Blindness

old db. malcolm mackay is dead, and, with more than usual truth, one may say he is at last at peace. His life was hard and bit-ter, those last few years. He was blind, of course, blinded as every-one knew by the three-year-long exposure to the intolerable light of the Sun.

And he was bitter, of course, as everyone knew. But somehow they could not understand that; a man so great, so loved by the population of three worlds, it seemed there could be nothing in his life to embitter him, nor in the respect and love of the worlds for him.

Some, rather unkindly, I feel, put it down to his blindness, and his age—he was eighty-seven when he died—and in this they were unjust. The acclaim his great discovery brought him was the thing which embittered him. You see, he didn't *want* acclaim for that; it was for the lesser invention he really wanted praise.

That the "Grand Old Man" may be better understood, I genu-inely want people to understand better the story of his work. And his blindness, but not as most people speak of it. The blindness struck him long before the exposure to the Sun ruined his eyes. Per-haps I had better explain.

Malcolm Mackay was born in 1974, just one year after Cartwright finally succeeded in committing suicide as he had al-ways wanted to—by dying of asphyxiation on the surface of the Moon, when his air gave out. He was three when Garnall was drowned in Lake Erie, after returning from Luna, the first man to reach Earth again, alive. He didn't go on living, of course, but he *was* alive when he reached Earth. That we knew.

Mackay was eleven, and interested, when Randolph's expedition

returned with mineralogtcal specimens, and the records of a year's stay on the Moon.

Mackay went to Massachusetts Institute of Technology at seven-teen, and was graduated a member of the class of 1995. But he took physics—atomic physics.

Mackay had seen that on atomic power rested the only real hope of really commercial, economically sound, interplanetary travel. He was sure of that at seventeen when he entered M.I.T. He was con-vinced when he was graduated, and went back for more, because about that same time old Douglas A. Mackay died, and left him three quarters of a million.

Malcolm Mackay saw that the hand of Providence was stretched out to aid him. Money was the thing that he'd needed. Douglas Mackay always claimed that money was a higher form of life; that it answered the three tests of life. It was sensitive to stimulation. It was able to grow by accretion. And finally—the most important, in Mackay's estimation—the old Scot pointed out it was capable of re-production. So Malcolm Mackay put his in an incubator, a large trust company, and left it to reproduce as rapidly as possible.

He lived in shabby quarters, and in shabby clothes most of the time, so he'd have money later on when he started his work And he studied. Obviously, there is no question but that Mackay was one of the most highly intelligent human beings that ever lived. He started with the basis of atomic knowledge of that day, and he learned it all, too, and then he was ready to go ahead. He spent seventeen years at M.I.T. learning and teaching, till he felt that he had learned enough to make the teaching more of a nuisance than a worthwhile use of his time.

By that time, the money had followed the laws of money, and life, and had reproduced itself, not once, but twice, for the Scot had picked a good company. He had two and a quarter millions.

There is no need to retell his early experiments. The story of the loss of three fingers on his left hand is an old one. The countless minor and semi-major explosions he had, the radiation burns he collected. But, perhaps those burns weren't so wholly injurious as was thought, for thirty-five years after he left M.I.T. he was still working at an age when most men are resting—either in coffins or wheel chairs. The Grand Old Man didn't put his final determi-nation into action until he was seventy-three.

John Burns was his laboratory assistant and mechanician then. Mackay's loss of his fingers had been serious, because it made deli-cate instrument work difficult, and John Burns, thirty-two at the

time, was his mechanician, his hand, and his highly trained techni-cal assistant. In May, 2047, the latest experiment having revealed only highly interesting but negative results, Malcolm Mackay looked at Burns.

"John, that settled it," he said slowly. "Something is missing, and we won't get it here in a pair of lifetimes, even long ones. You know the only place we can find it."

"I suppose you mean the Sun," replied Burns sadly. "But since we can't get near enough to that, it doesn't do us a bit of good. Houston's the only man who has come back alive, and his nearest approach was 41,743,560 miles. And it didn't do any good, anyway. The automatic rockets get nearer, but not very much

nearer; the heat beats them—all of them. And you, yourself, said we'd have to get within four millions, not four tens of millions of miles. And that's utterly hopeless. Nothing could stand it that close to old Sol."

