days before the Sunday afternoon he drove over to Grantville to go to the sport shop with his sister Lisa's husband Allan Dailey.

Jeffie hadn't stopped talking. "Well, about a month ago I was sitting on the table at the Hartkes' one

evening. Sitting on the table, with my boots on the bench, spinning yarns, and Gertrud was sitting down on the bench. I looked down and I could sort of see into her cleavage, that white thing they all wear, she had it pretty low. And she was looking up. Her eyes were about the level of my knee and she kept on looking the length of my leg and on up to where my codpiece would be, that is if Americans wore the things and even most Germans don't any more, just the most old-fashioned old men, and the idea sort of occurred to me that she might not object, so the next chance I got, we wandered off and one thing led to another."

"If you get her pregnant," Derek said, "you are a married man. Trust me on this, Jeffie. She's not a whore and she's the daughter of one of the other sergeants in the regiment."

"Hartke hasn't said anything to me."

"Damn it, Jeffie, that's because he's*assuming* that if you get the girl pregnant, you'll marry her. It's the way it seems to work around here with respectable people, and what's more, if they have something like an age of consent, Gertrud can't be over it by much. I'm involved because in spite of the fact that you work with Hartke and have ever since he joined our forces after the fight at Badenburg, you haven't made much of a try at figuring out things like that—about how things work with the down-timers. And Hartke hasn't made much effort to figure out how they work with up-timers. But Dagmar damned well has and she gave me an alert on this. I can't afford to have you tick Hartke off. He's too important in keeping discipline among the down-time troops."

"Oh," Jeffie said. "Dagmar."

Sergeant Hartke was a Pomeranian. His wife—his second wife, actually—Dagmar was a Dane and had been the widow of a Dane when she married the sergeant. She regularly pointed out that when*she* got involved in all of this, the*Danes* were the glorious champions of the Protestant cause in this mess and the Swedes were nowhere in sight. Her first husband had been killed in the Danish defeat at Lutter am Barenburg in 1626.

In the five years between that and her marriage to Sergeant Hartke in 1631, Dagmar had survived five manless years in the train of various Protestant armies, fairly intact, by not missing a thing. She definitely had not missed the Garand-Gertrud connection. She had been very verbose about it, as Derek recalled.

"Errr," Jeffie said. "I know that Gertrud isn't a whore. She's living at home with her family. Actually, we haven't quite gotten to the point yet where I could get her pregnant. Almost. I'm working on it, so to speak, but there's not a lot of privacy going around. That first time we wandered outside, once we got there, I was wearing an overcoat and she was wearing a cape. We both had on hats and boots. I was wearing long johns; she had on six woolen petticoats. About all we managed to do was pull off our gloves and poke our fingers at some of each other's more interesting parts, so to speak, before we headed back in to the fireplace."

"Maybe," Derek said, "It will be a long winter." He could always hope.

"The ground is still pretty cold. There's still snow under the bushes. Not to mention that the leaves aren't fully out. When the weather gets a bit warmer and the bushes get bushier—then I'll get my hopes up. Other things are already up every time I see Gertrud."

Derek looked at him. Jeffie's grin was totally unrepentant. But . . .

"In that case," Derek said firmly, "I hereby order you to have a talk with Gus Szymanski tomorrow, if

you haven't had one yet. Maybe he has some ideas about down-time techniques for delaying the probably inevitable."

Jeffie jumped up.

"I did not say 'dismissed.'"

"Sorry, Derek. I mean, sorry, Major Utt."

Derek sighed. Being military administrator in Fulda tended to be short on spit and polish. It was hard to impress a subordinate who somewhere deep down thought that you really were and really always would be just the little brother of one of his high school teachers.

Gelnhausen, May 1633

Riffa, daughter of Simon zur Sichel, looked out of the window. There was no especially beautiful scenery to keep her anchored there, but the view included David Kronberg, who was sitting on a bench and looking at the clouds.

She sighed. Some people said that David Kronberg was very odd. Most of the Jews in Gelnhausen said that David Kronberg was very odd. Riffa didn't think he was odd. Different, in an interesting sort of way, but not odd. If you had a husband who was a postal courier, he would come home bringing a lot of news.

Emelin Wohl, last week, said that he looked like a rabbit.

Riffa sighed. Objectively she had to agree that he looked sort of like a rabbit, but it was a really*cute* rabbit. The kind you wanted to take in your arms and cuddle, stroke its fur, feel its long silky ears. Snuggle it up to your bosom, where its little pink nose and whiskers could tickle your . . .

She pulled her thoughts back into order. Everyone knew that his parents and Jachant Wohl's parents were trying to make a match. Talk about having all the luck. Jachant would get to marry him, without even trying.

Not that there was the slightest chance that Riffa could ever marry him. There was no point in having impossible dreams. Her parents, Simon ben Itzig also called Simon zur Sichel and his wife, did not move in the same social circle as the Kronberg family. After all, Papa was just an itinerant peddler. It was the generosity of the Jewish community that allowed Mama and her to stay in Gelnhausen when he was traveling. They didn't really belong here. Or anywhere.

Often, she wondered if she would ever marry at all. Who would offer for her but some smelly, childless, old man who was hoping for better luck with a young, healthy, second wife?

* * *

David was looking at the clouds with one eye, visualizing pictures as they floated across the sky. With the other one, he kept monitoring the little cottage marked by a sickle over its front door. If he was really lucky, Riffa might come out to go to the well, or run an errand for her mother, or something. If she did, he could watch her until she turned the corner. Maybe he could even watch her come back.

For years, he had thought that the Thurn and Taxis postal station was the most interesting thing in Gelnhausen. For the past few months, the cottage with the sickle had given it competition.

Someday, perhaps, he would do a great and daring deed. Something heroic. After that, Riffa zur Sichel would smile at him. Would smile down at him. She was about two inches taller than he was.

Preferably, that would happen before his parents married him off to Jachant Wohl, because if it did not, it would not be proper for him to smile back.

* * *

It occurred to Riffa that if she offered to do the marketing, the route would take her past the bench where David Kronberg was sitting. Maybe he would look at her.

"Mama," she said.

He looked at her. Not directly, of course, but she could feel him looking at her.

He would be the father of such adorable babies, like plump, fluffy little bunnies. She could feel even now how delightful it would be to hold them in her arms.

Just before she turned the corner toward the marketplace, she managed to wiggle a little as she walked along carrying her basket. She hoped that he was still looking, but she could scarcely turn around and check.

Fulda, May 1633

Jodocus Menig looked up from his work, irritated. Someone was pounding on the door and he was not expecting any customers. His paper mill was on a stream about a half-mile outside the Fulda city walls. Most people with whom he did business had no reason to come out here; he met them in town to take orders and such. He made his own arrangements with a teamster to haul the deliveries and he knew that he did not have any scheduled for today.

Wiping his hands on his apron, he ran to the front. It was the courier—Wackernagel was his name—with the large envelope he had been told to expect. Menig signed for it himself. His wife was dead. As he signed, he thought that he would have to do something about remarrying. It was nearly impossible for a man to carry on a business if he didn't have a wife.

He didn't want a Catholic wife, though, and most of the marriageable women here in and around the city of Fulda were Catholic.

Jodocus Menig came from Schlitz. He had moved his business down to Fulda when the up-timers took over, because the*Ritter* , Herr Karl von Schlitz, had offered to invest some money if he would make the move. Schlitz thought it would be a good idea to have a man in Fulda who could keep an eye out on developments for him, now that the up-timers had opened the city to Protestants again. The*Ritter* had considered Menig a good choice. Fulda didn't have a paper manufacturers guild, so all he had needed to do was lease the site and get the permits to erect the buildings.

He'd ask the*Ritter* 's steward. Bonifacius Bodamer would probably be able to think of some healthy, practical, widow from Schlitz, a good housekeeper with not too many children from her first marriage. Still of child-bearing age.

More children wouldn't be a bad idea. When Kaethe had died, she had left him with just the one boy. You couldn't rely on just one child to care for you in your old age. Not the way that things were these days. However clever a child might be, he could get sick and die. Here today, gone tomorrow. That was the way of children, even when they seemed perfectly healthy.

Menig suddenly realized one horrible thing. Now that the stencils had arrived, he would have to figure out how to use the duplicating machine.

At least, his son Emrich had already put the machine together. Emrich was just barely fourteen. He was only starting to learn the art of making paper. But with these new devices that were appearing all over the place, all the time it seemed, he was better than his father.

Emrich had figured out how to put the machine together.

Maybe Emrich could figure out how to use it.

Jodocus certainly hoped Emrich could figure out how to use the stencils. He was expected to produce several hundred placards and pamphlets within the next two weeks.

He was not a printer. He had never planned to be a printer. He had never asked for a duplicating machine. He had never asked to be involved in his lord's politics.

"Put not your trust in princes." He should have known that when the*Ritter* offered to invest in expanding the business, he would be calling in favors.

* * *

If the*Ritter* wanted pamphlets and placards, he would get them. Jodocus and Bonifacius agreed on this principle solemnly. They sat in the front*Stube* of the paper mill, drinking beer and discussing eligible widows. They solemnly assured one another that they were much too old dogs to be expected to learn new tricks, either of them.

* * *

"There has to be something that I just don't understand," Emrich Menig complained. "Every single time I run the tray through the rollers, to transfer the ink through the stencil to the paper, I get some ink coming through onto the top roller. Not a lot, but enough to make smears on the back of the next copy."

"You didn't complain when we were running off the placards." Liesel Bodamer, just two months older than Emrich, stopped cranking the rollers and came round to the other side of the duplicating machine.

"It didn't make any difference when we were doing the placards. They are just one-sided, to be tacked up to doors and posts and things. It doesn't matter if they have some ink smears on the back. But for the pamphlets, we're supposed to run the paper through on one side, let the ink dry, and then run it through on the other side. So if there are smears on the back of the first run, people won't be able to read the printing we put there during the second run."

"Let me look at the manual."

"If I have to release the top roller and clean it for every single sheet of paper we run, we'll never get these done on time."

"Give me the manual, Emrich!" Liesel swatted his arm. "Hand it over. Now."

"It doesn't say anything."

"Something has to be wrong with the instructions. They must have left something out."

Emrich stared at her, shocked to the core of his faith. "The manual for putting together the duplicating machine was exactly right."

"Maybe two different people wrote them. Maybe the printer just left a line out when he was setting type. There's all sorts of things that could go wrong. We just have to think."

"All right. I'll clean the top roller again while you're looking."

"While you're cleaning, think. If they really haven't told us how to fix this problem, you're going to have to figure out a way to fix it yourself."

* * *

"In this illustration, the picture of the duplicating machine doesn't match the text." Liesel handed the manual back to Emrich.

"Yeah." Emrich sat there for a while, staring at the duplicating machine.

"Are you expecting it to talk to you?"

"Sort of. Did we take everything out of the envelope that the stencils came in?"

"No. I've been taking them out one at a time, so we don't mix them up."

"Take a look, will you. Are there any extra sheets of the waxed paper, without any stencil holes in them?"

"No."

"I think we need a solid waxed sheet, on top of the paper we're printing, to protect the roller."

Liesel looked. "I don't know if that's what the picture was supposed to show, but I think it would work. It's not as if you have a paper shortage around here. Do you have any wax?"

"Some candle stubs, probably. Wherever *Vati* puts them to give back to the candlemaker when we buy more."

"Let's look in the kitchen."

Emrich didn't know his way around the kitchen very well. It took quite a while to find a flat baking pan with edges high enough to melt a layer of wax in it. They never did find one large enough to lay a whole piece of paper flat.

"We'll have to do it part at a time," Liesel said. "Where's your fire-starter? I need to melt the candle stubs."

Two hours later, they determined that putting the extra sheet of waxed paper on top of the tray did keep the roller clean.

They were also getting hungry.

Their fathers were getting drunk. More precisely, had already gotten there.

"Do you have anything to eat, here?" Liesel asked.

"Bread, but it's a little moldy. Sausage, kind of dried out. And Papa won't like it if we eat it up and don't leave any for him."

"Well, ratzen-fratzen-snatzen-matzen to*him* . Here." Liesel dug into her pocket. "I have a couple of *Heller* . Run over to Barracktown and ask Sergeant Hartke's wife if we can have some eggs. She has three laying hens as well as the pullets, I know, because she bought them from Bachmann's widow. We already started the fire to melt the candle wax. I'll cut up the sausage and soften it in boiling water while you're gone and try to scrape the mold off the bread and toast it over the fire. I can make an omelet with sausage and toast cubes in it."

* * *

"What do you suppose those children are doing?" Dagmar asked a few evenings later. "Emrich Menig has been over here every noon for the past four days asking to buy something to eat. Doesn't Menig feed him? And why is Liesel there?"

"Bodamer is there, too," Jeffie Garand answered. "I've seen him around. Menig must have a big order on hand. They're probably too busy to pay any attention to the kids."

He looked at Gertrud and winked.

"Perhaps we should go outside and take a stroll up in the direction of the paper mill, just to check that they are okay."

They got all the way up there, knocked on the door, and were admitted by Liesel, who said that everything was all right, thank you. She seemed to be telling the truth, so they went back at a leisurely pace that included a couple of detours.

* * *

"I think," Liesel said, "that it would be better to stamp the woodcuts into the squares before we fold the pages of the pamphlets and sew them together."

"Sew them together?"

"Just in and out with the needle and then knot the thread on the outside. It doesn't have to be fancy. That's what keeps pamphlets from falling apart."

"How do you know?"

"Lorenz Mangold, the councilman from Fulda, gave my Papa another pamphlet while he was in Fulda

yesterday. He brought it back and was showing it to your Papa. Mangold got it from somewhere else. It's printed, I think, but he wants your Papa to make stencils and make more copies of it for him. It's sewed together like that. I can't think of any other way to keep the pages from falling apart. Mangold is coming out here tomorrow, Papa said."

"No," Emrich groaned. "No. Papa isn't going to make stencils. Papa isn't going to make pamphlets for Mangold. Liesel, we—you and me—are going to be cranking this duplicating machine until the day we die."

"Well, clean it up now. We can stop cranking until we finish stamping this batch. And pull the tray out. We'll have to use the ink pad in it for stamping the woodcuts, because they didn't think to send us a separate one."

* * *

"Emrich?" Liesel sounded a little doubtful. She was a country girl and quite familiar with the way that animals mated.

"Umm?"

"What the snake with the forked tongue is doing there, in the woodcut showing the woman Clara and the nun named Salome and the abbot. Is that possible?"

Emrich took stock of his limited knowledge of male anatomy, both human and serpentine. "I don't think so. I'm pretty sure not, even."

"That's what I thought. Is there any more of the sauerkraut left?"

Gelnhausen, June 1633

"It's not doing any good, Uncle Meier. Honestly. Thank you for coming, but it isn't helping."

"David," his father said, "it is not your place to be talking. The family is consulting about your future."

His uncle Salman ben Aron, called Samuel zur Krone, frowned a little and started to speak. His wife, Aunt Daertze, not just Aunt Daertze because she had married his uncle but because she was Daertze Zons, his mother's sister, put her hand on his arm to hush him.

"He has a right to some voice in his own future," Uncle Meier said.

"Not when the future he wants is so unimaginably and incomprehensibly wrong-headed." Samuel Wohl was sitting next to David's father. "The very idea that you would even consider letting him*apply* to become a postal courier is ridiculous."

Then Jachant Wohl was sitting there. Then her mother. Her mother and his mother, who was next, had their arms linked together.

They were all agreeing.

Jachant opened her mouth. "I refuse to even consider having a husband who would spend so much time as a vagrant."

"A postal courier is not a vagrant," David protested.

"David," his father said. "It is not your place to be talking."

"A postal courier is not a vagrant," someone else said. That was Zorline Neumark, his Uncle Meier's wife. "And they make reasonably good money. I know that Crispin's brother-in-law does."

The row of people on the other side of the table glared at her. Crispin, the grandson of the apostate. His grandfather had changed his name from Neumark to Neumann. How could Zorline admit that she still spoke with that branch of the family?

They all thought it. Hindle Kalman, Jachant's mother, said it.

*Der dicke Meier*defended his wife.

Jachant opened her mouth again. "You look like a rabbit, Meier ben Aron. And so does David Kronberg."

Her parents stared at her.

"It's true."

Everyone stared at her.

Except David, who took the chance to leave the room.

* * *

"He's leaving," Zorline Neumark told Hindle Kalman. Zivka, the wife of Simon zur Sichel, stood quietly in the back of the shop, listening. "David. Today. He says that he is going before he has an irretrievable fight with his parents. Meier suggested that he should come to Frankfurt with us, but he refuses to become another point of contention between brothers. He says that he is going to Fulda. So that is what your daughter Jachant and her runaway tongue have accomplished for us."

"To the up-timers?"

"He says that according to their 'constitution,' a religious test for holding public office is forbidden. He is going to apply to work as a postal courier there, somewhere in the New United States. Just walk in and apply, without even a letter of introduction."

Zivka had not missed the direction in which her daughter Riffa's eyes sometimes wandered. She went home.

"Oh," Riffa said. "I think that's the bravest and most daring thing that I ever heard of any man doing."

"I," Zivka said, "am going for water. After that, I may visit the bath. I certainly will not be back for two hours at least; possibly three."

* * *

"Riffa," David said. "Why are you here? Outside of the walls?"

He had never been so close her. He dreamed about her, but he had never approached her, because he knew that his parents would never agree that he could have her honorably, under the canopy. So he should not look. Even though he had looked, of course.

"I wanted to say something to you before you left."

"What do we have to say to each other?"

"I wanted you to know that I would be proud to be married to you. Even if Jachant Wohl will not. I just thought that I would like you to know that before you went away."

Now he looked up.

"Jachant Wohl won't take you, you know. Not if you leave. Her parents won't let you have her, either. Have you thought what you are doing? She's the best match in Gelnhausen. Pretty. Rich."

"You're prettier." The tone of David's voice carried full conviction.

Riffa had been about to say something else. Her mouth had been open. After a few seconds, she closed it, trying to remember what she had planned to say.

"Not richer. Is it true that you are going to the New United States?"

"To Fulda, yes. To talk the up-timers there. I'm pretty sure that I can't get a job with the municipal couriers here in Gelnhausen. The messengers are all one another's relatives. They look out for each other. But I've spent enough time watching, all these years. I know as much about what they do as anyone could who hasn't actually done it."

"All by yourself, someone said. Without even a letter of introduction."

"I'm not quite that foolhardy, no matter what some people think. Martin Wackernagel, the courier, gave me a recommendation to a Major Derek Utt. Wackernagel is acquainted with some of the people there."

"There's no Jewish community in Fulda."

"I know."

"How will you live, then?"

"Without one, I guess."

"Have you ever talked to my father?"

"No. Should I have?"

"He's a peddler, you know. That's why families like yours look down on him. After the Jews were expelled from Hanau in 1592, my grandfather went peddling.*Unvergleidet* , without a charter of protection from any Christian lord. My father did, too. When the duke let the Jews come back in 1603, my grandfather and father didn't come back. They kept peddling, from Denmark to Switzerland. Not far

east, but sometimes west into Alsace. I was born on the road. There was no*mikvah* for my mother to cleanse herself in forty days. Not for over a year. I don't remember it well. I was eight when he obtained permission for my mother and me to stay in Gelnhausen when he is traveling. You could have asked him, some time when he was here. Asked him what it will be like for you now."

David looked at her. "Even if you don't remember it, you must have heard them talking. Would you live that way?"

"If I were with you," Riffa said. "If I could go to Fulda with you. . . . In the New United States, I have heard, we do not need to be*vergleidet* . Or, we are*vergleidet* by their 'constitution' itself, and not by any prince."

David looked at her with some surprise.

"My father brings home newspapers."

"When I get a job there, as soon as I can, I will come back for you. What will your parents do when you go with me?"

Riffa shook her head. "I don't know. Come with us, perhaps."

"That would be nice."

She smiled down at him. Then she went back home to the cottage marked with the sickle and he went to Fulda, invisible fireworks bursting within his head.

Ups and Downs
June 1633
Schlitz

Bonifacius Bodamer was standing outside his grist mill, waiting for the mail.

It was Martin Wackernagel's opinion that Bodamer was usually standing outside his mill waiting for something, while his men did the heavy work inside. Maybe he had worked harder at an earlier stage of his life, when he was a mill hand rather than a mill owner. In any case, he also served as steward of the *Ritter* , Karl von Schlitz, along this part of the route. To get from Eisenach to Fulda, a person went through Schlitz. That was just how the road ran.

This morning, Bodamer had other men with him.

Wackernagel perceived signs of rank. Just as a precaution, rather than simply handing the packet over to Bodamer, he pulled up his horse, dismounted, and bowed with what he hoped was the appropriate amount of respect for whomever they might be.

The two older men ignored him. The two younger men gave him a look which said that they were willing to ignore him now that he had made a reasonably appropriate obeisance, but would not have ignored him if he had failed to do so.

There were a lot of people like that around.

