

## THE ORB OF PROBABILITY

THE YEAR 9678 did not start out as if it would prove particularly momentous. It was no different from a long line of preceding years that stretched far back into the dim and fabulous recesses of the fourth millennium. In fact, there was a certain dull monotony, a deadly sameness about the years and centuries and millennia as they slipped imperceptibly into eternity that explained, if perhaps it did not justify, the catastrophic experiment that Fran 19 evolved out of infuriated boredom and an atavistic thirst for adventure.

He stared with jaundiced eyes at the unending panorama of his Sector. He stood, rather than reclined, in itself a most unusual and strength-taxing effort. But then, Fran 19 was a mistake, a carelessly matched aggregation of genes. In former and less polished times he would have been quietly done to death, as a machine with ill-fitting parts is scrapped. But now even that bit of decision was too much for the Guardians of the Mating Cells. They opened somnolent eyes on that Machine that had perpetrated this grievous error, stirred slightly and perhaps uneasily, as if qualms of outmoded conscience whispered of their duty, and subsided into their original torpor.

As a result Fran 19 lived. He was the nineteenth mating of heritable qualities which had been approved in Francis Middleton, of the First Scientific Guild.

Inasmuch as the crude, blundering methods that nature employed for immortalizing the race were subject to incalculable mutations and twists of heredity, it was considered more scientific to employ the new technique of parthenogenesis, or unitary parental birth. Thus, the genes of Francis were stimulated to subdivision and reproduction by the use of the proper solutions, and gave rise to Francis 2. He in turn, at the calculated period when new births were necessary to counterbalance the deaths of a still mortal race, gave of his genes for the emergence of a successor. As like as peas in a pod they were—Francis 1, Francis 2, Francis 3. In the course of time, as speech became more and more monosyllabic and a tiring effort, the patronymic was shortened to Fran.

The first Frans had remarkably short lives, to wit, between seventy and ninety years apiece, but as the momentum of that first great scientific push continued, and disease was conquered, accidents reduced, physical conditions of the exterior world tampered with, and the internal mechanism of the human body more delicately balanced, death grew more and more tardy. Fran 18 had succumbed at the age of 790 years to a certain ennui, a lack of malaise, one might say, that made the burden of this world too grievous for his languid self.

There were even stray rumors that the present generation, of which Fran 19 was a member, was immortal, that only a definite exterior physical cause could bring oblivion and the surcease of death. Fran hoped not.

Already, at the youthful age of 75, he dreaded the long, unending years that stretched monotonously ahead. Rather a brief existence of say 500 years, crammed with the unpredictable, with physical and mental danger and excitement, with futile but vigorous strivings toward something outside oneself, than this creeping immortality in which everything was predigested, prearranged, precalculated for them by the omnipresent Machines.

Several times he had ventured to broach these rebellious thoughts to his friends. Friends, perhaps, was too strong a term for the pale, anemic relationship between man and man. Woman, with the abolition of the necessity of sex, had become almost indistinguishable from man. But they had edged slightly and languidly away.

Their fluted voices whispered in tired monosyllables.

Fran 19 was different from them, was he not? Something to do with his genes, it seemed. Made him sometimes a bit—shall we say, crude? Not like our highly civilized, polished selves. There were times when his voice was loud and raucous, when low animal vigor positively exuded from his body. Once Char 17 had seen him walking the flower-spangled turf between the vistas. All of a hundred yards, I

should say. Walking? Yes, a primitive form of locomotion produced by moving one's appendages alternately forward. Fancy—and here the speaker delicately shrugged the gravity-twisting cells that extended like short vanes from his shoulders—when soaring is so simple.

The narrator fell back on his couch exhausted. He had overtaxed his strength; he had spoken too much. For two days now he would retire into the quiet, during which period he would lie unstirring, unspeaking, unthinking, while the Feeding Machine injected liquid nourishment into his veins.

The art of conversation was completely lost. There was no need for it. The world was a perfect mechanism. Nothing ever happened, nothing could happen, to change the even tenor of existence. Each hour was like the preceding, each day like the last, and one century much like another.

THE MACHINES had achieved perfection back in the fifth and sixth millennia. From birth to grave they tended the human race—efficiently, tirelessly, perfectly. They dwelt in huge Machine Cities at regular intervals over the face of the earth. They dug metals from the stubborn ground; they powered themselves with smashed atoms. They sent pulsing surges of current through the ether to the subsidiary, personal Machines that tended the humans in their homes.

Within their gleaming interiors was manufactured the synthetic food—a perfumed liquid broth—which the Feeding Machine injected directly into the veins. They catalogued and kept alive in vitreous culture the precious genes of inheritance and arranged them in the proper combinations when the Statistics Machine calculated it was time for new births.

Fran 19 was an almost unheard-of accident. It was for rare occasions like this that a few human beings with dim memories of forbears who had been members of the Scientific Guild, maintained a nominal supervision of the Machines.

The Machines reared the children in automatically regulated incubators. They dressed, fed and clothed the people; they propelled the gravity-twisting cells by means of which man could circumnavigate the world, if he so desired, in a few hours. But very few did. There was no reason for it. The ends of the earth were an exact reproduction of the home Sector.

There were no deserts, no wild spaces, no glaciers, no jungles. From pole to pole the Sectors spread in endless monotony. There were no storms, no droughts, no mutable weather. A vast, unchanging blanket of warmth infolded the globe. Rain fell only when and in the circumscribed areas that it was necessary. Even the mountains were carefully trimmed and manicured. The oceans surged to the tides as of old, but no winds ruffled their broad bosoms to uneasy wrath, and huge retaining walls held them safe from harm.

Fran 19 stared out at the placid, interminable scene for the thousandth time. But this once the usual ennui, the unutterable boredom, the feeling of being swathed in soft cotton wool, did not possess him. He was in deep thought. Little ridges of flesh puckered up his ordinarily smooth forehead, little pulses throbbed in unaccustomed parts of his body. Excitement, such as he had never known before, swept over him in dizzying waves. It was alarming—and it was thrilling.

He turned for a last look at his crystal-inclosed laboratory. The apparatus, quiescent now, was plain for all the world to see. There were no secrets in the 97th century. Nor was there vulgar curiosity. The very fact that a human being, in this day and age, chose to exert himself unreasonably with messy wires and tubes and apparatus when the Machines were all-sufficient, gave rise to slight lifting of eyebrows, and nothing more.

Fran 19 laughed shortly. In all the world possibly he was the only one who thought the frontiers of science had not been reached, that with human experimentation, as against the cold precision of the Machines, new theories, new concepts of the universe might be evolved. For twenty years now he had worked in his laboratory, learning from the Memory Machines the science others did not trouble to know. Then, with their assistance, he had performed all the great path-finding experiments of the past. Slowly at first, laboriously, for the Machines required new settings for the unusual work, and his own fingers were clumsy at these tasks, but later with increasing rapidity and expertness.

One day, however, not two years before, the Tending Machines stopped all work. Not that they rebelled—they were not geared for human emotions—nor because any Guardian interfered—man-was a

free agent in the 97th century, unshackled by law or superior force—but because the Machines had reached the limits of the knowledge which had been originally incorporated into them and which they had been able to extend for themselves by purely mathematical and physical processes. Beyond that, to achieve new concepts, new hypotheses, if such there still remained in the universe, something else was required, something that no machine could duplicate, something which seemingly had died from persistent disuse. *Imagination!*

## II

FOR WEEKS Fran 19 had moped and sulked at his idle Tending Machines. His imaginative processes were still atrophied. But that accidental mingling of unpedigreed genes with the pure, but unexciting strain of his ancestors, continued to ferment. A little glimmer struggled painfully through his mind. The last experiments, dealing with Wave Mechanics and the innermost structure of the electron, furnished the spark.

He set to work again, a new grimness in the soft, hitherto unsullied lines of his face. He even immured himself for three and four hours at a time in the laboratory.

For two years Fran worked. The Tending Machines assisted, but only under specific orders. They were beyond their depth. The Calculating Machine, of course, did all the mathematical integrations. And now it was completed—that round, crystalline globe in the farther corner, in whose transparent depths was an intricate maze of metal.

