of the British 5-pound piece is 1⅜ inch.

As for silver, it is *the* coinage metal. Coin catalogues usually state what metal a coin is: G for gold and C for copper, but if the coin is silver, nothing is said. Silver coins, if U. S., also have a fineness of 900, but this time the 900 means the silver content; the remainder is mainly copper. The largest silver coin is almost the same size as the largest gold coins — it is a 4-thaler piece of Brunswick (1685) with a diameter of 3¼ inches, more than double the diameter of a dollar piece.

Before we proceed to nickel and copper, it must be mentioned that one country once had platinum money. In Russia, three platinum coins of 3, 6 and 12 ruble denomination were minted between 1828 and 1845. Just in case somebody is curious: they are not rare, merely expensive; a fine specimen of the 3-ruble piece will cost around $250.

Nickel, as I mentioned, is comparatively new on the metallurgical scene. Before it became available, money smaller in value than silver would conveniently be provided by copper. Well, it was copper with other things in it and that has produced a few mysteries. Let us first get the terminology straight.

Copper, when pure, is very soft too. The trick of adding tin to make it hard was discovered early. Copper with 10 to 15 per cent tin in it is called bronze; if it has 15 to 25 per cent tin in it, it is called bell metal because it was used for church bells. Brass, however, is copper with an admixture of zinc, and zinc did not become known until around 1500 A.D., and even then it was often confused with bismuth.

Many copper coins through the ages contain such comparatively small admixtures of other metals that calling them copper coins is fully justified. (The U. S. 1c piece, for example, is 95 per cent copper with 5 per cent tin and zinc.) But bronze coins with 10 to 15 per cent tin were also common since ancient times. For example, Celtic coins found in 1948 in England and dating back to 80 B.C. are bronze with 10 per cent tin.

Brass coins came much later, but they have a forerunner. One Roman coin, struck under the reign of Augustus, was found to contain 17.3 per cent zinc — straight "brass" of our terminology. But real brass was not developed until nearly 1700 years later. Correct—the brass of the Roman coin must be an accident, made from copper and zinc ores that occurred in conjunction.

Coins which were brass on purpose, so to speak, are rather unusual; most of them were due to an emergency of some kind. The most famous is the one which produced what is called "Irish gun money." When James II of England fled to Ireland, he gathered an army to force his return. The army wished to be paid. James took what he could get: bronze cannon and brass cannon, bell-metal bells, and bells of whatever alloy they happened to be. The guns and the bells were made into money, the so-called "brass shilling" being one of them. The workmanship of this "gun money" happens to be excellent, but the composition of any specific coin couldn't be more indiscriminate.

IT may be mentioned in passing at this point that British law was peculiar for several centuries. To forge gold or silver coins was punishable by death or deportation to an outlying colony. Forging copper coins, however, was just a misdemeanor.

Also in passing, the term cartwheel, so common for our silver dollar, was originally applied to a copper coin, the tuppence of George III of England which measured 1⅝ inch in diameter and was also very thick. (The Czars of all the Russias beat this later with a copper coin two inches in diameter, but you had to travel to Russia to see it, for Russians who could travel abroad would not declass themselves by having copper coins in their purses.)

Though bronze has been in use for a long time on and off, it did not find much favor in the Western Hemisphere. The Confederacy struck a 1c bronze coin, but it was not placed into circulation. The Union struck a 2c bronze piece in 1864; it did not live long. However, Americans can now handle bronze coins without crossing the ocean: the Canadian 1c of 1937 and the Mexican 20 centavos of 1943 are both bronze.

In trying to get back to nickel, I first have to say that there *was* a wooden nickel, or rather a wooden 5c piece, but it was local. And this side issue — nickel still has to wait — brings up the larger side issue of which other metals were used for coinage.

Well, a section of ancient India and more recently the Malay states had lead coins. More recently, on the Malay peninsula, you had "money trees" (Fig. 1.) from

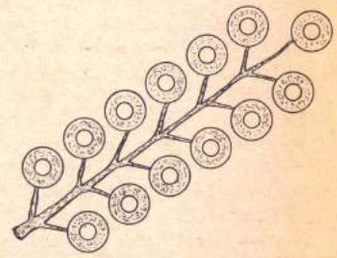


Fig. 1: Malaccan "Money Tree" when new. Broken-off "change" had center holes for stringing. The metal was pure tin.

which you broke off what you needed. They were usually tin, sometimes lead.

