Stanislaw Lem

On Stapledon's *Last and First Men**

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Stapledon's *Last and First Men* recounts the entire future history of humanity, from a distance of several billion years. As a whole, the book is an unquestionable success, in spite of certain serious flaws. It is the first attempt in a project whose value is not mainly *literary*. In fact, the literary virtues of this huge work fade into the background behind the ones the author had in mind when he called the book an "essay in myth creation." I would use another word, and speak of a modelling intention, which starts from the extremely modest state of existing knowledge and strives to grasp the gigantic, unfamiliar mass of the future's facts through approximation. Stapledon did not really set out to predict the future—how could he have constructed a prognosis embracing billions of years! Rather, the book is a form of fantasy-construct which takes into account everything that is already known, at least facultatively, and strives to grasp the structure, the breadth, and the informational richness of the unknown original: i.e., the future history of the human species.

It is as if, knowing there is a palace somewhere, more magnificent and wonderful than anything in our experience, we were trying to "reproduce" it in our imaginations. Naturally, we will not succeed. If our model should actually turn out to resemble the unknown palace, it would be merely a miracle. Even so, our intuition tells us that a few matchboxes, a few hundred sugar cubes, and a box of building blocks won't suffice for our imaginative reconstruction. First we must collect pictures of all the masterpieces of architecture, several books on construction, catalogues of all the building materials, the best artists' fantastic paintings depicting heavenly castles and paradisal buildings, every variety of metal, glass, and alloy, the colors of the

*Lem's essay on Stapledon's *Last and First Men* appeared, as did shorter essays on *Star Maker* and *Odd John*, in *Fantastyka i futurologia* (Cracow: Wydawnictwo Literakie, 1970). The discussion of *Last and First Men* is embedded in a long chapter, entitled "From Fantastic Philosophy to Historical-Philosophical Fantastic Literature," where it complements an extended meditation on Borges. The latter essay was reworked and translated from the German edition as "Unitas Oppositorum: The Prose of Jorge Luis Borges" (trans. Franz Rottensteiner) and republished separately in *Microworlds*, ed. Rottensteiner (NY: Harcourt Brace Jovanovich, 1984). The present translation was made from Beatrix Murányi's Hungarian version, *Tudományos-fantasztikus irodalom és futurológia* (Budapest: Gondolat, 1974).

palettes, reproductions of organic structures, photographs and etchings of flowers, grasses, trees, cliffs, and crystals—all just to get our thinking started. Charged with all these, we can begin our imaginative work. Whatever we actually accomplish will probably be pitiful—and certainly different!—compared to the original, but perhaps the scale of our undertaking will not lack all relation to the scale of the Great Unknown.

A man who defines his task in this way won't try to foresee the sequence of historical ages as they succeed one another over the course of millennia. He won't try to prophesy the concrete scientific discoveries, the moral and ethical revolutions, and the particulars of the auto-evolutionary transformations that humanity will accomplish over a million years. The most he can expect is to construct a scale so extensive and expansive that it will appear to be a miniaturization of the movements of the real phenomena, or at least of the categories in which they can be conceived.

For example, Stapledon's Fifth Men, after several million years of civilized existence and at the height of their cultural development, discover certain anomalies of the Moon's orbit that will lead in an astronomically brief time, a few million years, to the collision of the Moon and the Earth and the destruction of all terrestrial life. This anomaly is scientifically inexplicable for them; but since they have enough time and a highly developed technology, the Fifth Men migrate to Venus. Only several hundred millions of years later does another variant of the human species on another planet of the Solar System discover a causal connection between the psychocultural development of a planet's civilization and the planet's gravitational field. Now whether or not there might be some real correlation between psychozoic and gravitational phenomena is not important. Most likely there isn't any. But the statement is completely unprovable from the standpoint of our present knowledge. It goes beyond the boldest hypotheses of science and philosophy, and so it leads us to wonder. It is precisely its extraordinariness that gives it value as a model. In our own time we have seen bridges rise up between fields that were previously isolated from one another: like the bridge between thermodynamics and logic built by information theory. We should certainly expect other, similar discoveries, especially in the far distant future—probably not like the connection of gravitation and information, but on the same scale. A work of literature cannot simply assert that some future discoveries will shake the foundations of today's science; literature must work with concretes. The fictive connection that makes the Moon dependent on the degree of civilizational development introduces, in parabolic form, the element of the unknown and the unanticipated. It draws the questions that await us in the womb of distant millennia closer to the reader. Such ideas are very difficult to invent; moreover, they may not be structured as stories. Their structure must be strictly causal, and this requires the discovery of connections among phenomena that had been considered discrete before those discoveries.

