The interference had been something beyond all technical anticipation. The weapon had cleaned out the forever-unidentifiable obstruction, leaving the servo-robots free to attack their tasks like a tribe of maddened ants. They worked again. They had had defenses built in against the minor impediments of space. All of them scurried and skipped about.

With a sense of bewilderment close to religion, she perceived the wind of starlight blowing against the immense sails. The sails snapped into position. She got a momentary touch of gravity as she sensed a little weight. The *Soul* was back on her course.

## IX

"IT'S a girl," they said to him on New Earth. "It's a girl. She must have been eighteen or twenty when she left Earth."

Mr. Gray-no-more did not believe it.

But he went to the hospital and there in the hospital he saw Helen America.

"Here I am, sailor," said she. "I sailed too." Her face was white as chalk, her expression that of a girl of about twenty, body that of a well-preserved woman of sixty.

As for him, he had not changed again, since he had returned home inside a pod.

His eyes narrowed, and then, in a sudden reversal of roles, it was he who was kneeling beside her bed and covering her hands with his tears.

Half-coherently, he babbled at her: "I ran away from you because I loved you so. I came back here where you would never follow, or if you did follow, you'd still be a young woman, and I'd still be too old. But you sailed here and you wanted me."

The nurse of New Earth did not know about the rules which should be applied to sailors from the stars. Very quietly she went out of the room. But she was a practical woman. She called a friend of hers at the news service and said: "If you get over here fast, you can get the scoop on Helen America and Mr. Gray-no-more. They just met like that and fell in love."

The nurse did not know that they had foresworn a love on Earth. The nurse did not know that Helen America had made a lonely trip with an icy purpose, and the nurse did not know that the crazy image of Mr. Gray-no-more, the sailor himself, had stood beside Helen twenty years out from nothing-at-all in the depth and blackness of space between the stars.

## X

THE little girl had grown up, had married, and now had a little girl of her own. The mother was unchanged, but the spieltier was very, very old. It had outlived all its marvelous tricks of adaptability, and for some years had stayed frozen in the role of a yellow-haired, blue-eyed girl doll. Out of sentimental sense of the fitness of things, she had dressed the spieltier in a bright blue jumper with matching panties. The little animal crept softly across the floor on its tiny human hands, using its knees for hind feet. The mock-human face looked up blindly and squeaked for milk.

The young mother said, "Mom, you ought to get rid of that thing. It's all used up and it looks horrible with your nice period furniture."

"I thought you loved it," said the older woman.

"It was cute when I was a child, but I'm not a child any more, and it doesn't even work."

The spieltier had struggled to its feet and clutched its mistress's ankle. The older woman took it away gently, and put down a saucer of milk and a cup the size of a thimble. The spieltier tried to courtsey, as it had been motivated to do at the beginning, slipped, fell, and whimpered. The mother righted it and the little old animal-toy began dipping milk with its thimble and sucking the milk into its tiny, toothless old mouth.

"You remember, Mom—" said the younger woman, and stopped.

"Remember what, dear?"

"You told me about Helen America and Mr. Gray-no-more when that was brand-new."

"Yes, darling, maybe I did."

"You didn't tell me everything," said the younger woman accusingly.

"Of course not. You were a child."

"But it was awful. Those messy people, and the horrible way sailors lived. I don't see how you idealized it and called it a romance—"

"But it was. It is."

"Romance, my foot," said the daughter. "It's as bad as you and the worn-out spieltier." She pointed at the tiny, living, aged doll who had fallen asleep beside its milk. "I think it's horrible. You ought to get rid of it. And the worlds ought to get rid of sailors."

"Don't be harsh, darling," said the mother.

"Don't be a sentimental old slob," said the daughter.

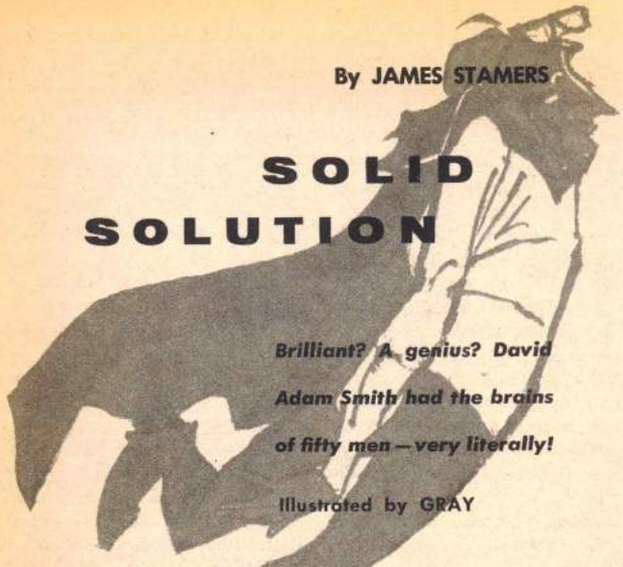
"Perhaps we are," said the mother with a little loving sort of laugh.

