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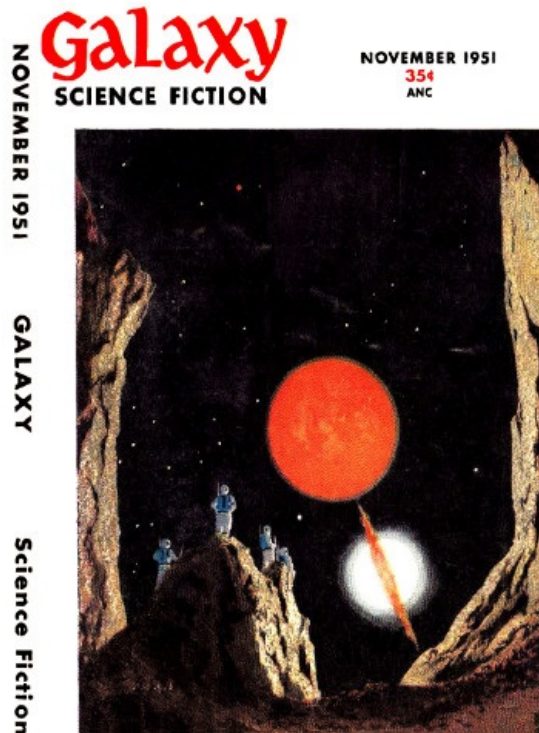
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*** START OF THE PROJECT GUTENBERG EBOOK SELF PORTRAIT ***



Self Portrait

By BERNARD WOLFE

Illustrated by MARTIN SCHNEIDER

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***In the credo of this inspiringly selfless
cyberneticist, nothing was too good for his colleagues
in science. Much too good for them!***

October 5, 1959

Well, here I am at Princeton. IFACS is quite a place, *quite* a place, but the atmosphere's darned informal. My colleagues seem to be mostly youngish fellows dressed in sloppy dungarees, sweatshirts (the kind Einstein made so famous) and moccasins, and when they're not puttering in the labs they're likely to be lolling on the grass, lounging in front of the fire in commons, or slouching around in conference rooms chalking up equations on a blackboard. No way of telling, of course, but a lot of these collegiate-looking chaps must be in the MS end, whatever that is. You'd think fellows in something secret like that would dress and behave with a little more dignity.

Guess I was a little previous in packing my soup-and-fish. Soon as I was shown to my room in the bachelor dorms, I dug it out and hung it way back in the closet, out of sight. When in Rome, etc. Later that day I discovered they carry dungarees in the Co-op; luckily, they had the pre-faded kind.

October 6, 1959

Met the boss this morning—hardly out of his thirties, crew-cut, wearing a flannel hunting shirt and dirty saddleshoes. I was glad I'd thought to change into my dungarees before the interview.

"Parks," he said, "you can count yourself a very fortunate young man. You've come to the most important address in America, not excluding the Pentagon. In the world, probably. To get you oriented, suppose I sketch in some of the background of the place."

That would be most helpful, I said. I wondered, though, if he was as naive as he sounded. Did he think I'd been working in cybernetics labs for going on six years without hearing enough rumors about IFACS to make me dizzy? Especially about the MS end of IFACS?

"Maybe you know," he went on, "that in the days of Oppenheimer and Einstein, this place was called the Institute for Advanced Studies. It was run pretty loosely then—in addition to the mathematicians and physicists, they had all sorts of queer ducks hanging around—poets, egyptologists, numismatists, medievalists, herbalists, God alone knows what all. By 1955, however, so many cybernetics labs had sprung up around the country that we needed some

central coordinating agency, so Washington arranged for us to take over here. Naturally, as soon as we arrived, we eased out the poets and egyptologists, brought in our own people, and changed the name to the Institute for Advanced *Cybernetics* Studies. We've got some pretty keen projects going now, *pret-ty* keen."

I said I'd bet, and did he have any idea which project I would fit into?

"Sure thing," he said. "You're going to take charge of a very important lab. The Pro lab." I guess he saw my puzzled look. "Pro—that's short for prosthetics, artificial limbs. You know, it's really a scandal. With our present level of technology, we should have artificial limbs which in many ways are even better than the originals, but actually we're still making do with modifications of the same primitive, clumsy pegs and hooks they were using a thousand years ago. I'm counting on you to get things hopping in that department. It's a real challenge."

I said it sure was a challenge, and of course I'd do my level best to meet it. Still, I couldn't help feeling a bit disappointed. Around cybernetics circles, I hinted, you heard a lot of talk about the hush-hush MS work that was going on at IFACS and it sounded so exciting that, well, a fellow sort of hoped he might get into *that* end of things.

"Look here, Parks," the boss said. He seemed a little peeved. "Cybernetics is teamwork, and the first rule of any team is that not everybody can be quarterback. Each man has a specific job on our team, one thing he's best suited for, and what *you're* best suited for, obviously, is the Pro lab. We've followed your work closely these last few years, and we were quite impressed by the way you handled those photo-electric-cell insects. You pulled off a brilliant engineering stunt, you know, when you induced nervous breakdown in your robot moths and bedbugs, and proved that the oscillations they developed corresponded to those which the human animal develops in intention tremor and Parkinson's disease. A keen bit of cybernetic thinking, that. *Very* keen."

It was just luck, I told him modestly.

"Nonsense," the boss insisted. "You're first and foremost a talented neuro man, and that's exactly what we need in the Pro department. There, you see, the problem is primarily one of duplicating a nervous mechanism in the metal, of bridging the gap between the neuronic and electronic. So buckle down, and if you hear any more gossip about MS, forget it fast—it's not a proper subject of conversation for you. The loyalty oath you signed is very specific about the trouble you can get into with loose talk. Remember that."