The ones who went in for new metals for coins were the Germans during the first World War. The Imperial coinage prior to 1914 consisted of the following: 1- and 2-pfennig pieces (copper), 5-, 10- and 25-pfennig pieces (nickel), ½ mark, 1-, 3- and 5-mark coins (silver) plus 10- and 20-mark coins (gold).

About three months after the war started a few changes became necessary. The gold and silver were needed for foreign exchange, so everything from one mark up became paper. The nickel was needed for steel and the copper was needed for driving bands for artillery shells. Still, the people needed small change, or else the very lack of small change would help inflation along. So the 1-pfennig piece reappeared in shiny aluminum and the 10-pfennig piece in dull zinc. A year or so later, the 1-pfennig was no longer needed and the 10-pfennig became iron.

It was the first zinc and the first iron coinage. As for zinc coins, Belgium adopted this metal in 1920 for small coins. And the Germans repeated during the second World War as occupation money for The Netherlands. Iron was used for 1c pieces in the United States in World War II.

BUT the 1-pfennig piece was not the first aluminum coinage. The French had announced a whole set of aluminum coins in 1906, but then did not issue them. (They have aluminum coins now.) The British did make aluminum coins in 1908 for British East Africa, but they were universally distrusted. However, the first aluminum coin was a Texas local token. It was about the size of a silver quarter — unfortunately I only have a photograph which does not show the denomination. The year is clear, though — it was 1890.

Aluminum and especially aluminum bronze coins are now in use in many countries, and after mentioning that the state of Saxony issued porcelain coins in about 1921 (they did not last long, but not because they broke easily; they didn't — inflation soon made their denominations ridiculous), I can go on to nickel as the concluding item. Actually the U. S. "nickel" has that name mostly by courtesy, for its official composition is 25 per cent nickel and 75 per cent copper. It is what might be called nickel bronze.

There is a reason for that which was first established — rather painfully — by the Swiss government. During the early part of the nineteenth century, when nickel became available in reasonable quantities, several manufacturers started compounding nickel alloys for cheap jewelry and ornamentation. A German firm was especially successful with an alloy which they named Argentan — Latin *argentum* is silver; the trade name was meant to indicate that it looked like silver but wasn't — but in other countries it was quickly dubbed "German silver." Its composition was, and is, 55 per cent copper, 25 per cent zinc and 20 per cent nickel.

In 1850 the Swiss government thought that Argentan would be a nice metal for small coins since it was so hard and durable. But the Swiss also wanted to make their coins more valuable, so they added between 5 and 15 per cent of silver, the percentage depending on the face value of the coin. This happened to produce an alloy that they just could not handle, it was so hard. The coinage die made such a shallow impression that the coin looked as if it had been in circulation for at least thirty years. Increasing the pressure broke the die.

After experimenting for several decades, the Swiss decided to use pure nickel, or almost pure, because somebody named Fleitman found that nickel became tractable with one or two per cent of magnesium added to it. Thus the Swiss in 1881 made genuine nickel coins. Nobody else ever did. The Belgians started the 75 per cent copper and 25 per cent nickel alloy in 1855. The United States struck their first nickel pieces in 1865. They were 3c pieces. The 5c nickels followed in 1866, slowly replacing the silver half-dimes.

These 3c and 5c pieces had the current composition, first used by the Belgians, but from 1856 to 1863 we had what was called "white cents," containing 22 per cent nickel, otherwise copper.

LIKE the first brass coin, the first "nickel" was also accidental. Numismatists, well acquainted with a coin struck under the reign of the Bactrian king Euthydemus II in 235 B.C., noticed that it looked different from all other ancient coins, and finally a much damaged piece was sacrificed for chemical analysis. To the chemist who performed it, the result might not have looked too strange, but the coin experts whistled in surprise. The result: 77.6 copper; 20.0 nickel; 1.0 iron; 0.54 cobalt; 0.86 residue.

No, the mintmaster of king Euthydemus II was not 2090 years ahead of his time; the mystery can be explained if we assume that the ingots came from China. Mines in the provinces of Yunan and Szechuan did produce something called *pei-tung* or "white copper," an accidental mixture of nickel and copper ores.

Well, now for the future.

What should a one-credit coin be like? To begin with, it should not be too large, but neither should it be too light, for there is some reassurance in the heft of your change. Of course it must look attractive and not tarnish. Naturally it must not show wear. Since it will be much used in vending machines, it must have some characteristic by which the machine can test it. Let us say it must give off a sound of a specific note if dropped one centimeter onto a stainless steel bar. It might fluoresce under ultra-violet light with a sharply defined specific wave length.