The two older, unidentified, men were chuckling to one another. Bodamer chuckled with them, obsequiously. He forgot to take the packet of mail that Wackernagel was still offering to him.

Liesel, Bodamer's daughter, came out of the mill and took the packet.

"May I water your horse?" she asked.

Wackernagel was still dismounted. "I would be grateful, ordinarily, but this monster is a bit frisky. I'm afraid that the millrace coming out of the pond is likely to spook him, so he will have to wait for a while."

"We have a barrel and leather bucket, right in the back of the building."

"Angel of mercy." He bowed to the girl with a flourish. "Show me where your barrel is, if you would be so kind, and I will lead him around."

"Who is with your father?" he asked once they were safely out of sight.

"Herr von Schlitz, our ruler, with his two sons."

That explained the arrogance.

"The other man, the one in green, is Lorenz Mangold. He is a city councilman in Fulda. He has been here several times, lately, talking to my father."

The chuckling that had been going on in front of the mill expanded into uproarious laughter.

"Something's funny."

"It's a pamphlet," Liesel said. "A satire. They are enjoying it a lot."

By the time they were done with the horse, the knight and his two sons were gone. Mangold was still standing there, waving some pieces of paper at Bodamer.

There was no reason for Wackernagel to go back and talk to them. The only words he heard were, "I wrote this one myself and I am very proud of it. I'll be happy to cover the costs, given how reasonable they are turning out to be."

Barracktown bei Fulda

At supper time, Martin turned in to the Hartke cottage. Dagmar the Dane always picked up anything he had for Barracktown when he came by. She always fed him, too.

A certain scurrilous pamphlet was the topic of the day.

"I tell you," Dagmar was saying. "According to my husband, Mr. Wesley Jenkins, the civilian

administrator, was truly furious. He ordered all the placards torn down and sent soldiers to Neuenburg to bring the members of the Special Commission back to Fulda."

"Why so angry?"

"It showed one of his staff in a scandalous position with the abbot of Fulda. And named her."

"Ah," Wackernagel said. "Yes, I can see that. Was a military escort really warranted, though?"

"Maybe not. Even probably not. Most of the time, the roads here are fairly safe now. Although, just yesterday, Helmuth's daughter Gertrud went into Fulda itself and was accosted by the older son of*Ritter* von Schlitz."

Wackernagel frowned. He had seen that man just this morning, up at Bodamer's. "Were his father and brother with him?"

"In Fulda? I do not know. Not, certainly, at the time when he called Gertrud a slut and soldier's whore and pointed to the placards saying that the same fate waited for her. Other people in Fulda started pointing at her and calling her the 'up-timer's whore' too."

"Then?"

"Then Captain Wiegand came along with some of the Fulda militia and took her into the*Ratshaus* ," Jeffie Garand said. He had his arm around Gertrud's shoulders. "She stayed there until the day was over and came back home with her father. According to Wiegand, von Schlitz was angry—tried to draw his sword on the captain. But the militia had other more urgent assignments, so they couldn't stop to deal with him the way he really deserved."

"Exactly what," Wackernagel asked, "was this placard about?"

Dagmar produced one. She had several. The soldiers had obeyed the orders to tear them down, which did not mean that they had destroyed such entertaining reading matter. And, in any case, they could be used to paper the walls of the cottages. The more layers of paper a woman pasted up on the wall, the fewer drafts would come through in the winter.

She had several copies of the pamphlet, too. She gave Martin a couple. He tucked them into his saddlebags.

* * *

They were about to start eating. Whether Sergeant Hartke was home yet or not, a meal could be kept warm only so long. A minor riot appeared to break out by the entrance to the compound. Jeffie jumped up and ran out; then came back with Hartke.

"I finally threw that sutler out," the older man was saying. "He's been trying for weeks to overcharge really drastically on the thread and notions for making the rest of the new uniforms and I've already warned him three times. Tell everyone tomorrow, Dagmar. He's not to be allowed back. Have some of the women take everything out of his cottage and throw it on the ground just outside the entrance. If he wants it, he can come and haul it away. If he doesn't bother, then it's free pickings."

The conversation meandered back to the scandalous pamphlet and stayed there all through the rest of the meal.

Wackernagel headed back down the road. There would still be a couple of hours of daylight and he didn't want to waste it.

* * *

Gertrud Hartke and Jeffie Garand wandered out of the compound, up in the direction of Menig's paper mill. They had discovered a rather nice stand of bushes there a couple of weeks before.

"Jeffie," Gertrud asked. "Can men really do all the things that those woodcuts in the pamphlet showed?"

"Not, um, precisely. No."

She didn't say anything.

"If you would really like to know what we*can* do, I'd be glad to demonstrate the whole procedure, so to speak. Think of it as a lesson in up-time scientific method. The hands-on experimental approach to finding out."

Gertrud thought about it. Up till now, she had really sort of been teasing Jeffie. He had made it so plain what he wanted from her, but at the same time he had been so unbelievably well-mannered about it, that she couldn't resist teasing a little. But. . . . If all those people in Fulda already thought that she was a soldier's whore, why shouldn't she be one? Especially his?

"Okay," she said.

* * *

"Gertrud," Jeffie said. "You know what?"

She shook her head no. It was too dark to see, but he felt her hair move against his chin.

"Last winter, Derek—Major Utt, that is—said something. He said that if I got you pregnant, I was a married man."

"Oh."

"I'm not as forgetful as people sometimes think I am."

Gertrud snuggled in. She wouldn't have minded being a soldier's whore. Not really a lot, at least if Jeffie was the soldier. There were plenty of them in Barracktown. But a soldier's wife would be better. She wondered how long it would take for her to become a married woman.

Gelnhausen

Martin Wackernagel found it odd to pull into the post station in Gelnhausen and not see David Kronberg waiting. He finished his business and prepared to start out.

There was a young woman standing outside.

"You are Wackernagel?"

"Yes, that's me."

"Have you seen David Kronberg?"

"I passed him at Neuhof. He was heading for Fulda, just as he planned."

She smiled. "Do you know where he will be staying, in case my father might wish to find him?"

"I told him to stop at Barracktown. Sergeant Hartke just threw out one of the sutlers, so there's a cottage standing empty. I expect he can stay there a few days until he finds a job. If David's already gone when your father gets there, tell him to ask for Dagmar. That's the sergeant's wife. She'll know where he is."

Riffa went home and talked to her mother. A sutler thrown out. A cottage. Zivka went to bed thinking. Could she afford to wait for her husband to come home? A sutlery. A permanent business for an honest man. A home, perhaps.

Hanau

"Ask him in person," Meier zum Schwan had requested. "I've written a letter for you to take, explaining the details. But please deliver it in person and tell him how urgent it is for me."

So here he was, talking to a rabbi. Martin Wackernagel smiled to himself. At least he knew the history. Jews had settled in the county of Hanau long ago. About four hundred years ago, probably. They had been expelled not long ago, in 1592. Then Count Philipp Ludwig II came into power in 1603 and he changed it again. He invited Jews back to his capital city—only wealthy Jews, to be sure, but Jews. He let them build a synagogue; he issued a charter defining their legal status and protecting them. The community had grown steadily. From ten persons in 1603 almost fifty families now.

Including the rabbi.*Der dicke Meier* wanted him to come to Gelnhausen to arbitrate the dispute within the Kronberg family.

"Isn't it a bit late?" Martin had asked.

"No. That's why David left when he did. Before it became too late; before someone said something that could not be retracted. Though Jachant Wohl came perilously close with her words about vagrants."

* * *

"Yes," Menahem ben Elnathan said. "Yes, I will go to Gelnhausen."

Wackernagel looked at the man. He wasn't young. He did not look particularly strong, either. "If it can wait for a week," he offered, "I will stop here on my next trip outbound and go with you to Gelnhausen. David Kronberg isn't there in any case. He has gone to Fulda."

"I would not refuse your offer," the rabbi answered. "It will still be necessary to deal with all the others involved in the debacle."

"I brought your newspaper, too," Wackernagel said.

The rabbi picked it up and shook his head. "Useful, but so predictable. It's been the same pattern for years. Almost everything concerning the Ottoman Empire comes through Venice. Vienna sends news about Hungary, the Balkans, and the Turkish wars. Nearly all the articles with information about the Spanish possessions in southern Italy, Spain itself, Africa, Latin America, and the Philippines comes through the imperial post office in Rome. If it pertains to England or France, it probably came through Antwerp although, possibly, now that the Swedes have a post office there, through Hamburg. Cologne gathers the news from the northern Netherlands and from the Germanies themselves, although that is now somewhat counterbalanced by the efforts of the postmaster in Frankfurt itself. A person has to read every story with an eye to who provided the information and how it is slanted."

He looked up hopefully. "Do you have unofficial gossip?"

Wackernagel offered a summary of the scurrilous pamphlet that had recently been circulated in Fulda.

"That is an unusually specific attack. Much of the material that has been sent to me recently is more generic in nature." Menahem ben Elnathan showed Wackernagel some examples of the anti-Semitic pamphlets that had been circulating in the CPE.

"Look," Wackernagel said. "Most of the pamphlets that you have bear no resemblance to the one in Fulda. But these two have a similar typeface and illustration style. I don't think that I have ever seen this typeface before."

"They are similar in another way," ben Elnathan observed. "Most of the pamphlets are general attacks. But you say that the two women mentioned in the Fulda exemplar are real." He picked up one of the other pamphlets. "As Rebecca Abrabanel, the wife of Michael Stearns, is quite real."

"I've never seen her," Wackernagel said, "Rebecca Abrabanel, that is. Or either of the Fulda women, but the up-timers in Fulda say that the face on the image of Clara Bachmeierin was a quite good likeness."

"Nor have I seen Rebecca Abrabanel. But something concerns me. The typology of Rebecca as the deceiver, deceiving Isaac into extending the blessing to Jacob rather than Esau, would not, I think, be the first thing that would spring into a Gentile's mind."

"If I could borrow that," Martin said, "I could show it to my brother-in-law. He's a printer; he might see something in it that we don't."

"You can borrow several. I'm not likely to run out."

Once More, with Feeling
Frankfurt am Main, June 1633

"What do you think of them, Crispin?" Martin asked.

His brother-in-law looked down at the pamphlets.

"You want to know if I think they're nasty? Loathsome? Fetid?"

"I want to know if you recognize anything about them. There's no printer's logo of any kind; not even an imaginary location and forged name of a printing house. No date of publication. I can tell that much for myself, but I'm not a specialist. You are."

"Let me look at them in the morning. In the daylight."

* * *

"I don't think they were printed."

"Crispin, they're lying on the table right in front of you. Of course they were printed."

"Umm, um. Look at this. It's printed. I printed it right here."

It was a neat pamphlet, full of illustrations, advising an expectant father how to build nursery furniture in his spare time. Self-improvement was the bread and butter of the small printer.

"Now, this one. Escher put it out last week.*How to Make Beer at Home* ."

Martin picked it up.

"And this one. It's from Freytag.*Sample Letters to Government Officials* . Both of these have the place and printer identified. They're trying to make money, after all. But just compare the pages."

Martin did not have much luck. Crispin patiently showed him the difference, point by point.

"I think these pamphlets you brought, both the Abrabanel one, which you say that according to ben Elnathan came from Magdeburg, and the one that showed up in Fulda, were produced on these new 'duplicating machines.'"

"That means?"

"I tell you, Martin, these new stencil systems will be running small printers out of business. If I don't manage to get hold of one of these 'duplicating machines' pretty soon, my own business is going to fold. It's not as if I make my money printing large editions of thick academic books. And Escher so far hasn't even let slip the name of the man he bought it from."

"Put an ad in the paper," Martin suggested.

"For what?" Merga asked. "Crispin isn't trying to sell something."

"Say you want to buy one. Escher and Freytag may not want to tell the rest of you where they bought them, but I'd say it's pretty likely that the maker would like to sell more."

The expression of Merga's face became quite predatory. "I'm going down to the post office right now." Which she did.

"While she's gone . . ." Crispin said.

Martin looked up. It wasn't like Crispin to sound so hesitant.

"This pamphlet that the Gelnhausen rabbi loaned to you . . . the one naming Rebecca Abrabanel . . ."

"Yes."

"I don't even like to suggest it. Jews get enough trouble in this world without my adding to it. But the way that it is written. I can't help but wonder about the possibility of an apostate—a convert—writing it. First generation—one born and educated in Judaism. That pamphlet, and some of the others the rabbi had collected. They rely quite a lot upon Talmudic tropes. If not an apostate, then perhaps a university-educated Hebracist."

"Either possibility is less desirable than the other."

"You might just mention them to the rabbi, though. Rabbis are trained to think their way through unpleasant possibilities. That's part of what they do."

* * *

He couldn't leave without going upstairs and saying goodbye to his mother. Or he could, but he would regret it later.

"About settling down," she was saying.

"Look,*Mutti* ," he said patiently. At least he made the effort to sound as if he were saying it patiently.

"It isn't just that I like being on the road, though I do like being on the road. I like it a lot. But working as a private messenger is a lot less subject to political vicissitudes than working for the imperial postal system used to be. Or, for that matter, than working for the Swedish postal system is now."

She looked skeptical.

"I wasn't dependent upon Johann van den Birghden's favor to get my job, which is just as well. I sort of doubt that van den Birghden would have hired the son of a man who worked for his main rival."

That was true enough—something that his mother couldn't argue with. Van den Birghden was not only the postmaster but also the newspaper publisher. It was the*Frankfurter Post-Avisen* . The only one, now. Martin's late father had worked as an itinerant salesman for Egenolph Emmel, a bookseller and van den Birghden's rival newspaperman. He had started the*Frankfurter Journal* in 1615.

Then van den Birghden had come to Frankfurt to run its newly established central post office for the Thurn und Taxis in Brussels. In 1617 he had founded the other paper. Emmel sued. In the course of the litigation, Birghden asserted that postmasters had a legal right to a monopoly on publishing newspapers.

"I've stayed out of the postmaster's way," Martin continued. "Van den Birghden is a busy man. Reminding him that my father ever worked for Emmel would not be a clever move. Even as a private courier, I have to work with the post offices, but it's not hard for me to avoid him. An ordinary person hardly ever has any reason to encounter the head of the postal system, especially not now that he is so busy establishing new routes. He's speeding up the field post system for the Swedish army. He's setting up alliances with the other postmasters working for the Swedes such as Wechlen in Leipzig and Stenglin in Augsburg. He's trying to speed up the links from Mainz to Hamburg and from there to Stockholm."

"Every one of those," his mother answered, "offers an opportunity for a man who is ready to settle down."

She looked at him.

"But," she said, "if you will not, perhaps you will not. Nonetheless, you could get married even if you continued to ride the Imperial Road. It is not likely, now, that Crispin and Merga will ever have children. I want to be a grandmother before I die."

He fled down the stairs.*Mutti* 's new thought could be dangerous. Never, never before, had she separated the ideas of "getting married" and "settling down." Always before, one had gone with the other.

The Wheels of the Gods
July 1633
Gelnhausen

It wasn't pleasant, Zorline Neumark thought. The community had not just split since David Kronberg left. It had shattered into a dozen pieces. It wasn't clear that it could ever be put back together. The only people who didn't seem to be involved, one way or another, were Zivka zur Sichel and her daughter, who had kept completely out of it.

Though they would probably be drawn in once Zivka's husband Simon came back from his current trip. Whenever he was in Gelnhausen, he made up part of the*minyan* .

Now, though, the Wohls were not speaking to her husband. Salman and Daertze were trying to keep the peace between Meier and Abelin. Some of the Zons in-laws weren't speaking to any of them. The parents of Feyel Wohl's betrothed were said to be having second thoughts after Jachant's very unsuitable statements. Feyel and her betrothed, who really did want to marry one another, now blamed Jachant. Hindle was shrewish.

Zorline was very glad to see the arrival of Menahem ben Elnathan. In a way, she was glad to see him riding with the Gentile courier. It sent a signal that Samuel Wohl,*parnas* or not, would not have things all his way. The president of a Jewish community was not a dictator.

* * *

"He's back," Riffa reported to her mother. "The courier. He brought the Hanauer rabbi, then went to the post office again."

"Get your basket, then. I have hired the teamster to come for the rest of it the day after we have left. He has the key to the lock. The current rent we have paid for the cottage with the sickle expires the day after that. We will follow the rider to Fulda."

Barracktown bei Fulda

"Can you believe it?" David Kronberg asked earnestly. "It was a competition, but still. Only forty-two

hours from Berlin to Hamburg. They say that the Brandenburg messengers are regularly covering Königsberg-Berlin in four days, now; Berlin-Cleves in six days when there aren't any armies in the way."

Three or four other post riders were gathered at the table, talking shop.

Not that David was a post rider, exactly, although he did have a job. He had happened to arrive in Fulda in the middle of a dispute between the NUS administration, the Swedes, and the city fathers over whether the city gates would be opened to allow passage of post riders in the night, since the main road led right through the city and the post office and change station with the remounts were inside the walls.

Since the city fathers would not budge from their stance that any proper set of gates remained closed from sunset to sunrise, the Swedes and the NUS moved the post office to Barracktown and surfaced a riding path around the city walls. David had ended up as a postal clerk, accepting, sorting, bagging, and routing the mail.

Since the up-timers had made this suggestion right after his first attempt to ride a horse*a diligence* for the whole length of a fifteen-mile*posta* , he seemed to be settling in happily enough. He still got to hang around a post office. That had been his real ambition.

Martin Wackernagel listened to the riders unhappily. None of the men sitting around the table seemed to have any doubts about the glories of riding short-distance*posta* lengths. None of them seemed to have any doubts about the wisdom of enforcing a government monopoly on mail handling.

Except Veit Huss. He was a teamster, not a post rider. Visions of stagecoaches danced in his head. Post chaises. Based on a novel, of all things, telling about life in England two hundred years in the future. A world in which the roads were so good that the mails were transported by coaches that also carried passengers.

"It will be decades before the roads permit anything like that," one of the riders said. "Especially in the Rhoen region. Can you imagine trying to take one of those 'post chaises' at any speed from Huenfeld to Kassel by way of Hersfeld. Or from Fulda to Wuerzburg? Just along that old heights-road that follows the Doellbach upwards to Motten . . ." He started drawing a map with his finger in the moisture that the beer steins had dripped onto the table. "I've talked to some of the Frammersbach teamsters and they say . . ."

"Except, maybe, right around that Grantville place." Another man picked up his stein. "I've actually seen the roads they brought back in time. Even the down-time roads they are improving would carry coaches easily most of the year."

"My cousin Hans . . ." Huss began.

"Is a road contractor," the rider retorted. "He has visions that the New United States will pay him money to make the roads around Fulda look like the roads around Grantville. Fat chance."

"It wouldn't have to be all the roads. They could just start by improving the main mail routes to that standard . . . Some are already fairly good. Think about that comfortable stretch from the monastery of Thulba as far as Hammelburg on the Franconian Saale out at the edge of the Abbey's lands."

Martin's thoughts wandered.

Maybe, now that the king of Sweden and his new up-timer allies wanted more than just a field post

system for the army, van den Birghden would become a consultant to many of the king of Sweden's allies. Maybe, the post office would need many more civilian carriers who would do for the CPE what the Thurn and Taxis did for the Holy Roman Empire

Unless politics got in the way. There were advantages to being an independent courier. Sometimes, it was better not to work for the government. Martin had kept right on riding the Imperial Road in 1627 when the fortunes of war and pressures of politics had forced van den Birghden out as postmaster in Frankfurt.

Van den Birghden was a Protestant. Before the war started, it had been acceptable for a Protestant to hold an important job in the imperial system. Van den Birghden had enemies. The charge was that he had been spying for the Protestants—telling them what was in confidential letters that important imperial officials and commanders sent through the postal system. He had fought being fired, of course. It had taken them several months and several hearings to get rid of him. Ferdinand II replaced him with a Catholic, even though a lot of influential people from the archbishop-elector of Mainz to General Tilly himself had advised the emperor to keep him on.

Martin had kept on riding the Imperial Road when the king of Sweden's forces swept through in the fall of 1631 and reinstated van den Birghden.

While it was all going on, while the politicians fought over control of the postal system, Martin had kept riding. He might not be as fast, but his customers knew him and trusted him. Riding this route was a lot more than a living. Riding this route was his life.

"Across the top of that pass before you get to Speicherz . . ."

"Over another mountain in order to reach the Schondra . . ."

"Additional teams needed at Brueckenau . . ."

"New bridge across the Sinn . . ."

The voices ran over and into one another.

"David," he said. "I hate to interrupt this thrilling conversation, but there's something you may want to know."

"My father has changed his mind?"

"Not exactly. Zivka zur Sichel and her daughter Riffa are at the Hartkes."

David Kronberg practically flew out of his seat.

* * *

Martin had deliberately built enough time into this run that he could stop and talk to Veit Huss and his cousin. Mail coaches would not be practical for a long time, Veit admitted, so what alternative was there to a mail monopoly? A regular freight wagon, such as Veit himself drove, was not suitable for the mails. It was simply too slow. The roads would not be ready for post chaises for a long time.