Unobtrusively, she put the sleeping spieltier on a padded chair where it would not be stepped on or hurt.

— CORDWAINER SMITH

By JAMES STAMERS

# SOLID SOLUTION



***Brilliant? A genius? David Adam Smith had the brains of fifty men—very literally!***

Illustrated by GRAY

THREE students were expelled for bringing the bubble dancer into the Desert Institute, Lee White, Burns Gilbert and John Thay. The Director did not like any of them. He liked me, Morris. I was his stooge, his squirming straight man. I was useful for his jokes.

"We know calculus is a method of measuring uncircular curves, such as beer barrels . . . but I fear Morris has allowed that thought to absorb him, hig, hig, hig, hig."

That was one of Professor David Adam Smith's favorites. Or:

"If you will visit me this afternoon, Morris, I will give you personal tuition in astrophysics . . . beginning with the more complicated parts of the alphabet, hig, hig, hig."

But he owned the Desert Institute. He was the only living authority on geology, terrestrial or extraplanetary, and there was a waiting list of students . . .

On their last afternoon, I was sent with the disgraced three on a specimen-collecting tour of the desert. It was my routine job but a real disgrace to them. I often thought the only reason David Adam Smith allowed me to stay on as a student, apart from offering him a target for sneering at, was because of my muscles. I could handle the long specimen trailer and heave boulders about more easily than the others.

"Do not sneer at Morris, gentlemen. Science tells us brain size is related to surface area. You should expect in Morris a potentially great brain therefore . . . if Morris were not devoted to obstructing science, hig, hig, hig."

The other three, Lee, Burns and John, were about six feet tall, slim, dark haired and handsome. But we were collecting specimens, not running for Miss Earth 2430. My extra seven inches in height extends more or less proportionately in my reach and thickness of shoulder. Anyway, they were depressed at being expelled, so I let them sit in the shade of the trailer while I set up the specimen plates and power unit, minima stand here, maxima stand there, controls on the sand beside them.

"I don't expect you've done this elementary stuff for a couple of years," I said. "So . . . don't walk on the plates and don't touch the dial or the red and blue buttons."

"Hell, Morry, we know."

"Okay, okay. Only it's more tricky than it looks."

THE whole desert belonged to David Adam Smith, which showed his political pull. Who else on Earth was allowed a whole *room* to themselves, even—except maybe the Planetary Salvager, and the heads of the Material Recovery subdivisions and top Government people like that. But David Adam Smith had to have a complete desert. He ruled from the Holiday Probable centers of Reno to the gambling computers of Las Vegas, where the bubble dancer had come from.

I put a single grain of sand on the minima plate and stood clear.

"Press the blue button, Burns."

Burns wasn't even listening.

"Burns," I repeated.

"Hell, Morry, who cares about these damned specimens? How would you like to be expelled? No classification, no chance of a job, spend the rest of your life in a compulsory Holiday Reservation."

"How does he get away with it," muttered Lee, looking around at the open desert and the bare hills on the skyline. "Tomorrow we'll be back in a ten-to-a-room bachelor unit in the Nebraska suburbs, with a fine view of continuous rooftops to the Gulf, the Atlantic and the Great Lakes, and the nearest geological specimen at the bottom of the community hydroponic tanks. And here he is — the only David Adam Smith, the one original — with a desert of his own. It makes me sick."

John Thay shook his head.

"That's just emotional reaction,

Lee. We were all busting ourselves to be admitted, to be one of the select three hundred. Just because we're being slung out doesn't mean the whole Desert Institute is no good. You know perfectly well why he has the place reserved."

"I know his excuse. I can just see him, flapping his cloak at the Salvagers and croaking, 'I don't care what you want to do with the ground, gentlemen. I must have open spaces to live in. Am I or am I not the only leading scientist of importance who has retained his sanity and continued to produce discoveries of unique value? Where is Firnivale, Williams, Hutk, Marrpole, and so on and so on? Lost. Missing. Probably in a sodden stupor in one of the South American City-States. I tell you, science cannot produce anything in laboratories. Science must have room to breathe!' "

It was a stock student's speech.

I waited for the other two to round it off.

"And why, Professor Smith," said Burns imitating a heavy official voice, "have you alone retained your faculties?"

"Because, dear sir," Lee answered in David Adam Smith's thin voice, "I never admit more than three hundred students to the Institute. And because apparently I have the only mind capable of absorbing the weight of modern knowledge without much strain."



"You do not dislike yourself, Professor."