I said I certainly would, and thanks a whole lot for the advice.

Damn! Everybody knows MS is the thing to get into. It gives you real standing in the field if it gets around that you're an MS man. I had my heart set on getting into MS.

October 6, 1959

It never rains, etc.: now it turns out that Len Ellsom's here, and *he's* in MS! Found out about it in a funny way. Two mornings a week, it seems, the staff members get into their skiing and hunting clothes and tramp into the woods to cut logs for their fireplaces. Well, this morning I went with them, and as we were walking along the trail Goldweiser, my assistant, told me the idea behind these expeditions.

"You can't get away from it," he said. " $E=MC^2$ is in a tree trunk as well as in a uranium atom or a solar system. When you're hacking away at a particular tree, though, you don't think much about such intangibles—like any good, untheoretical lumberjack, you're a lot more concerned with superficialities, such as which way the grain runs, how to avoid the knots, and so on. It's very restful. So long as a cyberneticist is sawing and chopping, he's not a sliver of uncontaminated cerebrum contemplating the eternal slippery verities of gravity and electromagnetism; he's just one more guy trying to slice up one more log. Makes him feel he belongs to the human race again. Einstein, you know, used to get the same results with a violin."

Now, I've heard talk like that before, and I don't like it. I don't like it at all. It so happens that I feel very strongly on the subject. I think a scientist should like what he's doing and not want to take refuge in Nature from the Laws of Nature (which is downright illogical, anyhow). I, for one, enjoy cutting logs precisely *because*, when my saw rasps across a knot, I know that the innermost secret of that knot, as of all matter in the Universe, is $E=MC^2$. It's my job to *know* it, and it's very satisfying to *know* that I know it and that the general run of people don't. I was about to put this thought into words, but before I could open my mouth, somebody behind us spoke up.

"Bravo, Goldie," he said. "Let us by all means pretend that we belong to the human race. Make way for the new cyberneticists with their old saws. Cyberneticist, spare that tree!"

I turned around to see who could be making jokes in such bad taste and—as I might have guessed—it was Len Ellsom. He was just as surprised as I was.

"Well," he said, "if it isn't Ollie Parks! I thought you were out in Cal Tech, building schizophrenic bedbugs."

After M. I. T. I *had* spent some time out in California doing neuro-cyber research, I explained—but what was *he* doing here? I'd lost track of him after he'd left Boston; the last I'd heard, he'd been working on the giant robot brain Remington-Rand was developing for the Air Force. I remembered seeing his picture in the paper two or three times while he was working on the

brain.

"I was with Remington a couple of years," he told me. "If I do say so myself, we built the Air Force a real humdinger of a brain—in addition to solving the most complex problems in ballistics, it could whistle *Dixie* and, in moments of stress, produce a sound not unlike a Bronx cheer. Naturally, for my prowess in the electronic simulation of I.Q., I was tapped for the brain department of these hallowed precincts."

"Oh?" I said. "Does that mean you're in MS?" It wasn't an easy idea to accept, but I think I was pretty successful in keeping my tone casual.

"Ollie, my boy," he said in an exaggerated stage whisper, putting his finger to his lips, "in the beginning was the word and the word was mum. Leave us avoid the subject of brains in this *keen* place. We all have a job to do on the team." I suppose that was meant to be a humorous imitation of the boss; Len always did fancy himself quite a clown.

We were separated during the sawing, but he caught up with me on the way back and said, "Let's get together soon and have a talk, Ollie. It's been a long time."

He wants to talk about Marilyn, I suppose. Naturally. He has a guilty conscience. I'll have to make it quite clear to him that the whole episode is a matter of complete indifference to me. Marilyn is a closed book in my life; he must understand that. But can you beat that? He's right in the middle of MS! That lad certainly gets around. It's the usual Ellsom charm, I suppose.

The usual Ellsom technique for irritating people, too. He's still trying to get my goat; he knows how much I've always hated to be called Ollie. Must watch Goldweiser. Thought he laughed pretty heartily at Len's wisecracks.

October 18, 1959

Things are shaping up in the Pro lab. Here's how I get the picture.

A year ago, the boss laid down a policy for the lab: begin with legs because, while the neuro-motor systems in legs and arms are a lot alike, those in legs are much simpler. If we build satisfactory legs, the boss figures, we can then tackle arms; the main difficulties will have been licked.

Well, last summer, in line with this approach, the Army picked out a double amputee from the outpatient department of Walter Reed Hospital—fellow by the name of Kujack, who lost both his legs in a land mine explosion outside Pyongyang—and shipped him up here to be a subject in our experiments.

When Kujack arrived, the neuro boys made a major decision. It didn't make sense, they agreed, to keep building experimental legs directly into the muscles and nerves of Kujack's stumps; the surgical procedure in these cine-plastic jobs is complicated as all getout, involves a lot of pain for the subject and, what's more to the point, means long delays each time while the tissues heal.

Instead, they hit on the idea of integrating permanent metal and plastic sockets into the stumps, so constructed that each new experimental limb can be snapped into place whenever it's ready for a trial.



By the time I took over, two weeks ago, Goldweiser had the sockets worked out and fitted to Kujack's stumps, and the muscular and neural tissues had knitted satisfactorily. There was only one hitch: twenty-three limbs had been designed, and all twenty-three had been dismal flops. That's when the boss called me in.

There's no mystery about the failures. Not to me, anyhow. Cybernetics is simply the science of building machines that will duplicate and improve on the organs and functions of the animal, based on what we know about the systems of communication and control in the animal. All right. But in any particular cybernetics project, everything depends on just how *many* of the functions you want to duplicate, just how *much* of the total organ you want to replace.