For the moment Fran 19 was stricken with panic. He was, in spite of everything, the product of his age. He shrank from the unfathomable possibilities of this thing he had created. There was even danger—danger that had been eliminated from the world for thousands of years. It was one thing to revolt in one's soul from the ineffable peace and accompanying boredom of existence; it was another to be confronted with the fact of disorder, confusion, physical danger and the not remote probability of annihilation.

Then his face hardened. The shiver of fear passed and left in its wake steel. The thrill of excitement, the incalculability of what faced him, even death, made him alive, as he never had been before. This was living, this was life! A song burst from his lips, tuneless, rusty. Man hadn't sung for centuries. What had there been to sing about?

He spread his flying vanes. He needed witnesses for his experiment, in case— A twitch of the shoulders and he soared off into the air. The vanes were uncanny. Slight twitches and they bent the gravity lines this way and that, propelling him on an appointed course. The sun's tempered rays were glareless and bathed the earth in a pleasant glow. A uniform layer of ionized atmosphere some three miles up took care of that. The warmth was that of a tepid bath, slightly under body temperature, comfortable but enervating. The Weather Machines provided for that.

His goal was the City of the Machines. There were two men with whom he wished to talk, Guardians both. As Guardians they were a step above the rest of humankind in initiative. No law compelled them to their self-appointed tasks; only a dim and fast fading tradition of service inculcated in their genes from remote ancestors of the Scientific Guild.

The Sector dropped away. Trim trees spaced beneath. Then the City of the Machines loomed into view. A great rounded dome of crystal clearness. He descended swiftly. At his approach a section swung noiselessly open. The shadow of his body had impinged on a photo-electric cell, closed a circuit. He floated down to the ground level. For a brief moment he stared curiously around. It was not his first visit. Years ago he had been a Guardian, until the tireless, noiseless movements of the Machines had oppressed him with a feeling of the futility of the human race, of his absolute inconsequence in the scheme of things.

Now he stared at them with new eyes. He even felt superior to their glistening, flawless surfaces. There was that in his *vista* which surpassed them all, which might even—and again the shock of the unknown tingled through him—bring about a new order of things, bring blessed chaos where monotonous peace had reigned so long.

IN THE very center of the crystal city was a huge, gleaming cylinder. It sprang solidly from the hard floor surface, thrust upward its smooth, rounded flanks until it penetrated the transparent hemisphere. At the very top it swelled into a faceted globe that turned with ceaseless motion. Light-blue flares burned within the innumerable facets, ebbed to nothingness, and flared again. Power sped on invisible beams to the Sectors, power and geared instructions to the mobile Machines that performed the local duties.

At the base of the cylinder, and encircling it with spaced platforms to a height of a hundred feet, was the Communications Board of the Machine. A bewildering maze of filaments and impulse receivers and cells. Yet each slender strand had its specific function. Here was determined, by a change in the steady vibratory beat of a Machine, that a breakdown had occurred, that the sensitive balance had been destroyed. Impulses flashed automatically to the sending cylinder for Repair Machines to get under way. Here were prepared the great calculations and integrations whereby the world was run on an even keel. They were based on innumerable sending reports from the individual Machines. Here was determined, on the data of reported death of their wards, the human race, the necessity for new matings of pedigreed genes. In short, the eyes, ears, and brain of a Machine-dominated civilization.

Huge flying transports, automatic in operation, dropped from the sky, nestled to magnetic currents on the landing platforms. Hatches opened automatically, disgorged their loads of minerals and precious metals from far-off mines into tubes that fed into the proper Machines on the floor of the city.

The atom-blasting units absorbed the gushing stream of bauxite, already pulverized at the mines, and with noiseless, yet supernal forces within their rounded bellies, tore the electrons from their flashing orbits, sent uncounted trillions of positrons on their ephemeral paths, flashed them both into annihilation, and thereby released in a blaze of photon bullets and gamma rays the stored energy of matter.

The Building Machines received their loads of metal and concrete, flew to their appointed tasks. The Cell-Mating Machines were idle now. No one had died within the past year.

A half dozen human beings reclined on luxurious, air-cushioned couches. They were the Guardians. They did not stir; their eyes were blank on somnolent visions. Their services were unneeded.

But there were two, whose couches, close together, faced the all-important platforms of the Brain. These were the Guardians whom Fran 19 was seeking.

Their recognition signals blazed greeting as he dropped to their side. The eyes of the younger lighted up with pleasure. He was about Fran's age, face delicate and girlish, and smoothly unlined. His hands, when they moved, were quick and birdlike. Vic 21 was Fran's best friend in a world where friendship was a forgotten dream.

"You appear excited, Fran," Vic said slowly. "You haven't—"

Fran nodded. He could not keep his eyes from dancing.

Vic half arose from his couch, sank back. "You—you've finished your work?" There was a hint of awe, of overlaid fear in his voice.

"Yes. That's what I came to see you both about."

The older man said nothing, but there was that in his still-piercing gaze which commanded explanation. He had not moved or stirred. His ruddy face, though smooth, connoted age. A patriarchal beard swept down over his tunic. No Barber Machine had ever cropped his whitened locks. Sem 15 was old, almost incredibly old in an era of Methuselahs. He was 1051 years old, the oldest man alive in the 97th century. He had outlived all his contemporaries, seen them succumb to sheer weariness of living, to accidents, to the natural decay of mortal faculties.

SEM 15 had no official power or dignities. No one bowed to his will, nor did he attempt to impose it. Such things were unheard of in the 97th century. But by reason of his tremendous age, by reason of the accumulated wisdom that the slow passage of the years must have brought, by reason of the fact that he had constituted himself a perpetual Guardian to the Brain Machine, he had achieved a certain prestige.

Fran turned to the patriarch. "I did not tell you before, Sem 15," he said respectfully, "because I had not finished; because I feared failure. Even now there—"

Sem surveyed the youth of seventy-five with benign tranquillity. "You have labored, Fran 19, as no one has labored since the memory of man." His voice was rusty, halting, but not unpleasant. "It is not good."

"But this is different, Sem 15," Fran said eagerly. "I have done something new, something that the Machines could never have accomplished. I have enlarged the boundaries of knowledge."

Sem smiled vaguely. "Knowledge?" he murmured. "What need have we for new knowledge? Is there more that the Machines can do for us? Unless"—and a slight flicker of interest showed in his eyes—"unless you have perfected a Guardian Machine."

Fran felt as if he were being bogged in an endless ocean of inertia. "No, it is not that," he answered slowly. "In fact, it is at the very opposite pole. Instead of still further elimination of human effort and toil, the principle I have discovered and the machine I have based upon it will bring toil and struggle and danger once more to the human race."

Vic's eyes flared with sudden enthusiasm, died down again to a fear—fear of the unknown. He stared at his soft, milky-white hands and said nothing.

But Sem 15 did an unprecedented thing. He jerked bolt upright, long beard rippling over his chest. Then as if the effort had been too great, he relaxed with a long sigh.

"Fran 19 is mad," he murmured to no one in particular. "He is a mistake, a dangerous mistake. I, Sem 15, who was Guardian of the Mating Cells at his birth, am to blame. He is a relic of barbarism, of his tailed ancestors in the mists of antiquity."

Then it was that Fran did an even more unprecedented thing. Never before had man exercised coercion over fellow man. But Fran was overwrought, tense with the completion of his work. Therein lay his excuse for what he did. Therein, and in the fact that by no other means could he have prodded Sem from his Guardian couch. And if Sem did not come, Vic 21 would not have dared.

With a quick swoop Fran was upon the patriarch. Before Sem knew what had happened, he was jerked violently from his seat, dragged like an inert lump of metal high into the air.

Fran's vanes were spread, heading him straight for the shining crystal dome.

"Come on, Vic," he shouted, "follow me. Sem will inspect my Machine whether he wants to or not."