It must be such, in short, that laws against counterfeiting are unnecessary because nobody could do it anyhow. And its value must be definite and stable.

May your grandchildren own more of them than their helicopters can carry!

ANY QUESTIONS?

Chow Call

MY first letter is from somebody I know personally, a fellow writer and good personal friend: syndicated TV columnist Eve Starr out in Hollywood.

She asks two feminine questions. One is easy to deal with, for it concerns the clothing that will be worn in a spaceship. The answer is: "Not very much, but what there is will be comfortable though not loose. A loose garment might catch on a switch or something similar."

The second question is one I can answer only by great good luck (other people have done a lot of research on it and have just published some of their findings). That part of the letter reads: "Just what are our astronauts going to eat in space? I know, mainly from your book, that the idea of ultra-concentrated food pills is an impossibility. But nowhere, not even in your book, have I found any specific information of just what they will eat."

Yes, Eve, that is not in my book — at least not yet — and you are very much yourself in asking that question. For those who live in cities where Eve Starr's column does not appear, I have to explain that it deals with television and that she is in the habit of poking a well-manicured finger at precisely the point which the producer, director, actor or script writer had hoped would not be noticed by anybody.

Now, as for the food which will be eaten by a space crew, it clearly falls into two categories: the food which is taken along as food, and the food which is produced while under way.

The ratio between the food that is carried and the food that is manufactured will depend mostly on the duration of the trip. For orbiting Earth for a day or several, and even for the ten-day flight around the Moon without landing, *all* the food will be carried along. Only when a space mission takes at least a month will manufactured food be considered at all, and when the duration approaches a full year, the manufactured food will outweigh (in the literal sense) the food that has been taken along.

AS regards the food which is to be taken along, there are several requirements. Of course there must be no dead weight, or as little as possible (things must be wrapped, after all). Moreover, the food must resist spoilage, remain appetizing, be not monotonous and, most important, it must be something that can be eaten under weightless conditions. The latter mainly means that it must not be dry and crunchy, for dry food is almost impossible to eat when weightless, as I explained in an earlier column.

Food manufacturers have started research in two directions, the "toothpaste" foods and the "lipstick" foods. The former can be squeezed into the mouth from a tube. The ideal is that the tube itself is edible too. If that cannot be accomplished, it should have as little mass as possible (thin plastic tubes would do that). The lipstick foods also live up to their name — there are foods of a certain consistency which can be shaped into sticks from which one can bite off a piece. If you imagine a stick of fairly soft cheese, you have a rather good idea of one type of such lipstick foods.

As regards the foods manufactured en route, all I could have said only three years ago was that the space engineers had certain ideas. But now we can be much more specific — let's admit it — partly due to research work which did not have space travel in mind at all.

For the last eight years or so, I have been pointing out that oxygen for breathing does not need to be taken along on long trips, because it can be manufactured by growing plants. For several reasons, it was known that the single-celled alga known as *Chlorella* was especially good as an oxygen manufacturer. All it needed was water (in which it lives), carbon dioxide (produced by the crew members) and sunlight (available in space at any time). Now these *Chlorella* algae, in producing oxygen, also reproduce themselves. Which means that after a week you have a much larger supply of *Chlorella* than you had at the outset.

Once this was realized, the question came up: "What do we do with the surplus chlorella?" The answer was: "Eat them, if

they are edible." But as far as space research was concerned, no additional work was done for a while. Now it happens that Japanese researchers have investigated the edibility and food value of *Chlorella* — but they did not have spaceships in mind; they were just interested in additional food supplies.

Chlorella, it turned out, was simply excellent. To begin with, it was edible; the Japanese made a *Chlorella* soup which looks green and pleased their taste. European and American researchers admitted that it might be nourishing, but said nasty things about the "cod liver oil taste." As a personal aside, I might mention that I happen not to share the wide dislike for that taste. I don't adore it, but it doesn't disturb me.

Leaving the question of taste aside for the moment, the nutritional value of *Chlorella* is most unusual. One kilogram of dried algae contains 5300 calories — or one pound contains 2410 calories, if you prefer the unscientific measurements.

Not only is the caloric value large, dried algae also contain a nice proportion of the items that make a balanced diet; 40 per cent albumin, 20 per cent fat, 30 per cent carbohydrates and 10 per cent mineral salts. As for vitamins, dried algae come through beautifully: a mere 100 grams (about 3½ ounces) contain more than the vitamin requirements of an adult per day, except for vitamin C, which is plentiful in fresh living algae but destroyed in drying.