He kept thinking. The imperial cities had tried to hang onto their own messenger systems. It hadn't worked, because of the pressure that the grant of an imperial monopoly to Thurn and Taxis had placed

on them.

Some of the territorial rulers still ran their own messenger services. Brandenburg, on the eastern edge of the CPE with interests far to the east in Prussia, outside the Holy Roman Empire, had its own good-sized office with over two dozen riders. Even inside the CPE, the electors of Brandenburg felt safer sending important correspondence between the branches of the Hohenzollerns in Berlin and those in Franconia by way of people whom they paid themselves. Not everyone was entirely sure that van den Birghen had been innocent of those charges of spying, after all.

But working for Brandenburg would take him off his beloved Imperial Road. If necessary, maybe things could be managed, but he would rather not.

Or maybe he could hire on with a freight line. The official postal system carried letters, sometimes whole sealed bags full of letters, but it didn't carry packages. If he located a long-haul line that carried from Frankfurt to Erfurt, he would move back and forth along the road more slowly, but at least he would move.

What would customers pay for the transport of light packages? Light enough that a man on horseback could carry several? Packages that did not really need a wagon and team, but were too bulky for a mail bag? Urgent packages?

Martin laughed, imagining a woodcut that depicted him on a horse with ten or a dozen lightweight packages tied to his back and his saddle, sticking out in all different directions. One hanging from his ear, perhaps. For a lot of horses, that would take some getting used to. A man would need the right kind of horse, steady and reliable.

What kind of customer would want a small or light package, too big for the mail bags but not heavy or bulky enough to require a freight wagon, taken somewhere fast? Who would want it enough to pay a tenth or twelfth of the cost of running the route and still leave the rider a decent profit?

Maybe there wouldn't be a new post office monopoly. The king of Sweden might not object to establishing one, but the Grantvillers were very enthusiastic about what they called "free enterprise."

Something to think about. Some way to keep riding the Imperial Road.

End of the Road?
Gelnhausen, August 1633

Simon zur Sichel came into Gelnhausen from a resupply stop in Frankfurt as he made his rounds. He found that Zivka and Riffa were gone and nobody in the community knew where.

When, they could guess, Zorline Neumark told him.

She and Meier zum Schwan were going back to Frankfurt. That was the general gossip. Meier had a business to run and there did not seem to be any sign that the feud in the Kronberg family would abate any time soon.

Samuel Wohl and Hindle Kalman had sent their daughter Jachant to cousins in Worms. The parents of

Feyel's fiancé had made that a condition of continuing the betrothal.

When he found out that a teamster had emptied the cottage under the sign of the sickle out neatly and driven away with the goods, Simon started to feel much better.

No one in the community knew who the teamster had been.

He asked at the post office. "Veit Huss," the postmaster said. "He drives from Fulda to Frankfurt. He was on his way to Fulda when he drove out that day."

Simon zur Sichel decided to head for Fulda. If Zivka had gone there, she would have had a good reason.

"If you are going," the Hanauer rabbi said, "may I accompany you? I would like to observe the changes that the up-timers have made in Fulda for myself."

Barracktown bei Fulda, September 1633

The Barracktown Council agreed to accept Simon zur Sichel as one of the approved resident sutlers. He requested permission to throw out the front of the cottage by about ten feet to make the front room into a "general store." After some discussion of the concept, the council, chaired by Dagmar, agreed to the proposition.

Menahem ben Elnathan and Simon zur Sichel discussed the heavy responsibilities of matrimony with David Kronberg, who said that he would be quite ecstatic to assume them, thank you. At least, he qualified, if they involved Riffa zur Sichel.

Then he asked Simon what name he intended to carry now that his family was no longer living in the sickle cottage in Gelnhausen. This proved to be such a successful distraction that it spared him from further embarrassment for all the rest of the evening.

Zivka did the same for Riffa, who indicated a high degree of reciprocal enthusiasm.

David said that he did not think that his parents would agree. The rabbi said that if they were patient, he would see to it, so they all relaxed.

Martin Wackernagel and the rabbi continued their discussion of stencils and duplicating machines. Both of them talked to Sergeant Hartke and his wife Dagmar about pamphlets. Dagmar recalled the Menig-Bodamer connection. Wackernagel recalled the Bodamer-Schlitz-Mangold chuckling convention. Gertrud Hartke and Jeffie Garand recalled the odd-looking contraption that was on the stand at Menig's paper mill the evening they had walked up to check if Emrich and Liesel were okay. They hadn't thought about the room being full of stacks of paper at the time, Jeffie admitted, since a person really expected to see stacks of paper in a paper mill. Then someone remembered seeing Mangold at Menig's.

Jeffie said that he thought he had better tell Derek—Major Utt, that was.

Major Utt got them an appointment with the NUS administrator, Wesley Jenkins. Not "one of these days," but first thing on his calendar the very next morning, even though the whole day was scheduled for

a big celebration of the up-timers' first down-time "airplane."

Fulda, September 1633

The NUS authorities arrested a lot of people, of course. First Jodocus Menig, who identified Karl von Schlitz as the person who paid for the import of the duplicating machine and stencils. They could not arrest him, of course, or his sons, since Schlitz, although in the CPE, was not in the NUS.

Captain Wiegand felt considerable relief that the miscreant had not been someone from Fulda. That lasted until Emrich Menig said that, by the way, they had just been getting ready to run off another set of stencils. He and Liesel Bodamer had made them, he reported proudly. They had followed the instructions in the manual and been entirely successful. These stencils had been brought to them by Lorenz Mangold.

Wiegand's apprehension lasted until someone read the manuscript, which proved to contain not anti-Semitic tracts but rather some of the worst heroic poetry ever written. Andrea Hill made some rather biting comments on the probable impact of "duplicating machines" on vanity publishing in the seventeenth century.

Wiegand's relief lasted until a search of Mangold's house, authorized before anybody got around to reading the manuscript found at Menig's, turned up several crates of pamphlets that were virulently anti-Semitic. And some more which advocated the resumption of witchcraft trials. Plus quite a few which were just weird. Nothing indecent, though. Mangold appeared to be downright prudish.

To the great disappointment of almost everybody else, Wes Jenkins refused to authorize the use of torture, even under these circumstances. Even though they pointed out that it was perfectly legal under the*Constitutio Criminalis Carolina* , which remained the law of the CPE because nobody had ever gotten around to repealing it. Wes said it wasn't legal under American law and that was that. And, moreover, it wasn't a capital offense anyway, as far as he knew, just to own the things.

All of which was terribly unsatisfactory.

Magdeburg, September 1633

"It's because we were thinking presses," Mike Stearns said. "Thinking inside the box. That's why we haven't been able to identify the bastards who are producing this filth. Even the Committees of Correspondence were thinking presses. Small presses; those are what they are distributing to their local organizations. That is what the Venice Committee of Correspondence is going to get. Improved small presses, but still presses using movable type. Because for copiers, we were thinking high-tech. We knew that the down-timers did have presses and that they did not have copiers."

He slapped his hand on the table, turning to Don Francisco Nasi. "How many of these duplicating machines are there now, Francisco? Inside the USE, spewing out this poison. Is there any way to make an estimate?"

Francisco Nasi shook his head. "I have people trying to find out how many Vignelli has shipped from Bozen. Some of the pamphlets are printed on presses, of course. We may still be able to trace those. But

the duplicating machines are so simple that there is no way Vignelli can possibly maintain a monopoly on them. Any decent craftsman who sees one can copy it. Successfully, I must add."

"So these things, these libels, whether they are specifically anti-Semitic or not, will just continue to proliferate. Anywhere, essentially undetectable. Unless we open every large envelope in the postal system—which, I emphasize, we most certainly will not do—the stencils will travel for no more than the normal*porto* , anywhere east of a line running from Sweden's Baltic provinces to Hungary."

This time, Don Francisco nodded. "They do not even need to send the stencils. That is clear from the statements made by the young boy and girl in the Fulda case. They only need to send one copy of a pamphlet, or a manuscript. Anyone who has a duplicating machine can prepare a stencil. Some will be better than others, but then some printing presses turn out much better quality copy than others. It depends on the skill of the operator, the quality of the paper, the quality of the ink. For longer books, I expect, printing will continue to be the preferred method."

"Yeah, that was true up-time, too."

"So unless you wish to duplicate the*Porte* , examining everyone's mail for possibly dissenting literature . . ."

Mike shook his head. "No. No, of course not. We are not going to stop the mail and inspect every item. That would be against every principle of intellectual freedom, freedom of the press, that we are trying to introduce. It's just so . . ."

"Loathsome," Don Francisco suggested.

"'Loathsome' is a very inadequate word."

Hanau, November 1633

"It's a personal thank-you letter," Martin Wackernagel said. "From Prime Minister Stearns."

Menahem ben Elnathan took it. "I am honored."

"And one from Don Francisco Nasi."

"Perhaps I should be apprehensive."

"From all that I hear, they are sincerely grateful for your contributions. Not to a solution of the problem of these scurrilous pamphlets, since perhaps there is none, but for assisting in defining it."

"No one among us did anything remarkable," the rabbi said. "But, then, most large events are the result of many small ones coming together."

"Exactly what do you intend to do to solve David and Riffa's problems? Perhaps I shouldn't ask, but I'm curious."

"It is well under way. There was no prospect that Abelin Kronberg and Bessle Zons would consent to

young David's new job and proposed marriage. They have too much pride invested in preventing him from joining the post office and in arranging the Wohl marriage. I suggested that they should release their parental rights in regard to this son who has caused them so much trouble and heartache, so that he may be adopted as heir by his uncle Meier and Zorline Neumark. Once that is completed, then the new parents can—and will—consent to the marriage. I have correspondence for you to carry to Frankfurt today. If all goes well, you should be able to bring me the completed legal papers on your return trip."

Martin looked at the rabbi for a few minutes. Then, in the up-time manner, he saluted him.

Frankfurt am Main, November 1633

"Where did you get it?" Crispin asked suspiciously.

"The administrator in Fulda for the New United States said that he owed me a favor. So I said that he could do me one, since they had confiscated it as evidence. It's the duplicating machine that Menig had at his paper mill, producing those scandalous pamphlets. It's yours legally. I have receipts."

Crispin looked at it with distaste. "Do you have an exorcist to get the evil spirits out of it?"

"Not exactly. But you'll be paying for it for several years, so don't feel that you got something for nothing."

"How?"

"I brought Menig's son to apprentice with you. He's at my rooms. No fee."

"I thought he was the one who actually ran the machine."

"He is, but the up-timers think he is not old enough to be held, as the woman named Mrs. Hill put it, 'criminally responsible.' I offered you and Merga as an alternative, which Mr. Wesley Jenkins accepted. He is, from what I have observed so far, an incredibly ingenious boy who will occupy a great deal of your time."

Merga looked at her husband.

"All right," he said. "We'll take it. Him. Both of them. The machine and the boy."

"What about the girl?" Merga asked. "Bodamer's daughter. Liesel. What have they done to her?"

"Gone to her mother's people, for the time being, at least. Bodamer is one of Schlitz's subjects and the *Ritter* 's lawyers asserted jurisdiction on his behalf, even though he is under arrest himself. Mrs. Hill was very angry about it."

"Beyond that," Martin asked after a while, "How's business?"

"I'm developing a new line," Crispin said. "Merga's idea. We haven't heard from the merchant selling the duplicating machines, yet, but then he is certainly not in Frankfurt. These things take time. I am creating a new small newspaper to circulate locally and present advertisements for things that people want. There

must be many people in Frankfurt who want some item, and other people who have it but no longer want it, but who do not know one another. With the duplicating machine, now, the cost of production for these 'want ads' will be reduced a lot . . ."

* * *

"Stop delaying, Martin," Merga said. "You have to go upstairs and say hello to*Mutti* ."

When Wackernagel came back down the stairs, he moaned. "You've got to do something, Merga. You absolutely have to get her off this 'settle down and get married.' Find her an avocation. A 'hobby' as the up-timers say. Some other interest."

She looked up from the stand where she was watching Emrich Menig piece the duplicating machine together. "Getting you married and settled down more than an avocation. It is her vocation, her calling."

"Merga, you have*got* to do something." Martin's desperation was clear from the tone of his voice. "I can't settle down. Not here, not anywhere."

"Why on earth not, Marty?"

"Because I*am* married. In Erfurt. Well, in a village right outside the city. And in Vacha. And in Steinau. With calling of the banns and everything. They were all such darling girls when I met them. I couldn't bear to disappoint them, so I told the local pastors that I was an orphan from Breslau. And if any one of them finds out . . . ever. Or the church! There are a lot of really good reasons that I love the Imperial Road."

"How many reasons?" Merga asked. She put as much "foreboding" into the tone of her voice as she could possibly squeeze through her vocal cords.

"Besides my girls? Eight, right now."

Merga gasped.

Her brother gave her the grin he had used—in his older sister's opinion, with an unreasonable degree of success—to get out from under impending disciplinary measures since he was three years old. "But Maria is expecting again."

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Those Daring Young Men

by Rick Boatright

The door into the building opened, spilling young men and sunlight into the space.

"Rotgut, Henrich, all around. And the paint."

"We're out of the Grantville Rotgut. You'll have to make do with the Italian version."

"As long as it's corn liquor, and burns, it will do."

Heinrich scanned the faces, quickly assessing who was missing. "Johan?" He took the container of bright pink paint down from the shelf behind the bar and handed it across. Then he placed a tray of shot-glasses on the counter.

"Ja. The left aileron hinge tore loose from the wing root, but not cleanly. The*Marie* was never built to attempt an immelman. The main wing spar cracked, and he came in hard." Georg's hand made a twisting swoop through the air, and fluttered to the bar top.

A sound of scraping came from the far wall as tables were moved. Eleven bright pink pairs of wings flew in perfect coordination in two rows along the top. Quickly, tables were piled and a young man stood and added another pair.

Meanwhile, the pink silk scarves they all wore were folded and placed under their epaulettes.

The tray made its way around the group. Each man took a glass, then twelve shot glasses were placed in a "missing man" formation with one out front.

Isaac looked around to see if everyone was ready. "To Johan! And to the SKY!"

"TO THE SKY!" Twenty shot glasses arced towards the fireplace, while the other twelve began burning with the odd blue flame that only rotgut produces.

Barmaids began passing around beers, while the notebooks and slide rules began appearing.*Marie* would be salvaged for her wire, and fasteners, and fabric, but*Emily* was almost ready. They might not have engines, but the catapult functioned well; the cabling seldom broke. Only one pair of wings represented a young man decapitated as the tow cable snapped. Since then, they had learned the value of bunkers for the tow crew.

They already flew, and it was, by God, 1635 in this modern era. How far away could engines be? A year? A month?

The slide rules slid. The beer puddled. The drawings and the arguments proceeded as they held their wake for the latest of their number to earn his wings in the only way they could think of that honored him. They prepared to go back into the sky.

The youngest of the barmaids approached Georg as he was sketching a truss joint. "Sir?"

He looked up. "Yes?"

"Sir, I just wondered. Why*pink* , sir?"

Georg gestured to the wall. "It's an American tradition. Pink is the color of bravery and honor and

manliness. That is why Colonel Wood made his first plane down-time pink, so all could see. It's in honor of the Belle."

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NCIS -Young Love Lost

by Jose J. Clavell

People sleep peaceably in their beds at night
only because rough men stand ready to do violence on their behalf.

George Orwell

I rode to the crime scene in the early morning calm of Magdeburg's streets. It was not difficult to find. The area, surrounded by the flickering light of torches, oil storm lamps, and at least one up-time flashlight, was in one of the worst-looking parts of town, and in a city that has been subjected to sacking and burning, that says a lot. The flashlight—one of the very few still left with some battery power—was being used sparingly, but it gave me a good idea of my goal. That was very fortunate because this area was far from our usual security rounds haunts around the riverside navy yard. I dismounted and left the reins of my "horse pool" mount in the care of one of the Marine military policemen who formed the outer cordon of the scene.

Some members of the city watch leaned on their pikes nearby, observing us, talking and joking in low murmurs, apparently without a care in the world. Their common seventeenth-century finery looked—now, to me—too ornate, especially contrasted with the simple subdued style of the up-time uniforms, armbands and weapons of the MPs and navy masters-at-arms who were present. Their disrespectful attitude towards the dead also bothered me but showed clearly that whoever was inside the area was no longer their concern. That made it one less turf fight for me. The young military policeman, on the other hand, was having problems dealing with their care-free stance and his clenched jaw and stern face failed to hide his contempt. In situations like this one, relations between military personnel and civilians tend to fray rather quickly, which, apart from the late hour, explained the absence of curious bystanders.

. I nodded to the MP and murmured my thanks, purposely ignoring the watchmen as I entered the cordoned-off area. I saw more MPs and masters-at-arms and sensed the air of contained fury that emanated from them. I braced myself for what was waiting. I could now see two bodies on the ground and, long before I got close enough to see them properly, I smelled the coppery odor of blood mixed with the pungent smell of feces and urine, the ultimate indignity of death. Finally, I came close enough to

make out the full details. A woman in a modest civilian dress lay facedown across the body of a man; she looked vaguely familiar. I racked my brain trying to place her. The man was in the undress greens of an enlisted Marine, a Private First Class by the single red chevron on his sleeve, and a stranger to me. Both were barely in their twenties, just children really; a young couple out on an evening stroll, not unlike dozens of others, and who, now, would never grow old. The scene filled me with sadness at the unnecessary waste of young lives and anger at the unknown killers. The area around their bodies had been blocked off with staked cords. It had helped to keep it mostly undisturbed but it still didn't answer my first question of the night. What the hell were they doing out here, so far away from the yard?

The owner of the up-time flashlight joined me and stood quietly by my side as I pondered that and many other questions, taking in the scene. Brunhilde Spitzer is a few years younger than I am, a comrade and more, from our Committee of Correspondence days. Brunhilde was not really her given birth name either; once she had been a camp follower and prostitute before heeding the message of Gretchen Richter, changing her name and starting a new life. Like Gretchen, you don't stand in her way. Perhaps that explained why she adopted the name of one of the Valkyrie warriors of the old tales; I have never inquired. I knew first-hand the power of that message; it had also changed my life, although in my case I got to keep my old name. When Admiral Simpson asked me to join and later lead what would become the Naval Criminal Investigative Service, I, too, followed Gretchen Richter's message and, emboldened by the love of a good woman, accepted and embraced the opportunity for a fresh start away from the petty thievery of my old life.

"Special Agent Spitzer," I said finally.

"Director Schlosser, I am sorry that I had to call you all the way out here this early in the morning. But I want a second opinion. You did much better than me at the crime scene investigation classes and I could use your advice. The night watch commander told me that they are our people, so this is our mess, sir." She addressed me in a formal manner that still barely contained her anger. There were too many non-NCIS personnel within hearing range, so we could not speak candidly. It was for the best; our exact opinion of the city watch and their officers was not for outsiders. Besides, we needed to maintain the professionalism that Dan Frost had drilled into us, and set an example for the young MPs and MAAs present. So I simply nodded in understanding.

The crime scene belonged to us now; it was our first major murder case.

* * *

When Admiral Simpson had put his group of civilian agents together, our primary mission had been to provide for up-time and naval personnel security as bodyguards—in naval parlance, force protection. In the beginning, Committee of Correspondence members had provided that service to the navy, by orders of Joachim Thierbach, the local committee chairman and who was assisted by Gunther Achterhof, my mentor. Even then, it was under my direction; a position that had first brought me to Simpson's attention. You could say that the good admiral had a personal interest in the subject, since French agents had tried to kill him shortly after his arrival in Magdeburg. In the maelstrom of the political scene of our newly formed nation, the United States of Europe, the navy could not afford to be associated too closely with one of the political factions. So the CoC was out and Simpson had approached me with a job offer. It had seemed simple enough: do the same thing for him that I had done for the committee, but now for pay. That was an offer that I could hardly refuse. Revolutionary fervor can go only so far in providing sustenance to the body or a roof over one's head, especially now that I had other responsibilities.

Our scope of responsibility continued to expand, in what I now knew to call mission creep. There was money to be made out of the business generated by the needs of a burgeoning navy and Marine Corps and the works of the shipyard, lots of it. Some parties were none too scrupulous in its acquisition. The

local authorities were uncooperative at times and some were outright on the take. That was not news to me; I had similar experiences in my CoC days, but it caught Admiral Simpson by surprise, and he told me to take care of it. So, we found ourselves dealing with corruption, fraud, shoddy materials, and outright theft.

Naturally, a case could be made that putting me and mine in charge of those investigations had been akin to letting the fox guard the henhouse. After all, most of our agents had lived very interesting lives before joining, and not always on the right side of the law. I prefer to think that we possessed hard-won expertise on the subject matter that makes us very difficult to fool. Owing our loyalty to the navy that had given us a second chance; we could not be easily bought, either. It showed in the success of our efforts. I have to confess that there is some truth to the rumors that a visit from me or mine could ruin your whole day. The admiral had once commented that our idea of law enforcement would have given apoplexy to any up-time cop. I reminded him that he was no longer living there; besides, our growing notoriety meant that no one now dared to cut corners on materials or services bought by either the navy or the Corps.