"We're going," said Mackay grimly. "I've spent close to three quarters of a century working on the problem of atomic energy, and we're going." He paused for a moment, then looked up at Burns with a kindly smile. "No; I guess it's not we who are going, but I. I'm more than willing to go, and lose perhaps two years off the tail end of my overlong life if need be, if I can send back the word to the world that will set it free of that age-old problem of power.

"Power. Maybe we can use Sun power, after all. They've been talking about solar power since the beginning of the last century, and they haven't got it yet. Never will, I guess, because the power's too diluted. They can't build a big enough Sun glass. But if we can steal the secret of the Sun, and give them little private suns right here on Earth, that will settle the question. And give rockets some real power, too, incidentally."

The old man chuckled. "You know, John, when I started, it was the dream of my life that rockets should have atomic power so they could really reach the other planets. Atomic power! And now, here I am, close to three quarters of a century old—and I've never even left Earth. A grounder.

"And atomic power isn't so badly needed for rockets, anyway. They have good fuels now, safe ones and powerful ones like atomic hydrogen and oxygen. Atomic power is needed here on Earth, where factories are, and men labor in coal mines for fuel, and where they make the fuel for rockets. That's where mankind needs atomic power.

"And by all the powers of Heaven, if the Sun's the place where I can learn, the Sun's where I'm going."

"But by that particular power of Heaven known as radiant en-ergy, you can't," objected Burns. "The radiation makes it impos-sible."

"Well, I'll kill that radiation, somehow. That's the real problem now, I guess. Wonder how—we've developed a lot of different radi-ation screens and blocks since we began this work here; we ought to find something."

"Yes, doctor; we can stop any kind of radiation known, including Millikan, but we can't stop three or four million tons of it a second. It's not stopping it. Anything will do that. It's a problem we've never before attempted—the problem of handling it after it's stopped."

"We'll stop it and handle it, somehow," determined Mackay.

Burns gave up. Mackay meant it, so that was the new problem. It was obviously impossible, Burns knew, but so was atomic power, evidently. They'd run against all the blind alleys in the universe seeking that, so they might as well try a few more in a different di-rection.

Malcolm threw himself into that problem with all the keenness and determination he had shown through fifty-five years of active research on the main line. This was just another obstacle on the main track. It stood between him and the Great Secret.

He experimented a little with photoelectric cells, because he felt the way to do it was to turn the heat into electric energy. Elec-tricity is the only form of energy that can be stepped up or down. Radiant energy can be broken down from X-ray to ultraviolet, to blue to red, to infra-heat But it can't possibly be built up or trans-formed down at will. So Mackay tried to turn heat into electricity.

He wasn't long in seeing the hopelessness of photocells. They ab-sorbed some of the radiant energy as electricity, but about ninety-five percent turned into straight molecular motion, known as heat, just as it did anywhere else.

Then he tried super-mirrors and gave up within three months. That was the wrong way. So it must be some way of turning molec-ular motion of heat into electric power.

It was like threading the way through a maze. You found all the blind alleys first, then there was only the right paths left. So he started on molecular motion-electricity transformations. He tried thermo-couple metals. They worked only when you had a cool

place. A cool place! That was what he was trying to get. So he quit that.

Then he got mixed up with hysteresis. He was experimenting with magnets and alternating current, and that gave him the right lead. He developed *thermlectrium* nearly a year and a half later, in 2049, of course.

The first fragment of the new alloy was put in the coil, and heat-treated till the proper conditioning had been obtained, and the se-cret of the heat-treatment is the whole secret, really. And finally it was taken out. It was dull, silvery gray, rather heavy, being nickel-iron-cobalt-carbon steel.

It looked like any of a thousand thousand other alloys, felt like any of them then. But they put it in the closed coil. In fifteen sec-onds dew formed on it; in twenty, frost, and the coil was getting hot, a current of fifty amperes flowing through it. Mackay beamed on it with joy. The obstacle had been removed! The way to the Sun was clear.

He announced his plans now to the news agencies, and to the Baldwin Rocket Foundry Co. They agreed to build him a ship ac- cording to his plans—and he made up his famous plans.