That's why the robot-brain boys can get such quick and spectacular results, have their pictures in the papers all the time, and become the real glamor boys of the profession. They're not asked to duplicate the human brain in its *entirety*—all they have to do is isolate and imitate one particular function of the brain, whether it's a simple operation in mathematics or a certain type of elementary logic.

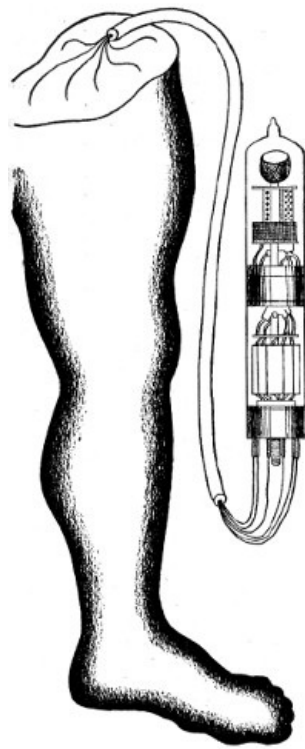
The robot brain called the Eniac, for example, is exactly what its name implies—an Electronic Numerical Integrator and Computer, and it just has to be able to integrate and compute figures faster and more accurately than the human brain can. It doesn't have to have daydreams and nightmares, make wisecracks, suffer from anxiety, and all that. What's more, it doesn't even have to *look* like a brain or fit into the tiny space occupied by a real brain. It can be housed in a six-story building and look like an overgrown typewriter or an automobile dashboard or even a pogo stick. All it has to do is tell you that two times two equals four, and tell you fast.

When you're told to build an artificial leg that'll take the place of a real one, the headaches begin. Your machine must not only *look* like its living model, it must *also* balance and support, walk, run, hop, skip, jump, etc., etc. *Also*, it must fit into the same space. *Also*, it must feel everything a real leg feels—touch, heat, cold, pain, moisture, kinesthetic sensations—as *well as* execute all the brain-directed movements that a real leg can.

So you're not duplicating this or that function; you're reconstructing the organ in its totality, or trying to. Your pro must have a full set of sensory-motor communication systems, plus machines to carry out orders, which is impossible enough to begin with.

But our job calls for even more. The pro mustn't only *equal* the real thing, it must be *superior*! That means creating a synthetic neuro-muscular system that actually *improves* on the nerves and muscles Nature created in the original!

When our twenty-fourth experimental model turned out to be a dud last week—it just hung from Kujack's stump, quivering like one of my robot bedbugs, as though it had a bad case of intention tremor—Goldweiser said something that made an impression on me.



"They don't want much from us," he said sarcastically. "They just want us to be God."

I didn't care for his cynical attitude at all, but he had a point. Len Ellsom just has to build a fancy adding machine to get his picture in the papers. *I* have to be God!

October 22, 1959

Don't know what to make of Kujack. His attitude is peculiar. Of course, he's very co-operative, lies back on the fitting table and doesn't even wince when we snap on the pros, and he does his best to carry out instructions. Still, there's something funny about the way he looks at me. There's a kind of malicious expression in his eyes. At times, come to think of it, he reminds me of Len.

Take this afternoon, for instance. I've just worked out an entirely different kind of leg based on a whole new arrangement of solenoids to duplicate the muscle systems, and I decided to give it a try. When I was slipping the model into place, I looked up and caught Kujack's eye for a moment. He seemed to be laughing at something, although his face was expressionless.

"All right," I said. "Let's make a test. I understand you used to be quite a football player. Well, just think of how you used to kick a football and try to do it now."

He really seemed to be trying; the effort made him sweat. All that happened, though, was that the big toe wriggled a little and the knee buckled. *Dud Number Twenty-five*. I was sore, of course, especially when I noticed that Kujack was more amused than ever.

"You seem to think something's pretty funny," I said.

"Don't get me wrong, Doc," he said, much too innocently. "It's just that I've been thinking. Maybe you'd have more luck if you thought of me as a bedbug."

"Where did you get that idea?"

"From Doc Ellsom. I was having some beers with him the other night. He's got a very high opinion of you, says you build the best bedbugs in the business."

I find it hard to believe that Len Ellsom would say anything really nice about me. Must be his guilt about Marilyn that makes him talk that way. I don't like his hanging around Kujack.

October 25, 1959

The boss came along on our woodcutting expedition this morning and volunteered to work the other end of my two-handled saw. He asked how things were coming in the Pro lab.

"As I see it," I said, "there are two sides to the problem, the kinesthetic and the neural. We're making definite progress on the K side—I've worked out a new solenoid system, with some

miniature motors tied in, and I think it'll give us a leg that *moves* damned well. I don't know about the N side, though. It's pretty tough figuring out how to hook the thing up electrically with the central nervous system so that the brain can control it. Some sort of compromise system of operation, along mechanical rather than neural lines, would be a lot simpler."

"You mean," the boss said with a smile, "that it's stumping you."

I was relieved to see him taking it so well because I know how anxious he is to get results from the Pro lab. Since Pro is one of the few things going on at IFACS that can be talked about, he's impatient for us to come up with something he can release to the press. As the public relations officer explained it to me at dinner the other night, people get worried when they know there's something like IFACS going, but don't get any real information about it, so the boss, naturally, wants to relieve the public's curiosity with a good, reassuring story about our work.

I knew I was taking an awful chance spilling the whole K-N thing to him the way I did, but I had to lay the groundwork for a little plan I've just begun to work on.

"By the way, sir," I said, "I ran into Len Ellsom the other day. I didn't know he was here."

"Do you know him?" the boss said. "Good man. One of the best brains-and-games men you'll find anywhere."