Despite the best efforts of pastors, priests, and rabbis, the men and women who had suddenly found themselves as new citizens of the USE had not suddenly metamorphosed into angels, either. The naval services had gotten their fair share of bad apples. We were tasked with cleaning them out. By this time, recognizing that we were now far from the bodyguards that he had originally envisioned, and needing a permanent solution, Admiral Simpson had bowed to the inevitable and created NCIS with our original men at its core. I mean,*re* created NCIS. His twentieth-century navy had a similar outfit, almost certainly for much the same reasons. Now officially the naval law enforcement organization, our mandate put us in charge of the entire navy- and Marine Corps-related criminal matters and, to prevent jurisdiction conflicts, also contained an imperial warrant from his majesty, Gustav Adolph II, that extended our reach through the whole USE and its territories.

The admiral had also taken steps to standardize and improve our training to keep us on par with the rest of the new technologically savvy naval service that he was busily building. He had hired the former chief of the Grantville Police, Dan Frost, to advise and orient us in the acquisition of those skills that the job now required. Chief Frost must have found it amusing to work with men that he would have once thrown into the slammer without a second thought. I know we did. He trained us and we then trained the military police and masters-at-arms, establishing the pecking order for naval law enforcement. It was during this period that "Brunhilde" joined us.

Of course, I was initially strongly opposed. Bodyguard work demanded big and muscled men. You either deter an attack with your sole presence or need to be able to fend it off on your principal's behalf. No women needed apply, I thought—sentiments that even my early exposure to Gretchen and her CoC ideals were unable to override. Once more, Simpson reminded me that we were no longer exclusively in that line of business, and then ordered me to hire her. She didn't remain our only female recruit for long. Since that time, I have very reluctantly come around to his point of view. Working for him and the navy, I was exposed to many women in non-traditional roles. Now, I know that they can be as capable, brave, dedicated, and, on several occasions with female miscreants, as malicious as any man. However, it was the internalization of Chief Frost's teachings that forced me to finally turn the corner on my beliefs. I learned that women could be invaluable on police investigative and undercover work, especially when the society in which they operated tended to make them invisible. That had also given me insight into how the up-timers see us. It was not a flattering portrait.

Brunhilde had taken to this line of work with an ability that was frightening in its single-mindedness. I suspect that her prior occupation and her life experiences had prepared her well for it. Regardless of my feelings, and despite our pre-existing relationship, she progressed quickly through the ranks through sheer competence. In Frost's seminar on crime scene investigation, she had come in a very close second in

class standing. I was first. Like me, she had discovered within herself an unexpected ability to solve criminal riddles and I was proud of her. She had been the senior agent of the criminal division on watch when she sent for me tonight, getting me out of my lonely but warm bed.

* * *

I stooped to get a different view of the bodies. Apart from the senselessness of it all, death did not bother me. I had seen too much of it already, and even inflicted it on others.

The girl's face once more caught my attention with its familiarity. I felt Brunhilde beside me, opening her always-present notepad, and waited for the mystery of her identity to be solved. "Herr Director, the female is Seaman Apprentice Wilhelmina Bischel. She was . . . assigned to the health clinic."

I heard the sudden grief stricken catch in her voice as it hit me like a punch in the belly. We both knew her as Willie, a friendly girl with a sunny disposition and constant smile that allowed her to deal with all sorts of difficult people, like an embarrassed and suffering NCIS Director, whose worried wife had forced him to seek care for a recurring ailment. I closed my eyes and muttered a short prayer for her soul. I felt ashamed for not recognizing her. The last time I had seen her, she had been full of life and happiness; her friends at the clinic had been teasing her mercilessly about her new beau. It had sounded serious and I had been happy for her.

"The male is Private First Class Wilhelm Hafner. He was a rifleman with Second Platoon, Bravo Company, First Battalion."

I nodded and assumed that he was the beau in question. I stood and walked around them before stooping again. This investigation had suddenly become very personal to me.

Chief Frost had started his seminar by giving us a lecture on all the technology that was no longer available to him and that now waited to be rediscovered again. It had been sobering. He had concluded by declaring that, despite these losses, the most important pieces of equipment had come through without any problem and were easily available to each of us: the brain, ears, and eyes of a trained investigator. The rest of the course had concentrated on helping us hone those innate abilities. Still, at moments like this, I would give my hoped-for first-born to have photographic equipment available. I had heard of some research in that direction, but I was not holding my breath. Maybe I could try to hire a sketch artist like they had done in Grantville. I have to look into that. I stood up again, deep in thought, and looked at Brunhilde. I knew that she had already formed an opinion, but appreciated the way she was letting me make up my own mind. "Who put the cord around them? It seems that someone was paying attention when we gave the class to the MPs and MAAs about preserving scenes."

Brunhilde usually has a well-developed sense of humor that I enjoy deeply but tonight she was all business. "Petty Officer Leiss and his partner, Private First Class Schuhmacher, were first on the scene, sir." She indicated the two individuals who held their horses in the shadows.

I walked towards them and Brunhilde followed. Leiss was in his late thirties, a riverboat man by the look of him. He was composed but wary. His partner, Schuhmacher, seemed younger than the deceased. Her face, even in the darkness, looked extremely pale although it also had a mixture of anger and grief. I pegged her for a farm girl with little experience with violent human death until tonight, and having chosen military law enforcement as her career, obviously made of sterner stuff than her appearance indicated. I gave her credit for that. Sadly as both a Marine and an MP, this would not be her last confrontation with the aftermath of violence. "Leiss, Special Agent Spitzer tells me that you and your partner were the first on the scene. I appreciate the care that you took with it. Can you tell me anything else?"

"Not much, Herr Director. Me and Schuhmacher were returning back to our rounds, after we made a stop at my home. My wife is expecting our third child and I like to check on her during my shift. It had been cleared with my tour commander. When we heard the whistles of the city watch, we responded with the intention of providing back-up. But when we arrived, the watchmen immediately handed primary control of the scene to us and backed off. It surprised the hell out of me, sir. That is, until I saw his uniform and Schuhmacher identified the young woman as navy personnel. We cordoned off the area and sent out for backup and NCIS support."

"You did very well, Leiss. I'll see to it that you two are commended for your quick thinking. " I made a mental note to keep an eye on the man. We were always on the lookout for more qualified personnel to join our ranks. I looked at his partner. "Schuhmacher, I am presuming that you knew Seaman Bischel."

The woman came to attention. Grief stricken or not, she was still a Marine. "Yes, sir. We both were billeted at Frau Muir's guesthouse. She lives on the same floor, two doors from me, but we seldom talked. Different shifts, you know. I knew that she was seeing Hafner; heck, the whole house knew it. She was head over heels in love. The scuttlebutt was that they were planning to marry as soon as he made corporal, sir."

I nodded. Her information dovetailed well with the little that I knew about Bischel. Still, she had been in contact longer with the deceased. I decided to follow my instincts. "Stand at ease, Marine. Did she ever mention anything to you about having enemies or problems with other men?"

She frowned. "Herr Director, the only thing that I can recall is that one of the girls once mentioned to me in passing that one of her cousins was not happy about her joining the navy or seeing Hafner. She and Hafner were from different religious backgrounds, but I thought that it sounded more like jealousy."

I considered her information for a moment. There was something there. Call it a hunch; according to Chief Frost, it was the other invaluable weapon in the experienced investigator's arsenal. "Thank you. Leiss, I would appreciate it if the two of you could stick around for a while."

"Aye, aye, sir," he said.

I returned to the bodies, a silent Brunhilde in tow. My attention was momentarily diverted by the arrival of more naval personnel from the yard. When I had been summoned to the scene, I had also sent out for others whose assistance could be useful in the investigation.

I turned back to Brunhilde and whispered, "Okay, Brunei, this is what I am thinking. This was not a robbery attempt gone wrong."

She looked down at the bodies. "No, it was not, Gunther. She still has her money belt, although I don't see any of their daggers. My gut feeling is telling me to look into that cousin."

My gut was telling me the same thing. "Agreed. By the footprints, I believe that there were multiple attackers, so he had accomplices. It looks like a well thought-out ambush."

Brunhilde looked carefully at the footprints by the light of her flashlight. "At least six, and the kids fought back. I don't believe that all this blood belongs to them."

It was a small consolation in the whole sordid affair that they had not gone meekly into the good night. I just wished that their efforts had been more successful or help closer.

I turned to greet the new arrivals. Senior Chief Hospital Corpsman David Dorrman, an up-timer, was the navy's most senior medical tech. He was accompanied by two litter teams. All of them now stood thunderstruck; they had no problem identifying Seaman Bischel. She had been both popular and well-loved in their ranks. The senior chief let loose a long streak of swearing, half of which was neither English nor German. I let him get it out of his system; I needed him with a clear head.

Finally, he turned toward me. "Director Schlosser, do you know who did this?"

I looked him straight in the eyes. "We have some ideas, but we would like you to examine the bodies and provide us with as much information as you can."

"Here, Director? I can't properly examine them with this little light." He put on his gloves.

"Sorry, but time is of the essence. My gut feeling is that the attackers didn't go too far."

He nodded and turned to his team. "Okay, folks. I need some help here. Help me get Willie on the litter." Carefully, almost with reverence, they picked up Bischel's body and placed her atop the waiting stretcher. Her face looked placid but tear-streaked; her eyes were open. At his command, his corpsmen opened several ponchos and, without being told, turned around as they held them open around her. I was sure that if she could, Bischel would have been grateful for the high regard that they held for her modesty. I wished that I could do the same, but my duty required that I examine the evidence first-hand.

I watched as Dorrman used large scissors to cut away her upper garments, revealing one stab wound on her left side. Brunhilde pointed at the multiple stab wounds on her forearms. We exchanged a knowing look. Her death now seemed accidental, although she had been in the thick of the fight. Dorrman closed her eyes, covered her with a blanket and looked up at me with tears in his eyes. "She didn't die immediately, Director. I'm not a coroner or a physician but I suspect a pneumothorax. Even if I had gotten here in time, I doubt that I would have been able to do too much for her."

I nodded. By the position of the bodies, I surmised that she had had just enough time to drag herself to where her lover had fallen. Brunhilde wiped a single tear away with her hand, her face impassive. There would be time to mourn them later. We watched as Dorrman moved to Hafner's body and, with his corpsmen's assistance, moved him to the second waiting stretcher. In seconds, his upper body had been bared. Unlike Bischel, he had multiple knife wounds on his chest, abdomen and arms, making it likely that he would have bled to death even if you didn't take into account the fatal stab wound under his sternum. Dorrman looked up at me without comment. There was no need; the scenario was now clear in my mind. I exchanged a look with Brunhilde and saw agreement in her eyes.

I moved to the second group that I had summoned that night.

* * *

I had requested a squad of scout-snipers and was pleased but not completely surprised to see Gunnery SergeantHans Hoffman,the head of the scout-sniper school, at its head. If I hadn't been looking for them, I would have missed them completely in the darkness with their camouflage battle dress uniforms and that unnatural stillness that was the mark of the trained sniper. I had requested their assistance because most scout-snipers had prior backgrounds as game wardens and were adept at following trails and tracking wounded prey. Their eyes were on the two blanket-covered bodies and their faces seemed carved in granite.

"Hoffman, we think that their killers were wounded in the attack and may not have gotten too far. Do you think that your men can attempt to pick up their trail?"

He looked once more at the bodies and then back at me. "We will try, Herr Director . . . we will try really hard," he said, before starting to issue his orders. The squad split into two-man teams and spread around the site in a circular search pattern, starting from the cordoned-off area. I knew that they were going to have to earn their pay tonight.

The area around the bodies and outside the corded area was muddled with footprints. I blamed our good friends from the city watch. Our agents, MPs and MAAs are trained to walk the same patches and not add confusion to crime scenes. The watchmen didn't have the benefits of future forensics knowledge and most didn't care to learn. We'd offered them training but they had been unwilling to accept lessons from people that they still considered thieves, thugs and prostitutes.

It was fifteen long minutes before one of the teams found a trail. Hafner and Bischel's bodies had been carried to the waiting ambulance and were now on the way back to the infirmary at the yard. Dorrman and all the male corpsmen had stayed behind and were now checking their personal weapons. Although navy, Fleet Marine Force corpsmen tend to reflect the same aggressive outlook of their usual companions.

The lucky team's bird call signaled their success. Immediately, Hoffman and the rest converged on them, examined the signs, and proceeded to follow the trail. I held everyone else back to give them space to maneuver until they were ahead of us by at least five hundred meters, then we followed. There was no thought of involving the city watch; for what we needed to do, they were practically worthless. We needed live perpetrators, not more dead bodies. Besides, it was a matter of naval honor.

We moved as silently as possible with frequent stops and starts for over half an hour before one of the scouts appeared at my side. Brunhilde, surprised, had to strangle a cry. I followed the scout back to where Hoffman waited. Our quarry seemed to be holed up in a dilapidated shack on the outskirts of Magdeburg.

"Herr Director, the trail ends there and we think that they are all inside. How do you want to do this?" he murmured in my ear. I looked at the house and then at the horizon, where the faint light of dawn had started to appear. If we delayed too long, darkness and the element of surprise would disappear. I decided that the rules of hot pursuit applied here and returned, trailed by Hoffman, to where the main group waited. I quickly sketched my plan on the ground and explained it to everyone, my voice pitched low.

The second wagon had brought weapons and Marine-issue breastplates and helmets. The scout-snipers quickly suited up. They were trained in ship-boarding maneuvers and that made them suitable to act as an improvised up-time-style special weapons and tactics team. Maybe it was overkill for a group of killers that had not shown too much enterprise in covering their tracks, but I was not in the mood to play fair. I donned a spare breastplate and helmet, intending to be part of the takedown, until I saw Brunhilde doing the same. I was momentarily flabbergasted but held my tongue. She looked directly into my eyes, and I was able to easily read her determination. I could have ordered her to stay behind, and my instincts screamed at me to do so, but I could not do it. She has earned her place here. So, I shrugged my shoulders instead and made sure that my NCIS gold badge was pinned firmly to the front of my breastplate. Brunhilde did the same. At my signal, everyone moved into place. The military police and masters-at-arms, reinforced by Dorrman and his corpsmen, surrounded the house at a distance. I had Leiss and Schuhmacher keep a discreet eye on Dorrman; he was still extremely pissed off and I didn't want it to interfere with the matter at hand. I wanted the bastards alive.

The scout-sniper squad split in two; half went towards the back where they would attempt a rear entry.

Brunhilde and I joined the group led by Hoffman with our handguns drawn. I made sure that Brunhilde was behind me, where they would have to go through me to get to her. We tiptoed toward the front entrance, using cover as much as possible, until we got to the door. The house seemed eerily quiet. I waited until Hoffman gave me the agreed "all ready" sign. I counted to three and then, with all the force in my lungs, shouted clearly for all to hear.

"IMPERIAL AGENTS. OPEN UP."

Legalities served, Hoffman and the rear entry team leader used almost simultaneous shotgun blasts to force open both doors. I followed my group into the house but by the time I entered it was all over except for the paperwork. Our suspects were being tied up even as they were waking up. If the thought of putting up a fight had crossed their minds, it had quickly died in the presence of the many armored and expressionless scout-snipers. They surrendered peacefully while still claiming their innocence. Well, not all of them. One was found dead on his bed. The notorious cousin and the rest of his accomplices were worse for wear, too. Our young couple had sold their lives dearly. We found their naval issue daggers on top of one of the tables.

Even without a confession, the circumstantial evidence against them looked strong. In a clear voice that dripped with contempt, Brunhilde read them their rights as we frog marched the cousin out of the shack. Although I once considered such things to be quaint up-time customs, both the admiral and Chief Frost had convinced me that we needed to set a higher standard than was commonplace—standards that hopefully one day would set the example for a whole nation—even the Magdeburg city watch. Besides, we were naval law enforcement professionals now, and we wouldn't take a second place to anyone.

Disappointed that no one had tried to escape custody, Dorrman had to be satisfied with providing our captives with medical care. I wanted to ensure that they would stay healthy long enough to make their almost-certain appointment with the executioner. However, first they were bound to have a long interview session with me. The results would be presented to the city prosecutor and magistrates. Confession was good for the soul.

I was so looking forward to that.

* * *

The slow cadence of a muffled drum set the pace of the funeral procession, the sound echoing along the packed streets of Magdeburg where its citizens stood respectfully. I had unconsciously fallen into step as we followed the two caissons that, side by side, were taking the flag-draped coffins of Corporal Hafner and Petty Officer Bischel—both promoted posthumously—to their final resting place. The pallbearers taking them there were a mixture of Marine and navy personnel extracted from the ranks of corpsmen, sniper-scouts, MPs, MAAs, and members of Hafner's platoon under the direction of Senior Chief Dorrman and Gunnery Sergeant Hoffman. Bravo Company, in dress blues and with fixed bayonets provided the escort.

Brunhilde and I walked behind the kids' grieving families. Admiral Simpson and the Marine commandant were at the head of the NCIS delegation, practically all of our agents who were off duty. Our gold badges had a thin black band across them, providing a shiny contrast against our subdued mourning clothes and set us apart from the rest. Behind us, military dependants, civilian clerks, shipyard workers and their families, off duty navy and marine ranks and any others that could lay claim to membership in our close-knit service family, followed. Still, the funeral was considered an unofficial activity and I was glad that Brunhilde's hand was firmly grasped in mine. She was here today as my wife and not as a fellow agent—another working couple in this strange naval community of ours, just like the two youngsters in the coffins would never be. I thought that, on a day like today, we needed each other's support in our

mutual grief for two lovers who could have easily been us.

But I was also grimly satisfied; their killers would have their own appointments with death, in the form of the hangman's noose, in a week. They had confessed to setting the ambush with the purpose of roughing up Hafner on her cousin's instigation. Of course, they failed to take into account the mettle of the individuals who volunteered to join the naval service and the situation had escalated beyond their control. Now, they'd had their day in court, and the case was closed.

On a more personal and happier note, this morning Brunhilde had given me the news that we had hoped to hear for so long. On a day of mourning over young lives lost, it was nice to know that another young life was just beginning, although the determined mother insisted on remaining on the job. Reluctantly—very reluctantly, I might add—I agreed. Me and mine would stand guard over them to protect and serve as we do with the rest of the naval community.

After all, we are the Naval Criminal Investigative Service—that's both our mission and our great honor.

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Those Daring Not So Young Men

by Rick Boatright

"Thank you for coming."

"Of course we came, lass."

"At least it's over now."

"Over? What's over?"

"This steam nonsense."

"Tisn't nonsense, lass. Your grandfather died because he got the last bit*working* ."

"It's still nonsense, Mr Iverson." She pointed at the "monster" in the work-yard. "What does it do that the mill doesn't do now?"

"It works when the water is frozen. It works when there is no breeze. It works when, and as hard, as we ask it to. And it eats coal or wood, not hay or grain.

"Your grandfather was right, and it's up to the rest of us to make it the success he knew it would be. Bradford Steam Works is ready to start offering stationary engines to mills and others, now, with your grandfather's invention of the automated condensing sprayer."

"Invention? What invention? You're just playing at being up-timers. There's nothing under the sun they didn't already try."

"Be that as it may, Victoria. Your grandfather's sprayer lets the steam condense fast enough that we don't have to have such a perfect fit in the piston. The leather seals are good enough to still generate the vacuum we need." Mr Iverson paused. "It's really too bad he bumped the valve while he was tightening the tie rod and was crushed like that. But thanks to your grandfather, lass, we get a good fast vacuum. If it didn't work so well, of course, he wouldn't have been killed, but thanks to your grandfather, when the steam goes away, the engine*really* sucks."

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A Matter Of Taste

by Kerryn Offord

The dining hall of a military leased house, Magdeburg, 1634

Cory Joe Lang looked down at his empty place mat. He had a bad feeling about the group's latest action. There had been mutterings about the food before, but this time they'd sent it back untouched. Even he hadn't been prepared to try Chef Magnus' latest offering, and with Velma Hardesty for a mother, he'd grown used to eating just about anything that was put on the table. Usually, anything had to be better than whatever his mother had cooked, but he hadn't been able to get past the smell of the stuff, whatever it was.

He looked around the dining room. Aaron Tyler, the guy responsible for initiating the food revolt, was busy telling his friends Vern Bellamy, Clint Acton and Daly Threlkeld about how this would teach the cook not to keep serving up that kind of junk. Cameron Hinshaw looked as guilty as Cory felt, while Casey Vanorman still hadn't recovered from having his meal snatched away before he finished eating it.

There was a rattle of the door and suddenly a Viking berserker burst into the dining room. Cory slid lower in his chair as Chef Olaus Magnus stormed up to the table, his eyes flashing and a giant meat cleaver in his right hand. "You sent back my lutfisk!" Chef Magnus emphasized the statement by swinging the meat cleaver, burying it into the table. Then he placed his big, meaty hands on the table and glared at the men seated around it. "What is wrong with my lutfisk?"