We may or may not approve of this idea of Stapledon's. A contemporary physicist might consider it nonsense. But if we could treat any of these ideas as intelligible hypotheses, if we could accept them without any resistance, they would not have the modelling value that Stapledon wanted them to

have. On this level of the work, phenomena must appear that are absurd from the viewpoint of contemporary science. In this they will correspond to the absurdity that a logician of the 18th century would have felt *vis-à-vis* the idea of a logic without the principle of the excluded middle, or a classical physicist *vis-à-vis* the conceptual foundations of quantum mechanics. The main point is that the future will certainly be unbelievably rich in different kinds of phenomena and facts, and with a richness we would never accept without resistance, even if a marvellous visitor from the 30th or 70th century were to appear and tell us nothing but the unvarnished truth about the shape of things to come.

Last and First Men is a monumental book. If it were sliced up into smaller pieces, into the stories about the individual cultures and the types of humanity that build them, none of them would deserve particular praise in its own right. But the individual parts are likely to seem irritatingly implausible only if we approach them one by one. In the great unitary process unfolding over millions of years, the stories convey a sense of the gigantic proportions of space and historical time, in which great formations emerge into and sink out of being. And so each detail that might seem dubious compared with the emerging whole becomes less and less significant as we read on.

Perhaps the most unfortunate part is the beginning. Starting with the 1930s, Stapledon describes a series of wars. At first they are limited to Europe; ultimately, they expand into world wars. 300 years after the first world war a unified—that is, an Americanized—planet emerges. Even if we ignore the fact that the author considers the most cultured, peaceful, and humanistic country in the '40s of our century to be Germany, his ignorance of exact science is very annoying. Just as the conflict between Europe and America is heating up, a group of scientists meet in the English city of Plymouth, where a young Chinese scientist introduces a weapon "rather like the old-fashioned rifle" which releases atomic energy. With this weapon, they destroy the American planes that are making demonstrative flights over England. This act precipitates the war in which Europe perishes. I am not taking exception to the fact that these events did not actually occur in reality, but rather to the fact that the Chinese physicist destroys his weapon after his dramatic demonstration, and then commits suicide in the presence of the assembled colleagues. Even if we could swallow this, it is indefensible to assert that the secret of his invention could not be reconstructed for several tens of thousands of years (!!). Only someone ignorant of the mechanics of scientific discovery could write something like this. Discoveries have little in common with lottery winnings, and the secrets of atomic energy do not lie behind mysterious locks, whose keys can only be found with the aid of extremely improbable accidents. It is absolutely certain that if all the physicists involved in the splitting of the atom had committed suicide, the application of nuclear energy would still be an accomplished social fact. This law holds not only for nuclear phenomena, but for every field of scientific research. The new and great discoveries become possible when the *totality* of science's information-fronts approach them. The first discoverers are likely to be surpassingly sharp-witted people. But the temporary lack of such people does not reduce the probabilities of discoveries to zero. At the most, it

will modify their calendar date to an insignificant degree, especially when those phenomena are viewed from a historical distance.

There are other naïve, anachronistic, and melodramatic details in the first part of *Last and First Men*. For example, the delegates of the US and China, in the course of secret negotiations taking place on a Pacific island and aimed at ending the war between the two states, encounter a beautiful native girl stepping naked from the water; the Chinese expresses his newly awakened desires in a flowery speech—yet this dark-skinned virgin, who calls herself "daughter of Man," chooses the American man; but before she departs to the States with him, she witnesses the secret peace treaty! When we add that the Chinese is wearing a silk robe and a pigtail (well after the year 2000), the absurdity of the scene is complete.

The culture of the Americanized planet after the year 2500 is also complete nonsense. This culture is dominated by the sacred cult of machines, especially the airplane. On the Days of Sacred Flight they design spectacles of aerial acrobatics as well as other liturgical demonstrations. Contraceptive techniques are considered to be a waste of life energy, and hence outlawed; therefore the citizens select among the newborns through an act of aerial baptism: a priestess tosses the infant from her airplane to the child's father in another plane; the infant must clutch the chord of its parachute, for if it lets go, it crashes to the ground. Many people nowadays speak of the "cult, or myth, of the Machine," which is supposed to substitute for the paradigms of more traditional religions; but they do not mean that any one product of technology could become a cult object in the strict sense of the term, an object of religious devotion. (Stapledon hints that the airplane will be chosen as a sacred object mainly because of its resemblance to the cross.) Furthermore, the statements that oppose Chinese culture to the rest of the world's—on the ground that purely contemplative values lie at the center of the Chinese value system—appear in a rather ironic light considering our recent historical experience. Let us be fair, and add that every prognosis becomes just as laughable when it wants to prophesy coming events in detail, with dates and facts. I believe Stapledon would be much more respected today had he excluded such details.[1]