"I give credit where it is due, dear sir." Lee stopped and continued in his normal voice. "The trouble is, he *does* produce the stuff. He's supposed to be a geologist, but there hasn't been an invention for the last decade that he didn't master-mind."

"Pity he can't think of some way of speeding up the emigration," John said. "If only we could leave Earth!"

I WALKED over and pressed the blue button myself.

The grain of sand on the minima plate flicked out of our time-space and reappeared on the maxima plate ten times larger. I picked it up and carried it back to the minima plate, repeated the process and went on until the grain of quartz was more than four feet long.

"Why don't you do it in one jump instead of walking backwards and forwards?" John Thay asked.

"Can't," I said. "It's got to be a perfect model of the crystal lattice of quartz. If you calibrate it for too big a jump in size it gets distorted. No one knows why."

"You don't tell us, Morry. Hell, the marvel is that it works at all."

I threw the four-foot-long crystal over to John and he put it in the trailer, after nearly losing it on the slight breeze. It is difficult to disbelieve your eyes and remember



that an overblown specimen has very little more than its original weight. The grain of quartz was merely expanded. Its molecular and nuclear structure stretched out in a magnified volume of space. It was almost all holes, an open arrangement of spaces between the force points of its matter; a direct magnification of the original without any other change.

We used these specimens in the Desert Institute because everyone could see the details of the crystal lattice for themselves, instead of having to use an electron microscope. It removed the practical difficulties of the principle of indeterminacy, David Adam Smith said. If light was too coarse to let him see the contents of a nucleus, he was damned well going to bring the nucleus up to a size where he could see it. And so he did, eventually, with this apparatus.

I was one of the very few students ever allowed to touch the apparatus, probably because he thought I was too dumb to do anything with it. There were several sets but they never left the Institute. The world was not ready for them, he said.

There was quite a lot of stuff that David Adam Smith kept to himself in the Institute. Not because the world was unready, but simply because he didn't think he would get maximum applause at that particular time. He only produced inventions at the right theatrical moment. David Adam Smith was quite a ham.

I was not supposed to tell anyone how this apparatus worked, but the three of them sitting facing me in the shade were not going anywhere after this. I didn't think it mattered. If you are not chosen at birth for emigration within the System, and if you also fail at the Institute or one of the dormitory-universities, you're just an extra unit of overpopulation.

I THOUGHT I'd give them something to think about instead of brooding over the bubble dancer and their expulsion.

"Of course it works," I said. "It's only Einstein with a twist."

The three of them laughed.

"No, really. You know the clocks that go out on every stellar-reporter and come back to the Institute with dope on the composition of this and that place in the Galaxy? You were advanced students, you must have sent them off every day, well, wasn't the clock always slow when it returned?"

"Against the dispatching room clock, of course it was," John agreed. "And if there was enough spare material left on Earth to send people apart from emigrants, a man would be younger than his twin when he returned."

"Well," I said, "that's what happens here, except that a specimen

goes out off a minima plate and comes back onto the maxima plate so fast that the time component is negligible. All that happens is that it gets moved outside the local space-time reference. It doesn't exactly go anywhere, I suppose. But instead of consuming less time on this shift out and in again, the time stays constant and it reappears occupying more space. And there you are, with a magnified version of the original."

There was a silence.

"Have you ever put anything living on the plate, Morry?"

I blushed. John had a knack of uncovering safely hidden facts.

"Well, I did make a small mistake once. A grasshopper got on the plate when I wasn't looking. I was magnifying an alumino-silicate and a few seconds after I got the specimen up to size, the grasshopper appeared in the middle of it. I had to reverse the specimen back to get it out. Meant picking the crystal off the plate fast, before the insect came through, but I managed it."

"Was it hurt?"

"The grasshopper? No. A little stunned, maybe. But perfectly well."

I went back to the plates and started another quartz grain. John, Lee and Burns sat and gabbled to each other.

"If the crystal lattice was expanded to start with . . ."

"Relative to its size, the crystal would be full of breathing holes . . ."

"You could take in nutrient through a lattice as big as that. It would be relatively porous . . ."

". . . molecular pressure . . ."

". . . shift that battery and move the galvanometer . . ."

". . . take out most of the instruments and fake up the records from the previous trip . . ."

"If we weren't being expelled this evening," said John.

They looked at me.

"Are you sure about the grasshopper, Morry?" Burns asked.

I nodded.

I HAD no warning. I had just put a half-inch expanded grain on the minima plate, when Lee White walked onto the maxima and Burns pressed the red button.

There was a flicker and White appeared, half an inch tall, in the middle of the expanded quartz crystal on the minima plate. He was able to move his arms. He seemed to be saying something that amused him. I knocked Burns away from the controls, pressed the blue button, whisked the empty crystal off the maxima plate as it came through and only just got it out of the way before Lee White reappeared on the maxima plate, his normal size again.