The fire in Chef Magnus' eyes scared Cory more than the still vibrating meat cleaver. He and the rest of the guys sat mute.

"Well? Answer me. What is it with you people? You eat my stew. You eat the bread and dripping. But when I dig into the measly allowance the army provides to pay for your food to give you my greatest creation, you send it back. You didn't even try it! Was there something wrong with it?"

Cory tried to sooth the savage beast. "There was nothing wrong with it, sir. It's just that it's not what we're used to."

Chef Magnus seemed to be about to accept Cory's peace offering. Until that fool Tyler started playing with fire. "I'm not eating no more stinking, weird . . . foreign stuff. I demand you make us some real American food."

*Oh, God. That's going too far. Tyler is so dead.*Cory shut his eyes to spare himself the sight of Aaron getting his just desserts.

After a couple of minutes without hearing the sound of a meat cleaver striking flesh, Cory opened his eyes. Aaron was still alive, for now. But Chef Magnus was towering over the cringing Aaron with that meat cleaver in his hand.

"My lutfisk is not 'stinking, weird, foreign stuff.' It is the ultimate in fine Swedish cuisine and deserves to be treated with respect." Chef Magnus drew himself up to his full five foot six and glared at Aaron . "What, may I ask, is this 'real American food' you demand I prepare for you?"

"Hamburgers, pizza, hot dogs, chili dogs . . ." Aaron 's voice trailed off in the face of Chef Magnus' unblinking stare.

Chef Magnus seemed to be a little appeased by Aaron 's answer. He stood in thought for a moment. "Dog." He smiled. "I do a very good roast dog."

There were choking sounds from around the table. A couple of the men giggled. Aaron laughed. Chef Magnus' took a firm grip on his meat cleaver. "I have said something funny?"

Even Aaron , Cory was happy to notice, realized Chef Magnus wasn't happy with the laughter, and kept his mouth shut. "Er, sir. Aaron didn't mean he wants you to serve dog."

Chef Magnus glared at Cory before using the meat cleaver to point to Aaron. "He said he wanted dog. I heard him."

"No. Yes." Cory swallowed. The way that meat cleaver was flashing around made it difficult to think. "We didn't eat dog back up-time, sir. Those are just names for the . . ." He paused, searching for the right word. ". . . meals. Up-time meals. Something we call 'fast food.'"

Chef Magnus brushed back his chef's cap with his left hand and wrinkled his brow. "Fast food? You mean something you eat before Lent?"

"No." Corey shook his head. "Fast food is usually stuff that's quick to cook that you can pick up and eat on the run."

"Fast food that is not food before a fast. Dog, but without the dog." Chef Magnus gave Cory a frustrated look. "Do you know how to make any of these fast foods'?"

Cory hesitated. Back up-time he'd worked after school at the local McDonalds. "I've made hamburgers. They're just grilled ground meat in a steamed bun with lettuce and other vegetables, sometimes with a slice of cheese, and maybe a fried egg added."

"Steamed bun? Why would you want to steam a bun? And what kind of cheese?" Chef Magnus was obviously waiting for Cory to say something, but all Cory could do was indicate his ignorance by shrugging.

Chef Magnus buried his head in his hands. "Why me, Lord? Why me?" He lowered his hands to look at the anxious faces around the table. "If you wish to eat 'real American foods,' then I must know how to prepare them. Do you have recipes?" The men shook their heads. "Do you know anybody who has recipes?" Most of the men nodded. "Good. When I have some recipes, then maybe you will get what you want."

Chef Magnus pushed himself away from the table, straightened his cap, took his cleaver in hand and said, "I am glad we have had this little discussion." Then he turned and made his way to the dining room door. He'd just grasped the door handle when Clint Acton called out, "But what about dinner? What do we eat tonight?"

He turned and smiled. "I have some lovely lutfisk."

Several of the men turned a shade of green. Others suddenly had difficulty swallowing. Cory admitted defeat for them all. "That would be nice, sir."

The kitchen of the same military leased house

Olaus gathered his assistants around. "Oskar, Petter. First thing tomorrow, I want you to go around to the American mission and start asking about recipes. Find out everything you can." He smiled at his assistants. "We will surprise these idiots with some of their fast food."

"Herr Magnus, one of them has eaten some of his meal."

Olaus jerked around at the interruption. "What? Someone gave my lutfisk the respect it deserved? Show me."

The servant pointed at the returned meals. There, amongst half a dozen untouched plates, was one that was at least a third eaten. Olaus reached out a hand. There was little heat radiating from the food. He turned to his assistants, an evil grin on his face. "Oskar, replace this plate with hot food. Then take it back to the dining room with the rest. Ask who ate their lutfisk. Give him the plate of hot food. The rest of them can settle for eating the food they so rudely sent back."

Oskar grinned back. "Immediately, Olaus." He loaded a plate with a fresh serving, placed a cover over it, and carried that towards the dining room. A team of servers followed with the remaining meals.

Petter, Olaus, and even the apprentices followed. None of them wanted to miss whatever happened.

The dining hall

Oskar stood at the door, the covered plate held chest high in front of him. "One of you started on their meal. Who are you please?"

Casey Vanorman gingerly put his hand up. Oskar walked round to serve him.

"You ate that stuff?" Aaron was scathing.

"It doesn't taste that bad, Aaron. Not with the side dishes. You're just letting the smell get in the way of the taste."

"How could you get past the smell?" Aaron looked at the meal being placed in front of Casey. "I know it can't taste good just from looking at it. The smell just confirms that. Mom would never expect me to eat anything that smelled that bad."

Casey looked up, finished chewing his latest mouthful, and smiled. "Then you wouldn't have liked eating at home." He grinned. "One year Mom tried us on durian."

"Durian?" Cory asked.

Casey looked across to Cory. "It's a fruit. The Asians call it the 'king of fruits.' But it's a bit notorious for its smell. Mom discovered some in Washington's Chinatown one year and decided we had to try it."

"And . . . ?"

"The first couple weren't so bad, but I think the last one was a bit overripe. Not even Mom would eat it."

"Hey!" Aaron looked from the plate of food that had just been placed in front of him, to Casey's obviously hot food, to Oskar. "How come his food's hot and mine isn't?"

Daly Threlkeld and Clint Acton quickly seconded Aaron 's cry.

"It is simple." Somehow Oskar was able to keep a straight face. "Herr Vanorman was eating his meal when the rest of you sent everything back. So he got a fresh serving. The rest of you didn't even try it. Herr Magnus was most offended." He shook his head and gave the Americans a pitying look. "That was not well done, gentlemen. Please be sure to ring as soon as you are finished. When serving lutfisk, all utensils should be cleaned as soon as possible. Good evening, and please enjoy your meal."

A few smart steps and Oskar was out the door, closing it quietly behind him.

Olaus grinned broadly at Oskar. "Very good, Oskar. That will teach them. Let us return to the kitchen and finish our meal."

* * *

"This stinks." Aaron screwed his nose up at the lutfisk on his fork. "Mom would never make me eat this

shit. They could at least have reheated it."

Cory swallowed a mouthful. "Give it a rest, Tyler. You're not at home now. Eat it or leave it, but stop complaining."

Cameron Hinshaw loaded his fork. "It's our own fault. It was hot when we sent it back."

Aaron gulped some wine to wash down the taste. "Yeah, well, first thing tomorrow I'm writing home to ask Mom for some recipes for real food." He gestured with his fork to the food still on his plate. "I don't want to have to eat this ever again."

"Yeah, this is a bit extreme." Cory hesitated. "It'd be a waste of time asking my Mom for any recipes. I don't think she ever gave us anything that wasn't frozen or out of a can. But I guess my aunt could help." He surveyed the faces around the dining hall table. "I guess we're all going to be writing to someone in Grantville for some recipes." He looked across to Casey, who had just about cleared his plate. "Except maybe Casey."

Casey looked up. "What? Is someone talking to me?"

Cory smiled. "I just wondered if you plan on copying the rest of us and writing home for some recipes for real food?"

"Oh yeah. Mom's got tons of recipes." Casey looked around the table. "Hey, Aaron, if you don't want your lutfisk, can I have it?"

Cory had to bite his tongue to stop himself laughing at the look on Aaron's face as pushed his half eaten serving across to Casey. How Casey could eat that crap with such obvious enjoyment he didn't know. That he could even think of eating it when it was cold made him shudder.

Casey scraped the food from Aaron's plate onto his own. "Thanks."

Office of the American mission

"Elisabeth, I'm just off to do some shopping. If my husband should finally show up, please be sure to let him know I'm not happy. This is the second time he's stood me up."

Elisabeth Vendenheim smiled. "Of course, Frau Drahuta. If I see Lieutenant Drahuta I will give him your message."

"Thanks. Tell him I expect to only be a couple of hours. Bye." Belle gave Elisabeth a wave and left the reception room with her two companions.

Oskar and Petter had been just behind Belle when she talked to Elisabeth. Their eyes followed the three women as they left the building. They exchanged looks, and set off in pursuit, their intention of speaking to the receptionist forgotten.

"Frau. Frau Drahuta. Could we have a moment of your time, please?"

Belle, and her sisters-in-law Jana Barancek and Tasha Kubiak turned at the interruption. "Do I know you?" Belle asked.

"No, Frau. We heard the other Frau call your name." Oskar bowed. "I am Oskar Karlsson, my companion is Petter Pettersson. We are assistant cooks in a house used to quarter some soldiers. They have been asking for 'real American food.' Something they call 'fast food.' Unfortunately, none of them know how to make it. Chef Magnus has sent us out in search of assistance. Is it possible you or your companions might be able to help us?"

"These are young male Americans you're catering for, I assume? Tasha asked.

Oskar nodded. "Yes. How did you know?"

Belle grinned. "It was the claim that fast food was real that gave the game away."

Oskar and Petter exchanged confused looks. "Not real? Please, you are confusing us."

Belle gave the two down-timers a sympathetic smile. "Young American males think fast food is real food. Their mothers tend to disagree."

Oskar sighed. "But they will eat it without complaint?"

The three women exchanged grins. "Oh yes. They'll eat the junk. The guy who won't eat that stuff hasn't been born yet."

Oskar gave Tasha a weak smile. "You are sure of this? Chef Magnus was most upset when they refused to eat his latest offering."

Tasha nodded. "I'm a cook in a greasy spoon back in Grantville. Believe me, if you serve what they call real food, they'll clean their plates."

Both Oskar and Petter zeroed in on Tasha. "Greasy spoon?"

Tasha laughed. "It's a name for a fast food restaurant. What is it you want to know? Between the three of us, we probably know enough to help you."

"What are hamburgers? What are hot dogs, and chili dogs? And pizza? What are they and how do you make them?"

Jana smiled. "I see they've covered the essential food groups." She turned to her companions. "I think we should all find somewhere to sit down and talk."

* * *

Tasha smiled across the table. "You really shouldn't be pandering to the tastes of your charges, you know. They'll just take advantage of you."

"Yes, Frau Kubiak. But Chef Magnus is at his wits end. They will eat the stews and the soups he prepares, but give them good, honest food and they turn their noses up. In fact, last night was the last straw for Herr Magnus. He presented them with his finest creation, and they not only turned their noses up at it, they returned it untouched." Oskar shuddered. "It was not a pretty sight, Frau. We have to do something."

Belle was outraged. "Give me their names and I'll have words with their mothers. That kind of bad behavior needs to be stopped immediately."

"If any of my boys did that I'd have made them go without." Tasha turned to Oskar. "I do hope you didn't feed them. That would have just been rewarding bad behavior."

"The food they had rejected was returned to them, Frau. Some of them ate it." Petter grinned. "Lutfisk is best eaten hot."

Jana tried to stifle her laughter. "Those poor boys. They can't have known what hit them."

* * *

Tasha turned to her friends. "Do you think Oskar and Petter will take up our suggestions?"

"Definitely, Tasha. Can you see their Herr Magnus missing the chance to extract any revenge he can? And making sniveling wrecks of the boys is less than they deserve."

Jana tried to keep a straight face as she protested. "That's just being nasty. Belle. The poor guys can't help it that they don't know beans about cooking."

"I'd love to be a fly on the wall when Herr Magnus interviews the youngsters."

"Same here," Belle answered.

"Me too." Jana nodded. Then she hesitated for a moment. "Do either of you have any idea what lutfisk is?"

Tasha shook her head. "Nope, but I intend finding out. Whatever it was, it must be pretty bad for Cory Joe Lang to send it back."

"Cory? Isn't he Velma Hardesty's oldest?" Jana asked.

Tasha nodded.

"Wow! It's hard to imagine anything could be worse than whatever Velma fed those poor kids."

Olaus Magnus' kitchen

Olaus looked at the array of books, papers, bags, jars and cooking utensils laid out on the work table. He picked up a set of cups, each smaller than the other. "Standard sized measuring vessels? And measuring spoons?"

Oskar nodded.

"And why would I, a skilled chef, need standard measuring cups and spoons?"

Oskar and Petter exchanged grins. The ladies had made some interesting suggestions. "The women said

that the recipes all assumed standard size measuring vessels, Olaus. They suggested that the young men would have no idea how to explain the measurements."

Olaus smiled in understanding. "I predict that the discussion of the recipes they offer could be interesting." He put down the measuring cups and picked up a couple of paper bags. "Sal Aer Fixus and Vin Sal Aer Fixus. What are they?"

"They are cooking powders, Olaus. When added to flour it will rise like yeast bread."

Olaus nodded at Oskar. "Yes, the recipe on the package suggests they are cooking powders. However, it is for something called biscuits. That wasn't one of the foods they asked for."

Petter nodded. "No, they didn't. However, Frau Kubiak says that they wouldn't have thought of it. Biscuits are the sort of thing they will eat if it is available, but it isn't a fast food. It takes more time to prepare than they are prepared to expend. Also, they say it is beyond the capabilities of most American males. We have been provided with a number of recipes, including several for something she called biscuits and gravy."

Olaus picked up a glass jar. "Pridmore's Pride?"

"The ultimate chili powder. Just add according to taste, or in the case of some, lack of taste. It is a collection of hot spices. You add the powder to ground or quartered meat to make what the up-timers call chili."

Olaus randomly opened a couple of the recipe books at the book marks left by the American women. "We shall test these recipes. By the time the young men collect their recipes, we'll be ready for them."

The three men exchanged grins. Then Oskar pushed forward the bag of Sal Aer Fixus. "We were warned that it might be a good idea to have a bag of this available. Apparently the young men have poor control and are likely to eat themselves sick. Mixing a teaspoon of this powder in a mug of warm water makes a draft that will calm their stomachs."

Olaus looked at the bag, then he grinned at his colleagues. "We don't have to tell them we have this, do we?" The subtle emphasis on the last two words told Oskar and Petter that Olaus still hadn't forgiven the up-timers for rejecting his lutfisk.

The dining hall, a few days later

Chef Olaus looked up from the recipe he had been looking at. "Take two cups of cake flour . . ." He looked straight at Aaron Tyler. "How big a cup?"

Aaron squirmed in the hard dining room chair. He looked around the table for support. Nobody offered to help. "I don't know."

Chef Olaus raised his eyes to the heavens. "And cake flour. Do you know what that is?" Aaron shook his head.

"A teaspoon of baking powder. What is a teaspoon? How big is it? And what is baking powder?"

Aaron swallowed. "I don't know, sir."

Chef Olaus glared. "Is this the best you can do? A set of recipes that you don't understand? If you don't understand them, how do you expect me and my assistants to understand them?"

"Sir?"

All eyes turned to Casey Vanorman.

"Yes?"

"My mother sent me a set of measuring cups and spoons. I don't know what cake flour is, but you can buy baking powder as Vin Sal Aer Fixus. I've seen it in the local shops."

There was an almost tangible sense of relief around the American side of the table. Olaus glared at Casey. "And do you have any recipes to offer?"

Totally unaware that he might have done something to upset Chef Magnus, Casey nodded and pushed forward a couple of booklets. "But they might not be to everyone's taste."

Chef Olaus gathered them up. "Very well, I will visit the shops and see what is available. If you are very lucky, I might be able to put together a meal of what you want. Until dinner then." He dipped his head in dismissal before leaving the room.

* * *

Chef Magnus stood watching while the food was brought in. "You have been most fortunate. I was able to find the ingredients for chili. After the effort I have been put to, I expect you to clear your plates."

Aaron Tyler watched the chef leave the dining room, then he returned to the important task of loading his plate. He paused to inhale the aroma rising from the pots of chili. His mouth was watering as he ladled it onto his plate. "Finally! Real food."

* * *

"Do you really think it'll work, Oskar?" Olaus asked.

"Of course, Olaus. We know they have been missing their favorite foods. So the first time you prepare them, they will overindulge. Within hours they will be suffering the consequences. The American ladies suggested it could be several meals before they readapt."

A week later

"Herr Lang. I must insist that you instruct your men that the army only provides sufficient funds to feed the residents of this establishment. If I am to continually feed your guests I must insist on you providing me with extra funds."

Cory sighed. It had been a pretty good week. At least, it had been after the first couple of meals. Everyone, except Casey, had suffered from upset stomachs that first meal. There had been some rough

justice there. Aaron Tyler had been amongst the worst sufferers, but it was his own fault. He'd taken seconds on everything. It'd been a wonder he could waddle from the table that first evening. And that night must have been uncomfortable. There were no flush toilets in their residence. They made do with chamber pots or the outhouse, and in Magdeburg in winter, you didn't want to be visiting the outhouse all through the night. Casey, though, had proved himself a true friend. He'd shared his bag of baking soda with Cory and Cameron Hinshaw.

"I'm sorry about all the guests, Chef Magnus, but the guys have been bragging about how you're serving up really good food, and everyone wants to come over for a meal."

Chef Olaus nodded. "Yes, I understand that, but the money only goes so far."

"Yeah, Chef Magnus. I understand. I'll pass the word. The trouble is, there isn't anywhere else in Magdeburg where you can get stuff like we get here." Cory's eyes lit up as an idea struck him. "You know, Chef Magnus. You should start a restaurant. One that specializes in real American food."

"The American Kitchen," Magdeburg, a couple of months later

Belle Drahuta stopped outside the little hole-in-the-wall restaurant her husband had insisted they try. "The American Kitchen?"

Ivan Drahuta put his hand on the small of his wife's back and gently guided her towards the restaurant doors. "It's new since you were last in Magdeburg. They opened their doors a bit over a month ago, and they've been doing a roaring trade with the expatriate community ever since. It's run by down-timers, but they know how to make stuff we like. None of that weird stuff most of the down-time cooks insist on foisting on us."

Belle stopped by the door to read a chalkboard menu. "I see they provide all the essential food groups. They even have fries and ketchup."

"Yeah, our very own little piece of America in Magdeburg."

Belle turned to look at her husband, her eyebrows raised. "Piece of America? When they offer Chili Escargot?"

Ivan nodded. "It's not half bad."

"You do know what it is, don't you?"

Ivan gave his wife a wry grin. "Yes."

"You wouldn't touch it that time you took me to that French restaurant in Washington."

"Yeah, but they smothered them in some fancy foreign sauce."

"While this place serves it in chili sauce?"

"Yeah."

Belle shook her head. "I'd love to know where they got the idea of serving Chili Escargot."

"That's easy. They run a suggestion box. They're willing to give just about anything a try." Ivan checked his watch. "Come on, they won't hold our table for ever."

"The American Kitchen," after hours

"I wish to propose a toast." Petter waited until Olas and Oskar had topped up their glasses. "To the Americans. Long may they continue to enjoy our food."

"To the Americans." Olaus and Oskar echoed.

After the toast the three colleagues returned to the important job of eating.

Olaus paused, his fork in the air. "I still can't believe that they're willing to pay good money for this stuff." He shook his head. "The American women were right. There really isn't an American male born who won't eat this rubbish."

Oskar scooped up another portion of lutfisk and lefse. "They don't even question what meat goes into those hot dogs. And after they insisted they didn't eat dog."

The three cooks exchanged grins.

Petter placed a piece of paper on the table. "We've got another request for rat on a stick, with chili sauce." He paused to look at his partners. "That's the third request for rat this week. Do you think they're serious?"

Olaus hesitated, and then nodded his head. "They must be. There've been too many different requests for rat. We'll start small though, like we did with the snails. If it catches on, we can think about making proper arrangements with the rat catcher."

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Those Not So Daring

by Rick Boatright

BANG!!!

Karen leaned her head towards the cellar. No more explosions were forthcoming.

"The boards worked."

"Yes. It appears that one doesn't shatter another now."

"Four dozen bottles all at once. But now that we've got a better judge of the amount of sugar to use, and how to wire in the corks . . ."

"And storing them each in their own little space with boards between to keep them from blowing each other up . . ."

