

THE PAPER

DRAGON . . . a tale of the times

45

By J. R. Pierce

ONCE, not so very long ago, a graduate student named Bill Farmer received his PhD in physics, cum laude, from Midwestern University. Some months before he received his degree he had reason to wonder what he should do next.

Bill was an intelligent and agreeable young man. He had no trouble with quantum mechanics and nuclear theory. Had he really loved these subjects for themselves, he might have received his degree magna cum laude or even summa cum laude. But at heart, Bill was a gadgeteer.

Under Professor Bowman, Bill did an experimental thesis, with a good deal of theory, on magnetohydrodynamic phenomena in solar storms. His analysis and interpretation of the data were sound and thoughtful, but what he had really enjoyed was devising small, reliable, and sometimes new circuits for gathering and sending data from balloons and satellites. His greatest joy came when his apparatus worked accurately and unfailingly. He suffered his nearest to gloom when, in the few satellite launchings, someone else's equipment unfailingly failed prematurely, and his own devices were either destroyed or cut off from communication with the earth.

Besides his general intelligence and his ability as a gadgeteer, Bill's greatest talent was that of listening. He spent his idle hours as a graduate student listening not only to other physicists, but to chemists, engineers, and psychologists as well, and even occasionally to historians and philosophers. He was attentive, he grasped what was said, and he asked intelligent but seldom embarrassing questions.

Bill's attention flattered those to whom he listened. Indeed, he exercised on them a sort of hypnosis. Uniformly, they spoke with unusual enthusiasm, candor, and confidence. Further, having laid bare their inmost thoughts and aspirations, these men felt no embarrassment whatever, but looked back on the conversation with a sense of having won a disciple who was sympathetic and discreet.

On his part, Bill loved to hear people talk. He stored away such facts as he felt he had acquired, and he wondered a little at the variety and vagaries

of human nature. However, Bill gave his real analytical insight to whatever particular problem of instrumentation he was working on at the moment.

Thus, as the month of his graduation approached, Bill had not really looked beyond his current activities. When recruiters from various companies began to press him urgently with offers, expense-paid trips for interviews, and blandishments and arguments, he didn't know what to think or to say. Because he had a great respect for Professor Bowman (perhaps because Bowman had never talked to him confidentially concerning his aims and aspirations) Bill asked the professor's advice.

"Of course, I'd be glad to keep you on here, Bill," Professor Bowman said. "You could start as an assistant professor, or you could work on the project as a research associate. But I don't think you know what you want to do. Why don't you visit half a dozen companies in all parts of the country. They'll be glad to pay your expenses."

"But is that quite fair, Professor Bowman?" Bill asked. "I'd be taking a lot of money from companies I wouldn't go to. After all, I can work at only one. Maybe I should try to make up my mind, and then visit only one or two places."

"Nonsense," Bowman said. "Every young lord should tour the continent, and you should stop at some universities and government laboratories on the way. You're the best student I've ever had. I'll write and tell them so. They'll be glad to see you. The companies that pay your expenses will be lucky to have a chance at you. And they don't get more than a sixth of the men who visit them, anyhow."

Bill had been honestly puzzled, and this set him at his ease. He forthwith made arrangements to visit a large number of places.

On the way East, Bill stopped at several universities. The men he met were impressed with Professor Bowman's recommendation and with Bill's own qualities. Most made him an offer.

Bill was universally told that although his salary for nine months would be less than industry would offer, pay for an extra two months would help to make up the difference. Beyond this, he would be allowed perhaps a day a week consulting, and he

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might receive supplementary paid work under a government contract.

Bill found that he might have even more to look forward to at some universities. Many of the professors he met had established small companies to which they devoted a good deal of energy.

"But, does that allow you enough time for teaching and research?" Bill asked Professor Double, the president of Electronoprox, Inc.

"I'm much relaxed because the capital gains tax allows me to accumulate a little money," Professor Double answered.

"But," Bill said, "research is the only thing I want to do. I'd think that a company of one's own would come first in his thoughts."

Professor Double thought.

"I think it does," he said.

Bill was intrigued by this view of university life.