The scattered Guardians raised themselves on elbows at the violence done their eldest. It was unheard of; it was an outrage; it was—sacrilegious. A vague premonition of future disaster flitted like a shadow over their thoughts; then they sank slowly back to their cushioned rest. Vic was horrified. Fran was his friend and like a breath of cold, invigorating wind, but this was really going too far. It was an unwarrantable invasion on man's sacred privacy; it was — He spread his vanes, twitched, and soared after his friend.

THE DOME slid open at their approach, slid shut behind them. Like a mythical eagle Fran flew, holding his prey in strong clutching arms. Sem 15 had not moved, had not stirred from his limpness. Now he raised his eyes to his ravisher.

"This work of yours," he observed quietly, "must mean everything to you, for you to have done this. I shall look at it."

"It does, and thank you," Fran cried, and released his hold. Side by side the three slid through the air. There was a song in Fran's heart. Sem 15 understood.

They landed on Fran's *vista*. The laboratory gleamed shining and intricate behind the vita-crystal walls. The transparent globe seemed but an inconspicuous part in the array of instruments.

Sem 15 stood gravely before its rounded orb. The rest of the apparatus had taken no more than a slow unhurried glance. Sem had seen equipment like that in the City of the Machines. But this

"The idea came to me almost in a flash, Sem 15," Fran said eagerly. "I was bored with life, with the do-nothingness that infects our race with dry rot. I wanted to know things, to seek for things unknown. I did not want the Machines to cradle me like an infant."

Sem surveyed the youngster quizzically. Back in his own youth he too had had such fleeting thoughts, but they had succumbed to the easy flow of existence.

"I started to learn for myself," Fran went on. "It was hard, tedious work, but there grew a certain joy

of achievement in me such as I had never experienced before. Then one day, it was over. I had learned all that the Machines knew, all that former generations of scientists had sought out and then declared that the frontiers had been reached. I was in despair. My accomplishments seemed futile. I felt there must be more; something important just beyond."

The words were tumbling from Fran now. "Then like a flash it came. The very last thing I had studied was the problem of Wave Mechanics. An ancient named Schrodinger had founded the science; later men had added to it. Matter is atoms, atoms are protons, electrons, positrons, neutrons. These in turn are aggregations of waves or ripples on the surface of a subether. The electron, for example, is the intersection of series of these waves."

Sem 15 nodded. He was listening intently now, the blankness of his placid existence pierced. Thus far he too had gone before he had left off.

"But this was not all," Fran said excitedly. "Even in the distant past, thousands of years ago, they knew more. They knew that the electron, while obeying the mathematical laws of waves and ripples, was also a particle, in obedience to even more ancient mathematics. But it could not be placed. Somewhere, it was true, it existed within a wave group, but that wave group was indefinite in extent. It had no sharp lines of limitation. It just trailed off into surrounding space; it might, for all they knew with the instruments at their command, extend vaguely into infinity."

"But what," breathed Vic, frowning painfully with unaccustomed thought, "did that mean as far as the electron was concerned?"

"Just this. That there was no determinate position for the electron. Somewhere within the vague and trailing series of waves the electron existed. Its exact position was purely a probability, and 'X' in the equation of the waves. Within that area it was equally likely to be anywhere."

"That much I knew also," Sem admitted.

"Heisenberg went a step farther," Fran said. "He elucidated the Principle of Indeterminacy. That it was impossible to know both position and velocity of an electron at a given instant. Measure one and the other changes instantaneously. Since both factors are required for accurate determination, we were, it was said, forever debarred from exact statement of cause and effect in the micro-universe."

Sem said placidly. "Well, what harm is there in that? For all practical purposes, the probability that an electron is within a given area of waves is sufficiently limited by the fact that the circumscribed area itself is so inconceivably small. It acts for our Machines as if it were a point."

"Exactly," Fran exclaimed, eyes snapping. "That's why nothing more was done about it. It was all pure theory. But I have changed that."

Sem stared at him. "How?"

Fran's voice vibrated with pride. He looked lovingly at the transparent globe. "I have," he said very slowly and distinctly, "immeasurably enlarged the limiting area of an electron wave."

Sem shook his head dazedly. He did not understand. Vic certainly did not. He said so vehemently. His head was aching.

"Hold this fact," Fran explained patiently. "An electron is merely something somewhere within a series of waves; these waves have no ascertainable limits, but the probability of the electron's existence so far has been limited to a tiny, circumscribed area."

"Continue," Sem ordered, knitting his brows.

"Well, with this Machine, I have enlarged that area of waves. Instead of trailing out into vagueness, I have continued them at almost a dead-level strain for tremendous distances. How far, I myself don't know yet. It might be a yard, it might be millions of miles."

Vic grasped at that eagerly, proud of the fact that he had followed. "That means then that the electron, the basis of matter, might be anywhere in that extended area; that its presence in the spot where it is visible in the mass is only a probability."

"Exactly."

'Sem, however, caught the implications like a blow in the face. His smooth, ruddy features went pale.

"If that is true," he almost quavered, "the present position of every particle of matter in the universe

would become only a mere probability. The probability that I, as an aggregation of electrons, am here in this vista might yield the very next instant to an equal probability that I am somewhere else within that enlarged area of wave trains."

"You have grasped it perfectly, Sem 15," Fran cried delightedly. "I committed no error in taking you into my confidence."

BUT Sem did not hear him. His eyes were fixed with a strange intentness on that innocent-looking globe. He saw the filaments, the receiving cells that tapped the unlimited power of the Central Machines, and a queer series of grids that looked like a new type of transformer.

"It is a transformer," said Fran, reading his thoughts correctly. "That is the heart of the instrument. It acts directly on the subetherial waves of matter. It is highly selective in principle. I have set it for maximum at the energy state of the densest part of the electron waves. Therefore it reacts with the gradually weakening waves as they shade off into infinity, and steps them up in intensity until they have achieved the maximum of the core."

Sem 15's face grew hard. A long-forgotten vigor infused his limbs. He took a quick step forward. His clenched fist raised.

Fran cried out sharply. He twitched in frenzied haste, thrust his vanes into a whirring glide. But already he knew, with a sickening sensation in the pit of his stomach, that he would be too late. He had been far back, off his guard. He had never dreamed—

Vic 21 was a blur of emotions. Never after could he determine what it was that made him do the incredible thing he did. Perhaps it was a latent instinct out of the distant reaches of time; perhaps it was a strangely novel access of loyalty to his friend; perhaps, somewhere in his genes, unknown to the Mating Cells, had lurked a curious adventurous streak— In any event he sprang, heaved Sem's down-descending fist aside, sent the patriarch sprawling with all the strength of his slender body.

For a small instant he stood panting, dizzy, filled with strange, ineluctable emotions that were somehow thrilling. The forgotten joy of conflict, of body hurtling into body. Then Fran, face drawn and white, flashed by, dead-stopped before his precious globe. That fragile bubble crystal, which Sem had attempted to smash, to rip tubes and strands and transformer into irremediable ruin. Delicate apparatus that had taken two years to complete.

Sem was slowly, painfully dragging himself to his feet. His gravity-twisting apparatus had been smashed by his fall. A Tending Machine, its delicate impulses disturbed by the thud, by the cessation of vibrations from the vanes, floated into the room. Two supports jerked out, clasped gently around the old man, set him on his feet. A lever unfolded and unhooked the wrecked cells. A message surged through the ether for new gravity vanes.

Fran breathed hard. "You—would have—smashed my invention?" he asked heavily.

Sem's eyes met Fran's squarely. There was no anger in them, no resentment; only sorrow and the shadow of disasters to come.

"Yes," he answered quietly. "I would have smashed it. And I beg you, Fran 19, to do what I was prevented from doing."

A tremor rippled over Fran. "Never," he cried.

"You must," Sem insisted. "I too was once a youth, with youthful ideas and follies. I too rebelled at what seemed the dreadful monotony of the years that spread before me like a lusterless carpet. I too sought knowledge beyond the Machines; but I stopped in time. Now I am older, with more wisdom. Our life is placid; it is uneventful. Each day is like the last, each century indistinguishable from the others. But that is the inevitable concomitant of perfected civilization."

A Repair Machine soared squatly into the room. Folded vanes slid out of an underhanging rack; jointed metal arms hooked them into place on Sem's shoulders. Then it was gone, with the noiseless speed that characterized all the Machines. Sem did not even seem to notice.