Thermlectrium is a magnetic alloy, the unique property being that its crystals are of almost exactly uniform size. When a magnet is turned end for end in a coil of wire, when the magnetic polarity is reversed, a current is induced in the circuit, at the expense of the energy which turned the magnet.

In any permanent magnet, the crystals are tiny individual mag-nets, all lined up with their north poles pointing the same way. In magnetized steel, if the bar is heated, the heat-motion of the mole-cules turns some of them around, with the result that the magnet- ism is lost. In thermlectrium, even at low temperatures, the crystals turn, but they all turn together. The result is the same as though the bar had been inverted. A current is induced in the surrounding coil. And, of course, the energy which inverts the magnet, and drives the current of electricity, is the molecular motion known as heat. Heat was conqueredl

Dr. Mackay drove his plans on to rapid completion. Burns insisted on going, and Mackay could not dissuade him.

The plans were strange. They were enough to dissuade any nor-mal man. Only such a fanatic as Dr. Mackay really was, and as Burns had become, could have imagined them. Either that, or a man with colossal self-conceit. The *Prometheus* was to leave from Luna. Then she was to circle down toward the Sun, down very,

very nearly one hundred million miles till she was within three mil-lion miles of the million mile globe of incandescent fury, and stop her fall by going into a close, circular orbit.

That means less, today. No one had ever imagined attempting anything like that. Houston, who had circled the Sun, had actually merely swung in on a comet's orbit, and let his momentum carry him away again. That wasn't difficult. But to break the vast para-bolic orbit a body would naturally attain in falling from Earth to-ward the Sun would require every pound of fuel the *Prometheus* could carry and break free of Luna.

The *Prometheus* could set up her orbit around the Sun. That was going to be easy. But they couldn't possibly pull loose with any known power. Only atomic power could do it. When and if they found it!

Malcolm Mackay was eager to bet his Me on that proposition. Atomic energy or—eternal captivity—death. And Burns, as much a fanatic as Mackay, was willing, too.

There were only two horns to this dilemma. There was no third to escape on, no going between them. So the Grand Old Man sank every penny of his fortune in it, and would have sunk any he could borrow had he been able to get it.

The *Prometheus* rose, slowly. And during the weeks and months it was being built, Mackay and Burns spent their time gathering supplies, instruments, chemicals. For one thing, every element must be represented, and in proportion to its availability. Radium, even, though radium could never be a source of atomic power, for power derived from radium would still be too expensive for commercial use. But radium might be the absolutely essential primer for the en-gine—so radium went. And fluorine, the deadly unmanageable halogen, everything.

Then, gradually, the things were moved in as the ship neared completion. The outer hull of the high-temperature tungsten steel, the space filled with hydrogen under pressure, since hydrogen was the best conductor of heat practicable, and in that interspace, the thousands of thermlectrium elements, and fans to force circulation.

The *Prometheus* was a beautiful ship when she was finished. She glowed with the gleam of a telescope mirror, polished to the ulti-mate. Only on one side was she black, black as space, and, here studded with huge projectors and heaters. The power inevitably generated in absorbing the heat in the therm elements would be cast out here in tungsten bars thick as a man's arm, and glowing white-hot in an atmosphere of hydrogen gas.

She left, finally. Struggling up from Earth, she reached Luna, her first stage, and filled her fuel tanks to the last possible ounce. Then, in August, 2050, she took off at length.

Reaching the Sun was no trick at all, once she had broken free of the Moon and of Earth. Day after day she fell with steadily mount-ing speed. The Sun loomed larger, hotter. The great gyroscopes went into action, and the *Prometheus* turned its silvered face to the Sun, reflecting the flooding heat. Nearer and nearer. Venus fell behind, then Mercury's orbit at last.

They knew heat then. And radiation. The Sun loomed gigantic, a titanic furnace whose flames reached out a quarter of a million miles. The therm elements began to function, and the heat dropped somewhat. Then the rockets started again, started their braking ac-tion, slowly, steadily, braking the ship to the orbit it must make, close about the Sun.

Hour after hour they droned and roared and rumbled, and the heat mounted, for all the straining power of the therm elements. Radio to Earth stopped the second day of the braking. The flooding radiations of the

Sun killed it. They could still send, they knew, but they could not receive. Their signals were received by stations on the Moon, where the washing static of the Sun did not blanket all the signals that came. For they were beaming their waves, and the Sun, of course, was not.