Stapledon charts the actual events and their extrapolations according to a fairly simple scheme. The future history of humanity does not disclose definite, immanent laws of motion, though it does seem rule-governed to a degree. We can hardly consider the several-million-year fluctuation that constitutes Stapledon's principle of earthly existence to be a "law of motion" or a "law of historical evolution," for this fluctuation is aperiodic. Essentially, the great civilizations rise slowly and laboriously out of forms of primitive chaos, they reach a peak, and then they plummet back. Enormous chasms can separate the phases of development from one another: "dark ages," periods of obscurity, force, and confusion, in which every stratum of culture is worn away and only the bare core of humanity's biological qualities remains. But a close look at the mechanisms of both the ascents and declines reveals that none of the victories nor the failures issue from identical causes. Stapledon does not depict the life-cycle of the successful civilizations as a unified group of laws, analogous, say, to the laws guiding the ontogenesis of

living organisms—in the sense that the living organism already carries the inevitability of aging and death in itself at its birth. Stapledon does not plant fate-like seeds of destruction in his civilizations. They fall because of purely statistical, accidental phenomena, not predetermination.

The Americanized planet enjoys about 2000 years of prosperity. Its great crisis ensues when all the energy sources are exhausted, and the attempts to release atomic energy are unsuccessful. By the way, Stapledon envisions the future of institutionalized science in sacred-liturgical form. The bankruptcy of the world's system of energy production dissolves the unity of humanity, China and India once again announce their independence, and, in response, the world government seated in America resorts to bacteriological weapons. Civilization disintegrates completely in the bloody tumult; "whole populations vanished in an orgy of cannibalism," the author notes succinctly. The dark age lasts 90,000 years. In the changed geological and climatic conditions, Patagonia and its adjacent ocean become particularly favorable to life and thus become the scene of a new culture, equivalent to the one that emerged from the Mediterranean in an earlier age.

Eager to increase their energy supplies, the Patagonians penetrate to the Earth's core. They in fact are the first to release nuclear energy on a social scale; but as a result of social unrest, an inadvertent nuclear explosion occurs, and its chain reaction spreads over the whole Earth. Only a small, isolated research team working on the North Pole survives (thus, according to the prophecy, atomic destruction will occur in 100,000 years, but not as a result of warlike, intentionally genocidal acts). Thus ends the second culture of the First Men. The earlier, first culture (i.e., ours) was suffocated by the exhaustion of energy resources, while the second was destroyed by the reverse (in the midst of social conflicts, a mistake is made in handling the *too much* energy latent in the atom).

The planet's radioactivity, the enormous changes in the composition of its surface and atmosphere caused by the Patagonian catastrophe, make the rebirth of civilization impossible for several million years. (Let us note here that while the first atom bombs were being made in the 1940s, it was feared that, once detonated, they might set off the "nuclear ignition" of a significant number of the Earth's elements, although theory refuted it; in this sense, the author did not invent the hypothesis of the Patagonian catastrophe out of whole cloth.)

The saplings of the next civilization do not emerge for ten million years following the total destruction. Radiation and the biological mutations brought about in the normal passage of time create the Second Men. Like the later variants, they differ from us, yet they are sufficiently like us to allow us to speak of the continuity of the species and the fate of civilizations.

The Second Men create a civilization with singular forms of culture extending all over the Earth. Stapledon lavishes a great deal of attention and space on the successive cultural formations. An invasion by Martians first merely damages this civilization, but then sweeps it into a horrible, murderous conflict. These Martians are perhaps the most original "aliens" in all of SF. They are gigantic aggregates composed of microscopic "droplets"; they resemble a fog that congeals into semi-viscous clouds. They have no psychic

individuality like humans, since evolution progressed along a different path on Mars than on the Earth. Since they are almost gas-like, they particularly revere the hardest and densest substance: the diamond. Whenever they find one on Earth, they quickly and greedily transport it back to Mars. (I have always found this aspect of their "religion" rather implausible. I have never been able to accept it as a revelation of "the customs and characteristics of the aliens"—but perhaps this is a matter of taste.)