His voice rose to unwonted passion. "What more can we desire? Shelter? We have it. Food? At the asking. Leisure? All our time. Luxuries? Name any desire and the Machines will gratify it. Everything that our uncivilized, barbarous ancestors yearned for and deemed unachievable. They who worked by the

sweat of their brows and the wearied straining of their backs for a hundredth of what we possess today without effort; who lived in a world of suffering and disease and torture, who died before they had lived, who agonized for what they never attained, who were filled with vile thoughts and viler emotions—hate, envy, lust, greed—terrible things that you can never fully appreciate.

"Wars there were, in which man slew man and laughed at him in the doing, vast cataclysms of nature which crushed him, pounded him to pieces. Hunger assailed his wretched stomach, thirst his soul. Now"—Sem's voice took on a whispered longing—"we have peace, comfort order, security."

FRAN was not moved, however. "That's just it, Sem 15. We have—everything. Everything—and nothing. We have physical comforts—a superfluity of them—and they are meaningless. Life has become a gray blank. We are dead—and do not know it. We are helpless wards of the Machines. We are their slaves. Without them we die. What profit is there, what incentive remains for us? Life is a struggle, a continual striving for something higher, nobler. Evolution taught us that; without that constant struggle we would still be slimy bits of protoplasm crawling along a slimy shore. We have reached the peaks of civilization, and are frustrated.

"There is no other way but down. With all our perfect, too-perfect state, we are immeasurably inferior to that brutal, lustful, bloodthirsty primitive you have depicted. He at least strove upward and onward, groping in his dim way for something higher, something just beyond his reach. When he starved, he lived; when he struggled with a hostile nature for the bare means of subsistence, he lived. When his few years were over, he died, but not in vain. The wine of life had been in his veins; his offspring groped still farther. And that, Sem 15, is what I intend to introduce into the world again."

"It is back to the brute," Sem cried in shaken tones.

"No," Fran exulted. "It is a breaking of our chains. Chance, the ruling, benevolent spirit of the universe, which we have unwisely eliminated, will once more come into its own." He swung his hand in a wide gesture toward the crystal sphere. "This—this will do it. Electrons, protons, neutrons, positrons, matter of which they are component parts, will widen their range of probability. They may be here, they may be there. No one will know; no one, not even the Statistics Machine, will be able to calculate their whereabouts. No longer will life be safe, sane and monotonous; the future, the present, perhaps the past, will be totally unpredictable, obeying no laws except those of chance; wildly illogical, dangerous.

"Thereby will mankind regain his rightful heritage. Nature will once more prove inimical, to be breasted, fought, conquered. Strange and terrible combinations will lurk in every corner; death will be part of our daily burden. Man will live dangerously, die gloriously. It is worth it."

Vic 21 shrank back half afraid of this stranger who had been his friend. He shrank, yet he was fascinated. Fire surged through his veins, made his heart pound with breathless emotion. Sem 15 seemed suddenly a shrunken old man. His thousand years were an insupportable weight. He bowed his head in resignation. "So be it;" he mumbled.

"Back! Both of you!" Fran said. "I accept full responsibility for what I am about to do. There are two stages possible. The first affects only a radius of ten feet around the Machine. The second"—he shrugged his shoulders slightly, "the vista, the Sector, the earth, the universe perhaps—I do not know. I shall first experiment upon myself."

They moved slowly out of the charmed circle, staring, finding breathing suddenly uncomfortable. That crystal hollow with the shining metal within seemed a thing of dread, ominous in its very quiescence. Fran 19 made a queer, stiff little gesture of farewell. He did not use the greeting signal. Then his long fingers, now steady, closed on the knob, twisted.

Blue flame sheeted through the filaments. A metal governor bobbed up and down. Tiny balls whirled in smooth, noiseless revolutions. A hissing, crackling sound. The pungent odor of ozone. Involuntarily, Vic 21 thrust a slim arm over his head, as if to ward off a blow. Fran dropped nerveless fingers to his side. His body was tense, rigid. His face was white with agonized strain. That very instant he might whiff into atomic ruin.

The blue flame continued to flare, the balls to revolve, the governor to bob. Seconds passed, minutes. Nothing happened. No sign of any change, no sign of anything abnormal. Fran's tight fists slowly

opened. Bewilderment crept into his eyes. Vic let his shielding arm down. Sem straightened a bit; a thin smile played around his half-hidden lips.

Fran saw that smile. A new emotion surged through him. The fear of ridicule. Anger too—at this preposterous Machine he had toiled over.

"You wait," he said thickly. "The Machine's all right. It's just—it's just the limits I tried to place on it. If I open her wide, as far as she will go

He turned the second knob. His voice held a confident ring, but inwardly he knew that it was a failure. It would not, could not work.

A little brighter flare, a tense surge of power that set every nerve tingling. But that was all. Sem said almost kindly: "Turn it off, Fran. The frontiers of science are still closed. It is better so."

Fran groped blindly with both hands. The hot tears scalded his eyes. He was crying with shame and humiliation. Something man hadn't done for centuries. That look in Vic's eyes—of scorn, of His fingers reached for the knob.

#### IV

THE HISSING, crackling sound cut off sharply. The blue glow blanked out with startling suddenness. Fran's hand went forward, forward, and met nothing. His eyes were still blurred with unaccustomed tears. But behind him, from Sem and Vic, came quick, frightened cries.

Fran straightened unsteadily, wiped his vision clear with the soft synthetic stuff of his tunic. He spun around in surprise, raked the room with wide-open eyes.

"My Machine!" he demanded thickly. "Where is it?" Vic was up against the farther wall, crouching, panting.

"It was there," he screamed, "right under our eyes. Then—then—it seemed to puff out of existence."

They searched then. But nowhere was there any sign or mark of the Machine. It was as though it had never been, as if the entire affair had been a dream, a hallucination from which they had just awakened. Even the metal cradle that had held the globe rigid and firm was gone.

Sem 15 raised a patriarchal arm, rested it on Fran's trembling shoulder.

"Fran 19," he said with respect, "you are a mere youth, but you have widened the boundaries of knowledge ; you have done what you set out to do."

Fran lifted his head incredulously. "You mean—you think—" He gasped.

"I *know*," the old man said. "Your Machine worked. It enlarged the wave areas of electrons. It created new probabilities of the positions of those electrons."

Fran was shaking. His thoughts were still not coherent. "Then what—"

"Just this," Sem interrupted. "For some reason, as yet unknown, the Machine acted only on itself. It was its own waves of probability that were affected. The Machine has taken another position in that area. It may, as you remarked before, be just outside; it may be in a distant Sector; it may even be in another galaxy."

Involuntarily all three turned to the crystal walls of the *vista*. Everything was peaceful as before, as if no world-shaking experiment had just taken place. The tempered rays of the sun bathed the Sector in its uniform glow; a few inhabitants soared at different levels; far off, a Carrier Machine was bringing a cargo to the City of the Machines. Nothing else. No sign of the crystal sphere.

Sem spoke with measurable relief. "You have won, Fran, and I am glad." His halting voice deepened. "But I am more happy that it turned out the way it did. We have been saved from terrible catastrophe." He shuddered. "Who knows what might have happened?"

Vic said softly: "Forgive me, Fran, for doubting you. It—it was miraculous. You are a great man. But it is better so."

Fran's ego healed and expanded under their praise. It was good to hear such things. Shame sloughed off like an outworn garment. Now he could face his fellows proudly. He had accomplished the impossible. He had not been content with mere existence; he had toiled; he had achieved; more, he had suffered strange new emotions.

Aloud he said in a disappointed tone: "I am sorry it did not work the way it should. Perhaps a filament was bent and forced the step-up surge into a circumscribed circle." But inwardly he was very glad.

His eyes had been opened. That swift, unforeseen vanishment of the Machine had frightened him, left him trembling in every limb. Suppose the globe had worked as he had intended.

Suppose his waves of probability had extended to the outer reaches of space; suppose he had shifted without warning into the blazing maw of the sun, into the unutterable cold of interstellar emptiness.