. "We must establish the orbit soon, John," said Mackay, at last. He was lying down on his couch, sick and weak with the changing Strains. "I am an old man, I fear, and I may not be able to endure ,much more of this."

8 "We will have to brake more sharply then, Dr. Mackay," replied

^ Burns concernedly. "And then we may not be able to establish the perfectly circular orbit we need."

. Mackay smiled faintly, grimly. If it is not soon, John, no orbit

,, will mean anything to me."

The rockets roared louder, and the ship slowed more rapidly. But it was three days yet before the orbit trimming could be started. They left the ship in an eccentric orbit at first, though, and counter-acted for the librations of the ship, which tended to turn the blackened radiator side toward the Sun, by working the gyroscope planes.

Dr. Mackay recuperated slowly. It was three weeks, actually, three, precious oxygen-consuming weeks, before they started the final orbit trimming. Then day and day they worked, observing,

and occasionally giving a slight added rocket thrust for orbit trim-ming.

But, finally, at a distance of three point seven three millions of miles, the *Prometheus* circled the titanic star. The sunward side, for all its polish glowed red-hot continuously. And the inside of the ship remained a heated, desiccated furnace, for all the work of the therm elements. Even they could not perfectly handle the heat.

"Ah, John," said Mackay at last. "In some ways Earth was better, for here we have strange conditions. I wish we could get a time sig-nal from Earth. The space is distorted here by the Sun."

Old Sol, mighty in mass and power, was warping space so that spectrum lines were not the same; their instruments were not the same; the titanic electric and magnetic fields threw their delicate apparatus awry. But they worked.

It was fortunate that the therm elements produced power, as well as getting rid of the heat. With the power, they kept the functions of the ship running, breaking down the water formed in their breathing to oxygen once more, and storing the hydrogen in one of the now empty fuel tanks.

And their observations went on, and their calculations. In six months it seemed they had never known another life than this of in-tolerable, blinding light if they dared to open an observation slit in the slightest; intolerable, deadly radiation if they dared to step be-yond the protected walls of their laboratory and living quarters without a protective suit. For most of the ship was as transparent to the ultrashort waves of the Sun as empty space.

But it grew to be a habit with them, the sending of the daily neg-ative reports, the impossibility of hearing any signal from Earth, even of observing it, for there was the eternal Gegenschein. It was blinding here, the reflected light from the thin-strewn dust of the Sun.

That dust was slowing them down, of course. They were, actu-ally, spiralling in toward the Sun. In some seventy-five years they would have been within reach of the prominences. But before then —one of the pans of their balance would have tipped. Atomic power—or the inevitable end.

But Mackay was happy here. His eyes turned from deep blue-gray to a pale blue with red bloodshot balls; his skin turned first deep, deep brown from the filtering ultraviolet, then it became mottled and unhealthy. Burns' skin changed too, but his eyes en-dured better, for he was younger. Still, Mackay felt sure of his goal. He looked down into the flaming heart of a Sun spot, and he ex-

amined the underside of a prominence, and he watched the ebb and flow of Sol's titanic tides of white-hot gas.

2050 passed into history, and 2051 and 2052 followed in swift succession. No hint of the great happenings of Earth and the planets reached there, only the awful burning of the Sun—and, in February of 2053, a hint of the great changes there.

"John," said Mackay softly one day, "John—I think I see some hint of the secret I think we may make it, John!"

Burns looked at the sharp-lined spectrum that lay on the table before Mackay, and at the pages of calculations and measurements and at the data sheets. "I don't see anything much different in that, doctor. Isn't it another will-o'-the-wisp?"

"I—I hope not, John. Don't you see this—this little line here? Do you recognize it?"

"No—no, I don't think I do," he said slowly. "It's a bit too high for the 4781 line. And I don't know what's in there—"

"There isn't any there, John," said Mackay softly. "There isn't any. It's a forbidden line, an impossible line. Ifs the impossible line of sodium, John. It's a transformation that just couldn't take place. And it did, so I'm going to find out how it did. If I can make the impossible release take place the same way—"

"But that tells so little, so very little. Even if you could duplicate that change, make that line, you'd still be as far from the secret as from Sirius. Or Earth for that matter."