"Well, it works," he said.

"You crazy?" I yelled at him.

"Just think," Burns said, sitting up and holding his jaw. "The number of times we've watched this fella pressing his red and blue buttons, and dismissed it as elementary stuff for beginners."



They calmed me down and apologized for doing a thing like that. Hell, I would have been expelled too if I had gone back to the Institute with one of them missing. David Adam Smith had a very elaborate hearing aid, but it never enabled him to hear excuses. Students only on Institute property, no readmittance for expelled students — and certainly no expelled students locked up in a lab specimen.

I suppose they would have thought it funny to sit in a crystal and make faces at David Adam Smith. They were wild, all three of them, and had been since they were admitted. I had no desire to be expelled with them.

"You're not going to be expelled, Morry. Not if you do as we ask."

"And if you don't," Burns said, still rubbing his jaw, "we'll tell the dear Director that you explained how his specimen collector works."

"Then you'll be expelled with us, Morry."

"He's going to get tired of having you around to laugh at one day, Morry. Then you'll be out anyway."

"No use appealing to him with the broad theme, I suppose?"

I look at John Thay.

"What broad theme?" I asked.

"Do you know what you've got here, Morry? You have the only mass escape route from Earth."

"You're euphoricked!"

"No, we're not. Do you know how many habitable planets we've listed? Over three hundred and fifty. We've sent stellar-reporters out and back every day and we know. They're listed back there at the Institute. We can reach them on the hyperspace transmitter, you know that. The only things that stop a mass emigration are David Adam Smith, the small size of the transmitter and the impossibility of building enough ships to carry everyone. The alloy supply only just covers the standard emigration program. But a stellar-reporter comes back with the data, is re-set and goes out again and comes back again. Don't you see, Morry?"

"No," I said, "I don't."

"Look. If you can use the same ship over and over again, the shortage of alloys doesn't matter provided you can build the first ship."

"Okay," I said, "but a stellar-reporter isn't a ship, unless you're a two foot midget and . . ."

I stopped.

If Lee White could get in and out of a crystal safely — and he seemed to be unchanged after having just done so — he could travel inside a stellar-reporter with the other delicate mechanisms.

I had never been promoted to those classes, but I knew the stel-



lar-reporters were baby rockets that gouged specimens from the planets they were sent to, measured, recorded, and brought themselves back on the same tracker path. When they were not burned up in stars, that is.

But if the three of them were willing to take that chance, I was not going to get in the way.

"I may not be as bright as you three," I said. "But even I can see you may have something here. If you survive the journey. You don't need to threaten me about telling you how this specimen collector works. I'll help anyway."

We prepared the specimens I sent out to get, then experimented.

I could not get used to seeing each of them inside an expanded grain of sand, but the pore structure and the crystal lattice itself seemed to leave them room to breathe. They could even move about, within small limits.

The crystal had to be expanded up to a reasonable size before it was safe to be transmitted into it, for an unexpanded quartz crystal would be immediate suffocation. The force vortices of the quartz nuclei, even when expanded, seemed to have no effect on a living body. It was a solid solution, as John said.

"The ideal," he added, "would be for us to coach Morry up to the stellar-reporter class levels. But I think we had better start meanwhile. No sense wasting time."

"I think so, too," I said.

BEFORE we left the open desert, I unpacked the apparatus so they could examine it. They thought they could make sets without much difficulty. The apparatus was largely an electrically inhibited accelerator, they said.

I knew the desert quite well, including the areas where the Institute radar boundary fogged out and where people could crawl in a few hundred yards without being detected.

"That's all we need," Burns said. "If we plant another set of plates and power controls out there, and Morry keeps burying prepared crystals in advance, he can meet us there, do the conversion and bring each of us in in a half-inch crystal in his pocket."

"Then what?" I asked.

"Then you hand us over to little Dimples. She'll get us into the right stellar-reporters together with a reduced set of plates and controls so that we can reconvert on the planet. We can travel in the specimen grabber. That will dump us out immediately the stellar-reporter lands."

I knew little Dimples by sight. She was a plump redheaded student in their class.

"You can't all go," I said.

"Why not?"

"Because I can't leave the Insti-

tute grounds. Anyway, where are you going to collect the other emigrants from, once you're out on a habitable planet at the back end of the Galaxy?"

"He's right."

We talked it out as I drove the trailer back to the Institute. Two of them would go immediately, each to a different planet on the list. They would return to report and be sent out again on the next stellar-reporter collecting data from that planet. Meanwhile, the third would be expelled. He would spend his compulsory Holiday selecting people for despatch. I would meet them at the boundary, convert them and carry the crystals in, for Dimples to insert into the stellar-reporters.