I explained that Len had gotten his degree at M.I.T. the year before I did. From what I'd heard, I added, he'd done some important work on the Remington-Rand ballistics computer.

"He did indeed," the boss said, "but that's not the half of it. After that he made some major contributions to the robot chess player. As a matter of fact, that's why he's here."

I said I hadn't heard about the chess player.

"As soon as it began to play a really good game of chess, Washington put the whole thing under wraps for security reasons. Which is why you won't hear any more about it from me."

I'm no Eniac, but I can occasionally put two and two together myself. If the boss's remarks mean anything, they mean that an electronic brain capable of playing games has been developed, and that it's led to something important militarily. Of course! I could kick myself for not having guessed it before.

Brains-and-games—that's what MS is all about, obviously. It had to happen: out of the mathematical analysis of chess came a robot chess player, and out of the chess player came some kind of mechanical brain that's useful in military strategy. *That's* what Len Ellsom's in the middle of.

"Really brilliant mind," the boss said after we'd sated for a while. "Keen. But he's a little erratic—quirky, queer sense of humor. Isn't that your impression?"

"Definitely," I said. "I'd be the last one in the world to say a word against Len, but he was always a little peculiar. Very gay one moment and very sour the next, and inclined to poke fun at things other people take seriously. He used to write poetry."

"I'm very glad to know that," the boss said. "Confirms my own feeling about him."

So the boss has some doubts about Len.

October 27, 1959

Unpleasant evening with Len. It all started after dinner when he showed up in my room, wagged his finger at me and said, "Ollie, you've been avoiding me. That hurts. Thought we were pals, thick and thin and till debt and death do us part."

I saw immediately that he was drunk—he always gets his words mixed up when he's drunk—and I tried to placate him by explaining that it wasn't anything like that; I'd been busy.

"If we're pals," he said, "come on and have a beer with me."

There was no shaking him off, so I followed him down to his car and we drove to this sleazy little bar in the Negro part of town. As soon as we sat down in a booth, Len borrowed all the nickels I had, put them in the jukebox and pressed the levers for a lot of old Louie Armstrong records.

"Sorry, kid," he said. "I know how you hate this real jazzy stuff, but can't have a reunion without music, and there isn't a polka or cowboy ballad or hillbilly stomp in the box. They lack the folksy touch on this side of the tracks." Len has always been very snobbish about my interest in folk music.

I asked him what he'd been doing during the day.

"Lushing it up," he said. "Getting stinking from drinking." He still likes to use the most flamboyant slang; I consider it an infantile form of protest against what he regards as the "genteel" manner of academic people. "I got sort of restless this morning, so I ducked out and beat it into New York and looked up my friend Steve Lundy in the Village. Spent the afternoon liquidating our joint assets. Liquidating our assets in the joints."

What, I wanted to know, was he feeling restless about?

"Restless for going on three years now." His face grew solemn, as though he were thinking it over

very carefully. "I'll amend that statement. Hell with the Aesopian language. I've been a plain lush for going on three years. Ever since—"

If it was something personal—I suggested.

"It is *not* something personal," he said, mimicking me. "Guess I can tell an old cyberneticist pal about it. Been a lush for three years because I've been scared for three years. Been scared for three years because three years ago I saw a machine beat a man at a game of chess."

A machine that plays chess? That was interesting, I said.

"Didn't tell you the whole truth the other day," Len mumbled. "I *did* work on the Remington-Rand computer, sure, but I didn't come to IFACS directly from that. In between I spent a couple years at the Bell Telephone Labs. Claude Shannon—or, rather, to begin with there was Norbert Wiener back at M.I.T.—it's complicated...."

"Look," I said, "are you sure you want to talk about it?"

"Stop wearing your loyalty oath on your sleeve," he said belligerently. "Sure I want to talk about it. Greatest subject I know. Begin at the beginning. Whole thing started back in the Thirties with those two refugee mathematicians who used to be here at the Institute for Advanced Studies when Einstein was around. Von Morgan and Neumanstern, no, Von *Neumann* and *Morganstern*. You remember, they did a mathematical analysis of all the possible kinds of games, poker, tossing pennies, chess, bridge, everything, and they wrote up their findings in a volume you certainly know, *The Theory of Games*."

"Well, that got Wiener started. You may remember that when he founded the science of cybernetics, he announced that on the basis of the theory of games, it was feasible to design a robot computing machine that would play a better than average game of chess. Right after that, back in '49 or maybe it was '50, Claude Shannon of the Bell Labs said Wiener wasn't just talking, and to prove it he was going to *build* the robot chess player. Which he proceeded withforth—forthwith—to do. Sometime in '53, I was taken off the Remington-Rand project and assigned to Bell to work with him."

"Maybe we ought to start back," I cut in. "I've got a lot of work to do."

"The night is young," he said, "and you're so dutiful. Where was I? Oh yes, Bell. At first our electronic pawn-pusher wasn't so hot—it could beat the pants off a lousy player, but an expert just made it look silly. But we kept improving it, see, building more and more electronic anticipation and gambit-plotting powers into it, and finally, one great day in '55, we thought we had all the kinks ironed out and were ready for the big test. By this time, of course, Washington had stepped in and taken over the whole project."

"Well, we got hold of Fortunescu, the world's champion chess player, sat him down and turned the robot loose on him. For four hours straight we followed the match, with a delegation of big brass from Washington, and for four hours straight the machine trounced Fortunescu every game. That was when I began to get scared. I went out that night and got really loaded."

What had he been so scared about? It seemed to me he should have felt happy.

"Listen, Ollie," he said, "for Christ's sake, stop talking like a Boy Scout for once in your life."