The most exciting visit Bill made in the East was to World Wide Electronics Communications, Incorporated. Professor Bowman had recommended him to the director of research. After a few kind words with the director, he was introduced to Dr. John Hardy, a project engineer in charge of satellite communication.

Dr. Hardy and his group of about twenty men were frantically at work preparing a proposal for a world-wide satellite communication system. This preparation consisted of studying reports made by others, making calculations, visiting government laboratories, making presentations to government agencies, writing reports, getting bids on antennas and transmitters, letting subcontracts, making calculations, . . .

Bill explained that he was an experimental physicist with experience in satellite instrumentation and would be happy to do experimental work on satellite communication.

"You have to do the planning first," Dr. Hardy explained. "If we are to get a contract we have to show clearly just what the final economies will be. We have already demonstrated conclusively that satellite communication will be cheaper than anything that exists. Now we have to decide what features the satellites will have, how long a life we will require, what the launching and stabilization requirements will be, and what ground terminals will be needed. As soon as the government gives us a letter of intent, we are ready to order twenty million dollars worth of ground equipment. We are also ready to subcontract for launching and guidance. As a matter of fact, we have the assurance of the Starling people that the Behemoth booster will meet all our launching requirements. Then,

when all that is settled, we can start research on the many unsolved problems."

"But how can you plan a system in all that detail when so many problems are unsolved?" Bill asked.

"It's a matter of systems engineering," Dr. Hardy replied.

"Mightn't it be cheaper to do the research first?" asked Bill. "Maybe things will turn out differently from what you expect."

"Perhaps that might be all right if it were not for the Noviet threat," Dr. Hardy said. "But, to surpass the Noviets we must advance rapidly in all directions at once. Besides," he added, "it's difficult to sell a program to the government unless it involves hundreds of millions of dollars."

World Wide made Bill a flattering offer, but he said that he was to visit other companies, and would have to make comparisons before deciding. They took this as a matter of course.

From the East, Bill flew to the West Coast, stopping first at the University of Washoregon, Professor Bowman's alma mater. There he was cordially received by Professor Pingre, head of the Physics Department and director of the Institute for Prashadic Applications, a nonprofit institution, largely government supported, attached to and managed by the University. The Institute was staffed partly by university faculty members who found it a pleasant refuge from teaching, and partly by full-time employees.

Professor Pingre got to the point immediately. He wanted Bill to head a new division of the Institute, devoted to the application of the Prashada effect to television.

"We must be ready," Professor Pingre explained. "When our basic research on the Prashada effect is complete, we must be fully prepared to apply it in all relevant fields. We already have teams working in the fields of microwaves, microscopy, and microcephalogy. It is only by being prepared that we can advance quickly."

Bill inquired concerning progress in applications of the Prashada effect.

"We are still doing basic research," Professor Pingre asserted, "but we are preparing. Our budget this year was a half a million; next year it will be a million."

"I hope that people in Washington don't get impatient while you are preparing," Bill said. Professor Pingre smiled grimly. "They did!" he admitted. "The National Research Foundation is short-sighted. Senator Orotund is a dear friend of mine, however, and a loyal son of Washoregon as well."

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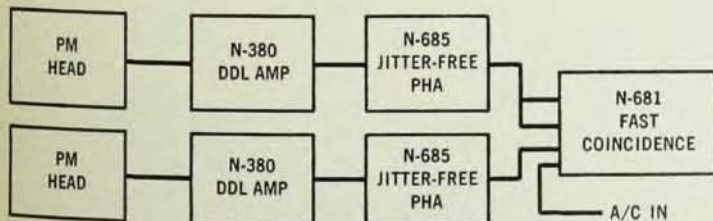
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He had the appropriation reinstated in the budget. Besides," he added, "if the National Research Foundation fails Washoregon, I am assured of support from the Space Force. I will prepare to apply the Prashada effect to antimissile devices and to interstellar travel."

Bill promised to consider Professor Pingre's offer.

After visiting several universities and laboratories, Bill arrived one morning promptly at 9 a.m. at the Starling Aviation Company, a division of Universal Statics. This huge enterprise was far different from the campus-like atmosphere of the Institute for Prashadic Applications.