The two women embraced and smiled. The demand for "up-timer style" fizzy beer continued to expand, and the sisters had finally gotten the potter to cast the bottles thick enough, the corks to fit tight enough. They had scrounged and bartered enough cork for their next several months product, and they now knew they could re-cycle the corks if they were careful . . . and the whole concept of "deposit and return" was working out so well.

Who better to brew the up-time style beers? Who else had unlimited access to the mill? Cheap access to grains? Who else had a father who imported*rice* ? Visions of money and lines of suitors danced in the sisters' heads. It was inevitable. It was appropriate. It was "Miller Time."

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Anna the Baptist

by Terry Howard
December, 1634

Julio stacked clean glasses under the bar. "Damn it Ken! I don't know what's got you riled but I'm sick of it! Back off or I'm goin' home. I don't have t' have this job. I only took it to help you out."

Julio didn't mention his fear of losing his regular job to what he thought of as cheap foreign labor. The

fear drove him to drink, something he'd done little of before the Ring of Fire. He did his drinking in the one place a man didn't have to put up with "krauts." This led to a part time job.

* * *

Julio had been sitting at the bar, contemplating the world at the bottom of his beer, when Ken yelled, "Julio!"

He looked up and said, "Yes?"

Ken Beasley calmed down immediately. "I'm sorry, Mister Mora. I'm almost out of glasses and I was yelling at my dish washer. I forgot he quit."

"You need a dish washer?" Julio tipped his beer, set the empty down on the bar and headed for the swinging door to the kitchen.

"Hey, the bathroom's that way." Ken pointed.

"I know," Julio answered.

"Where're you goin'?"

"To wash dishes."

Someone called out, "Hey, Ken, where's my beer?" First things first, Ken took care of the customer, then another one, then he cleaned up a spill. By this time there was a tray of glasses under the bar. Glasses and customers kept coming. The stack stayed topped off and all the glasses were clean. Ken quit checking.

At closing, Ken remembered someone was working for him that he hadn't hired. He found Julio mopping the kitchen floor. To Ken's disappointment Julio would only take the job part time. Short of hiring a kraut, what was he going to do?

* * *

"Sorry, Julio," Ken said. "It's the damned krauts."

Julio relaxed. Ken had his full sympathy. The Ring of Fire changed everything, mostly. He still spent third shift mopping, vacuuming, cleaning bathrooms, and washing windows at the bank and elsewhere. Food had changed. Bread didn't come pre-sliced in plastic bags. Canning jars came up out of the basement. Pepper had to be ground. Salt didn't come in round boxes anymore. Ken had him take an ice pick and make the holes in all of the salt shakers bigger, but getting it out was still a problem. The big difference, though, was "the krauts."

"I'm sorry," Ken continued. "I'd hardly gotten to sleep last night when, at the crack of dawn, a bunch of damned krauts woke me up singing hymns off key, right out side my window!"

"What're you talkin' about?"

"My neighbor, damned hypocrite, is letting a bunch of damn bible-thumping krauts use his storage shed for a church," Ken said.

"They can't do that! It's not been consecrated. You can't have a church without an altar, or an altar with out a relic. The saint has to be installed by a bishop. They sure wouldn't put one in a garage." Julio didn't get to Mass as often as he should, but knew his catechism from when he was an altar boy. "When the cops stop in, you tell 'em about it. If people can complain about us making noise late at night, then they ought'a do something about the krauts waking you up."

"The cops?" Ken growled. "Just great! What in hell are they doin' here?"

"They're here every Sunday," Julio said. The police investigated every complaint. As sure as God made little green hypocrites, one of the old ladies in town called the station after Sunday dinner and complained.

* * *

As Julio predicted the cops showed up on a noise complaint.

The cops were Hans and Hans. One was Hans Shruer, the other was Hans Shultz. Ken Beasley couldn't remember which was which. It didn't matter. They came in a matched set, Catholic and Lutheran. It was too bad the sign on the door, "No Dogs And No germans Allowed," didn't apply to cops.

As cops went, Hans and Hans were all business. If they talked to each other about anything else, it ended in an argument about religion. They sure couldn't talk of families. Hans Shruer had watched from the hill while a Catholic troop burned his home, raped his mother and sister and tortured his father. Hans hated Catholics, collectively and individually. The only redeeming fact in a Catholic's favor was he would be spending eternity in Hell. The sooner he got there, the better.

Hans Shultz's family had been well off before the Lutherans came. They lost over half of the family and everything but the clothes on their backs. Compared to Hans Shultz's attitude towards Lutherans, Hans Shruer was a soft spoken, forgiving moderate.

"You want to talk about noise?" Ken blew up. "What are you going to do about those damned Baptists waking me up at the crack of dawn with their singing?"

"Mister Beasley, you live over a mile from the Baptist church, and they start at ten," Hans Shultz said.

"Well, maybe it wasn't dawn but I'd just gotten to sleep. And I'm talkin' about the ones who've moved into the garage behind my house!"

A blond haired, heavy set man in a plaid shirt sitting at the bar spoke up. "They ain't Baptist. That's why they got thrown out of the church. They're Anna Baptist. But I got no idea who Anna is."

Jimmy Dick called out, "Read your bible, Bubba. Anna Baptist is John Baptist's sister."

Julio spoke up to straighten Dick out. "Anna is the mother of the Blessed Virgin Mary, the mother of God." He had stacked a half full tray of glasses on the pile under the bar as an excuse to leave the sink when the cops showed up.

"Well, if that don't beat all," Bubba said. "No wonder they got tossed. It's bad enough, the Catholics worshipin' Mary. Now you got people worshipin' her mother! Humf." He snorted. "Sssshit! Does that make her the grandmother of God?"

* * *

At the accusation that Catholics worshiped Mary, Hans Shultz started to object. Veneration is not worship. It might be a small hair to split, but the difference is very important to knowledgeable Catholics. At the words "Anna Baptist" Hans lost all interest in straightening out one ignorant, obnoxious up-timer.

"Anabaptist?" Hans Shruer asked in a shocked voice.

"Yeah." Bubba agreed. "That's what I said. Anna Baptist."

Hans and Hans looked at each other in apprehension bordering on fear.

Hans Shultz spoke slowly in a soft voice, as if it were bad luck to speak the name aloud. "Anabaptist."

* * *

Ken was very good at reading people, especially people who were scared or angry or just plain crazy enough to start a fight. Fights were bad for business. Hans and Hans suddenly needed watching. "What's wrong with Anna Baptist?"

"Mister Beasley, they're trouble! Every one knows that! Even the English heretics have outlawed them! They are . . . what is the word . . . people without respect for authority, who do whatever they please, without concern for decency or order."

"Red necks?" Bubba volunteered.

Hans ignored him.

"Antichrist?" Hans Shruer supplied cautiously.

"That will do. I was looking for anarchist. Anabaptists are anarchist, rebels, nihilists, fanatics, troublemakers! Luther, Calvin, the king of England and the pope all outlawed them!"

"Sounds like red necks to me," Bubba said.

"Shut up, Bubba," Ken said. "So what's so wrong with Anna Baptist?"

"They do not give proper respect to the civil authorities. Their practice of re-baptizing strikes at the very root of Christianity. They want to tear the church down and start over, their way. Have you heard of Munster?" Hans Shruer asked.

Ken shook his head.

"A thousand Anabaptists took six wives each, declared the city of Munster an independent republic. It took war to stop them!" You don't need all the facts completely right when you are spreading slander.

Bubba was on a roll. "Sounds like my kind of red necks. Six wives? Where do I join up?"

Ken tried to shut him down. "Shush up! You can't handle the wife you've got or you wouldn't be in here every other night, drinking."

"Do you know of the peasant's revolt?" Hans Shultz asked.

Ken shook his head.

"They nailed priests to the doors and burned the churches. They raped the nuns. They burned manor houses, convents, castles, entire villages. They drank the cellars dry, looted . . ."

"Sounds like red necks to me," Bubba said.

"I said shut up, Bubba!"

Hans ignored the interruption. ". . . every thing they could carry and burned everything they couldn't. Even Luther condemned them.

"It took the armies from four countries to put the revolt down, and the nobles back in charge. Anabaptists are evil incarnate." The last four words were rote dogma.

"We need to tell the chief! He needs to do something before it gets bad."

"Like what?" Ken asked. "Run them out of town?" Hans and Hans didn't catch the note of sarcasm.

"That would work," Hans Shultz said.

"Like hell it will!" Bubba didn't catch the note of sarcasm either.

"Shut up, Bubba," Ken said.

"Hey, Ken. What cha' got against religious freedom?" Bubba asked.

"I ain't got nothin' against it, Bubba. I just don't want it in my back yard."

* * *

Later in the night, Lyndon Johnson stopped in. Departmental policy required a follow up call to anyone making a complaint after an investigation.

"Mister Beasley," Lyndon said with the serious demeanor he used for official police business, "Hans and Hans said you want some people run out of town and they agree with you.

"The two of them were adamant. Hans said 'the disease-carrying vermin should be exterminated for the good health of the community and the general improvement of mankind.' They were distraught and sure there would be trouble. Chief Richards told me to check it out and file a report."

Ken shook his head. "Officer, they said something had to be done, not me. Usually, when I hear talk like that, it's from some old lady talking about the bar. The next words would be 'run it out of town.'

"So I asked, 'You mean something like, run out of town' and they agreed. I don't want them run out of town. I just don't want them over my back fence." Ken glanced both ways and leaned forward before asking, in a voice too soft to carry, "Lyndon, what's goin' on? Who are these people?"

Officer Johnson leaned forward over the bar. "Ken, that's what is really strange about this whole thing!

"Hans and Hans came in to the station all hot and bothered. I mean to tell you they were really wound tight. They're pretty good cops for a couple of krauts. So Chief Richards told me to look into it, quick! I went over and had a chat with Shultz's pastor, then with Shruer's pastor, then with Reverend Green

down at the Southern Baptist church. Green said Joe Jenkins was the pastor of the Anabaptist church and I should go talk to him if there was a problem."

"Old Joe?" Ken asked. "A pastor? Can he do that?"

"I asked Green about it," Lyndon answered. "Green said he could. Seems he was ordained in some off-brand Baptist denomination years ago. Green says it's still valid.

"As I was saying, Hans and Hans were making some mighty wild claims! Shultz's pastor said they were true. Shruer's pastor agreed."

* * *

The down-timer Shultz called Father and Lyndon addressed as Reverend assured Lyndon the Anabaptists were trouble just waiting to happen.

The Lutheran pastor's first words were "Spawn of Satan! The Augsburg confession clearly condemned them." He was sure they were Arminians. It was the only one of Pastor Holt's six syllable words Lyndon remembered because he knew where Armenia was. Holt made it sound contagious, vile and shameful. Any Anabaptists discovered in a Lutheran country would be lucky to escape with their lives. He was sure they were nothing but lawless, reckless, rioters without morals, decency or self control.

By the end of the second conversation, Officer Johnson was convinced Grantville had a real problem on its hands. He was wondering how they had managed to miss it so far.

* * *

"I caught Reverend Green right before his evening service," Lyn told Ken. "He didn't have time to talk right then but he had someone go to the office and get me a list of the Anabaptists who'd left and those who agreed with Southern Baptist doctrine and stayed, which was over half of them.

"I asked about them being thrown out. He said they left by mutual agreement, which means 'left quietly.' I took the lists down to the office, to have names cross reference to complaints for the report.

"Then I drove out to the Jenkin's place to let Joe know what he'd gotten into so he could get out before he got hurt. And let me tell you did I get an ear full!"

* * *

"Joe, what's this I hear about you starting a church for a mess of bad news Germans the Baptists threw out because they're Armenian Anabaptist?"

"Lyndon, first off,*all* Baptists are Anabaptist. They only baptize adults. It is true most Baptists are Calvinist, but a few of us are Arminians."

Lyndon was shocked and puzzled. Joe sounded proud of it. So he asked, "What is an Armenian?"

"An Armenian is someone from Armenia. An Arminian holds a doctrine the Calvinists dislike."

* * *

Lyndon leaned a bit farther over the bar. "You know what 'once saved, always saved' means?"

"I think it means if you're born Baptist you can do whatever you want and still think you're not goin' to hell," Ken answered. It was an impression he got from listening to drunks.

"Well," Lyndon said, "according to Old Joe, an Arminian is the other side of it."

* * *

Officer Johnson looked at Old Joe Jenkins, who was on his back porch in an old rocking chair. The last light faded from the sky along the ridge line. Joe nursed a shot of corn squeezin's his father had put in the cellar. He smoked a hand rolled cigarette made from tobacco raised in a cobbled up green house behind the barn. There was a crate of papers, bought wholesale, in the house. He had offered Lyndon some of each but Lyndon didn't drink or smoke.

"That's it?" Lyndon asked. "That is what all the fuss is about?"

Joe looked at Lyndon and smiled. "If it's already decided, why bother tryin' to change things? If it's a matter of choice, then if things are bad you're obliged to try an' change 'em."

Lyndon didn't think through the implications of Joe's statement. "You know there are a lot of people mighty riled up over this. They're sayin' these people are trouble."

Joe smiled again. "Check the records."

"They're being checked now," Lyndon replied.

"You won't find nothin'."

"If that's the case, why is everybody so upset with them?"

"It's not their theology," Joe replied. "It's their politics."

Lyndon thought*what does theology have to do with politics?* Then in short order his mind clicked through the Moral Majority, the Christian Coalition, and Right to Life.*Maybe theology does affect politics.*

Joe explained. "They want the government to stay out of religion and religion to stay out of government."

"Separation of church and state?"

Joe snorted. "Where did you think the idea came from?"

"The Constitution," Lyndon said. "People went to America for religious freedom."

"Yeah," Joe said. "Freedom to have their own church. But when Roger Williams started preaching free will, he got chased out of Massachusetts for heresy and went down to nowhere and started the Rhode Island colony where you could believe anything you wanted and worship God any way you pleased. And from there it got into the Constitution."

"You mean we got these Arminians to thank for freedom of religion?"

"Pretty much," Joe said.

Lyndon didn't know whether to believe him or not but decided he'd ask a history teacher first chance he got.

* * *

Ken Beasley looked at the young, clean cut police officer in puzzlement for a few seconds. Ken knew the kid and liked him. Lyndon had briefly dated his stepdaughter, Morgan. The boy had been polite. He got her home before the deadline with time to spare. He had treated Morgan well, and her mother with respect. Ken and Lyndon had formed an odd friendship in spite of the difference in age and attitude. Morgan broke the relationship off when Lyndon wanted her to start going to church with him. Finally, Ken asked, "That's all this is about?"

"Looks like it, Ken." Lyndon stepped back from the bar and back into the voice and demeanor he used when he first entered. "Mister Beasley, they ain't doin' nothin' I can do anything about. Shoot, if everybody was as good at staying out of trouble as these folks, I'd be out of a job.

"I mentioned the noise to Joe. He said he was sorry but didn't think it was overly loud. I'll stop by Sunday and see for myself, but I'm afraid I won't be able to do much about it."

"Why am I not surprised?" Ken let sarcasm drip off the end of every word.

* * *

Lyndon started his written report with a one paragraph summation concluding with his recommendation.

"This alleged noise violation is nearly the only complaint to be lodged against anyone on either list of Anabaptists Rev. Green gave me. All other accusations are lodged against the group in general and arise from blatant prejudice. I recommend no action be taken at this time."

February, 1635

"Hey ,Tom. Let me buy ya' a beer," Dick said when Tom stepped up to the bar.

Tom was chronically short on money. His wife counted his pocket change to keep track of how much he was spending on beer and bad company. Dick was chronically short on someone to drink with. He rubbed everybody the wrong way.

"Ain't seen much of ya' lately. What's the matter? Won't the little lady let ya' stop for a drink on your way home from work?"

Tom didn't say anything.

Dick saw a sore spot and pushed. "Hey buddy! What's the matter? Cat got your tongue?" The attitude, a malicious condescension, was raw. "The old hen pecked problem, huh?" Dick was not going to drop it.

Tom needed a reason why he hadn't been in lately. "I don't like drinkin' in a place that lets in krauts."

Dick smirked, and looked around. "No krauts here."

"Yeah? What about Sunday morning?"

"Shoot, they don't count. They're gone before the bar opens," Dick said. "Besides, there's krauts and

there's krauts. These are our kind of krauts."

* * *

Ken heard it and shook his head. Just yesterday, Dick was complaining about the krauts using the place to hold church on Sunday morning. Jimmy Dick would argue either side of anything.

* * *

"Don't see it," Tom said.

"Then ya' haven't looked. Open your eyes man! These krauts are red necks."

"How do ya' figure?"

"Well first, how many churches ya' know who'd ever hold services in a bar?" Dick asked.

"None," Tom said.

"Wrong! Wrong! Wrong! Ya' know one. This one, so they ain't your average, run of the mill, goody two shoes. Second, Zane was a good old boy right?" Dick asked. Zane was a drunken reprobate who wasn't home for the Ring of Fire.

"What's your point?" Tom answered.

"Well, the Baptist church threw him out. They threw these krauts out too. Makes 'em our kind of people."

Tom shook his head. "Don't see it."

"Three," Dick said. "Half the people in here can't stand somebody else in here. Right?"

"So?"

"So these here krauts can't get along with each other either. Ken didn't offer to let them use the place until they started havin' two services back to back 'cause they couldn't get along. So ya' see, they're our kind of people."

* * *

This time Jimmy was half right. Some of the Anabaptists were non-violent, amongst other things. They wanted to hear their own speaker. The other group liked Brother Fiedler's preaching. The building was getting too small for all of them at once so they went to two services. If Ken had known they'd take him up on the offer, he wouldn't have made it. Still, the rent helped.

* * *

"Don't see it," Tom said.

"Well, we don't like krauts and the krauts don't like us. Right?"

"And?" Tom asked.

"So the other krauts can't stand these people. I mean Catholics pick on Lutherans and Lutherans don't like Calvinists. But all three of them got it in for Anna Baptists."

Tom became half interested in spite of himself. "Yeah? Why's that?"

"'Cause they won't buckle down and go along. They insist on doin' things their own way. Like only baptizin' adults and to hell with the consequences. Sounds like red necks to me." Dick grinned.

"Don't see it." Tom shook his head.

"And I hear tell back in the world, it was these people who got freedom of religion put in the constitution."

"They didn't do it from Germany," Tom answered.

"Well, how about the place bein' cleaner since they started usin' it?" Dick asked.

* * *

They came in the first Sunday and moved the tables and set up the chairs. Before they put the place back together they mopped the floors and wiped down the chairs and the tables.

* * *

"So? Ken could hire an American to do it," Tom said.

"Yeah? With what? So many of us are in the army or off somewhere else, business is way off. Shoot, with the rate we're droppin', all of his regulars will be dead shortly anyway. He can't afford to hire more help. Besides they were keeping Ken awake, singing and preaching just over his back fence."

"He could sleep here Sunday nights," Tom suggested.

Dick grunted. "And not go home to the missus? Not Ken. But then he's not henpecked."

"I ain't henpecked," Tom muttered.

Dick took out his wallet and put five twenty dollar bills on the bar. "Hundred dollars right here says ya' are."

"Well, I ain't. Who we goin' get to settle it?" Tom asked.

"Uh uh. If you ain't henpecked, then she'll do what you tell her." Jimmy Dick pointed at the door. "The day she walks through that door and stays for one hour you win the bet."

"I ain't got a hundred dollars on me."

Dick sneered. "And you won't have it come pay day. Shoot, you won't have it at twenty a week. Hell, you won't have it at five a week, 'cause you're a loser. I tell ya' what, I'll put up the hundred against you admitting you're henpecked. Hey, Ken."

"Just a minute, Jimmy Dick," Ken called back. Ken finished the order he was working on. Since the bartender quit, he'd gone back to doing it all himself. "What do ya' need?"

"Tommy and me got a bet goin'. Can you put this in the box until we settle it?"

Ken went down to the cash register and grabbed a lockbox out of the cabinet. When he got back, he opened it and took out a pad of paper. "Okay, what's the bet?"

"I bet Tommy one hundred dollars he's henpecked."

"How ya' gonna settle it?"

"If his wife comes in and stays for an hour any time in the next month, the hundred is his. If she don't, then he answers to henpecked."

"You agree, Tom?" Ken asked.

* * *

Tom was caught in a web. "Sure. Why not?" What in hell did I just get my self into, he thought. Maybe if I agree to go to church with her? Naw, won't work she won't agree to come in here anyway. Then it clicked.

Tom smiled. "Sure! If she comes through that door and stays for an hour anytime in the next month the money is mine. Give me the pen."

Tom snickered as he signed his initials to the bet slip. "You just lost your hundred dollars, Dickhead." Then he tipped back his beer and drained it.

All the way home he tried to figure out the best way to get his wife to agree to the plan. He settled on goading her into bugging him to go to church. She did it often enough without his trying. Then he would agree to go if he got to pick the church. When she balked, he'd offer to go with her to her church after she went with him to the church of his choice.

The bet was any time in the next month. Sunday morning would do just fine.