If he was going to insult me—

"No insult intended. Just listen. I'm a terrible chess player. Any five-year-old could chatemeck—checkmate—me with his brains tied behind his back. But this machine which I built, helped build, is the champion chess player of the world. In other words, my brain has given birth to a brain which can do things my brain could never do. Don't you find that terrifying?"

"Not at all," I said. "*You* made the machine, didn't you? Therefore, no matter what it does, it's only an extension of you. You should feel proud to have devised a powerful new tool."

"Some tool," he sneered. He was so drunk by now that I could hardly understand what he was saying. "The General Staff boys in Washington were all hopped up about that little old tool, and for a plenty good reason—they understood that mechanized warfare is only the most complicated game the human race has invented so far, an elaborate form of chess which uses the population of the world for pawns and the globe for a chessboard. They saw, too, that when the game of war gets this complex, the job of controlling and guiding it becomes too damned involved for any number of human brains, no matter how nimble."

"In other words, my beamish Boy Scout, modern war needs just this kind of strategy tool; the General Staff has to be mechanized along with everything else. So the Pentagon boys set up IFACS and handed us a top-priority cybernetics project: to build a superduper chess player that could oversee a complicated military maneuver, maybe later a whole campaign, maybe ultimately a whole global war."

"We're aiming at a military strategy machine which can digest reports from all the units on all the fronts and from moment to moment, on the basis of that steady stream of information, grind out an elastic overall strategy and dictate concrete tactical directives to all the units. Wiener warned this might happen, and he was right. A very nifty tool. Never mind how far we've gotten with the thing, but I will tell you this: I'm a lot more scared today than I was three years ago."

So *that* was the secret of MS! The most extraordinary machine ever devised by the human mind! It was hard to conceal the thrill of excitement I felt, even as a relative outsider.

"Why all the jitters?" I said. "This could be the most wonderful tool ever invented. It might

eliminate war altogether."

Len was quiet for a while, gulping his beer and looking off into space. Then he turned to me.

"Steve Lundy has a cute idea," he said. "He was telling me about it this afternoon. He's a bum, you see, but he's got a damned good mind and he's done a lot of reading. Among other things, he's smart enough to see that once you've got your theory of games worked out, there's at least the logical possibility of converting your Eniac into what he calls a Strategy Integrator and Computer. And he's guessed, simply from the Pentagon's hush-hush policy about it, that that's what we're working on here at IFACS. So he holds forth on the subject of Emsiac, and I listen."

"What's his idea?" I asked.

"He thinks Emsiac might eliminate war, too, but not in the way a Boy Scout might think. What he says is that all the industrialized nations must be working away like mad on Emsiac, just as they did on the atom bomb, so let's assume that before long all the big countries will have more or less equal MS machines. All right. A cold war gets under way between countries A and B, and pretty soon it reaches the showdown stage. Then both countries plug in their Emsiacs and let them calculate the date on which hostilities should begin. If the machines are equally efficient, they'll hit on the same date. If there's a slight discrepancy, the two countries can work out a compromise date by negotiation.

"The day arrives. A's Emsiac is set up in its capital, B's is set up in *its* capital. In each capital the citizens gather around their strategy machine, the officials turn out in high hats and cut-aways, there are speeches, pageants, choral singing, mass dancing—the ritual can be worked out in advance. Then, at an agreed time, the crowds retreat to a safe distance and a committee of the top cyberneticists appears. They climb into planes, take off and—this is beautiful—drop all their atom bombs and H-bombs on the machines. It happens simultaneously in both countries, you see. That's the neat part of it. The occasion is called International Mushroom Day.

"Then the cyberneticists in both countries go back to their vacuum tubes to work on another Emsiac, and the nuclear physicists go back to their piles to build more atom bombs, and when they're ready they have another Mushroom Day. One Mushroom Day every few years, whenever the diplomatic-strategic situation calls for it, and nobody even fires a B-B gun. Scientific war. Isn't it wonderful?"

By the time Len finished this peculiar speech, I'd finally managed to get him out of the tavern and back into his car. I started to drive him back to the Institute, my ears still vibrating with the hysterical yelps of Armstrong's trumpet. I'll never for the life of me understand what Len sees in that kind of music. It seems to me such an unhealthy sort of expression.

"Lundy's being plain silly," I couldn't help saying. "What guarantee has he got that on your Mushroom Day, Country B wouldn't make a great display of destroying one Emsiac and one set of bombs while it had others in hiding? It's too great a chance for A to take—she might be throwing away all her defenses and laying herself wide open to attack."

"See what I mean?" Len muttered. "You're a Boy Scout." Then he passed out, without saying a word about Marilyn. Hard to tell if he sees anything of her these days. He *does* see some pretty peculiar people, though. I'd like to know more about this Steve Lundy.

November 2, 1959

I've done it! Today I split up the lab into two entirely independent operations, K and N. Did it all on my own authority, haven't breathed a word about it to the boss yet. Here's my line of reasoning.

On the K end, we can get results, and fast: if it's just a matter of building a pro that works like the real leg, regardless of what *makes* it work, it's a cinch. But if it has to be worked by the brain, through the spinal cord, the job is just about impossible. Who knows if we'll ever learn enough about neuro tissue to build our own physico-chemico-electrical substitutes for it?

As I proved in my robot moths and bedbugs, I can work up electronic circuits that seem to duplicate one particular function of animal nerve tissue—one robot is attracted to light like a moth, the other is repelled by light like a bedbug—but I don't know how to go about duplicating the tissue itself in all its functions. And until we can duplicate nerve tissue, there's no way to provide our artificial limbs with a neuro-motor system that can be hooked up with the central nervous system. The best I can do along those lines is ask Kujack to kick and get a wriggle of the big toe instead.