Bill first saw the assistant personnel manager, who explained the climatic merits of the particular part of the West Coast in which the company was located, the pension plan, group insurance, the Starling Club, and general policies concerning pay and promotion. He also had an assistant take Bill for a quick look at the major branches of the company.

Bill was impressed by the acres and acres of desks at which men sat drawing up bids on government contracts, writing contract reports, editing scripts for visual presentations, and making drawings. He was also impressed by the huge shops and elaborate equipment which were used in the assembly of planes and missiles, and particularly in the assembly line which was turning out Behemoth missiles one after another.

The hurried look at the research and development department just before lunch was rather a letdown. The department seemed so small compared with what he had already seen.

Bill had lunch with several physicists who appeared to be harried with getting at least some sort of equipment together to meet various deadlines on new and old projects. A fair amount of the work seemed to be ordering equipment on subcontract and making frantic efforts to fit it together in some fashion in order to meet firing dates.

Either Bill had made an unusually favorable impression or Professor Bowman had indeed recommended him highly, because he was introduced to the vice president in charge of research and development before he left. The vice president had with him both Dr. Zimmelsweiss, the Director of Advanced Planning, and Commodore Tatum, a Space Force representative connected with the Behemoth booster program. Both of them knew Professor Bowman and seemed glad to see his favorite student.

Bill expressed his wonder at the huge Behemoth program, and asked concerning the progress of the

booster. This was a topic on which the vice president appeared to be well prepared to speak. He did so at length.

"So you see," he said at last, "we are almost at the end of our troubles. While some progress was made in correcting defects found during the first ten partial technical failures, that is, the boosters that didn't get off the pad, the limited success of the next twenty boosters, which exploded or were destroyed after launching, showed us that a more forceful approach was required to overcome inherent difficulties. Six months ago we changed everything. *Everything!* Not one of the defective components or features remains."

Bill inquired concerning subsequent progress.

"Although one might class the last five launchings as failures," the vice president replied, "one must expect some setbacks in a bold, new program. And," he added optimistically, "we are prepared to change everything again if we have to."

"But," the vice president continued, "Dr. Zimmelsweiss is going to tell Commodore Tatum about our plans for an atom-powered, ion-propelled manned interplanetary vehicle. Perhaps you would care to listen."

After the whole proposal had been explained to Commodore Tatum and Bill, including the provisions for replacing ion propulsion with antigravity when the expected breakthrough in gravity research came, the commodore and Bill left. It turned out that they were both taking the same plane, and the commodore talked to Bill during almost all of the flight.

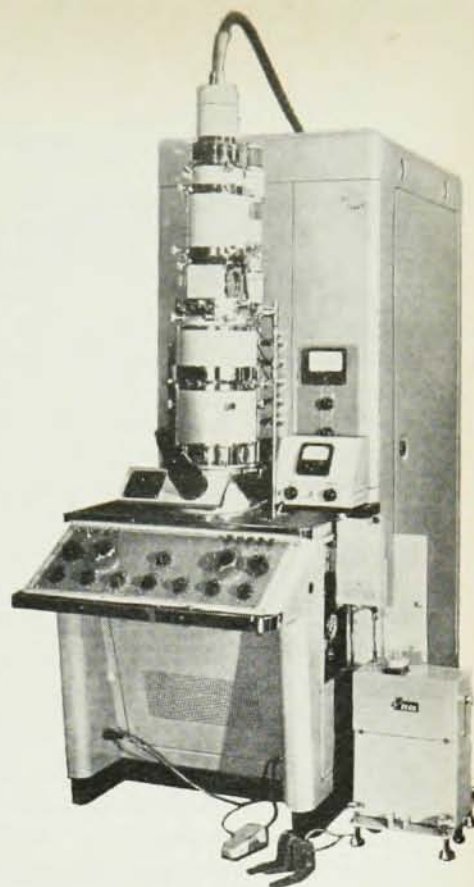
"We respect Starling in the Space Force," he said. "They have their troubles of course. The Behemoth booster has had its partial failures, while the Giant, which is being developed by Astral Incorporated, has had a few successes. But the Giant is outmoded. In fact, in order to make it fly, Astral had to abandon all of the later, improved features and go back to a design that was four years old.