April, 1635

"What can I do for you fellows?" Ken asked as Hans and Hans approached the bar. He had talked to them on Sunday when they routinely "investigated" the noise complaints called in on Sunday afternoon. Now it was Monday and the cops were back.

"Mister Beasley, do you know where your congregation was on Sunday?" Hans Shruer asked.

Ken Beasley broke into a deep belly laugh. Somehow, they were his congregation and he was supposed to know what they were up to. The cops seemed to think he knew what his regular patrons were doing twenty-four, seven. Now he was supposed to keep track of the Anabaptists, too.

The fact was he knew exactly where they were on Sunday morning. Tom Ruffner and his wife Jenny were part of the congregation now. Tom had stopped in for a beer last night. Oddly, his wife didn't mind his having a beer now and again anymore. She even came with him for an hour one evening. She found out about the bet with Jimmy Dick and said it wasn't right. He said he wasn't giving it back. So she traipsed in one evening, hopped up on a bar stool and ordered a cup of coffee. Then she announced it was six minutes after six. At seven minutes after seven, she walked out the door.

When Tom stopped in for a beer, Ken complained about the mess.

"Ain't our fault," Tom said. "Weren't none of us here. We all went over to Rudoltstadt for the first service of a church Joe is starting over there. They're gonna have some trouble on account of Rudolstadt being nothin' but Lutheran. We went over to show support. If there was a mess, it was your mess."

Ken had to concede the point. Still, just because he knew where they were didn't mean he was going to tell the cops anything, especially not in front of Jimmy Dick. James Richard Schaver was the only patron in the place at the moment. The lunch drinkers were gone; the "beer or two on the way home" crowd wouldn't trickle in for awhile and it was way too early for the every-night late-night regulars. If he told the cops anything, sure as Saint Patrick wasn't Jewish, Jimmy Dick would see to it everybody knew it. His patrons expected privacy with their beer.

When his laughter ran down Ken responded to the question without answering it. "Joe Jenkins hasn't been in yet to pay this week's rent. When he does, I'm going to complain about the mess they left me. It almost looked as if there hadn't been anyone here at all."

Hans and Hans exchanged knowing glances.

"What's up?" Ken asked.

"We got a query from over in Rudoltstadt. It seems someone with a truck was at an unauthorized church service," Hans said.

The description of the truck matched Joe's ancient (early fifties vintage) coal hauler to a "T." Joe ended up with the old thing when the company he was working for went bankrupt. It was so old the army didn't want it. Even the tires weren't worth taking. Now, it had a propane tank for natural gas over the cab. The bed was boxed in against the weather with benches down each side, with a door and steps to the rear for people. Joe was using it for a church bus.

"Unauthorized?" Jimmy Dick piped in. "It was Sunday. How much more authorized do you need to be?"

"Mister Schaver," Hans said. "The ruler in Rudoltstadt is Lutheran. So the church in Rudoltstadt is Lutheran."

"And if you ain't Lutheran?"

"Then you convert, or you move," Hans said.

"That ain't right! What ever happened to freedom of religion?!"

"Rudoltstadt is not America. Not being Lutheran in Rudoltstadt is a punishable offence!"

The law in the USE called for religious tolerance, but the gap between custom and law is often quite large.

"That just ain't right," Jimmy said.

"Punishable, how?" Ken asked.

"Fines, confiscation, exile, imprisonment, beheading." Hans knew full well capital punishment was rare even before the USE. Still, getting sick or starving to death in prison or on the road was not in the least uncommon.

Jimmy practically squealed. "That's medieval!"

"And just when do you think you are, Mister Schaver? This is the year of our Lord sixteen hundred and thirty-three. You are in Germany and this is the way things are done," Hans said.

"Mister Beasley, when . . ." It was clearly when, not if. ". . . you see Joe Jenkins, please let him know we would like him to stop in at the station. We need to assure the people over in Rudoltstadt that it won't happen again."

Having made that pronouncement Hans and Hans stalked out. Ken watched them leave with a feeling of anxiety.

"That's bull shit!" Jimmy Dick said. "They can't tell our krauts what to do."

Ken's head snapped around. "Our krauts? Since when did any of those shit-heads become our krauts?"

"Ken, there ain't a conversation in this bar you don't know about." It was a slight exaggeration, but only a slight one. "You know we've been sayin' the krauts holdin' church here are red necks and our kind of krauts."

When Jimmy said "we" he was talking about himself. But no one was shutting him down, which he took as agreement. "We ain't gonna let them push our krauts around. Not when it comes to religious freedom."

"Jimmy Dick, you're full of shit!"

"Well, sell me another beer."

* * *

Later, Jimmy Dick was riding a high horse hell bent for leather. What surprised Ken was that people were listening. Normally, Jimmy had to buy to get anyone to drink with him and listen to his ranting insults. But he started talking about religious freedom.

"We shouldn't let them outside krauts over the border push our good old boy, red neck krauts around. Our krauts ain't too stuck up to hold church in a bar. Are we goin'a let some asshole over the border tell them what they can and can't do? We ought to take our shotguns and go over there to church next Sunday and how ever many Sundays it takes until they figure it out and leave our krauts alone." Jimmy actually had people buying him drinks.

Ken heard it and the sinking feeling in his stomach started turning into a large knot.

* * *

Joe Jenkins turned up the next day after the lunch crowd was gone. Ken let him know right away the cops had been in looking for him.

"I've already talked to them."

"Then you're shutting down the church over there?" Jimmy Dick asked. He was there for lunch, as usual,

and would likely stay to closing. Between his disability from the army and family money he hadn't held a job since coming back from Nam.

"No," Joe answered.

"Good. Me a few of the boys are talkin' about comin'."

"Be glad to have you."

"You got this week's rent?" Ken planned to tell Joe it would be going up.

"We didn't use the place this week."

"Why, you cheap S.O.B. Get your worthless, sorry ass out of my place and don't let me ever catch you in here again." In truth, Ken was relieved. He knew in his bones something bad was going to happen and he didn't need to be part of it.

"Sorry ya' feel that way about it." Joe sighed.

* * *

Hans Shruer requested permission to handle the follow up on the complaint that Grantville was exporting heresy. Hans wanted it handled by someone sympathetic. He was not sure an up-timer would show proper respect for a pastor.

Despite everything he loved in Grantville, there were things which troubled him. Their willingness to treat all men as equals was refreshing. It was amusing when the emperor became Captain General Gars upon entering Grantville. It would not be amusing if someone was less than deferential to a pastor.

Hans rose early, mounted a borrowed horse and made his way across the boarder. Pastor Holt received him in the study. The room's fireplace was welcome on a chilly April day. A writing desk, a magnificent library of seven books and two comfortable chairs in front of the fire furnished the room.

"Pastor, I am here in response to the complaint you lodged with the Grantville Police."

"Good." Pastor Holt said. "We need this nipped in the bud with as little fuss as possible."

"I couldn't agree with you more, Pastor. But I am afraid I must inform you the chief of police feels there is nothing he can do."

"What?"

"He says it is outside his jurisdiction."

"He intends to let these, these blasphemers, carry on their criminal activities because they cross the border to do it?"

"Pastor, first, he does not see it as criminal."

"Nonsense! It is against the laws of God and man!"

"Pastor, the laws of God are not the laws of the USE. Or of Grantville."

"They should be!"

"I agree. But unfortunately they are not. The different churches cannot agree was to what those laws are and . . ."

"On this point we are in agreement! The re-baptizers strike at the very root of Christianity. How can anyone have confidence in their salvation when someone claims baptism does not save?" Pastor Holt shuddered. "Where does this leave those children who die an early death?"

"I understand completely. You are absolutely right. Except all of the churches do not agree on . . ."

"Nonsense. It was settled at the second Diet of Speier. The Catholics, the Lutherans, and now the Calvinists, all agreed the Anabaptists are not to be tolerated."

"Pastor, there are three established churches in Grantville who practice only adult baptism. They have, or will have, existed for hundreds of years in America. Their existence is not a threat to the Lutheran church or Christianity. The chief feels you will just have to make an accommodation in your thinking. You know they have a radical concept of religious freedom."

"I can do nothing about what 'they' do in Grantville." It is amazing how much can be said with how a word is pronounced. "But, I will not allow this travesty to be inflicted on the people of my parish."

"Pastor, Joseph Jenkins claims to have the count's permission."

"Nonsense! The count is a loyal member of the Lutheran faith. He would never condone this."

"The chief has known Mr. Jenkins for years. He accepted his statement without bothering to verify it. I overheard the conversation. Mr. Jenkins claimed to have talked with the count. He claimed the count does not want to lose a large party of gunsmiths who were about to move so they could attend church without walking miles and miles. The count, according to Jenkins, feels this acceptance of any faith as long as it does not create social disorder is one of the secrets of Grantville's prosperity."

"Social disorder? What does he think rebaptism is? Doesn't he know about Munster?"

"Pastor, you will have to ask the count. I fully sympathize with your problem. Believe me, I will do anything I can to help. But the response I was sent to deliver is: the officials in Grantville are not prepared to do anything."

"Surely you jest?"

"I wish I did."

* * *

The count did not relieve Pastor Holt's frustration. "Pastor Holt, I know you are aware the Emperor has declared religious freedom."

"Religious freedom? Yes. But surely it does not include these people."

"Yes. It does."

Next Sunday's sermon was a railing accusation against Godless polygamists and anarchists. On Monday, word came from the count to drop it. Pastor Holt had no choice but to obey. After all, the count was the one who appointed him to the pulpit and paid his salary.

* * *

About three months later, the English version of the Magdeburg Freedom Arches propaganda broadside started turning up in Grantville. When Jimmy Dick saw the lead article, he wondered just how long he would have to do his drinking at home.

Red Necks to the Rescue by Leo Nidus

If you have not been to Grantville then you may not know of a private drinking establishment called "Club 250." There is a sign on the door "No Dogs and No germans Allowed."

The people who drink there are referred to by the general population of Grantville as "red necks." This is a derogatory term designating a lower class of people. They are presumed to be louts, willfully ignorant, belligerently pugnacious, and ethnocentric in the extreme, as noted by the sign on the door. They are not well considered and clearly stand in opposition to the general policy of acceptance which is a hallmark of Grantville. But since tolerance is so highly esteemed by Grantville's ethos, even red necks are secure by law from any disapproval beyond verbal condemnation.

Why should I write of these dregs of their culture, the lowest order of society? That is simple. I write of them because of the nobility of their actions and the generosity of their spirit.

When no place to worship could be found amongst the established churches—yes, churches. Grantville's tolerance fosters over half a dozen different faiths existing side by side without even covert violence—for a small Anabaptist sect, the red necks of Club 250 opened the doors of the club to them in off hours, asking only that they be gone well before the club opened for business. When the sect opened a church across the border and encountered active opposition, including the threat and actualization of violence, these same "degenerate louts" undertook to guarantee the safety of the congregation by standing armed vigil over the services until the violence subsided.

Why would the dregs of society, the despised lowest order, the willfully ignorant do such a thing? Because they know in their hearts, they hold the conviction deep in their souls, that freedom is not free. They understand that when one man is not free, then none are truly free.

If today we allow the Anabaptists to be denied the right to freely assemble, then tomorrow that freedom could be denied to others and then to us.

The price of freedom is the defense of the rights of others, even if it is the right to be wrong. As one red neck put it, "the price of freedom is the defense of idiots."

Fly Like a Bird

by Loren Jones

Paul Meinhart left Grantville in the autumn of 1632, but not before he spent several months in the Grantville jail. He'd been imprisoned for such a stupid little thing, yet the Americans had treated him like a murderer. The one good thing that came out of his imprisonment had been knowledge.

He couldn't read English. He couldn't read German all that well. But he had a good memory, and the books and magazines that had been provided to him in prison had shown him wonders. One of the magazines, a serial dedicated to things of a mechanical nature, had been inspiring. Especially the pictures. There had been pictures of just about everything, often in fine detail. Including flying machines.

Paul wasn't able to steal the magazine when he left the jail, but he had been able to copy several of the pages by hand while he waited, tracing the drawings and writing down what he could of the information with them. There was a kind of triangular flying machine that was simple to make, and he knew he would be able to build it. He had the drawings in his pockets when he left.

Paul turned south, heading toward a warmer climate as the year turned cold, and finally made his way to Venice. He gave out dribbles and drabbles of information about the strange people in Germany and their amazing devices to several wealthy men in search of a patron, and finally found one in Don Giovanni Romano, a merchant with ties to many other wealthy men.

"You speak of wonders, Heir Meinhart," Don Giovanni said when they had first met.

"Wonders indeed, Don Giovanni," Paul had replied, bowing low. "Wonders that let but a few handfuls of these people defeat whole armies. Wonders that they freely discuss amongst themselves, and pay no attention to who might be listening."

"Tell me of these wonders," Don Giovanni commanded, and Paul happily complied.

"These people have weapons that shoot a hundred bullets in the time it takes a musketeer to shoot one. They have great machines that move on their own, traveling faster than the fastest horse, and carrying many men shoot thing their terrible weapons. And, the greatest of their wonders, they possess the knowledge of how to fly."

"Fly!"

"Fly, Don Giovanni. I had the opportunity to copy some plans for a simple flying machine, one that they don't think of as valuable. " Paul sat forward, sensing that he had the rich fool hooked.

"Show me," Don Giovanni demanded and Paul brought out his drawings.

"You see, it is simple. A frame and some cloth, stretched tight. While I couldn't copy all of the drawings and pictures, I remember them well enough to be able to build one of these machines—with the proper

patron, of course." Paul smiled and Don Giovanni smiled back.

"Of course."

Don Giovanni provided Paul with everything he asked for, and in return Paul provided Don Giovanni with a flying machine. It was triangular, seven yards across the base and four yards from tip to tail. Don Giovanni had provided Paul with fine, light-weight yew wood for his spars, and a small fortune in silk for the cloth. It took some time, and not a little trial and error, but the day finally came that Paul arranged for Don Giovanni and his friends to meet him on a hillside near the sea.

"Don Giovanni, I am pleased that so many of your friends could join us today," Paul said as he bowed to all of the nobles.

"I hope you have something to show us that is worth the trouble," Don Constanza said. "I have a much prettier person I would rather be spending the day with."

"You will soon be happy that you came here today, Don Constanza," Paul said, not adding that if he had been a man of vision he would have been the one celebrating this day instead of Don Giovanni.

Paul walked over to where his helpers were holding his flying machine, the so-called "hang glider" and got under it. He lifted the contraption and looked at the supports. He'd eliminated several of them in order to shed weight, but still it felt like he was carrying a barrel on his back. He felt the breeze in his face and remembered the pictures of men running down a hill and sailing away, and his feet began to move.

Faster and faster Paul ran, and as he did he felt his load lighten. Then, as the breeze freshened, he felt his feet start skimming along the ground, and he jumped up to drape his stomach across the bar. A gust of wind lifted him and he felt a rush of excitement as he soared over the astonished nobles. Then he heard a crack.

Don Giovanni and his friends watched Paul soar fifty meters into the sky. They cried out in wonder as the flying machine lifted the man high above them. Then it collapsed, folding around its inventor like a napkin around a bone, and crashed to earth.

Don Giovanni heaved a great sigh of disappointment. "He seemed so sure." Turning to the men who had been assisting Paul, he said, "Salvage the silk. Whatever you do, salvage that silk. Take the body to the church for burial."

"Man was not meant to fly, Don Giovanni," Don Constanza said. "I told him that when he approached me. Come, I know what will lighten your heart."

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Gearhead

by Mark H Huston

It was quiet. Way too quiet. Of all the things Trent Haygood hated about the seventeenth century, the quiet was the worst. He missed the sounds of engines. Internal combustion engines. Hell, he'd be happy with some noise from a steam engine. As he sat on the front porch of his parents' home, he leaned forward and listened.

He held his breath and focused his hearing for some sign of mechanized civilization, anything. He listened carefully.

Only a cow mooed in the distance.

He sighed, leaned back into the chair, and put his hands behind his head. Back up-time, he could almost always tell you what kind of vehicle was coming down the road just by the sound of the motor. Mopar, Chevy, Ford, old KW or Freightliner.

Things were getting a little noisier lately, he had to admit. It had been a slow rebuilding. There was the occasional airplane now, built from Formica and car engines. Someone else was also building aircraft, having bought up a lot of motorcycle engines for propulsion. Cars and trucks never did go away altogether. Folks were pretty creative in these parts, so if there was something to be had that was sorta liquid and flammable, then someone modified a motor to run on it. His old man had reestablished the family distilled spirits business while he was away, and that was always good for fuel or trade.

He still missed the background noise of motors. He considered it the basis of true civilization. Not the stinky, organic things—like horses and oxen—that moved people and goods from place to place in this time. Or the dreadfully slow barges, lolling up and down the river like some demented version of "Life on the Mississippi" that went horribly bad.

There was the train. A bunch of folks had gotten together and built an honest-to-God steam engine. Still, it wasn't the same thing. It was slow, maybe five miles per hour. But it worked. He sighed.*Maybe by the time I'm fifty or sixty, there will be real racing again. Not horse racing, but NASCAR.* God, he missed NASCAR. Big E and Little E were the thing in 2000. Daytona had happened, the season was underway, and it was looking like another great year. Ford had a good car, and Jeff Gordon was as still strong. Trent never liked Jeff Gordon. Too pretty. Plus he was from California, of all places.*Who ever heard of a NASCAR driver from California for crying out loud?*

It was still quiet. No engines anywhere to be heard. He sighed again.

Trent had been a high school senior when the Ring of Fire hit Grantville and had been conscripted into the military at graduation, along with the rest of his class. He had spent most of his time drilling, marching, and waiting. He never got to fire a shot in any battle. In the first his rifle had jammed, and in the second he had been held in reserve, and in the last one he had broken his ankle marching and sat out the whole thing in the rear. It wasn't like he was trying to avoid things; it just worked out that way. He didn't even have any good stories.

He had been transferred to Grantville, detailed to work with the phone company as a trainee, but still

stuck in the army. It was boring. He knew that wasn't what he wanted to do with his life, telephones or the army. He had known back home, back up-time. He had gotten a small scholarship to become a race mechanic at a school in North Carolina. He was going to work for a NASCAR team. He had built and raced his own car senior year and had done pretty well. He finished third at Tyler County speedway in his first season. It was not what you would call a big time racecar, just an old P-Stock Camaro that he had welded a cage into, and built a motor to meet—well, exceed actually—the rules. His dad and a couple of buddies had been the crew. They didn't spend a lot of money, as it was a basic car, running in a basic class on a small dirt oval track. Towing the car to the track was the toughest part of the deal. God, he loved that stuff. The odor of racing gasoline and the smell of hot brake pads were perfume to his nose. They had called him Mario Haygood at school.

Some of the funds for the racecar came from the little side business his old man had, back before the Ring of Fire. Trent smiled as he recalled the fun he had making the "runs" over to Clarksburg.

Today, all that remained of that car was the V-8 engine on a stand in the garage, a transmission, front subframe, drive shaft, and the wheels and tires. Everything else had been salvaged, scrapped, sold or substituted for something else. The fuel cell and most of the safety equipment and the racing seat went to the air force, the battered body went to the scrap yard and the roll cage tubing was pulled out and sold. Other than some glass and wiring odds and ends, it was all gone.

He stood up and stretched. The family home was not in Grantville proper, but on a road off Route 250, about a mile and a half from town. Dad moved here because it was quiet, before the Ring of Fire happened. Quiet. Still too quiet. He sat back down into the lawn chair.

Times like this, up-time, he would get into his street car, an old beat up Ford Fairmont and go blasting around the back roads, chewing up the already old tires, and overheating the inadequate brakes. The thing had an old straight six in it, and it barely had enough power to get out of its own way. But it was still driving, and West Virginia hill country had some challenging and twisty back roads that were his playground. Guys would make fun of his beater, but all his extra money went to the racecar. Even in the land where beaters were almost an art form, his was a beater. He smiled at the memory of that car. That one, too, had gone to the scrap yard, after stripping some of the items out of it. He kept the steering wheel, almost everything else was gone.

That old beater was special. After all it was in that car that he and his first girlfriend had—he paused again. His old girlfriend had gone off and gotten married while he was off getting bored to death in the army. He started to feel even more depressed.

"I wish I could go for a drive. Somewhere. Fast. Push it to some limit, screw conserving resources. Fast." He paused, surprised that he had been speaking out loud. "Way too frigging quiet. I am talking to myself, for heaven's sake. Out loud." He walked to the front yard, and shouted at the top of his lungs. "This SUCKS! It REALLY SUCKS! I WANT EVERYONE TO KNOW THAT THIS REALLY, REALLY SUCKS!" He paused to listen.

The cow mooed again, off in the distance.

Trent gave the unseen cow a defeated shrug, walked back into the house, and flopped onto the couch.

Face down on the couch, he mumbled into the cushions, "This still sucks." He rolled over onto his back, and put his feet up and stared at the ceiling. "What are you going to do with your life, Trent, old buddy? What the heck does a gearhead like you do for a living? There is absolutely nothing here that goes fast. Nothing." He paused, looked out the front window, and sighed again.