So the perspective is clear. Mechanically, kinesthetically, motorically, I can manufacture a hell of a fine leg. Neurally, it would take decades, centuries maybe, to get even a reasonable facsimile of the original—and maybe it will never happen. It's not a project I'd care to devote my life to. If Len Ellsom had been working on that sort of thing, he wouldn't have gotten his picture in the paper so often, you can be sure.

So, in line with this perspective, I've divided the whole operation into two separate labs, K-Pro and N-Pro. I'm taking charge of K-Pro myself, since it intrigues me more and I've got these ideas

about using solenoids to get lifelike movements. With any kind of luck I'll soon have a peach of a mechanical limb, motor-driven and with its own built-in power plant, operated by push-button. Before Christmas, I hope.

Got just the right man to take over the neuro lab—Goldweiser, my assistant. I weighed the thing from every angle before I made up my mind, since his being Jewish makes the situation very touchy: some people will be snide enough to say I picked him to be a potential scapegoat. Well, Goldweiser, no matter what his origins may be, is the best neuro man I know.

Of course, personally—although my personal feelings don't enter into the picture at all—I *am* just a bit leery of the fellow. Have been ever since that first log-cutting expedition, when he began to talk in such a peculiar way about needing to relax and then laughed so hard at Len's jokes. That sort of talk always indicates to me a lack of reverence for your job: if a thing's worth doing at all, etc.

Of course, I don't mean that Goldweiser's cynical attitude has anything to do with his being Jewish; Len's got the same attitude and he's *not* Jewish. Still, this afternoon, when I told Goldweiser he's going to head up the N-Pro lab, he sort of bowed and said, "That's quite a promotion. I always did want to be God."

I didn't like that remark at all. If I'd had another neuro man as good as he is, I'd have withdrawn the promotion immediately. It's his luck that I'm tolerant, that's all.

November 6, 1959

Lunch with Len today, at my invitation. Bought him several Martinis, then brought up Lundy's name and asked who he was, he sounded interesting.

"Steve?" Len said. "I roomed with him my first year in New York."

I asked what Steve did, exactly.

"Reads, mostly. He got into the habit back in the 30s, when he was studying philosophy at the University of Chicago. When the Civil War broke out in Spain, he signed up with the Lincoln Brigade and went over there to fight, but it turned out to be a bad mistake. His reading got him in a lot of trouble, you see; he'd gotten used to asking all sorts of questions, so when the Moscow Trials came along, he asked about them. Then the N.K.V.D. began to pop up all over Spain, and he asked about it.

"His comrades, he discovered, didn't like guys who kept asking questions. In fact, a couple of Steve's friends who had also had an inquiring streak were found dead at the front, shot in the *back*, and Steve got the idea that he was slated for the same treatment. It seemed that people who asked questions were called saboteurs, Trotskyite-Fascists or something, and they kept dying at an alarming rate."

I ordered another Martini for Len and asked how Steve had managed to save himself.

"He beat it across the mountains into France," Len explained. "Since then he's steered clear of causes. He goes to sea once in a while to make a few bucks, drinks a lot, reads a lot, asks some of the shrewdest questions I know. If he's anything you can put a label on, I'd say he was a touch of Rousseau, a touch of Tolstoi, plenty of Voltaire. Come to think of it, a touch of Norbert Wiener too. Wiener, you may remember, used to ask some damned iconoclastic questions for a cyberneticist. Steve knows Wiener's books by heart."

Steve sounded like a very colorful fellow, I suggested.

"Yep," Len said. "Marilyn used to think so." I don't think I moved a muscle when he said it; the smile didn't leave my face. "Ollie," Len went on, "I've been meaning to speak to you about Marilyn. Now that the subject's come up—"

"I've forgotten all about it," I assured him.

"I still want to set you straight," he insisted. "It must have looked funny, me moving down to New York after commencement and Marilyn giving up her job in the lab and following two days later. But never mind *how* it looked. I never made a pass at her all that time in Boston, Ollie. That's the truth. But she was a screwy, scatter-brained dame and she decided she was stuck on me because I dabbled in poetry and hung around with artists and such in the Village, and she thought it was all so glamorous. I didn't have anything to do with her chasing down to New York, no kidding. You two were sort of engaged, weren't you?"

"It really doesn't matter," I said. "You don't have to explain." I finished my drink. "You say she knew Lundy?"

"Sure, she knew Lundy. She also knew Kram, Rossard, Broyold, Boster, De Kroot and Hayre. She knew a whole lot of guys before she was through."

"She always was sociable."

"You don't get my meaning," Len said. "I am not talking about Marilyn's gregarious impulses. Listen. First she threw herself at me, but I got tired of her. Then she threw herself at Steve and *he* got tired of her. Damn near the whole male population of the Village got tired of her in the next couple years."

"Those were troubled times. The war and all."

"They were troubled times," Len agreed, "and she was the source of a fair amount of the trouble. You were well rid of her, Ollie, take my word for it. God save us from the intense Boston female who goes bohemian—the icicle parading as the torch."

"Just as a matter of academic curiosity," I said as we were leaving, "what became of her?"

"I don't know for sure. During her Village phase she decided her creative urge was hampered by compasses and T-squares, and in between men she tried to do a bit of painting—very abstract, very imitative-original, very hammy. I heard later that she finally gave up the self-expression kick, moved up to the East Seventies somewhere. If I remember, she got a job doing circuit designing on some project for I.B.M."

"She's probably doing well at it," I said. "She certainly knew her drafting. You know, she helped lay out the circuits for the first robot bedbug I ever built."

November 19, 1959

Big step forward, if it isn't unseemly to use a phrase like that in connection with Pro research. This afternoon we completed the first two experimental models of my self-propelled solenoid legs, made of transparent plastic so everything is visible—solenoids, batteries, motors, thyatron tubes and transistors.