"As a matter of fact, even the Behemoth is outmoded," the commodore continued. "We'll never surpass the Noviets by plodding after them step by step. We must forge ahead. And, you can see that that is how Starling have set their sights. They're making provisions for antigravity in this new vehicle right at the start."

Time passed rapidly as Commodore Tatum talked, and soon he and Bill arrived at Luna Field, the great space base in New Texico. The commodore offered to introduce Bill to the commandant the next day, but Bill said he would rather not bother the commandant.

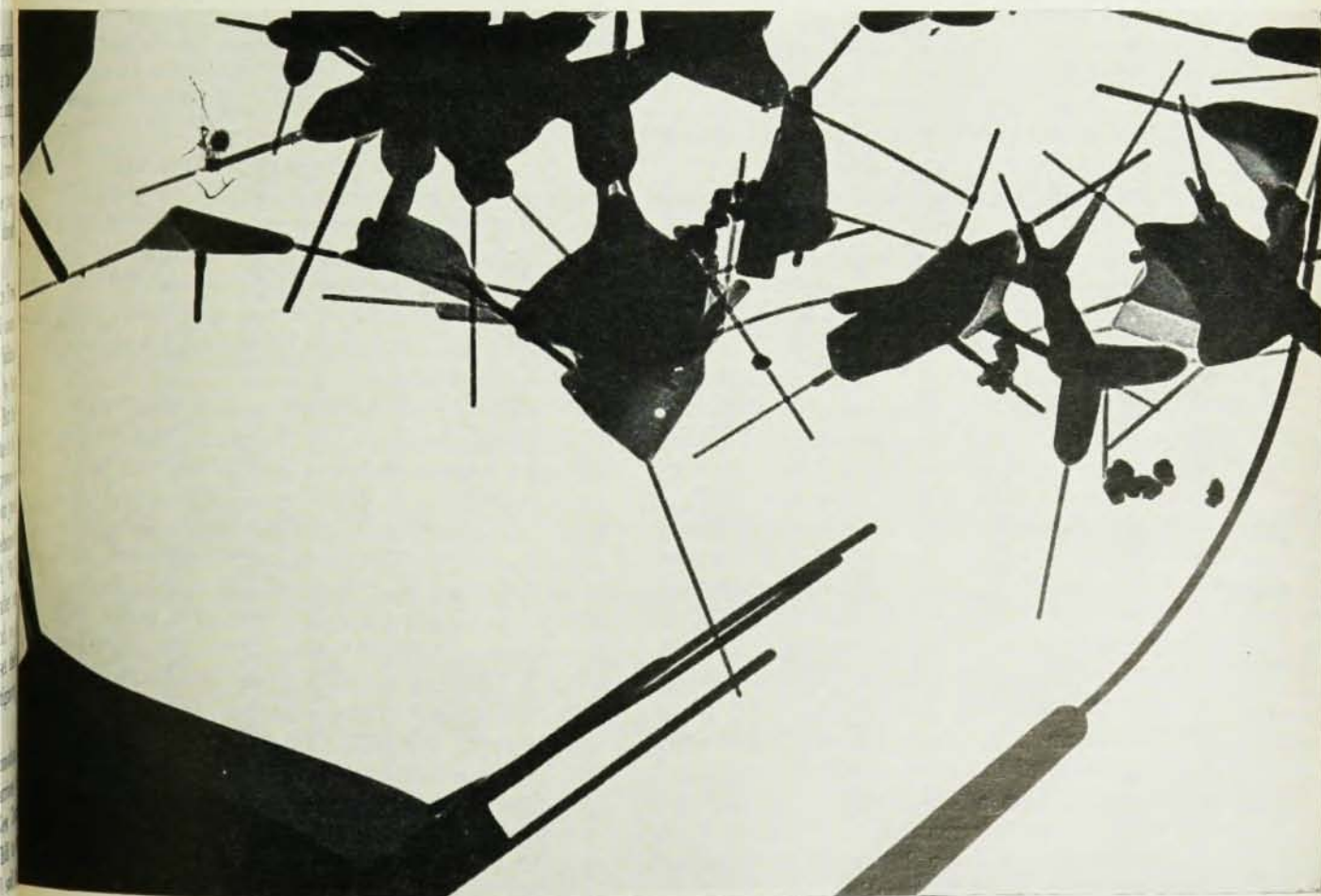
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Nonetheless, he was well enough received. It was clear that Professor Bowman's recommendation had again preceded him. The receptionist sent him at once to the communications and intelligence officer, who was also a commodore. This commodore was alert, self-possessed, and enthusiastic as he explained the problems of the Space Force.