LIKEWISE, the so-called "essential amino acids" are present in fully sufficient quantities, and there is also enough fat. In fact, it is quite easy to make *Chlorella* produce more fat than it usually does. The trick is so simple as to be nearly ridiculous: just prevent the algae from getting nitrogen. If they can't get nitrogen, they cannot produce albumin, and after some time they cannot reproduce any more because there is just that much albumin available to them. However, while they can no longer split, they still go on living and producing food, but because nitrogen is lacking, the only food they can make is fat.

As I mentioned, the taste is too much like cod liver oil to please Europeans and Americans. For this reason Madame N. Tamiya concocted a few recipes for non-Japanese, like white bread with *Chlorella* and green noodles with *Chlorella.* But the addition of the algae is only about six per cent of the total weight, not enough for space voyages.

Knowing that the taste is suppressed by the addition of sugar, Mme. Tamiya produced her masterpiece: *Chlorella* ice cream. The ice cream is very nourishing, has a pretty light-green color (which, to our mind, is all right for ice cream but somewhat disturbing in bread) and is vanilla flavored.

While Japanese scientists were going after *Chlorella* for direct consumption by humans, scientists of the Boeing Aircraft Company followed a different idea. Is there something that lives on *Chlorella* — or any kind of algae, in case somebody comes up with another alga which is a still better oxygen producer — and which people would eat?

The answer is *Tilapia* (Fig. 2).

Fig. 2: *Tilapia*, of the family *Cichlidae*, the fish that will go to Mars.

Tilapia is a fish, of a size that a man can comfortably hold in his hand, with the tail hanging out. It is a fresh-water fish perfectly adapted to scum-covered tropical ponds, peaceful, content if it is provided with the two necessities for its life: warm water and plenty of little algae to eat. In nature (the fish is spreading fast through the tropics, naturally), it will probably snap up insects which have fallen into the water and eat a worm if it can get one. But it will thrive and grow and make nice white fish flesh on a diet of algae alone.

One of the answers to the question of what to do with surplus *Chlorella* is *Tilapia,* so the astronauts will probably add fresh fish to their "toothpaste" and "lipstick" foods. *Tilapia,* in addition to being tasty, has another admirable characteristic for space travel purposes: about eight weeks after it has been hatched, it is ready to produce offspring.

I can add one more specific item, also based on research going on at Boeing: mushrooms. They are a fast-growing kind which can be raised on waste matter. Since mushrooms are mostly water, they do not contribute many calories to the diet. But they do provide flavor and a change in the menu.

Well, here is the space dinner: *Chlorella* soup, boiled fresh *Tilapia* with mushrooms, bread (taken along) with fatty *Chlorella* spread, *Chlorella* ice cream dessert.

Jobs for Space Psychiatrists?

THE next letter is also from a lady, Mrs. Toni Pedigo (no address given), who writes that her husband "is going into psychiatry and would like to combine it with space research. In what way could a psychiatrist work in the field of space research without getting involved with military service?"

The joker is in the last six words of that second sentence. Otherwise I am quite sure that a good psychiatrist would be welcomed with open arms (and a steady pay check).

The whole field of space research falls into three categories.

First, the machinery, rocket motors, fuels, fuel pumps, control systems and so on. A fantastic amount of work is being done, and has been done in this field — after all, what have I been writing about and revising for the last dozen years?

The second item is the physical well-being of the pilot, bearable accelerations, comfortable cabin temperatures, something to eat. Here, too, a great deal of work has already been accomplished, mostly by the Department of Space Medicine of the U. S. Air Force. And, as my reply to Eve Starr shows, the food problem is under concentrated and apparently successful attack right now.

As for the third item, the mental well-being of the space pilot, I find myself somewhat at a loss for words. Indubitably work is going on, but I haven't read much about the psychological end, except occasional papers by Dr. Siegfried Gerathewohl in the *Journal of Aviation Medicine* and similar places.

I may be completely off-track — tomorrow's mail may bring a nice fat volume on psychological research — but I have the feeling that this field has not been pursued as assiduously as the mechanical and physiological aspects. Maybe this is given by the nature of the case: first we had to find out what could be done, and then what the man (or men) will have to endure physically before psychology could be tackled.