Kujack was waiting in the fitting room to give them their first tryout, but when I got there I found Len sitting with him. There were several empty beer cans on the floor and they were gabbing away a mile a minute.

Len *knows* how I hate to see people drinking during working hours. When I put the pros down and began to rig them for fitting, he said conspiratorially, "Shall we tell him?"

Kujack was pretty crooked, too. "Let's tell him," he whispered back. Strange thing about Kujack, he hardly ever says a word to me, but he never closes his mouth when Len's around.



"All right," Len said. "*You* tell him. Tell him how we're going to bring peace on Earth and good will toward bedbugs."

"We just figured it out," Kujack said. "What's wrong with war. It's a steamroller."

"Steamrollers are very undemocratic," Len added. "Never consult people on how they like to be flattened before flattening them. They just go rolling along."

"Just go rolling, they go on rolling along," Kujack said. "Like Old Man River."

"What's the upshot?" Len demanded. "People get upshot, shot up. In all countries, all of them without exception, they emerge from the war spiritually flattened, a little closer to the insects—"

like the hero in that Kafka story who wakes up one morning to find he's a bedbug, I mean beetle. All because they've been steamrolled. Nobody consulted them."

"Take the case of an amputee," Kujack said. "Before the land mine exploded, it didn't stop and say, 'Look, friend, I've got to go off; that's my job. Choose which part you'd prefer to have blown off—arm, leg, ear, nose, or what-have-you. Or is there somebody else around who would relish being clipped more than you would? If so, just send him along. I've got to do some clipping, you see, but it doesn't matter much which part of which guy I clip, so long as I make my quota.' Did the land mine say that? No! The victim wasn't consulted. Consequently he can feel victimized, full of self-pity. We just worked it out."

"The whole thing," Len said. "If the population had been polled according to democratic procedure, the paraplegia and other maimings could have been distributed to each according to his psychological need. See the point? Marx corrected by Freud, as Steve Lundy would say. Distribute the injuries to each according to his need—not his economic need, but his masochistic need. Those with a special taste for self-damage obviously should be allowed a lion's share of it. That way nobody could claim he'd been victimized by the steamroller or got anything he didn't ask for. It's all on a voluntary basis, you see. Democratic."

"Whole new concept of war," Kujack agreed. "Voluntary amputeeism, voluntary paraplegia, voluntary everything else that usually happens to people in a war. Just to get some human dignity back into the thing."

"Here's how it works," Len went on. "Country A and Country B reach the breaking point. It's all over but the shooting. All right. So they pool their best brains, mathematicians, actuaries, strategists, logistics geniuses, and all. What am I saying? They pool their best *robot* brains, their Emsiacs. In a matter of seconds they figure out, down to the last decimal point, just how many casualties each side can be expected to suffer in dead and wounded, and then they break down the figures. Of the wounded, they determine just how many will lose eyes, how many arms, how many legs, and so on down the line. Now—here's where it gets really neat—each country, having established its quotas in dead and wounded of all categories, can send out a call for volunteers."

"Less messy that way," Kujack said. "An efficiency expert's war. War on an actuarial basis."

"You get exactly the same results as in a shooting war," Len insisted. "Just as many dead, wounded and psychologically messed up. But you avoid the whole steamroller effect. A tidy war, war with dispatch, conceived in terms of ends rather than means. The end never did justify the means, you see; Steve Lundy says that was always the great dilemma of politics. So with one fool sweep—fell swoop—we get rid of means entirely."

"As things stand with me," Kujack said, "if *anything* stands with me, I might get to feeling sore about what happened to me. But nothing happens *to* the volunteer amputee. He steps up to the operating table and says, 'Just chop off one arm, Doc, the left one, please, up to the elbow if you don't mind, and in return put me down for one-and-two-thirds free meals daily at Longchamps and a plump blonde every Saturday.'"

"Or whatever the exchange value for one slightly used left arm would be," Len amended. "That would have to be worked out by the robot actuaries."

By this time I had the pros fitted and the push-button controls installed in the side pocket of Kujack's jacket.

"Maybe you'd better go now, Len," I said. I was very careful to show no reaction to his baiting. "Kujack and I have some work to do."

"I hope you'll make him a moth instead of a bedbug," Len said as he got up. "Kujack's just beginning to see the light. Be a shame if you give him a negative tropism to it instead of a positive one." He turned to Kujack, wobbling a little. "So long, kid. I'll pick you up at seven and we'll drive into New York to have a few with Steve. He's going to be very happy to hear we've got the whole thing figured out."

I spent two hours with Kujack, getting him used to the extremely delicate push-button controls. I must say that, drunk or sober, he's a very apt pupil. In less than two hours he actually walked! A little unsteadily, to be sure, but his balance will get better as he practices and I iron out a few more bugs, and I *don't* mean bedbugs.

For a final test, I put a little egg cup on the floor, balanced a football in it, and told Kujack to try a place kick. What a moment! He booted that ball so hard, it splintered the mirror on the wall.

November 27, 1959

Long talk with the boss. I gave it to him straight about breaking up the lab into K-Pro and N-Pro, and about there being little chance that Goldweiser would come up with anything much on the neuro end for a long, long time. He was awfully let down, I could see, so I started to talk fast about the luck I'd been having on the kinesthetic end. When he began to perk up, I called Kujack in from the corridor and had him demonstrate his place kick.

He's gotten awfully good at it this past week.

"If we release the story to the press," I suggested, "this might make a fine action shot. You see, Kujack used to be one of the best kickers in the Big Ten, and a lot of newspapermen will still

remember him." Then I sprang the biggest news of all. "During the last three days of practice, sir, he's been consistently kicking the ball twenty, thirty and even forty yards farther than he ever did with his own legs. Than anybody, as a matter of fact, ever has with real legs."