"We're an operational command," he emphasized. "We know what the real problems are. It's up to us to tell the Space Force what we need. Then they can set the government and industrial laboratories at work to get it. Right now, for instance, we have the biggest world-wide communication and intelligence problem the world has ever seen. It's up to us to see that it's solved."

"But don't new things start with research, Commodore?" Bill asked.

"Oh, of course, of course," the commodore replied. "We're thoroughly informed about the scientific world. You'll see Dr. Chaff before you go. A really penetrating intellect; deep and yet practical, too. He knows our needs. Now, Lieutenant Ivy here will show you around and answer any questions. Then, after you've seen Dr. Chaff, you can talk to our Personnel Office."

Lieutenant Ivy showed Bill aircraft, radars, computers, television equipment, and missiles in bewildering array. But the culmination of the visit was a talk with Dr. Chaff, who needed an assistant in his systems engineering activities.

Dr. Chaff was a short, solid, graying man whose hair insisted in sticking out in all directions. His clothes were good but slightly rumpled. He spoke clearly but as if he were performing a much-rehearsed incantation; he seemed scarcely to be in the room with Bill.

Bill, who knew little about systems engineering, gathered at last that it consisted of drawing maps of unexplored technical territory; maps which were to be a sure guide in the Space Force operations of the future. Dr. Chaff's maps were concerned with communication and intelligence. They were covered with little boxes with labels on them. Some of these labels bore the words, "Here be information reducers" and "Here be voice typewriters". Lines with arrows ran between the boxes, and the maps were decorated with symbolic hurrying figures, planetary symbols, and cuneiform inscriptions.

"What is an information reducer?" Bill asked, pointing to one of the boxes on the map.

"Naturally, even a fast electronic system can't cope with trivial information," Dr. Chaff replied. "An information reducer is an electronic device which discards trivial information."

"And what is a voice typewriter?" Bill asked as he pointed to another box.

"A voice typewriter," Dr. Chaff replied, "is an electronic device which reduces the spoken words to typescript."

"I've never heard of these devices," Bill marveled.

"I, myself, read of them just recently in the *Engineer's Astrological Guide and Dream Book*," Dr. Chaff said. "They have also been mentioned in *The New York Times*. They are invaluable in our plans, invaluable," he added. "Without them we could never hope to solve our problems as we see them."

When the Chaff plan had been thoroughly explained to him, Bill asked what steps lay ahead.

"After the commodore and the commandant approve it, the plan goes to the Nonogon," Dr. Chaff explained. "There an operational requirement based on it will be drawn up. After the plan has become an operational requirement, purchase requests will be sent to various industries, who will bid on the job. But this is all up to others," he added. "As a matter of fact," Dr. Chaff continued, "we are almost done with the plan. We are about to take up the problem of a universal electronic translation and communication system for use in our dealings with extraterrestrial beings."

Bill left Luna Field without accepting the generous offer that was made him.

When Bill got to Midwestern after these and other equally interesting adventures, he meditated for a week. At the end of that time he called a friend who worked for a small company on the West Coast. He then had a long farewell talk with Professor Bowman, who listened with interest.

"What have you decided to do?" Bowman asked when Bill had finished.

"I noticed one thing during my visits that I haven't told you about," Bill replied. "All the laboratories I visited had test gear of one sort or another: oscilloscopes, counters, signal generators, and so on. They had bought this equipment, not because of promises, but because it existed and worked. I asked everyone what make was best, and they all pretty much agreed with me. I have a friend with the company. I called him up, asked for a job, and I got it. I'll leave as soon as I get my degree."

"Bill, I think that you are being unfair to a great many people," Bowman said. "I can appreciate your reaction though. Go ahead and build oscilloscopes for a few years. At least it's honest. Besides, you're sure to do something good and unexpected. Then come back here; by that time we can make you an associate professor."