Suppose—

All his fine, glittering theories fell from him. He had confronted the inscrutable face of reality and he was afraid. Adventure, chance, glorious annihilation, struggle, suffering—empty phrases. He clung to the peace, safety and security of their uneventful existence with a certain desperation. He had been saved from himself.

He sank gratefully upon a couch. His voice was a monosyllabic whisper. He sighed relief.

"Warm—safe!" he muttered drowsily and fell asleep. So did Sem and Vic. They were exhausted. The Feeding Machines came and injected warm nutriment. They did not hear or feel. The Tending Machines transported them gently into the *quiet*.

But out in space, five hundred miles above the surface of the earth, a new planetoid whirled in ceaseless flight. A tiny crystal sphere, holding in its hollow shell strange metal parts that glowed and revolved and bobbed. And sardonic laughter filled the universe.

THE THREE who had seen the Orb of Indeterminacy vanish came out of the *quiet*. The even tenor of existence flowed slowly on. Sem 15 and Vic 21 once more rested on their couches as Guardians of the Machines. Fran brooded in his *vista*, oddly uneasy. A vague restlessness pervaded him. Nothing had happened, nothing could happen now. Yet, somehow, his inner being had been disrupted. Perhaps, he thought, it would have been better if—

It was a small thing that happened first, a most unimportant event. A Cargo Machine from the mines of Sector 112 was two ounces shy in its hundred-ton load of bauxite. The Atom Smasher jerked momentarily in the smooth surge of its operation. It was geared to exact weights. But almost immediately the Compensator made the necessary adjustments, and the swift routine went on.

Two ounces in a hundred tons. An inconsiderable amount. Perhaps the Loading Machine at the mine had erred; perhaps particles of the crushed ore had spilled. Nothing at all. But such a discrepancy had never happened before.

The next item was more disturbing. Sector 87 reported the sudden, fantastic appearance of a human being within the very wall of a *vista*. Like a fly immersed in a lump of amber. His limbs were distorted, crushed. His face was a pulped agony. He was dead. The immensely strong vita-crystal showed a long, irregular crack, a slight bulging, as if enormous outward pressure had been exerted, as if two bodies had attempted to occupy the same space at once.

The Repair Machines hastened to the spot, excised the shattered stranger, rebuilt the wall to its pristine purity. But not before it had been seen by a passing human. Within seconds the Sector had disgorged its inhabitants. They swarmed to the disturbance; they chattered with tongues that were rusty from disuse; their cheeks flushed and their eyes sparkled. An unprecedented thing had occurred.

Almost at the same time a Tending Machine from Sector 32 reported in passionless pulses of ether to the Communications Board the inexplicable disappearance of its ward, Wil 16.

As the televised representation of the tragedy flashed on the screen of the Board, Vic twitched so violently that his Gravity Vanes thrust him almost to the dome.

"Great Heavens, Sem 15," he gasped on his hurried return, "Fran's invention did that!"

A little shiver passed over Sem; then his face was calm and immovable as before.

"Nonsense," he said slowly. "The sphere removed itself; it had no effect on anything outside. What has happened is an accident, some tiny filament that went wrong in a Gravity Cell unit and smashed the poor fellow against a *vista*. The Statistics Machine will make the necessary adjustments." But there was a strained unease in his eyes as he settled back to the couch.

Integrations poured out of the Calculator, tremendous mathematical phrases to take up the load of the new order of events, to equate them into the scheme of things. But nothing could be done. For simultaneously, overwhelmingly, from the far corners of the earth, came new reports. Sector after Sector flashed uncanny occurrences.

Then, suddenly, disaster struck home. Half a *vista* materialized in the clear atmosphere high over the City of the Machines, hung in momentary suspension, then fell with constantly accelerating force to the ground.

Vic uttered a hoarse cry of warning. The recumbent Guardians seemed paralyzed with fear. They gaped upward, unshaking. But Sem 15 had seen, and acted. The inertia of a thousand years swept off him like a cloak. His vanes catapulted him from his seat, sent him with tremendous acceleration straight for the huge round of the Gravity Distorter. This was the Machine that deflected the lines of gravity around the city when Cargo Flyers approached, routed them within range of the Magnetic Clamps. But now it was silent, unshaking even as the Guardians. Only through an impulse-beat from the swift-moving Cargo Flyer could it spring into automatic action.

Sem's hand clutched fiercely at the manual control. He yanked it down with a quick thrust. Already the down-rushing segment of building was almost upon the crystalline dome of the City.

Tiny dots sprang away from its sides, darted swiftly through the air. Closer, closer, hurtled the crashing destruction. It filled the sky with its smooth-shorn section; it blazed with the friction of its passage. Contact, and the City with all its Machines, its human Guardians, would be pulverized into primal atoms.

Sem gave a great groan. He had been too late. Involuntarily he closed his eyes. There was a thin, scraping sound. Then a tremendous crash. The world was full of noise and confusion.

Shrill screams, then—silence. Sem opened his eyes unbelievably. He was safe. So were the others. Outside, a blaze leaped sky-high, fell back. A long grooved scar showed over the crystal dome, where the falling *vista* had ploughed its way in the sudden swerve of deflected gravity. The Gravity Distorter had worked. Not so the Magnetic Plates. The momentum had been far too great for their calculated power.

Vic 21 was somehow at Sem's side. His body trembled as with ague, but his eyes were shining.

"Sem 15," he cried, "you are a hero." Sem felt suddenly weak. He sank down on a convenient couch. But the blood raced furiously in his veins. His temples throbbed. The world was askew; danger had shown its dreadful face and barely been averted; peace and safety were forever gone; death might in close him any moment; outside men had fallen to flaming annihilation. Yet somehow his blood sang a strange, exultant refrain. He took a deep breath. Even the air seemed more vigorous. He had *lived* this one fierce moment. He had not known life before.

He bounded up from his couch of ease. Contempt flared in his eyes at those other elderly Guardians, younger all than he. Some had fainted; others were fear-bound to their couches. He was a different breed.

"Come, Vic 21," he said crisply, with new-found authority. "We are going to see Fran 19. There is no question that his Orb of Indeterminacy is functioning."

*Fran cried out sharply as Sem raised his fist. He twitched in frenzied haste, but already he knew he would be too late.*

The youth followed with a new meekness. Discipline, authority, obedience had been reborn into the world!

FRAN 19 listened to their excited accounts with a deepening pallor. He had loosed this terrible engine upon the world; his was the blame. Already thousands had been crushed out of existence. The reports were accelerating now. Holes had yawned in the earth; cubic miles of ocean had overwhelmed all

in their path in the interior prairies, on the high plateaus of what had once been the Gobi. Whole Sectors had been wiped out of existence, gone no one knew where.

The earth heaved and crumpled as massed matter assumed new positions of probability which coincided with still stable configurations deep within its bowels. Earthquakes spread endless destruction. Loose, masterless electrons shifted their probabilities in undreamed-of trillions of trillions, let loose X rays, gamma rays, alpha rays, cosmic radiations, upon a groaning, suffering world.

The blanket of ionization was pierced in a hundred places. Winds sprang up, grew to hurricanes. Rain fell, sleet howled, snow came in thick, mantling drifts. The Weather Machines battled valiantly, but some had smashed, others had vanished. The unleashed forces of nature proved irresistible.

"We've got to find my Machine," Fran said with despairing determination.

"How?" Vic asked plaintively. He shivered in his thin synthetic stuffs. A cold rain lashed interminably against the vita-crystal walls. Clouds scudded over a furious sky. A vital part of the Sector's Weather Machine had disappeared. The Repair Machines were tirelessly at work to bridge the gap, but it would take at least a day.

Fran shook his head. "I don't know how—just yet. But there must be a way."

Sem 15's voice was a gusty bellow. His great wide beard whipped around his glowing features. He stood with firm legs spraddled. He did not seem to mind the cold, the damp.

"You'll do nothing of the kind," he roared. "You were right, Fran 19, and I was wrong. You have worked a miracle. This is life!" He tossed his arms wide. "This is living! Struggle, violence, man against nature. Who knows what comes next, who cares? One day like this is worth a hundred thousand of slow rot. Bah!" He spat gustily on the polished floor.