They disappeared into the metallurgical labs as soon as I pulled up in the main courtyard. The Director missed them by micromillimeters.

David Adam Smith was a small man. With his cloak and large hearing aid and long thin face, he always made me think of a grounded bird. He came hopping over the tiles with short quick steps, peering at the specimens and at me.

"Go out again tomorrow," he snapped. "I want some copper chloride specimens."

"Would you like me to drive the bubble-dancer to transportation?" I asked.



"Who? Oh, that girl. No, Morris, I sent her away. You'll have to confine yourself to the curriculum, I fear, hig, hig, hig."

That was odd because I thought I was about the only person in the Institute who could drive a land-vehicle. The roads outside were built over and everyone used jets. But I wouldn't have put it past him to have made the girl walk out of the desert, or to have sent her in his own space-glass jet, depending on how he assessed her publicity value.

I forgot about it while carting off the specimens.

DIMPLES was pretty, a trifle Venusian in her plumpness but very intelligent. We met by the fountain in one of the smaller courtyards. John Thay, she told me, had volunteered to remain but I was to collect the other two from the boundary.

"They won't be too heavy will they. Morry?"

"Three or four pounds. Living substance modifies in some way, or it may be the effect of being in solid solution in an expanded lattice."

"But you can take them down to half an inch?"

"I hope so."

We arranged to meet just before the afternoon session the next day, so that Lee and Burns would be sent off in the afternoon stellar-reporters with as little delay as possible.



They were there at the boundary when I drove up the next day. Their converter worked. They were embedded neatly in the quartz crystals. I took them in, handed them to Dimples and that was that.

Neither Burns nor his stellar-reporter returned.

We never knew what happened. Some of the little rockets did fail. Not many. But it was his misfortune to be in one that did not come back.

Lee White did return safely, and was sent out again to his chosen planet.

We began to handle crystals regularly. John sent each emigrant with a miniature converter and controls, which I reduced on the edge of the desert and handed to Dimples, who inserted the crystal and the miniature converter into the next stellar-reporter due for Lee's planet. He was accumulating heaps of converters on his planet, but we could not risk leaving an emigrant helpless in his crystal when the stellar-reporter dumped it on the far planet. This way they rolled out together on arrival.

We must have sent out two hundred emigrants of all kinds, for John was sending in a mixed selection to give the far planet every chance of a successful settlement, when Dimples met me at the fountain and cried — moistly — all over my arm.

"Oh, Morry," she wept. "He's found out."

"He," obviously, was David Adam Smith.

"How do you know? What did he say?"

"He hasn't said anything. But I saw one of the emigrants in his private lab! I shouldn't have been there, and he didn't know I was. But I saw him with one on his desk."

"Sure about it?"

"Absolutely certain. It looked like one of the men with a beard we sent through about a month ago. Do you remember?"

"But how did he get hold of him?"

"I can't think. The stellar-reporters are going off all right. I thought they were coming back empty. I've had to let the rest of my class know, so that we could keep the records faked. We can't account for two hundred stellar-reporters all to the same planet, Morry, so I had to."

I sent the next bunch of emigrants back with a mesesage to John Thay. He came the next afternoon and we met on the edge of the desert. I explained what had happened.

"Is Dimples certain?" he asked.

"The man had a beard and was still in his crystal, the way we sent him off."

John shrugged his shoulders.

"Well, Morry, it can't be helped. There's only one course now. We must get hold of any crystals in the hands of David Adam Smith and send them off again — unless you and Dimples and all of us want to end up in a satellite penitentiary. I expect he's preparing a case against us now. With his influence he can make it stick. No doubt about that."

Illegal emigration, criminal use of the Institute property — oh, from that angle there was enough to have us all put away in space all right. I had no doubt that David Adam Smith would do it, too.

"NOW, his weakest point," John said, "is his vanity. That, as we know, is immense. Who else would run an Institute for three hundred students with himself as the sole Director? So, if we can arrange something to keep him occupied for a day or two, we may be able to break up into his private labs through the floor. I know for a fact the walls and ceilings are studded with alarms. But we thought of booby-trapping him when we were expelled, and the floor seemed the best way in."

"And the diversion?"

"You'd better take me in now in your pocket. I want to have a word with Dimples' class."

He stepped on the maxima plate. I converted him down, buried the plates as usual and went back to the Institute.

I gave the crystal to Dimples.

"Meet me here in an hour," she said.

An hour later, she was back.

"Here, Morry. This is the power slicer from a shovel. There's one in every stellar-reporter for cutting rock specimens. John says you can come up from the cellar with that. Do you know what he means?"

"Yes. What's he doing with you?"