But to do any work here without being involved with the military services sounds like an impossible order. It is true that the Space Agency NASA is a civilian agency, but NASA does not maintain factories where big rockets can be built. NASA goes to Redstone Arsenal, or to the Air Force, and then to Convair and Martin and other companies, and tells them what they want next. Since NASA also does not maintain a big proving ground (their own is the comparatively small one on Wallop's Island), the firings have to be done from the Atlantic Missile Range at Cape Canaveral (run by the Air Force) or from Vandenberg in California.

My opinion, therefore, is this: a good psychiatrist will certainly be welcomed and there will be work for him. Said psychiatrist can continue to wear a business suit instead of a uniform. But he will be involved with the armed services consciously, subconsciously and in any other way there is.

There Was Darkness over the Whole Land

READER P. Christopher Osborn in Nashville, Tennessee — as a result of a private argument — wrote to ask whether scientists or historians, or both, are in agreement on the natural cause of the darkness at the death of Christ, which, as the Bible says, lasted "from the sixth to the ninth hour." Either Mr. Osborn or the man with whom he argued (the letter is by no means specific on that point, possibly by design) "always" thought that the darkness was an eclipse of the Sun, while the other said it must have been a sandstorm because eclipses of the Sun do not last three hours.

Half of the argument can be settled in one paragraph: it could not possibly have been an eclipse of the Sun. The Crucifixion took place on the last day preceding the Passover week, and it is clearly stated that the first day of that week was a Saturday. Since Jewish holidays begin at sundown, Passover began Friday night at sundown, so the Crucifixion took place in the afternoon of that Friday. Now at Passover the Moon must be full, hence it is at the opposite end of its orbit.

However, there is one more possibility.

Fridays with Passover beginning in the evening hours are comparatively rare. During the latter part of the lifetime of Christ, there were just two. One was April seventh, 30 A. D.; the other April third, 33 A. D. (Julian calendar). Historians are generally in favor of the later date because an early Christian writer stated that the event took place "during the eighteenth year and seventh month of the reign of Imperator Tiberius." That is, from March 17 to April 16 of the year 33 A.D.

Astronomically speaking, nothing out of the ordinary happened on April seventh, 30 A. D. But on April third, 33 A. D., there was a partial eclipse of the Moon, visible from Palestine. As seen from Jerusalem, the Moon rose while in partial eclipse a few minutes after six P.M. From moonrise to the end of the eclipse took half an hour.

It could not have been an eclipse of the Sun.

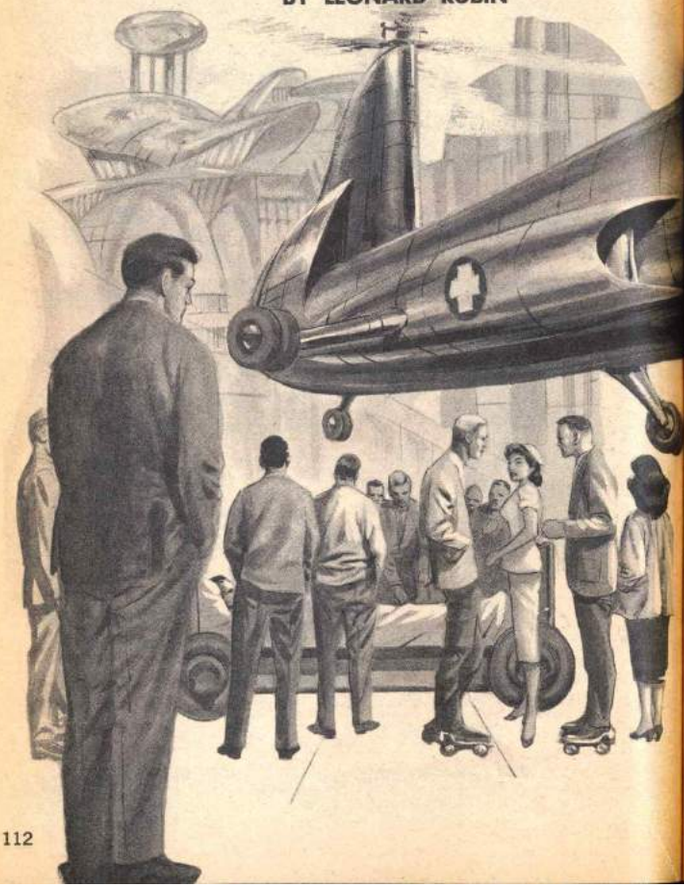
For the hours given in the Bible, it must have been meteorological, most likely a sandstorm. But on the historically most likely date, there was an eclipse of the Moon in the evening — that is, during the first hour of the holiday week. The possibility of a later "condensation" of events certainly does exist.