At least before the Ring of Fire, when his old man would have him make a run over the mountains into Clarksburg to drop off some of his special distilled spirits, he could have some fun. But since the Feds went away, and Clarksburg went away, and the racetrack went away, motor sports excitement was hard to come by. He smiled as he remembered some of the high-speed runs he made. Dad liked to use him for runs. At the time, he was only sixteen and still a minor. He wouldn't get in as much trouble if he got caught.

The thoughts of those good times made him itchy. He jumped up from the couch, went to his room and grabbed a few dollars, and headed out the door.

He finally ended up at a little joint on Main Street. He took a seat at the window and watched the traffic go by. Foot traffic. Occasionally a horse. Some sheep went by. He grimaced. A couple of years ago, he would have been astounded at a bunch of sheep being driven through town, down to the banks of Buffalo Creek. From where he was sitting in the front window, he could look down the street. He could see the place in the streets where the Croats were cut down as they tried to take the town At the end of the street, the road split into a Y shape and each road crossed Buffalo Creek on a pair of concrete bridges that had made the trip, along with everything else from up-time.

Between the bridges and across the creek, there stood an old brick three story building that was once part of the early mining industry in town. It was now four or five retail shops on the first floor, with apartments jammed onto the upper floors.

The way that the building was situated, made the side of it an ideal billboard at the end of the street, in the crotch of the Y. For as long as Trent could remember, that sign had read "Welcome to Grantville. Worship with us". And then it listed the six or so churches in town. Several had been added, including a synagogue, since the Ring of Fire.

He recalled that his old man had stood in front of that sign when Trent was a kid, and cussed out Reverend Wiley, the Presbyterian minister for the town. Something about his first wife. Or maybe his second. Trent wasn't too sure. But Trent's old man had stood in the same place and cussed Reverend Wiley, that Dan Frost had stood when he opened fire on the raiding Croat cavalry. He had taken out several horses, enough to stop the charge cold. Trent wondered how many of the Croats were able to read that sign before they died. He shook his head slowly. He had been detailed as part of the burial crew. It was not something he ever cared to repeat.

It was while he was staring at the sheep as they made their way down Main Street, that he had the idea. THE idea. His beer was halfway to his lips, when he stopped to listen. He heard a small motor, sounded like a Honda motorcycle, put-putting from around the corner. The sheep took an instant dislike to the noise and began to get fidgety. They parted for the vehicle that was coming down the middle of the street. It had everything that he needed to make a car! Four wheels and a motor, brakes, suspension, everything. Why didn't he think of it before! There was an old LP gas tank on the back of the vehicle, so it was powered by natural gas. Of course. It was a four-wheel drive All Terrain Vehicle. There were hundreds of them in the county! Why didn't he think of it before? There was his racecar. With a few modifications, more horsepower, larger chassis and steering assembly, someplace to sit . . .

He looked at the ATV as it scooted past the sheep and took off down the road, across the bridge and softly rumbled up the hill and out of town. He smiled. For the first time in a while, he smiled widely.

* * *

Trent was going to go fast again, and a highly modified ATV chassis was how he could accomplish his

goal. And, like a true gearhead, there was nothing that was going to stand in his way.

He started out by selling his old performance V8 from the racecar to the mine. The mine needed it to operate one of the pumps, and at three hundred horse power, that engine was the only thing that could do the job. That money bought him the basic components; a pair of clapped-out, beat-up, skanky, old ATVs, that looked as if they were pulled out of a creek. They were just about junk. But both engines turned over, they had compression, and the gearboxes were in good shape. He bought them from Mitch Kovacs. Mitch, who Trent knew was not the brightest crayon in the box, thought he had gotten a great deal. Trent knew better.

He dragged the two pieces of junk home by hiring a tow truck. He refused to call it a tow wagon. It was an old rear end off of a tow truck grafted to a harness and a pair of large horses. The driver was proud of what even Trent recognized as very large horses.

Trent scoffed. "I don't see what the big deal is. Hell, it's still only two horsepower."

The tow-wagon driver was unimpressed with the observation.

He disconnected the two ATVs from the tow-wagon, paid the grizzled and now grumpy German, and pushed them into the garage one at a time. He stripped the two machines down, cleaned everything and took inventory. He had purchased what amounted to about three fourths of an ATV between the two junks. Still, it was enough. He even had parts left over, which he promptly sold. Both of the ATVs had good transfer cases and selling those brought in nearly twenty percent of what he had spent on them.

It helped that his old man had the handyman business. Bartering was a large part of that business, so Trent bartered too. Sometimes doing two or three deals to achieve the part, or the welding rod, or the fasteners he needed. It was difficult and sometimes it seemed impossible.

But nothing distracted him. Girls? Nope. Hanging out at one of the bars downtown? Nope. Bustin' ass all day to pay for some minor part, or to buy something to trade, was the only thing he was focused on all summer. And after working like a dog all day, he would come home and work well into the night, by candlelight at times, until he would drop. He would get up and do it all again the next day. He never seemed to tire. He was a gearhead on a mission.

He needed rod end bearings for the steering and tie rods. For those, he acquired a fancy halter, which he traded for an air conditioning compressor that he rebuilt, and then traded for some rod ends that were "acquired" from some piece of mining machinery. His old man always told him never to ask many questions. He didn't.

He also enlisted the help of the boys next door, the Marcantonios. The three grubby pre-teen boys turned out to be excellent scroungers.

With his father's connections, and working "favors," he was able to pay for much of his machine work. He re-roofed three houses that summer for his old man. It took work. Hard work.

He didn't need a lot of drawings before he started the build. He had visualized the entire project in his head on the very first day. First, he lengthened the frame. He then relocated the motor mount, built a roll cage from pipe and tubing, improved the brakes, fabricated the new seating mounts, changed the controls from motorcycle type to car type, including adding a sequential shift that he controlled by hand. He grabbed an alternator and built an electrical system out of the remnants of the old racecar and the Fairmont. Even used some glass for the front windshield. He spent quite a bit of time on gearing and tire

size, and he ended up using the old racecar wheels and tires to get the correct gearing for the speed he wanted. They were tough dirt track tires with only a few laps of use. They would be good for a while. The chassis was done. All that remained was the power plant.

What fuel should he choose? Granted, he could use LP Gas, like the other ATV. Conversions were not that hard, he had seen several around town, even before the Ring of Fire. All he needed was a nozzle in the carb, and a pressure compensated regulator. Everything would be easy except the regulator. He looked at other installations; there were plenty to look at around town. But with gasoline now in production, and the old man's former side business of distilled spirits going strong, he chose to stick with gas. Horse-trading the two commodities was already shaping up as a lucrative side business for the family, and everyone did their part.

When the motor finally came back from the machine shop, he could hardly wait to put it together. But he controlled his excitement, and closed up the garage to assemble the new motor. If everything was done correctly, if all of his calculations and the performance engineering handbooks were correct, the motor would produce over one hundred twenty-five horsepower.

Gently, he laid a clean sheet on the workbench to provide a pristine altar for the final assembly. He laid the precious and gleaming components out on his workbench and began to carefully measure everything with his micrometers and calipers. He positioned everything, head, valves, connecting rods and pistons, wrist pins, crankshaft, carefully and in an exact order.

He measured and recorded all that was measurable, and compared it to the ideal. He had carefully figured the copper-and-lead head gasket crush by testing several different combinations. If the gasket was too tall, he would lose horsepower. If it crushed too much when he tightened the head down to the block, the valves could strike the pistons and ruin the motor. He looked at every angle, every measurement, and every dimension as carefully as he could. He knew that there would be no way to go back to the auto parts store and get a new set of valves. If he needed that, he would have to get a motor from somewhere and disassemble it for parts. Finally, after three days of painstaking trial assembly, final assembly, and mounting the motor in the chassis, he was ready to fire it up.

There are times in the life of a gearhead that are special. And when the motor leapt to life without a moment of fuss, exactly as it was supposed to do, Trent knew that this was one of those moments. It was his project, his release, the thing that he had poured his energy, brainpower, and (too much) money into. His very soul finally revved back to life on that late summer evening. The exhaust tone even sounded right, slightly dissonant, unusual, and sharper than it should be as the motor ran. Trent caught his reflection in the rear view mirror as he revved the engine in the back. He looked tired, he thought. Older somehow. His reflection would vibrate as he revved the engine until it disappeared, and then returned when the revs dropped. He checked everything carefully, let the entire thing come up to operating temperature, and shut it down. He began to look at every hose and gasket, inspecting it for any signs of leakage.

It wasn't long before Trent noticed the three faces peering into the open garage door, drawn there by the harsh engine noise. The faces belonged to the kids that lived next door, the Marcantonios. One was an up-timer kid, Joe Marcantonio, the other two, Hans and Manny, were down-timers. All were dressed in cutoff jeans, sneakers, T-shirts and ball caps, and were between ten and thirteen years old. Trent couldn't tell the original hillbilly from the two German ones. And he had done everything he could to turn them into little hillbilly gearheads the past couple of months of summer.

"Damn, Trent," Joe said. "We didn't know that you had the motor back yet. That sounds like . . . Trent, I have no idea what that sounds like. It sounds—well—nasty."

"Ya. That sounds loud! And fast. How fast can it go?" Hans was nearly shouting.

Trent gloated. Just a little. "Aww, I told you racing virgins that the old racecar was louder than a shotgun going off, except that it's constant. You two smarty-pants said that I was full of*Scheiss* . Told'ja it was louder than anything that you ever heard. We used to rev up the racecar in the garage and the dust would fall out of the rafters from the sheer noise. But no, you guys said it was just another story. What d'ya think now, boys? Ha!"

Joe stepped across the threshold of the garage door, and the two down-time boys looked at each other and crossed over too. The garage had been verboten to them until now, but if Joe was crossing, and the door was open, maybe it was now okay. They stepped carefully across the threshold.

Joe crouched down to Trent, as Trent was checking some connections in the back, making sure it was all tight, no leaks, and nothing had vibrated loose. "Uhh, Trent. Is there any chance that I might be able to have a—"

"No. No rides. Not yet anyway. I built this for me. For a reason." Trent looked away from the kids, and seemed to focus more than necessary on the task at hand.

Joe scratched his head. "C'mon Trent, we stayed out of the garage and out of your way like we promised. You said that—"

"I never promised you guys rides."

Manny stepped up. "Not exactly, but you said if we left you alone, you'd take care of us when it was done. It looks done. And it's not like you built it all by yourself. Me and Hans scrounged the metal for the brackets off of old Mr. Lawler's fence. And Joe got the drill bit you needed for the steering rack, and I got the seats from—well, don't ask where I got the seats, okay? I just found them. I told you that."

Hans stepped beside his brothers. "We could, ya know, sort of un-find them."

Trent squirmed. "All right, all right. You guys are right. I couldn't have done it without you. But nobody else drives. I drive." He stood up and faced them. "Only I drive this thing. I have no idea how the car is going to handle. It could be pretty squirrelly. I set it up to have a low polar moment of inertia, so it will rotate quickly, and the spring rates are too high for the weight—"

Joe giggled. "You call this thing a car? Looks more like a dune buggy than a car."

"Yeah, what do you know about a car, you doofus? You'll probably never drive anything faster than a horse and buggy." Trent looked at Manny and Hans. "And it is going to be twitchy. I made it that way. And it will take a beating, or at least it should. This motor doesn't have a lot of horsepower, but this thing is lightweight. It should fly with the modifications I've done."

Mannys' eyes grew even bigger. "You mean this will fly too! Holy crap! How high?"

All three of them took turns hitting Manny.

* * *

Trent was up before the sun the next day, moving by memory in the cool of the pre-dawn darkness. He opened the garage door, and when the sun was peeking over the hill to the east, he pushed the car out onto the drive for the first time. He looked at his checklist. He rechecked the tire pressures, walked

around the car one more time, mentally going over each system that he had built or modified. Finally he was satisfied. He stepped back and looked at his creation. It did look a little like a dune buggy. Lower by a bit, too small of wheels and tires, but the thing did have a roll cage, two seats, and a steering wheel. He sat further forward and lower than he would have with a typical dune buggy, a compromise with the ATV roots of the chassis. He simplified things by keeping it only two wheel drive, and lost the extra weight of the transfer case and the drive shaft. Besides, four wheel drive is nice, but it is a little more difficult to hang the tail out through a corner. Maybe on the next design. He took another step back. Yeah, a dune buggy or maybe something out of one those old Mel Gibson movies, with the post-apocalyptic road racers. Come to think of it, his whole situation wasn't that far off from those movies. He smiled in anticipation.

The sun was now fully over the hill, and the dew was disappearing as soon as the light hit it. It was time. He double checked the fuel level, and snaked his way into the seat around the rollcage. The seatbelt was scavenged from some GM car, it still had the emblem on it, he noted as he snapped it in place. He wasn't sure about the windshield, or if it would fully protect him from the wind. But this was the time to find out. He took a deep breath and let it out. He could hear his heart pounding as he reached for the ignition switch.

"Okay, Trent. You're as nervous as you were the first time on a racetrack. This is just a test drive. You're not going to push this thing very fast, you're just going to check everything out and make sure nothing is going to fall off. Take it easy, okay, buddy? Just take it easy."

He pushed the switch for the starter to crank and the motor instantly jumped to life. The sound was different with the motor behind him; in the open air it was less nasty, not as harsh. But it was clearly not your typical ATV either. He blipped the throttle a couple of times and allowed the motor to rev and then fall. With the machining he did on the flywheel, and the increased compression, the motor lost revs quickly. It sounded nasty.

He caught sight of the three brothers from next door, running across the yards toward his open garage. The noise of the motor brought them out of the house at a dead run. He waved them to the front porch of his old man's house. They hesitated, but he waved them there again. They finally complied, dejectedly.

He sat in the car, listening to the motor as it came up to temperature. Since the Ring of Fire, he'd felt like he was on another planet. That is how different things were. He smiled and waved at the boys.*You want different? Here is different. Look out 1634 Germany, and all of you pedestrians, oxcarts, and buggies. Mario Haygood is back in business.*

He decided to show off a little. He pushed in the clutch, revved it, let the clutch out too fast with the revs too low, and promptly stalled it. Not what he planned.

Joe whistled at him. "Way to go, Trent. You want me to drive that thing for you?" The other two laughed.

Trent just made a face and restarted the motor. "Nice and easy. Test drive, remember?" He felt his ears burning red in the cool of the morning. "Easy out on the clutch, remember the lightened flywheel that makes it a little harder, ease it out, let it roll, and there we go."

He was doing it. He was driving again. He eased the thing into second gear and picked up a little speed down the driveway. He tapped the brakes, and they grabbed evenly. Back down to first gear, the motor made a nice sound on the downshift. He was at the end of the drive. He had planned to only go to the end of the drive and back, but the motor was just up to temperature, and it felt solid. He smiled. Why

not? He turned left down the street and headed out to Route 250, the main drag through the valley.

"Just down to two-fifty. Check the brakes at a little higher speed." His local street had a little curve to it, so he moved the wheel back and forth to check the steering and suspension. It felt okay. A bit twitchy, nervous. Like the steering was too sensitive for the car. "Damn," he thought. "I didn't think of that. I just used the steering rack that I had, didn't think about the steering ratios." Still it wasn't that bad. It still worked. It was just something that he needed to get used to. He came to the intersection of his street and Route 250. He could just pull out, and use the wider road to turn around. But what the heck. He looked at the gauges again, tugged at his seatbelt, and turned left, away from town.

"Just run it up to third gear, see how it handles a little bit." So he did, and then fourth gear, and finally fifth gear. He was just loping along with very low revs, well off the power band, just lugging along. . . "Idiot!" he yelled. He pushed in the clutch and revved the motor. "Don't lug this motor. It is the only one you have." The low revs and the load on the motor could have damaged a rod bearing. "Think. This is the only one of these you will ever have. Don't break it the first time out." He pulled to the side of the road and revved the motor a couple of times. Sounded good. Good oil pressure.

"Okay. Seems to be all right. Let's just turn this thing around and head back. Make sure everything is tight." He paused. "Well, I suppose I could just run up two-fifty to the high school, turn around and come home." He smiled. He didn't stall it this time as he got the thing moving. The motor was making good horsepower and the suspension was softer than he thought it would be. Everything was feeling good. He paused again, and a face cracking grin slowly spread across his face. "What the hell. Let's open it up a little."

* * *

Opal Sizemore loved her police scanner. It sat in the center of her bedroom dresser in the extended care facility. The scanner let her know what was happening in town all the time. She had loved it before the Ring of Fire, and had used it to monitor both the police and fire department. As she shuffled past her dresser that morning, she heard the scanner come alive as it had not in a long time.

"Ahh, Dispatch, this is Car Two. Southbound on Route 250, by the high school, in pursuit of, uhh—stand by, Dispatch . . . We think it is some sort of dune buggy, no plates."

That would be Ralph Onofrio, she thought. He sounds like he's a little excited.

"Did you say in pursuit, Car Two?"

Opal sat on the edge of her bed in front of the scanner. This was the best thing that had happened in a while! Certainly more fun than that Croat raid. Opal figured that today Angela Baker was running dispatch.

"That's affirmative, Dispatch. We are in pursuit."

"Haven't had one of those in a while."

"Yup, that was Angela all right," thought Opal. She always did have a dry sense of humor.

"Technically, ahh, Dispatch, since Heinrich is uhhh—driving, this is his first one ever."

"Dispatch copies that. What is your speed and position?"

"We just passed the mine road cut off, top speed so far is only seventy-five, but there are some straight parts up here . . ."

"Roger that, Car Two. Be advised the street cleaner's wagon had its wheel break. It's at the outside of the funeral home curve. It was not all the way off the road; use caution. The tow-wagon has been dispatched."

"Car Two copies, Dispatch. Heinrich, remember the wagon up here. Heinrich. Heinrich rememb—-! The SHIT WAGON! SHIT WA . . ."

Opal leaned closer to the scanner. She heard a squeal of tires, some thumps, like they hit something, and then a long squishing rumbling sound. And then silence, as Ralph must have released his grip on the microphone. She pursed her lips. It sounded like Angela was worried, too.

"Car Two, do you copy? Car Two, do you copy?"

"Stand by, Dispatch. We have a—well, just stand by. We have uhh—broken off pursuit. Yeah. Broken off the pursuit."

"Copy that. You have broken off the pursuit. Do you require assistance?"

"We think it was Trent Haygood, Dispatch. I recognize the driving. Nobody else would be that fast. Wait unit I get my hands . . ."

"Dispatch copies. Do you require assistance?"

"Well, uhh, sort of, Angela. There's the street cleaner's wagon still out here that will need towing and repair, and the county trucks need to get out here with something to pick up, oh maybe, 'bout a ton of horse shit off the road."

Opal noticed there was a long pause.

"Do you copy, Dispatch? Angela?"

"Dispatch copies. A ton?"

Opal heard laughter in the background, behind Angela's transmission. Quite a lot of laughter.

"Affirmative. And have Heinrich's wife bring him a change of clothes. He had his window open when we bumped the parked wagon. He almost got the car stopped, and he just touched the jack. The wagon teetered for a moment, and it uhhh—yeah. I'm gonna tell her—they're gonna find out sometime, Heinrich—sorry, Dispatch. But it seems the wagon dumped the better part of the load into the driver's window."

"Copy that. So you hit a load of horseshit. In a high-speed pursuit. In 1634."

"That about covers it."

Opal clutched her sweater around her neck. And then laughed like she had not laughed in the last ten years.

"Car One, Dispatch."

"Go ahead, Dispatch, this is Car One."

"Car One, you need to respond to the traffic accident and write it up."

"Already on the way. We just wish we had some film left in the camera."

They found that Opal had passed away in her room later that morning, when she failed to show up for breakfast. She had a curious smile on her face.

* * *

"Well, how did't go?" Manny was jumping up and down.

Trent had come flying up the driveway, braked hard, and then pulled the car into the garage and closed the door. He was now sitting on the porch with his three junior hillbilly cohorts, catching his breath, sipping a cold beer, and grinning from ear to ear.

"C'mon, Trent. How was it? Was it fast?" Manny was really jumping up and down now.

Trent turned to look at them. "Yes. It was fast."

"How fast?" Manny was jumping up and down so much he was in the air more than he was on the ground.

Trent looked at them calmly. "Fast enough."

Joe looked at him with a pained expression. "C'mon, Trent. How was it? Tell us!"

Trent looked over at the boys. "Not bad, boys. Not bad at all. Kinda like old times." He felt the grin get even wider, if that was possible.

They all turned and watched as the Grantville patrol car eased down their street, and pulled slowly into the driveway. The car seemed to have a definite purpose, a focus, the way a police car will. The three boys looked at Trent. His mother stepped out onto the porch and looked at Trent. She was not smiling. The police car stopped.

Trent put his feet up on the porch rail and leaned back. He felt better than he had in quite a while. For now, the world was right again. "Yup. Just like old times."

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Framed

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