"You'll see. Just come to our class area tomorrow as if you're delivering specimens. Put the crystal with John in it in your pocket and go and report to the Director exactly what you found in our area — apart from the crystal, of course. You are to release John from that when you get to the cellar, immediately after David Adam Smith goes hurrying out to see what happened to us."

She would not tell me any more than that.

So when I found next morning that every stellar-reporter in the class area was missing and that Dimples and her entire class had gone with them, I did not have to act astonished. About a third of the Institute — nearly a hundred students — were in that class, doing nothing else but build a complete catalogue of the stars and their planetary systems by means of the stellar-reporters. And the whole lot had gone!

David Adam Smith did not believe me, either, until he saw for himself. Then he sat down to work through the firing calibrators to find out where the stellar-reporters had been sent. He waved me away.

I went straight to the cellar beneath his private labs and reconverted John. He stepped off the maxima plate swiftly before the crystal could materialize him.

"Hey," I said, "you've reversed it."

"Naturally. It's a minor adjustment in the time-lag. Otherwise there would always have to be a second person present before you could get out of a crystal. We think that's what went wrong with poor Burns Gilbert. But we'll never know, I'm afraid. Let's get on."

We set the power cutter to work on the cellar ceiling.

It was only designed to cut rock specimens small enough to be brought back in the stellar-reporters that carried it, but after two hours we had a hole right up into the private labs.

I lifted John Thay and followed him up.

DIMPLES was right.

There was a long row of crystals in a nutrient tank against one wall, arranged so that it could not be seen into from the windows. About fifty crystals were racked there and each had a six-inch figure in it. I walked over to look at them with John.

"These aren't the ones I sent!" John said.

"They're not?"

"Not one."

We looked at the line in silence. I had gotten used to handling filled crystals, but the sight of all these human beings, miniature and watching us, making waving motions so far as they could within the lattice of their crystals — this was unnerving.

"No," John Thay repeated. "These are not ours. But that one there is the bubble dancer we were expelled for bringing here!"

I looked at the little figure, pink against the clear quartz.

"Who are the others?" I asked.

John Thay walked briskly down the line scooping them up.

"Never mind that for a moment, Morry. Just help me collect every one of these."

I grabbed handfuls of crystals from the rack, stuffing them in my pockets, until between us we had every one.

John took a last look to check. Then we dropped through the hole in the floor, down into the cellar.

"I had an elaborate plan in mind," he said to me, as we hurried away. "But this changes everything. Is the converter in your truck working?" We shot out into the courtyard.

"If you're in a hurry, John, why not use the one there in the cellar?"

"Hell, you're right. This has

shaken me so much I can hardly think. Quickly, let's get these crystals reconverted."

We turned and rushed back to the cellar we had just left.

I grabbed the power controls, John fed the crystals onto the minima plate, I pressed the button and fielded the staggering human being off the maxima plate before the enlarged crystal came following through. The crystals I kicked into the corner of the cellar.

We did not talk, but concentrated on this rush conversion.

When we had released the last man, there were fifty-three people in the cellar, including John, myself and the bubble dancer, who for some reason clung to me and kissed me.

Most of the people were elderly men. Their clothes were tattered and stained by nutrient solution. Some were threadbare. Many had been wearing laboratory coats of ceramic fabric, which had chipped and fallen away in patches.

They must have been in the crystals for a long time.

I watched John bend anxiously over a group of elderly men.

"Doctor Firnivale. Professor Marrpole. Doctor Hutk. And Williams."

The men we had just released nodded in turn.

"You, Dr. Firinvale," John said. "Did you give the advanced geophysics lectures?"

"Through that crook's hearing aid," said the tattered man on the cellar floor. "Yes, I did. I could hear the questions and I told him the answers. So did all these others here."

"Professor Marrpole, I recognized you from a stereo-record you made on magnetic differentiation on small planets. Is that how David Adam Smith became the world authority when you disappeared?"

"Yes," the man with the shaggy beard confirmed. "He caught me by asking me to stand on a plate for a live recording."

JOHN turned to me.

"We have here, Morry, a careful collection of the leading specialists in the world. These people are the reason for David Adam Smith being able to outthink any fifty men. These are the fifty men he built his reputation with!"

"I don't understand why you all helped him," I said.

"Because he used to oscillate the crystals we were in, young man."

"But now it's our turn!"

"By heaven, wait until I meet that treacherous snake . . ."

"I'm going to sue him for every credit he has!"

"Who would care to join me in pulling him into small pieces surgically?"

The babble in the cellar rose in volume and intensity. Under it all, the bubble-dancer was whispering in my ear how grateful she was to great big me, and how that foul old goat had kept her for amusement just because she walked into his office to complain when he fired those nice boys . . .

"He had to, I suppose," I said. "If you saw all these people in crystals."