"That's a wonderful angle," the boss said excitedly. "A world's record, made with a cybernetic leg!"

"It should make a terrific picture," Kujack said. "I've also been practicing a big, broad, photogenic grin." Luckily the boss didn't hear him—by this time he was bending over the legs, studying the solenoids.

After Kujack left, the boss congratulated me. Very, *very* warmly. It was a most gratifying moment. We chatted for a while, making plans for the press conference, and then finally he said, "By the way, do you happen to know anything about your friend Ellsom? I'm worried about him. He went off on Thanksgiving and hasn't been heard from at all ever since."

That was alarming, I said. When the boss asked why, I told him a little about how Len had been acting lately, talking and drinking more than was good for him. With all sorts of people. The boss said that confirmed his own impressions.

I can safely say we understood each other. I sensed a very definite rapport.

November 30, 1959

It was bound to happen, of course. As I got it from the boss, he decided after our talk that Len's absence needed some looking into, and he tipped off Security about it. A half dozen agents went to work on the case and right off they headed for Steve Lundy's apartment in the Village and, sure enough, there was Len.

Len and his friend were both blind drunk and there were all sorts of incriminating things in the room—lots of peculiar books and pamphlets, Lundy's identification papers from the Lincoln Brigade, an article Lundy was writing for an anarchist-pacifist magazine about what he calls Emsiac. Len and his friend were both arrested on the spot and a full investigation is going on now.



The boss says that no matter whether Len is brought to trial or not, he's all washed up. He'll never get a job on any classified cybernetics project from now on, because it's clear enough that he violated his loyalty oath by discussing MS all over the place.

The Security men came around to question me this morning. Afraid my testimony didn't help Len's case any. What could I do? I had to own up that, to my knowledge, Len had violated Security on three counts: he'd discussed MS matters with Kujack in my presence, with Lundy (according to what he told me), and of course with me (I am technically an outsider, too). I also pointed out that I'd tried to make him shut up, but there was no stopping him once he got going.

Damn that Len, anyhow. Why does he have to go and put me in this ethical spot? It shows a lack of consideration.

These Security men can be *too* thorough. Right off they wanted to pick up Kujack as well.

I got hold of the boss and explained that if they took Kujack away we'd have to call off our press conference, because it would take months to fit and train another subject.

The boss immediately saw the injustice of the thing, stepped in and got Security to calm down, at least until we finish our demonstration.

December 23, 1959

What a day! The press conference this afternoon was *something*. Dozens of reporters and photographers and newsreel men showed up, and we took them all out to the football field for the demonstrations. First the boss gave a little orientation talk about cybernetics being teamwork in science, and about the difference between K-Pro and N-Pro, pointing out that from the practical, humanitarian angle of helping the amputee, K is a lot more important than N.

The reporters tried to get in some questions about MS, but he parried them very good-humoredly, and he said some nice things about me, some very nice things indeed.

Then Kujack was brought in. He really went through his paces, walking, running, skipping, jumping and everything. It was damned impressive. And then, to top off the show, Kujack place-kicked a football ninety-three yards by actual measurement, a world's record, and everybody went wild.

Afterward Kujack and I posed for the newsreels, shaking hands while the boss stood with his arms around us. They're going to play the whole thing up as IFACS' Christmas present to one of our gallant war heroes (just what the boss wanted: he figures this sort of things makes IFACS sound so much less grim to the public), and Kujack was asked to say something in line with that idea.

"I never could kick this good with my real legs," he said, holding my hand tight and looking straight at me. "Gosh, this is just about the nicest Christmas present a fellow could get. Thank you, Santa."

I thought he was overdoing it a bit toward the end there, but the newsreel men say they think it's a great sentimental touch.

Goldweiser was in the crowd, and he said, "I only hope that when *I* prove I'm God, this many photographers will show up." That's just about the kind of remark I'd expect from Goldweiser.

Too bad the Security men are coming for Kujack tomorrow. The boss couldn't argue. After all, they were patient enough to wait until after the tests and demonstration, which the boss and I agree was white of them. It's not as if Kujack isn't deeply involved in this Ellsom-Lundy case. As the boss says, you can tell a man by the company, etc.

December 25, 1959

Spent the morning clipping pictures and articles from the papers; they gave us *quite* a spread. Late in the afternoon I went over to the boss's house for egg-nogs, and I finally got up the nerve to say what's been on my mind for over a month now. Strike while the iron's, etc.

"I've been thinking, sir," I said, "that this solenoid system I've worked out for Pros has other applications. For example, it could easily be adapted to some of the tricky mechanical aspects of an electronic calculator." I went into some of the technical details briefly, and I could see he was interested. "I'd like very much to work on that, now that K-Pro is licked, more or less. And if there *is* an opening in MS—"

"You're a go-getter," the boss said, nodding in a pleased way. He was looking at a newspaper lying on the coffee table; on the front page was a large picture of Kujack grinning at me and shaking my hand. "I like that. I can't promise anything, but let me think about it."

I think I'm in!

December 27, 1959

Sent the soup-and-fish out be cleaned and pressed. Looks like I'm going to get some use out of it, after all. We're having a big formal New Year's Eve party in the commons room and there's going to be square dancing, swing-your-partner, and all of that. When I called Marilyn, she sounded very friendly—she remembered to call me Oliver, and I was flattered that she did—and said she'd be delighted to come. Seems she's gotten very fond of folk dancing lately.

Gosh, it'll be good to get out of these dungarees for a while. I'm happy to say I still look good in

formals. Marilyn ought to be quite impressed. Len always wore his like pajamas.

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