I can't help but end this on a note of personal curiosity. Which side am I on, that of Mr. Osborn or his opponent?

— WILLY LEY

don't look now

BY LEONARD RUBIN



Illustrated by WOOD

"YOU'RE not allowed in the ambulance," Miss Knox said.

They were both typical advertising men, down to the motor-skates strapped beneath their shoes. Their faces were so utterly undistinctive as to seem fuzzy. Each carried a large flat briefcase with a coil antenna sticking out.

The Royalty Party wasn't what you would imagine—it stood for a great deal, but there was as much it wanted no part of!

"Watch it!" the attendant growled, and they skated aside with a whir.

Big Carl came driving up the ramp, ducked his head to enter, and brought the bed to a stop in the belly of the ambulance. Miss Knox pressed the button and the door closed in the admen's faces.

When Mr. Barger was lowered from the hovering ambulance, his swollen, tearful eyes were sunblind. Square hands clenched over and over with pain. Above the rotors' *rackety-rackety-rack*, Miss Knox shouted soothing things. She didn't wait for an answer. He was the worst case of laryngitis she had ever known — the only case, really, in her professional experience. Abolished diseases always came back virulently.

She and the bed sank between white hospital walls and landed in the room with a bump. The waiting attendant walked around the platform, folding the safety gates. He unhooked the four support cables, each vanishing out of his grasp like spaghetti slurped from a plate.

Just as the ceiling closed overhead, cutting off sight and sound of the whirlybird against the sun, Brooks, the radiologist, came in through the door, shepherding an entire class of medical students. Then two nurses seemed to clear an inoffensive path through the chemically tainted air of the corridor — and after them came Dr. Gesner, the greatest throat man in the country. Miss Knox knew him from his portrait in the Mushroom.

Brooks winked her an "At ease!" with a shaggy eyebrow and followed the fat man through the crowd. Dr. Gesner went to the bed and sat down. He was Barger's weight, with the same sort of elephantine bones, but he was almost two feet shorter. He stared at the nose and cheeks protruding from the bedclothes, and opened a fat black bag.

A BELL rang three times in the corridor. Five internes scurried into the room and stopped still, watching Dr. Gesner as though he were a golden calf. On each side of the doorway stood a student nurse at attention.

Mr. Barger stopped twitching and opened one eye wide. His chin lifted, and his other chins came out from under the sheet's folded edge.

One of Dr. Gesner's hands felt through the black bag. It emerged dragging a mutape by one wire. Brooks leaned forward and took out the rest of the apparatus. Shaking the hair off his forehead, he plugged into the bedside computer relay and placed the rubber-rimmed cup against the patient's skull, just over the Broca convolution.

Mr. Barger remained staring at the doctor through a gray film. The mutape chattered rapidly. Miss Knox craned her neck, deciphering the punched tape as it unrolled from the recorder in Brooks' hands. Sweat popped out on Mr. Barger's forehead.

"Help me, damn it," read Mr. Barger's tape. "I know you. You abolished laryngitis; why should it come to me now? I have a right to stop misuse of my work and to be free from pain — my patent is vital — free from pain. I want to be free . . ." His face turned pink in a new contortion and the hands folded over.

"Yes," Dr. Gesner said as the chatter stopped. "I know it hurts." He smiled gently in the middle of his face. He was writing on an index card, but his main effort was devoted to getting up from the bed with the help of two internes. "It will hurt this badly for twenty-four hours. Then the injection will have the upper hand." He turned to Brooks. "Please pass the tape around, Doctor. If any students haven't seen the X-rays yet, they're in my file."

Mr. Barger's face grayed a little; the sweat had turned to patches of crust against his skin. Dipping cotton in alcohol, Miss Knox bathed his forehead.

"That's all," said Dr. Gesner, handing her the card as the students began to vanish.

She stalked after him. "No examination, Doctor?" she asked, ignoring Brooks' horrified expression.

"Unnecessary, Nurse." He backed away from her and the door slid open. "I've already seen the X-rays and charts you phoned from the ambulance. And the patient cannot open his mouth. His intravenous menu is all here . . ."

"Yes, Doctor."

Three bells sounded in the corridor. "Calling Dr. Gesner. Emergency. Please come to the telephone. Emergency. Calling Dr. Gesner . . ."

He rolled his eyes at the index card in her hand. "You yourself are to take the shots prescribed for you, to prevent your catching or carrying the disease. In that bed, but for the grace of God . . ." He was crying softly.