The invasions are repeated many times over millennia, and it takes a long time for the Second Men finally to comprehend that they are being attacked by a living being and not some fate-like natural catastrophe, a cosmic "rain." The Martians force the humans out of certain regions, while in others it is they who are forced to retreat temporarily. In the end, after a series of very long struggles, the Earth is faced with the following problem: a certain synthetic virus has become available to destroy the Martians, but it will also certainly kill off the human beings. The mood is such, the author hints, that the humans resign themselves to "biplanetary" annihilation. The Martians do indeed perish (the ruins of their civilization on Mars are discovered several million years later by the spacemen of another earthly civilization), and in the universal agony the whole of earthly culture turns to dust. But the Third Men appear on the Earth (again, after an extremely long time), the product of interplanetary cross-breeding. The Second Men grafted into themselves the remaining Martian viruses, and thus the Third Men have telepathic powers because the Martian-clouds also had these powers. (Today we would say that the elements of the new microscopic organism were assimilated as a new gene in the hereditary code of humanity.)

We can see that a qualitatively new factor caused the destruction of the Second Men: a cosmic invasion. Thus, although the cycle of growth and decay is repeated again, this regularity embracing the ages means only that—considering the enormous time-periods—the system is neither entirely autonomous nor perfectly stabilized. This is doubtless true. It is certain that within a time-frame of several millions of years, global changes are not only possible; they must be expected: changes in climate, in the continents' topography, fluctutations in the biosphere, disturbances of solar radiation, etc., of such magnitude that in the course of several tens of millions of years, they might have the character of cataclysms (large-scale seismic or glacial changes, or astrophysical changes, such as the explosion of a nearby star, etc.). However improbable we might therefore find the notion of a "Martian invasion," the idea of the interference of external factors threatening civilization becomes an increasingly probable hypothesis the more millions of years we take into account in measuring the time of such an occurrence. After all, a severe ice age, with the glaciation of both poles and the corresponding rainfalls in the equatorial region, would be no less fatal for civilization than Martians, though it might be less dramatic than an alien invasion. (The Martian invasion is, in my opinion, Stapledon's tribute to his great countryman, the author of *The War of the Worlds*, but a tribute that also conceals a challenge; Stapledon confronts Wells's prototype of the Martian with a more startling model, unlike any previous conception.)

The Third Men (I must condense events) construct the Great Brains, powerful living brainlike structures, gigantic lobes of neural tissue sited on mountain tops in half-spheres resembling the cupolas of observatories. These artificially living, but immobile, creatures conquer and enslave their creators, the Third Men; in the course of the conflict, they ultimately annihilate them, and rule the Earth as the Fourth Men. They acquire tremendous knowledge, incomparably greater than any of the Earth's previous inhabitants', but their non-evolutionary origin becomes the source of their tragedy. They are gigantic brain-lobes, dependent on mechanical scaffolds and mechanically supplied with oxygen-rich blood. Human experience, feelings, and interests are all unavailable to them. The disproportion between their intellectual and physical lives leads them to embark on the construction of the Perfect Men. These are the Fifth in the sequence, and their creation is planned using all the Great Brains' prodigious genetic technology. The designers, however, wish to remain their creatures' eternal guardians, and even their supervisors. A cruel war ensues in which all the Great Brains are destroyed, and the Fifth Men are decimated as well. In the aftermath, the Fifth Men construct the last and most advanced earthly civilization. This is threatened by a new danger: the collision with the Moon caused by the "psycho-gravitational" phenomenon mentioned earlier.

The Fifth Men migrate to ocean-covered Venus. Fully aware of the shamefulness of their acts, they are forced to annihilate the planet's intelligent aquatic life-forms because of their own need for living space. In the course of millions of years, new forms of humanity evolve, among them the Flying Men, who have wings. These wings are not technical instruments; they are natural bodily appendages. (Another big mistake on Stapledon's part, I believe; but in the case of futuristics on the scale of billions of years, there are no probabilistically rational criteria for establishing credibility, only different tastes and intuitions.) A sudden flare-up of the Sun threatens to burn up the inner planets of the Solar System, and forces humanity to migrate to Neptune. The enormous gravity and alien physical and chemical conditions cause profound changes. In a million years, the only inhabitants of Neptune are dwarfed, four-legged beings. After another several eons, a rising branch of psychozoic evolution emerges once again and the next variants of *Homo* begin to evolve—16 in all.[2] The Sixteenth Men, who are genetic engineers, create the final form—which conquers the whole Solar System and sets out for the stars (but is able to reach only the nearest, completely dead stars). This human form, which has risen the highest materially and spiritually, must perish because some unknown cosmic factor is turning all the nearby stars into supernovas. This is the "violet plague." But even more interesting is the physiognomy of the Sixteenth Men: they are gigantic, ursine, bi-sexed creatures, with a third eye on the scruffs of their necks, with a harmonious and de-urbanized culture. They live in bi-sexed groups, in a form of polygamy. They have extremely long lives, and they are appropriately balanced physically and spiritually. When the Sun, under the influence of the violet plague, begins to consume its nearby planets, the Sixteenth Men contemplate how they might move Neptune onto an ever-widening spiral path. But the catastrophe unfolds too quickly. The Sixteenth Men cannot bring themselves