Then the building heaved violently beneath them. The heavens seemed to fall. They fell flat on their faces.

When they dragged themselves painfully to their feet, all was deathly silence. Even the rain had stopped. A strangely brilliant sun, untempered, unshorn, shone mockingly through a rift in ragged, fleeing storm clouds.

"What—what happened?" Vic whispered painfully.

Fran helped Sem to his feet. Blood streamed from a gash in his forehead. He wriggled his shoulders. Nothing. He was rooted to the floor.

"Try your Gravity Cells," he said quickly.

They did. Nothing again. A Tending Machine wobbled crazily in a corner, rolled to a dead stop.

"I think," he said, very slowly and very distinctly, "that something has destroyed the City of the Machines. There is no power."

They stared at each other with dull, drawn faces. No power! That meant no Tending Machines, no Repairs, no food, no locomotion, no means of communication, no civilization. Fran's wild dreams had come to fruition with a vengeance.

"Now, do you see, Sem 15," he asked softly, "why it is imperative to find the Orb?"

The patriarch shook the blood in a spray from his matted locks. He seemed like some Neanderthaler from the days when the earth was young.

"I do not," he declared defiantly. He shook his fist at the heavens. "I am not afraid," he shouted. "Bring on your probabilities; bring on the unpredictable. Ha! ha! I am as incalculable as you all. While I'm alive, while I'm here, I'll seek no favors. I'll wrest what I want from an unwilling world."

Like a prophet of old, like that man immortalized in the long-forgotten song, his head was bloodied, but unbowed. Perhaps he was a little mad just then.

Fran watched him in half admiration, but he saw clearly what had to be done. Instinctively he took command.

"The first thing to do is to determine what happened to the City of Machines; whether there is any possibility of repairs or salvage. Vic, Sem, follow me." Vic looked bewildered, but went obediently. He

was a follower, not a leader. Sem grumbled in his beard, and went along.

## V

OUTSIDE everything was chaos. All landmarks were gone. Strange *vistas* lurched on their sides, or emerged, half buried, from the ground in which they had materialized. Bottomless pits yawned underfoot; great fissures ran diagonally through earth and vita-crystal. Bodies lay in profusion. Remembered faces, faces never before seen, stared sightlessly up at them. Others resembled nothing at all, mere shapeless lumps that had dropped from tremendous heights.

Fran shuddered and stumbled on. Vic was suddenly sick. But Sem did not seem to see. Death and destruction were inevitable concomitants of the change.

Walking was wearisome to their unaccustomed feet. Even to Fran, who had practiced secretly in the days of his revolt. For one thing the ground was a bumpy, hummocky mass. For another, the rain water swirled around their legs, poured in sheeted waterfalls into the depthless chasms beneath. And the City of the Machines was a good four miles distant.

As they made a long detour to avoid a fissure and climbed over the crumpled remains of a *vista*, something darted at them. It had been one with the shadows, flattened stealthily against the wall. Now it was a crashing thunderbolt. Straight for Vic it hurled, a long, quavering howl in its throat.

There was a startled cry from the youth. He tried to swerve. But it was too late. The apparition fastened on him with a hideous cry of triumph. A mouth gaped wide, teeth flashed white in the sunlight, dipped eagerly for Vic's throat.

Fran came out of his daze. He leaped forward. His fist swung out, smashed with a satisfying thud into yielding flesh. The apparition howled with pain. He dropped the half-fainting youth, glared fiercely at his attacker, and darted back into the shadows from which he had come.

Fran caught Vic as he swayed. Sem glowered after the vanished man, shouted strange words that sounded like ancient imprecations.

"You all right, Vic?" Fran asked anxiously.

The youth shuddered, smiled faintly. "Quite. But what—what was that?"

"That," said Fran gravely, "was Char 17. Once a civilized man. Now he is a beast of prey, seeking the food the Tending Machines can no longer give him."

"But I—I didn't have any," Vic protested.

"Human flesh," Fran said, "is food. Long, long ago there were men who ate and found it very good."

They continued in silence. Even Sem seemed shaken by that episode. Bars of metal, wrenched from the lever supports of wrecked Machines, were in their hands. They met other prowlers, who fled like ancient wolves at their determined approach, at the primitive but effective weapons they held.

The dead were everywhere, but so were those who were still alive. Some, unhurt, not yet ghouls and cannibals, lay where they were. Unaccustomed to physical movements, unused to decisive processes of thought, they seemed sunk in deathlike stupor. Fran moved toward them with pitying gestures. They needed help. They would starve to death in their helplessness, if the prowlers did not get to them first.

"Let them alone," Sem objected. "They are not good for anything. They are weaklings who will never survive the new conditions. Better they should die now than drag us down with them."

It was pitiful, but Sem was right. This new world of theirs was a hard, cruel one. Only the strong, the determined, could survive. Food, shelter, clothing, would be at a premium. The weaklings would impede them in the struggle.

So, with the stirrings of humanitarian impulses sternly repressed, they went on. But there were other men, men in whom already the new conditions had brought the latent iron to the surface. Men who did not slink or prowl, who did not weep and bemoan their fate, but toiled purposefully at the wreckage, succoring the wounded, seeking the Machines, trying clumsily to make them work.

These the little party hailed. These were the men of whom the new world would be fashioned. They fell in behind, a steadily growing horde, hasty weapons in hand, streaming toward the silent City of the Machines.

SOMETHING sang in Fran's bosom, something exulted. If only the devilish Orb he had invented were smashed, fate might still prove not too unkind.

"Did you notice," he told Sem abruptly, 'that there have been no further shifts of probability since that last great crash?'"

It was true. All the strange transmigrations had ceased. Matter once more seemed immutably rooted, subject to immutable laws. The First Phase had passed. But Fran did not know it then.

There were almost a hundred men in the band that followed Fran by the time they reached the City. The last chasm had been skirted, the last upheaval laboriously surmounted. As one man they stopped, aghast at what they saw. Whatever hopes they might have cherished were dashed to the ground.

The City of the Machines was an irremediable chaos. A huge hole went down half a hundred miles into the very bowels of the earth. Machines, Tenders, Calculators, Statistical Integrators, had vanished into no one knew what realm of probability along with the hundreds of thousands of tons of soil and underlying rock. Only the Central Power Cylinder remained, flaunting its smooth metallic slenderness on the very edge of the tremendous deep. Nothing else.

The weaker in the party sank hopelessly to the ground. Tear glands sent strange watery fluids trickling down their cheeks. What could they do; where could they turn? The Machines had tended them for thousands of years; now that aid was withdrawn. A new and raw world faced them, a world that cared not whether they lived or died, whether they fed or starved. Even Fran was stunned for the moment. He had not expected quite such a cataclysmic disaster.

But a curious sense of responsibility stirred him to action. These men, and women who were almost like men, were his wards now, even as they had once been wards of the Machines. They looked to him for guidance, for leadership. It would never do to show that he was afraid.

Therefore, he said cheerfully; "We are very fortunate. The Power Cylinder is still intact. We may be able to start it operating again. If we can, there are plenty of Machines lying around in the wreckage that no doubt will work."

Thus, with words of encouragement, with face that was gay and open, he lashed them on to further struggle. Sem thundered and exhorted and was a tower of strength. Finally, somewhat red and shamefaced, the easy despairers tottered to their feet, took their places in the long line that wended over the broken terrain toward the still-standing Cylinder.

"Keep away from that hole," Fran cried sharply. But it was too late. One man, shambling wearily along, had slipped on loose rubble. Before their horrified eyes he shot over the smooth knife edge, went tumbling and gyrating into the terrific cavity. For long minutes they heard his echoing, frantic screams as he went down, down. Finally there were no more.

The band stared at each other with ashen-white faces, and went on. There was no time now for vain regrets or lengthy mournings. Life faced them. Life must be conquered.

Fran, Sem and Vic inspected the Power Cylinder, the Communications Board that went around it in a spiral platform. They had been Guardians, hence they knew something of the mechanism. The rest huddled like sheep beneath, waiting for the leaders to emerge. On their report rested their chances of survival. Already they were hungry and cold, and these were at once novel and terrifying sensations.