"Doctor!" said Brooks, and the internes and nurses gasped.

"After all," said Dr. Gesner, "I *did* abolish laryngitis."

MISS Knox walked back up the drive and struck a cigarette on one of the stone lions. It glowed in the dark, but the river breeze blew it out before she could draw. She snorted in annoyance.

Miss Erwin looked up sharply.

"Is there *anywhere* where you can still buy matches?" asked Miss Knox.

"Not in New York City. Why?"

"We used to just try again when a cigarette didn't light. Now we have to throw it away."

"Of course," said Miss Erwin. "That's how they train us to be right the first time."

"Ridiculous. That's how they sell more cigarettes."

"Why, *Miss Knox!* You sound like Royalty!"

Miss Knox laughed. "I'm not ready to join the British Commonwealth yet. No fooling, Hilda, you see the Silvertongue cigarette factory across the river?"

Miss Erwin twisted white-gloved hands in the dark. "Why, no . . . mmm, smell that spray." An ocean-breathing tugboat passed, its complicated silhouette blocking the view. "No-oooooo," the whistle blew.

"Just wait till that tug is gone. There, Miss Erwin. Do you see the Silvertongue factory? Just before the Williamsburg Bridge."

"Is it the one with the new radio — the radio-thing on top?"

"Radiocompressor. Yes."

"They used to put *names* on those factories. All lit up."

"Well, ladies — ladies," said a gravel voice beyond the entrance lights. "How is life in the Toadstool?"

"Boney!" said Miss Knox.

"The what?" asked Miss Erwin.

"That's what Dr. Brooks called it. Now you tell me what he meant — he wouldn't say. Toadstool."

"Come into the light, Boney — you frighten us," said Miss Erwin.

The man appeared, smiling, and climbed the first stone step. Resting his elbows on the lion and his chin in his hand, he looked down on them sideways.

"Not *another* new suit," said Miss Knox.

It was an archaic double-breasted suit in good condition. Where the jacket hiked up in back, a wide expanse of extra trouser seat had been folded over and tucked beneath the belt.

"Hundred-fifty-dollar suit," he said.

"With or without the bottle?" asked Miss Knox.

"What bottle?"

"The one that bangs on your ribs when the breeze blows."

"Now listen here, lady . . ." He came down the step.

"Boney, I'm only kidding. You know that."

"Kidding. *Kidding.* And here I was giving you inside information. *Inside* information."

"What information?"

Bringing his drawn face so close that they could smell the wine, he gave both women a look of scorn. Then he backed away and leaned his padded shoulder against the lion.

"Boney, she's sorry," said Miss Erwin.

"I am not," said Miss Knox.

HE glowered at her and walked away into the dark, his spider legs dissolving sooner than expected. Then he marched back.

"Sorry," he said. "Ha. I won't tell you. I'm going to tell it to the Director himself."

"Forget it, Boney. He'd throw you out again. You'd better just tell us."

His skeleton hand stretched toward the water. "You see that radio presser?"

"You mean the new radiocompressor on the Silvertongue factory?"

"*Radio*compressor. All right. Do you ladies know what it does?"

"Anything," Miss Knox said. "Our patient, Mr. Barger, builds them. He told us all about it the moment he came. In Greek."

"Not — not *all* about it. *I* know all about it. I had a big deal going — my Armenian partner and me, we were buying up neckties to sell in the hospital . . ."

"*What* do you know? And will you *stop* blowing in my face?"

He glowered.

"I'm sorry, Boney."

"Radiocompressors can do things — any things — without touching. Like rolling cigarettes or chopping up tobacco. The radio waves are so small they — push things." He pushed the air with his left hand. "Not just go through them." He wiggled the brittle fingers of his right.

"Everyone knows that," said Miss Knox. "What you mean is that the supra-short wave has an intense direct effect on matter. It was in all the papers."

"Oh, is that so? Is *that* so? Well, you listen to me. *This* isn't in all the papers."

"All right, go on." Miss Knox struck a cigarette, which blew out. She threw it down and succeeded in lighting another.

"You can fool people, also, with the same radio waves," said Boney.

"You mean hide behind the door with a wave compressor and push chairs around? Like that?"

"Don't be silly. Nothing like *that*. Dr. Brooks told me today, when I was sweeping his *private* lab in the Toadstool, he told me they make one kind where if you put it on a table, say, no one can see what else is there. You could put — a cat on the table, and anyone would think it was just a table with a radio presser. Until the cat jumped off. Then you could see it."