"I'll know more, though, John. You forget that only knowledge is the real secret When I know ajl about the atom, I'll know how to do what I want to do. If I know all the changes that can take place, and why, then I can make that other change. Ah, if only I could see just a few miles deeper into the heart of the Sun—"

"We've seen some of the greatest Sun spots in history, and at close hand Do you think we could see any deeper? The light—that terrible light."

"It blinds even the instruments, so there is little more we can do. But we can calculate and take more photographs for more of those lines. But now I must see what the instruments recorded when we got this line."

(They had recorded even more than the old man had hoped. It
, was enough. Mackay and Burns duplicated that impossible line,
and then they produced some more impossible lines. It was the key.
It wasn't impossibly difficult then. They could design the apparatus,
,.. and did, in September, three years and one month after lifting off
. for the final drop to the Sun.

They made it, piece by piece, and tested it January. It wasn't winter there; there was no winter. Only everlasting heat. And Mackay's eyes were failing rapidly. His work was over. Both be-cause he could scarcely work any longer, and because, on January 14, 2054, the energy of the atom was harnessed by man! The Great Secret was discovered.

It took the intense light of the mighty arc to stimulate the old eyes when the thing was done. Only its tremendous blinding power was visible. His ears could hear the roar, well enough, and his fingers could feel the outlines of the hulking machine. But he could no longer make it out when it at last roared its lusty greeting to human ears.

His thin lips parted in a contented smile, though, as his tough old fingers caressed the cold metal and the smooth cold glass. "It works, doesn't it, John? It works. John, we've done it." A shadow passed over the old man's face for an instant. "We haven't heard from Earth in over three years. Do you suppose someone else has discovered it, too? I suppose I ought not be selfish, but I do hope they haven't. I want to give this to the world.

"John, can you make the drive apparatus yourself?"

"Yes, doctor; I can. You had all the plans worked out, and they're simple to follow. It isn't really greatly different. Only that instead of using a high-temperature gas ejected at thousands of feet a second, we'll use a high-voltage ion ejected at thousands of miles a second. And because we can burn iron, as you predicted, we don't have to worry at all about power."

"No, John. We don't have to worry at all about power." The old man sighed, then chuckled contentedly. "I always wanted to live to see the day when atomic power ran the world. But I guess I won't after all. I can't see, but it won't matter. I have so few years left, I won't worry about a little thing like that. My work's done, anyway. We don't have to worry about power, John; the world doesn't any more.

"Men will never again have to worry about power. Never again will they have to grub in the Earth for fuels. Or do things the hard way because it is less costly of power. Power—power for all the world's industry. All the wheels of Earth's factories driven by the exploding atoms. The arctic heated to a garden by it. Vast Canada opened by it to human habitation, clear to the North Pole.

"No more smoke-clouded cities.

"And the atom will lift the load of labor from man's back. No more sweating for six hours every day for daily bread. An hour a

day—and unlimited, infinite power. And, maybe, even, some day it will lead to successful transmutation, though I can't see it. I mean, I can't see it even mentally," he said with a little smile. "The Sun showed me the secrets it held—and took away the impious vision that gazed upon them.

"It is worth it. The world will have power—and my work is done.

"You are starting the drive apparatus?"

"Yes, doctor. The main tube is to be—"

Burns launched into a technical discussion. The doctor's eyes could not follow the plans, but the old mind was as keen as ever. It pictured every detail with a more penetrative vision than ever his eyes could have.

He chuckled contentedly as he thought of it.

"John, I have lost little, and gained more. I can see that tube bet-ter than you can. It's a metal tube, but I can see to its deepest heart, and I can even see the ions streaming out, slowly, precisely. My mind has a better eye than ever my body had, and now it is developing. I can see the tube when it is not yet, and I can see the heart of it, which you cannot.

"Make it up, John. We must hurry back."

The lathe hummed, powered by atomic energy, and the electric furnace glowed with a heat so intense the old scientist could see it, driven by the power of the bursting atoms.

The mental eye he had boasted of was keen, keener than his old eyes had ever been. But still it was blind. Somehow, it did not see the white-hot tungsten bars on the "night" side of the ship pouring thousands and thousands of kilowatts of power out into space. The power the therm elements were deriving from the cooling of the ship.