Minutes passed, hours, and still no word. Then suddenly, high up, like three tiny dolls, they appeared. Fran's hand went out in a wide gesture.

"Friends," he shouted, "the Cylinder can be repaired. It will take days of work, but determined men can do it. Also, there is a storage tank of food intact, enough to last a month. After that—"

But the rest of his speech was lost in the great cheer that went up. Confidence surged through them, a feeling of strength and mastery. Shoulders went back, eyes snapped with alertness, power tensed their soft muscles. They laughed and jested as men had not laughed and jested since the advent of the Machine Cities.

It took them a grueling month of work. They were unaccustomed to their tasks; muscles grew slowly hard while blisters yielded plentiful crops. Missing parts had to be searched for among the debris of former Machines. Discipline had to be initiated, responsibilities divided. Guards were set, and a code of

signals evolved. For outside humanity—those who had survived the great catastrophe—had reverted to primitive savagery. Normal food had long since given out. There was only one supply left to the half-mad, beast-like creatures—the flesh of living men.

Time and again the little band heard the code alarm, dropped all tasks, snatched up the metals bars that never left their sides, and surged in disciplined ranks to repel the swarms of shrieking, maddened beings who clawed at them with taloned fingers. Always they beat them back, but not without losses. However, there were additions also. Weakened but still civilized humans who managed to elude the roving hordes came to join this last stand of the human race.

BY THE END of the month food was perilously low. The newcomers were an unexpected drain. Yet they were not refused admittance. Sem attempted to argue the matter, but Fran was very firm, and Vic backed him up.

"We live or die together. They have shown their worth and stamina by not succumbing to the frightful conditions outside. They need us, and we need them, and more like them, if we are to conquer our new world."

At last, with the precious ichor, which was their only known supply of food, down to the last thin lining of the Storage Tank, Fran dropped a plate of metal into place, bolted it clumsily to the otherwise smooth round of the Cylinder.

Vic, watching, shouted exultantly. The workers dropped everything, swarmed cheering and laughing and crying into the room. The job was finished.

Fran swayed with weariness. The back of a dirty hand swept salt sweat from a smudgy brow. Callouses and blisters covered his palms. He grinned faintly. "Don't cheer yet, boys. It may not work."

"It must," Sem shouted, capering like a youngster of twenty instead of a patriarch of over a thousand.

Fran walked steadily to the manual control. There was a sense of fate, of doom, in his firm, resilient step. The confused crying ceased.

For an imperceptible second Fran's fingers hesitated. Now he was afraid, deathly afraid. His fingers firmed, he closed his eyes and pulled.

What was that little purring sound? A veritable frenzy overtook the devoted band of humans. They shouted, they sang, they danced insanely. Life before the debacle had never held anything so heady, so thrilling.

The Power Cylinder was operating! The last delivered load of bauxite fed smoothly into the one remaining Atom Smasher, there to be converted in a blast of annihilation into power. The tremendous energy flowed into the huge Cylinder, flashed in blue flares in the faceted ball at the top of the column. Repair Machines they had salvaged and dragged with aching shoulders to the Machine City galvanized into life, floated like worker bees to the great Queen Cell. Patched, clumsy repairs the humans had made were transformed to perfect adjustments. Gravity Cells lifted at the slightest twitch.

The first and most vital function to which they put the resurrected Power was the synthesis of food. Repairing and Building Machines set to work. Within two days a Food Synthesis Machine was completed; within three the first precious drops of the nutrient liquid flowed into the Storage Tanks.

"We've won back to where we were," Fran told his friends with quiet exultation a month later. Already the Machine City was building back to its former proud estate. More and more humans came in, with dreadful tales of unbelievable conditions outside. But within was security, peace, and a growing population. Already, in his mind's eye, Fran envisaged the world recovered with Machine Cities, using their own as a base, and Sectors of *vistas* rising phoenixlike from the debris of the former civilization.

Sem grunted. He had been oddly morose for over a week.

"What's the matter?" Fran asked in some surprise.

"Matter enough," the patriarch retorted. "Is that what we suffered for, struggled, conquered? To restore the deathlike dullness and inanity of a world that was well lost?"

"But—" Fran started to protest.

"Look at them now," Sem interrupted tensely. He seized his more youthful friend by the arm, dragged

him out on a balcony of the new City. Sem had smashed his vanes with a violent gesture the week before. He had discovered his legs, he averred, and he intended to keep on using them.

Fran looked down on the great temporary communal hall. The Sector was still in the process of rebuilding.

THE WHOLE community, some five hundred in all, was congregated in the spacious expanse. They reclined on couches, languidly, inertly, scarcely deigning to lift their heads at the appearance of their leaders. Feeding Machines floated among them, injecting nutriment into their veins; Tending Machines supplied their slightest unuttered want.

"Look at them," Sem thundered with fierce contempt. "A month ago they were alive, vigorous, masters of their fates. Now—bah!—they have slipped back to their old selves, weak, colorless nonentities babied by the Machines. A month ago, when the Cell-Mating Machines no longer existed, men and women drew apart, looked at each other with new eyes, new comradeship. Now they are indifferently one, sexless. We have labored mightily and brought forth a pallid simulacrum of all you revolted against."

Fran knit his brows. He had spent some anxious moments himself over this easy sliding back into old grooves, but — "There's nothing we can do about it, Sem," he submitted.

Sem lowered his voice to a tense whisper. His eyes blazed fanatically. "Yes, there is. Smash the Machines. This time thoroughly, so they can never be rebuilt."

Fran shivered. "Then we'd all die," he protested. "There would be no food, no—"

"Natural food once grew in the bosom of the earth," Sem pointed out.

"There is none now," Fran said. "No, Sem, I'm afraid we must continue."

And for another month they did. The Sector was finished, men reclined on their private couches now as of old. The Machines did all the work. New Machine Cities sprang up in a steadily widening territory, powered as yet from the Great Central Cylinder. Except for certain tremendous chasms in the ground, it was hard to believe that anything had happened. The great disaster faded from minds that held less and less of thought. Why think when the Machines did it so much better?

By this time Fran had almost ceased to think of his vanished Orb of Probability, the Machine which had started it all. He assumed, and plausibly, that it had destroyed itself in that last tremendous crash. Once again, the world was fixed, immutable; and electrons were held within inconceivably small areas of indeterminacy.

But unknown to him, to anyone, a small crystal sphere swung around the earth in planetary flight, five hundred miles out in space. Cold and lifeless it was during the middle period when the Central Cylinder had blanked out of commission. The power that fed its tubes and filaments and transformers had come from the faceted balls at the top of the tall metal column.

Then the Cylinder was repaired, and started anew. Once more waves surged out into the ether, even into outer space. Once more the rushing energy impinged on the delicate apparatus, sent it into ceaseless motion.

But something had happened. Some small imperceptible change in the character of the waves perhaps, in their lengths and frequency. Therefore, when the Orb of Probability functioned again, it was on an entirely new principle, something that Fran in his experiments had never anticipated, had never believed possible even in his wildest theorizings.

## VI

IT WAS almost two months after that last discussion with Sem that the Second Phase brought new and undreamed-of disaster to a world that had relapsed into its old patterns of life.

Fran noticed it first. He was talking to Sem in Sem's *vista*. The patriarch was gesticulating, walking back and forth, harping on his old grievance. His long beard swept wildly behind him, his hair in an uncut tangle. Fran rested delicately on a couch, a trifle weary. He who had once been alone in his revolt, now floated in a pleasant enervation of relaxed effort. It was good; it was normal; it was civilized.

"I like it this way," he said a bit defiantly. He had not quite stilled the last qualms of the old stirring. Subconsciously he realized that Sem was right.

The old man swerved on him with a bull-like roar. It sounded terribly loud to Fran's newly fastidious ears. Then, abruptly, it cut off.

Fran turned his head languidly, stared, and jumped violently to his feet. Sem was no longer in the room. That is, not the Sem he knew. There was a man, it was true, in exactly the same spot where the indignant patriarch had stood, but—but—he was a beardless youth, with smooth, delicate features, a mere boy not over fifty.