"Gentlemen, gentlemen," John roared. "Please!"

There was silence.

"Thank you. Which of you in fact thought of the stellar-reporters for accumulating data on other parts of the Galaxy?"

"I did," said a tall thin man by the door. "Higgins is my name."

Even I had heard of the astrophysicist inventor.

"Had it occurred to you that with these crystals and your stellar-reporters man could expand through the Galaxy?"

"No. But now that you raise the point, of course we could!"

"My friend, Morris here, and I and some colleagues have been doing so privately for some time . . ."

John waited until the excited murmuring died away.

"We thought David Adam Smith had discovered us. And that is really why we broke into his office . . . and found you all there. But I now think he knows nothing about it. Subject to your agreement, I suggest we should keep him in ignorance, lock him in a quartz crystal here and continue the private migration without involving him."

"Why not bring him to justice?" asked Higgins.

"Because I doubt if the government would believe their eyes. You have built David Adam Smith into a legend that would be difficult to break. Also because they would certainly take the Institute from anyone else, hold up the experiments and delay everything. And I have a lot of friends out there in space trying to establish a planetary colony."

Marrpole laughed.

"Really," he said, "we have been providing all the brain power of this Institute for so long, we may as well continue. Speaking for myself, gentlemen, a few years free from any restraint whatever are exactly what I now need. I am in favor."

There was a general mutter of agreement.

"Thank you," John said. "And now, if you will follow me, there are excellent showers and a whole class of spare rooms."

"You stay with me," I said to the bubble-dancer.

I led her through the Institute to the classrooms where Director David Adam Smith was still plotting the courses of the missing stellar-reporters. They would be back soon, but he was never to know that.

I took him from behind and held him off the floor by his elbows, then

twisted him round in the air so that he could see us both.

"Yes," I said. "She's out. And you're going in."

He started to scream so I clipped him.

Then I carried him out to his private labs. I made him unlock the door and unset the alarms, dumped him on the maxima plate of his own converter and shot him into a spare enlarged crystal he had on his desk, after taking off his hearing aid. He didn't need it. It was only an amplifier so that he could hear the advice of whoever was in there at the time. I put him in and clipped the mike onto my shirt.

"What are you doing?" asked the bubble-dancer.

"Look," I said. "This fella could do it. And someone's got to take the other lectures. And I'm never going to get to be a qualified professor any other way."

"But I thought they said he didn't know anything?" the bubble-dancer asked.

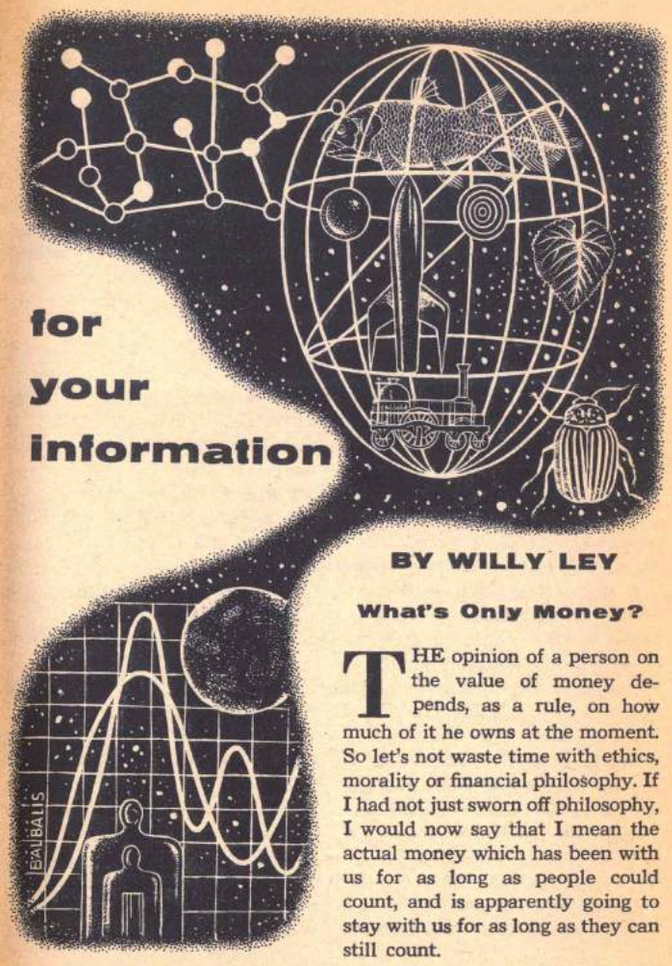
"He must remember some of it, or I'll oscillate him at a high frequency."

Meanwhile, I thought I'd practice laughing, "hig, hig, hig." But the former Director did not seem to find it funny.