"Can it jump off? asked Miss Knox.

"Can it jump off? Did you ever see a cat that couldn't jump? And that's not all—"

"Quite a trick," she said.

"No trick. You could rule the world with that, ladies. Think about it. Rule the world. Got a cigarette? After all, I always get you coffee."

She handed him one.

Miss Erwin stared across the river. "I hope it isn't a new kind of bomb," she said.

Boney pulled out a stick match and struck it on the stone lion. Cupping his hands around the flame, he lit up and walked away.

"BUT, Dr. Brooks, when you tell Boney things like that," said Miss Knox, "he believes them, and he quotes you like mad. Don't you care about your reputation at all?"

"My dear woman," Dr. Brooks replied, "I've been interested in many things in my years, but getting my portrait in the Mushroom has never been one of them—"

Mr. Barger's legs spasmed suddenly and shot straight out, jerking the covers from his fat-layered neck. But the pink shut eyelids hadn't quivered.

"— and, anyway, Boney is right," Dr. Brooks finished. "Why do you think the Royalties want government control of the whole invention?"

Miss Knox was tucking the covers around his warm, sticky jowls. "But he said you said—"

"I said she said we said." Brooks grabbed her chin between his thumb and forefinger. "Did you know that machine on the Silvertongue roof could get at us inside our own homes?"

She shook her head, swinging his arm from side to side.

"If you know nothing about it, girlie, let me explain." He squeezed her chin tighter. "You saw those two men from the Christian E. Lodge Corporation — Silvertongue, that is — who came this afternoon to see Barger? The ones on motorskates?"

"They shouldn't allow those buzzing things in the hospital. They make more noise than a whirlybird." She backed away, tugging at the white-coated arm until her chin was released. "I mean I saw them yesterday. They tried to get in the bird. I don't know why *they* visit him — he can't say a word. Doesn't he have a family?"

"No, but the Silvertongue men love him like a brother. Barger designed their radiocompressor — the one in all the newspapers. Here, you can see it from the window if you—"

"I know, Dr. Brooks."

"Do you know what that machine can really do, girlie?"

"When I was your age—" Miss Knox began.

"You are. I just *look* young. That machine can cure and shred tobacco with supra-short waves on a polished magnesium bowl, just the way the papers say, but they have cheaper ways to process their tobacco. They really use the machine for guided tours of the factory. Public relations."

"You mean float visitors through the air?"

"No. You'd need the power of ten maritime atomic piles in series just to lift Dr. Gesner to the height of—"

"Very funny!"

"— his own square root. What they can do with that machine is to disguise an object — say the incoming leaf tobacco. They can make it look firm, golden, and so forth. The girls at the sorting tables, wherever the guided tour happens to be, will all look like Norma Norden. They'll be dressed as angels and work in heaven. Then the V.I.P.s can tour the girls' homes and dormitories, and instead of a dirty slum, they'll see — they'll see *mushrooms*, if they like."

"How is it done?"

"Only Barger Electronics really knows," said Dr. Brooks, "and the Christian E. Lodge engineers. It's something to do with compressing the wave length to approximate that of light, so that images are canceled out. This leaves a clear field for subliminal techniques. If there are subvisual images projected on the walls, for instance, that's what the observers will see inside the room."

"Oh, my God!" exclaimed Miss Knox.

"The only other thing I know is that it has to be done with intersecting spheres. The machine has two portable secondary transmitters — or projectors, or whatever they call them — each emitting in all directions to form a wavesphere. Where the two spheres overlap, you get your possible interference with light."

"Frankly, I just don't understand it."

"Any radio waves go out in all directions to form spheres." His voice had become a mutter. "You know that."

"No, I didn't."

HE gave a false sigh. "Well, take an ordinary weak phone transmitter very high up in a whirlybird. That's the simplest case. You know what sound a whirlybird makes, don't you?"

"Of course," said Miss Knox.

"What?" Dr. Brooks challenged, moving at her. "How does it sound?"

"Oh, clatter-clatter chug-chug," she said, moving back.

"No. Listen closely and you'll hear any whirlybird — especially hospital ambulances — go *rackety-rackety-rack groundhog, rackety-rack groundhog!* — a reminder to people that they belong on the ground, one may assume. Picture a microphone attached outside the bird and wired to your transmitter. The radio waves go out in all directions through the air. Suppose your air is all of the same density, and so forth — then all the waves peter out at a constant radius and form a perfect sphere going *rackety-rackety-rack ground-hog!*