The drive tubes grew, and their great metal bed-bolts were turned. Then the great rocket tubes were sealed at the far end, cut, and insulated again. But now, electrically insulated, the great ion tubes took shape and were anchored, and the huge conductors ran back to the ion-gas chambers, and to the hunched bulk of the atomic engine. Day succeeded day, and Burns cut and fashioned the metal and welded it under the blazing power of the broken atoms in their atomic generator.

And at last the ship trembled with a new, soft surge. It must be slow, for the men were used now to weightlessness, three long years of it. But gradually, gradually, the *Prometheus,* bearing the fire it had stolen from the Sun, swung swifter in its orbit, and spi-raled out once more, slowly, slowly. And the radio drove out its beam toward Earth.

They *could* not hear the messages that Earth and Luna pounded back at them, but gladly they guessed them. The ion tubes whis-pered and murmured softly, with a slithering rustle as of a snake in dry leaves, and the ship accelerated steadily, slowly. They ran those tubes day and night and slowly increased the power. There was no need for maximum efficiency now. No need to care as they wasted their power. There was plenty more.

Their only difficulty was that with the mighty ion tubes working they could not receive radio signals, even when they gradually circled out beyond Mercury, and finally Venus, slowly growing ac-customed once more to weight. They did not want to turn off their tubes, because they must get accustomed to weight once more, and they were moving very rapidly now, more and more rapidly, so that they passed Venus far too rapidly for the ships that rose from the planet to congratulate Dr. Mackay and tell him the great news.

They circled on, in the *Prometheus,* till they were used once more to Earth gravity, and then they were near Earth, and had to apply the braking ion rockets.

"No stopping at the Moon, John," Malcolm Mackay smiled. "We and all humanity are through with that. We will go directly to Earth. We had best land in the Mojave Desert. Tell them, tell them to keep away, for the ions will be dangerous."

John Burns drove out his message, and Earth loomed large, and North America came slowly into view. Then they were settling to-ward the desert.

The old scientist heard the faint, cold cry of ruptured air first, for his eyes were dark, and only his ears brought messages from out-side. "That's air, John!" he cried suddenly. "We're in the air againl Earth's air! How far up are we?"

"Only another one hundred and fifty miles now, doctor. We're al-most home."

"Home—I should like to see for just this second, to see it again. John, John, I'll never see Earth again. I'll never—but that means lit-tle. I'll hear it. I'll hear it and smell it in my nostrils, clean and sweet and moist, and I'll taste it in the air. Earth's air, John, thick and spicy with green things. It's autumn. I want to smell burning leaves again, John. And feel snow, and hear its soft caress on a glass pane, and hear the soft sounds men make in snow. I'm glad it's au-tumn. Spring has its smells, but they aren't so spicy and clean. They're not so interesting, when you can't see the color of grass, so green—too bright, like a child's crayon drawing. Colors—I'll miss

them. There weren't any out there. Colors—111 never see the leaves again, John.

"But I'll smell them, and I'll hear the hum and whisper of a thou-sand thousand atomic engines making the world over for mankind.

"Where are we? The air is shrilling thickly now."

"We're less than fifty miles up. They've cleared the Mojave for fifty miles around us, but, doctor, there are a hundred thousand pri-vate air-cars there—a new design. They must have developed broadcast power. They're all individually powered and apparently by electrical means."

"Broadcast power? That is good. Then atomic energy will reach every home. The apparatus would be expensive, too expensive for homes."

"The air is full of ships—there are half a dozen great stratosphere ships flying near us now; can you hear the *chug* of their propel-lers?"

"Is that the noise—ah! Men, men, again, John. I want to hear a thousand voices all at once."

Burns laughed recklessly, carefree. "You will, from the looks of things. You will! There are nearer a thousand thousand down there now!"

"The ship is slowing?" asked Mackay.

Burns was silent for a moment. Then, suddenly, the dry rustle of the tubes changed its note; it flared for an instant, there was a soft, grating thud, a harsh scraping of sand—and the ion tubes died in si-lence.

"The ship is stopped, doctor. We're home."