— JAMES STAMERS








BY WILLY LEY

## What's Only Money?

THE opinion of a person on the value of money depends, as a rule, on how much of it he owns at the moment. So let's not waste time with ethics, morality or financial philosophy. If I had not just sworn off philosophy, I would now say that I mean the actual money which has been with us for as long as people could count, and is apparently going to stay with us for as long as they can still count.

Although in science fiction money is mentioned quite often — some writers are realists and assume that budget fights will also be with us for as long as there are budgets, which is perhaps forever —you rarely hear anything of what kind of money it is. The hero often pays "three credits" or "two stellors" for a meal or something, but just what does he pay? Does he hand over paper bills or does he drop coins on the counter?

I can think of only a few instances where science fiction writers were more specific. When Kimball Kinnison loses a "one millo bet," he sends a coin halfway across the Galaxy, being a Lensman and, as Galactic Coordinator, presumably entitled to free mailing privileges. When the hero in *Gravy Planet* is lost in South America, he feeds plastic coins into a pay telephone — without getting his connection. George O. Smith, having invented a duplicator which can duplicate anything, then had to invent something (an alloy, I think) which could *not* be duplicated because it would blow up if anybody tried to.

I can think of another example, this one from foreign science fiction. Kurd Lasswitz, in his *On Two Planets* (way back in the final decade of the last century), described how his hero had to pay for a trip on Mars. The Martians expressed values in terms of electric current; the trip cost an unspecified number of kilowatts and the payment is made in the shape of a coin which is a storage battery actually holding that number of kilowatts.

Since the future of coinage is so disputable, let us look at the past and see what has gone before. I'll not dwell on weirdies like payments in strings of cowrie shells or the big stone money of the island of Yap but stick to normal coins.

IF you ask anybody which metals are used for coinage, you receive the more or less automatic reply "silver and nickel." If you keep quiet, the man will somewhat shamefacedly remember that there are copper coins, and everybody knows, naturally, that Dad still handled gold coins. Actually nickel is a late-comer to the coinage picture; it is just about a century old. Before that, the coinage metals were gold, silver and copper.

The most valuable of them, the gold coins, seem to have started out as *electrum* coins. *Electrum* is a naturally occurring alloy of gold and silver, and one might say, as a rule of thumb, that gold containing more than 20 per cent silver was *electrum*. The trouble was, of course, just how much silver a given lump of metal contained. Was it 20 per cent or 30 per cent or still more?



By about 700 B.C., gold could be separated from silver and the first gold coins came into existence. Since nobody ever threw a gold piece away, the number of coins from the past that are still around is simply fantastic (everything the gold would buy has been used up, worn away, decayed or eroded, but the coins remain) and it was no great loss to history to analyze a few of them. They turned out to be 997 and 998 fine, actually too high a purity to be practical, for pure gold is a rather soft metal.

When it comes to purity, the layman generally flounders a little. He knows that 14-carat gold is good gold, and when he looks for a stamp, it probably says 14K. But if he should buy a wedding ring in England, the salesman will say "22 carat, of course," but the stamp inside is likely to read 917. The system here is that pure gold is 24 carat or 1000. Consequently, then, gold of 12 carat would be 500, the other 500-1000th being usually silver; normally the best gold used for jewelry is 18 carat or 750. But coins run from 917 (British) to 980.

"Pure" coins continued to be made though, long after it was realized that pure gold was too soft. The Palatinate (in West Germany) struck coins from gold washed from the Rhine river; they felt that *Rheingold* must not be alloyed. The city of Hamburg could not do less, so there are Hamburg coins (say of about 1750) of more than 990 purity.

Aside from these facts, only a few oddities can be told. The biggest gold "coin" ever to exist is one mentioned in the Bible; it is the gold "wedge" or "tongue" of 50 shekels' worth. But we don't know how it looked. The largest known coin was struck in 1654 by order of Shah-Jahan, Mogul Emperor of Hindustan. It was a 200-mohur piece with a diameter of 5⅜ inches. Knowing what a mohur piece is supposed to weigh, its weight figures to more than 70 ounces. We can't weigh it any more because it is lost, but it was last seen in Patna in 1820 and about that time somebody made a plaster cast which is now in the British Museum. The second largest (not lost) is a Venetian 100-zecchini piece (undated) with a diameter of 3⅛ inches, while the third largest (you can buy one for about $6000) is a Bohemian 100-ducat piece of 1629 with a diameter of 3 inches.

TO give you a more tangible comparison: the "cartwheel," the U. S. silver dollar, has a diameter of 1½ inches and an official weight of 412.5 grains. Its true weight may be 6 grains more or less. The double eagle, the U. S. $20 piece, has a diameter of slightly over 1¼ inch, and the diameter