"Why—where—what—" He spluttered. "Sem, where are you?" he shouted, fear clutching at his heart. Had that long-vanished Orb started functioning again, transported Sem to another level of probability?

The stranger stood as one in a daze, as one emerging from a clogging dream. His eyes lifted with a puzzled expression to Fran; he did not know him.

"Why," he said haltingly, in a thin, fluted voice, "I am Sem—Sem 15. But who are you, and what is this place?"

Fran fell back a step, groaned. Was he mad? Was this beardless unknown who had appeared unaccountably in the patriarch's place also mad? It was impossible; it was—

He came closer. Something in that tone, something in the line of those delicate features He clapped his hand to a fevered brow, twitched shoulders and soared out into the Sector. The youth who had called himself Sem 15 watched him go with bewildered amazement. He had not oriented himself yet.

Fran went headlong for Vic 21's *vista*. Fear fled with him, a terrible clutching fear of this new and more dreadful manifestation. Had anything happened to Vic, too?

But Vic 21 was still Vic 21. Thank heavens for that! The young man looked up slowly at his disordered friend.

"You look," he remarked placidly, unstartled, "as if you have seen a—what the primitives called a ghost."

"I have," Fran cried, and poured out his story. Sem 15 had vanished, yet Sem 15 was back there, in his *vista*. But a different, younger Sem; a Sem of almost a thousand years ago.

"I am not mad," Fran insisted. "I saw it with my own eyes. The features, a certain intonation in the voice, were the same. But he did not know me.

Naturally"—he caught himself up at the new thought—"for I hadn't been born yet."

Vic smiled, a faintly irritating, superior smile. "You need your Tending Machine," he said.

Then everything seemed to fall away from them. Only the instinctive twitching of their shoulders and the spreading of their Gravity Vanes saved them from a fatal hundred-foot drop.

The *vista* had puffed out of existence; so had the surrounding buildings for a space of half a mile. They floated to an earth that was strange and unfamiliar. Far off they saw the normal *vistas* of the Sector, tall and crystalline; still farther off, the recently erected Machine City.

But around them was warm brown earth, thick with unknown smells. Tall grass, light yellow in color, and tasseled with queer, elongated seeds, waved in a billowing sea. Little brown bodies, seemingly alive, with long, bent-back ears, scattered fearfully from under their feet. And, strangest phenomenon of all, an outlandish Machine approached them with great noise and clatter. Before it the tall grass waved; behind it lay long, cut swaths. Two huge beasts, gray of body, pulled it with thudding hooves. A human being sat in an iron seat, made funny clucking noises to the beasts.

They saw each other simultaneously—the men of the 97th century, and the farmer man of the 19th century. The farmer yelled in fright, jumped off the mower, and ran as if he were being pursued by devils out of hell. The horses snorted and went clattering after him.

"What the—" Vic commenced. But he had no time to finish. Fran knew what had happened.

"Come," he shouted frantically, "to the City of the Machines ! We must put a stop to this before it is too late." Once more obedient, Vic followed.

At the Communications Board everything was chaos. Reports tumbled in from all over the earth. More ominous even, was the lack of reports from vast sections of the world. Everything was topsy-turvy,

much more so than even during the First Phase.

Time had gone haywire!

HERE AND THERE, incalculably capricious, the 97th century had disappeared. Whole Sectors went into oblivion—the oblivion of nonbeing—and other times, other civilizations, sprang into their places.

Cities of the 51st century, crowded with people, juxtaposed in amazed contact with steamy jungles from which the dinosaur peered and Neanderthal man hunted with huge stone club.

Pickett led his gray wave in that last desperate charge at Gettysburg, only to halt in stunned bewilderment at the turreted walls of Carcassonne which had unaccountably veiled the blue line of Meade's army. Athenian orators found themselves addressing primordial slime in waveless seas; a 32nd-century dictator, holding powers of life and death over all the world, was suddenly alone on a featureless plain over which the wild hordes of Ghengis Khan were pelting.

Centuries, millennia, eons, were mingled in inextricable confusion. Even the future was there. Unimaginable beings, gracious and godlike, impassive even in this sudden wrench to their surroundings, floated next to shoreless seas of frozen ice, over which the sun, a dying shrunken ball, cast its last wan glow. The beginning of time, the end of time, stared at each other in equal incomprehension.

Only Fran 19 knew, there on that still secure plot of the 97th century, watching the welter of the inpouring reports, the sudden cessation from Sector after Sector.

His face was grim and lined. Vic asked anxiously: "What does it mean?"

"What I had forgotten. That time is a dimension even as the three we know of space. The electron, the proton, the rest of them, move in a time dimension as well as in spatial dimensions. Undoubtedly, time is also a wave of probability in which the electron exists. The Orb of Indeterminacy, which I thought was smashed, is somewhere, functioning again. Only this time it is enlarging the probability waves of the Time Dimension instead of space. As a result, matter is jumping from probability to probability in time, mixing all the ages, shifting eras

Vic's eyes popped at that. A new and fearful thought had just struck him. "Suppose," he said, "this City of Machines shifts to another probability. Suppose we do."

"In that case we'd either be so far back as not to be alive yet, or so far ahead as to have been dead for centuries!"

"For heavens' sake," Vic clamored, "do something about it!"

"I am," Fran retorted grimly. There was pain in his eyes, but also a new light that had been gone since the First Phase. "I am destroying the Central Power Cylinder, destroying it so thoroughly it will never be rebuilt."

Vic shrank back, alarmed. "Why?"

"Because the Orb of Indeterminacy has no power of its own. Wherever it is, it works only on the waves of energy sent out by our Machines. That was why, after the crash of the City, the First Phase stopped."

"But—but—we will starve again," Vic protested.

"No we won't," Fran retorted, queerly exultant. "That field in which we were dropped was a field of wheat from an earlier day. The animals that ran from under our feet were rabbits. Both were used for food long ago; we shall relearn to eat. Think of it, Vic," he cried. "Smash the Machines, stop the Orb, bring back the old spirit of adventure, of struggle with nature that was so satisfying in those two months of the First Phase, now to be forever our heritage."

"And those other times that exist with ours, the civilizations, the people, the customs of other days and years?"

"They shall stay. Never in the history of the world has there been such a glorious chance. The map of time is outspread for us to read, to learn the wisdom of all the ages."

Fran sprang through the trembling Guardians, disappeared into the walls of the Cylinder. Vic held his breath. Any moment, before Fran could act, annihilation might be upon them. Outside, where the great cavity had yawned into the earth, something had happened. In its place stood a roaring, teeming city. Tall

buildings of stone and steel soared in jumbled confusion. Subways grumbled underneath; automobiles, street cars, clanged slow progress through narrow streets black with hurrying people.

New York City in the 20th century! Vic cried out. "Hurry, Fran!"

There was a grinding, rending smash. The shining Cylinder shook with inner vibrations. The faceted ball on the top went dark and lusterless. The Atom Smasher shuddered, stopped; Tending Machines fell heavily to the ground.

Vic's Gravity Cell was dead. All power was gone!

Fran ran down the outer spiral passage. "It's done, Vic," he panted. "The Cylinder is a wreck of twisted parts. It can never be repaired." He sopped short, stared with avid eyes at the 20th-century city that blocked his view.

"Adventure!" he whispered to Vic. "In there, elsewhere, all over the world." He flung his arms wide, as if to drink in the wonder of it all.

"How about Sem?" asked Vic practically.

Fran's face clouded, lighted up again. "We'll find him," he shouted. "That youth of our own age whom we know and who doesn't know us. We'll explain it all to him. He'll understand. He'll be our friend again."

Together they went running to seek him out. They skirted the city in which traffic had stopped in sudden disorder, -in which frightened people stared out at the silent City of the Machines of the 97th century. A new and unimaginable era had dawned for the world.

Overhead, five hundred miles out, a tiny crystal sphere rushed through space, round and round and round. Within its transparent depths were silence and blank death. Round and round and round, unknowing what it had done, what strange new world rotated beneath.