Dimly, faintly, the sound of a thousand voices clamoring and shouting came through the heavy walls. Mackay had landed! The Grand Old Man was back! And half the world had turned out to welcome him, the man who had remade all Earth, and all Venus.

The lock opened, and to Mackay came the roar of voices, the thrum and hum and rumble of thousands and tens of thousands of propellers. There was the musical cacophony of a thousand air-car signals, and the mighty thunder of a titanic voice, rumbling, hoarse, and godlike in power, cutting through, drowning it all.

"They're welcoming you, Dr. Mackay—welcoming you."

"So I hear," said Mackay, half happily, half sadly, "but I am so tired, perhaps I can rest a bit first. I am older than you are, John. You have done as much as I; you had better answer them."

Suddenly, close-by human voices cut in, excited, happy, welcom-ing voices, and John Burns' swift answering speech:

"He is tired; it has been hard for him. And—you know he has lost his sight The radiation of the Sun so close. He would rather be taken where he can rest."

"Very well—but can't he say something? Just a few words?"

Burns looked back at the old man. Malcolm Mackay shook his head.

The man outside spoke again: "Very well. We will take him directly to anywhere he wants."

Mackay smiled slowly, thoughtfully. "Anywhere, anywhere that I can smell the trees. I think I'd like to go to some place in the moun-tains where the air is sweet and spicy with pine smells. I will be feeling better in a few days—"

They took him to a private camp in the mountains. A ten-room "cabin," and they kept the world away, and a doctor took care of him. He slept and rested, and Burns came to see him twice the next day, but was hurried away. The next day and the next he did not come.

Because even Burns had not gathered quickly the meaning of all this. Even he had thought at first it was in celebration of the inven-tion of the atomic generator.

At last he had to come. He came into Mackay's room slowly. His pace told the blind man something was wrong.

"John—John, what's troubling you so?"

"Nothing; I was not sure you were awake."

Mackay thought for a few seconds and smiled. "That wasn't it, but we will let it pass now. Do they want me to speak?"

"Yes. At the special meeting of the American Association for the Advancement of Science. And—also on the subject of the thermlec-trium elements. You have done far more than you thought, doctor. You have remade the worlds already. Those cars I thought were powered by broadcast energy? I was wrong. We were blind to the possibilities of that lesser thing, the thermlectrium element. Those cars were powered by it, getting their energy from the heat of the air. All the industries in the world are powered by it. It is free power.

"The elements are cheap, small, simple beyond anything conceiv-able, a bar of common metal—a coil of wire. They require no con-trol, no attention. And the energy costs nothing at all. Every home, every store, every man, has his private thermlectrium element. Every car and every vehicle is powered by it.

"And the map of the world has been twisted and changed by it in three short years, The tropics are the garden-spot of the world.

Square miles of land are cooled by giant thermlectrium instal-lations, cities air-conditioned, till the power they develop becomes a nuisance, a thing they cannot get rid of. The tropics are habita-ble, and they have been given a brisk, cool, controlled climate by your thermlectrium elements.

"Antarctica is heated by it! There are two mining developments that suck heat from that frozen air to make power in quantities they cannot use.

"And rocket fuel costs nothing! Nothing at all. The tropical coun-tries find the electrolytic breaking down of water the only cheap, practical way to get rid of their vast energy, without turning it right back into heat. They give the gases to whosoever will take them away.

"And Venus you have remade. Venus had two large colonies, al-ready. They are cooled, made habitable, by the thermlectrium ap-paratus. A ten-dollar unit will cool and power an average house for-ever, without the slightest wear. By moving it outside in winter, it will warm and power it. But on Venus it is all cooling. They are developing the planet now. Dr. Mackay, you have remade the worlds!"

Dr. Mackay's face was blank. Slowly a great question was form-ing. A great, painful question. "But—but, John—what about—atomic energy?"

"One of the greatest space lines wants to contract for it, doctor. Their interplanetary ships need it."

"One!" cried the Grand Old Man. "One-what of the others?"

"There is only one interplanetary line. The lines to the Moon are not interplanetary—"

And Dr. Mackay caught the kindness in his tone.

"I see—I see—they can use the free gases from the tropics. Free power—less than nothing. "Then the world doesn't want my atomic energy, does it?" he said softly. His old body seemed to droop.