to flee into the cosmic void in their spaceships. They prepare to die and complete their last act: producing spores with an ingrained hereditary code, and casting them into the vacuum of space. This sowing is already the last act of the beginning of their agony; for the planet, shocked by the elemental cataclysms brought on by the ever-rising heat of the Sun, attacks its social organization. The Sixteenth Men—the most secure, rational, and disciplined variant of all those that have lived in the course of billions of years—sink into stupidity or explode with aggressive madness, ending their life in fratricidal war.

For Stapledon, the causes of these civilizational fluctuations lie in the heterogeneous mass of phenomena. Sometimes it is a combination of earthly causes (exploitable mines go dry), sometimes cosmic ones (the Martians' invasion, the explosion of the Sun and its transformation into a supernova), and sometimes of involuntary suicidal acts (the Fifth Men drag the Moon down on themselves, as it were, through the development of their civilization); there are regressions (e.g., the biological degeneration following the move from Venus to Neptune); and on at least one occasion on Earth, humanity clashes with its own tools (the Third Men designed the synthetic Great Brains to be tools). Now, it would be unjust to judge the book only by its catastrophes. It is not merely a series of cataclysms. We tend to emphasize those moments when the curve of fluctuations ascends (usually slowly) or declines (for the most part steeply and quickly). But these are relatively short periods compared to the growth stages, which endure for many millions of years. (The longest periods of all are, understandably, those of biological decline, since in such periods the quick pace of social evolution is squeezed out by the slow rhythms of bio-evolutionary fluctuations.) Should Stapledon's philosophy of history be included among the "cyclical school," with its many exponents, from Spengler to Sorokin? This isn't an easy question to answer, since the time-scale involved is an important factor. Stapledon's scale embraces several billions of years, and can be measured by astronomical phenomena. The philosophers of "cyclical history," on the other hand, operate at most with century-long units of magnitude. They generalize from known history, which is only a few thousand years long. It is true that there are probably no perfectly acyclic phenomena in the universe, if we may extend the time of observation at will. The birth of planets has a cyclic character, in that solar and planetary systems are not eternal; each one has an end and a beginning in time. Elsewhere, new stars and probably new planets emerge. Mountain ranges, too, rise and then perish from erosion; and in the place of one mountain, a new one rises in the next phase of mountain formation. Every river flows from a source to the sea, never the reverse, and therefore it may appear to be an aperiodic phenomenon. But rivers don't live eternal lives, either, and the transformation of the Earth's continental topography ultimately destroys them. Then, as a result of new mountains, watersheds and rainfall gradients, new rivers appear. On this scale, then, rivers also submit to the determined cycle of coming into being and passing away.

We know very well that the philosophers of cyclical history are not thinking about this sort of cyclicality at all. They all share with one another a fundamentally non-empirical point of view. If they were to observe a

housewife, whose pastry failed once because the eggs weren't fresh, another time because she added too little yeast, or again, because the fire went out in the oven—or even because just then everyone in the family had stomach aches, and no one felt like eating a batch that had actually turned out well—these philosophers would state that they are witnessing a cycle regulated by a law of higher inevitability, the very historical necessity that directs the fate of every possible pastry. The fact of the matter is that pastry-cooking, like the stabilizing of civilizations, requires the simultaneous harmony of an enormous number of different factors. Neither the pastry, nor civilization, involves a single historical law that *a priori* makes regulation and success impossible in their respective realms.

Stapledon's inventory of scientific-technological inventions is amazing. The book speaks of the release of atomic energy, space travel, a form of cybernetics in the construction of the Great Brains (which we would call bionic systems), and vigorous auto-evolutionary processes—the Fifth Men are altogether the fruits of theoretical planning, for the Great Brains design and build them. Beyond these we read about the secret, "the connection of information and gravitation," and finally, "time-travel." As the preface announces, the book has two authors: the true author is one of the Last Men who, since he is able to travel in spirit back in time, has simply made "Stapledon" his mouthpiece.

These revelations are distributed through truly astronomical time. When we compare the book with reality, we get an astonishing scale. In the text, discoveries and technologies are realized over the course of billions of years and at vast distances from one another. In reality, we have already either realized most of them (atomic energy, space travel, cybernetics), or we have begun working on realizing them (intelligence augmentation, global automatization, the exploitation of stellar energy, etc.). Compared with the novel's time scale, all this has come to pass in "microscopic" time. A few decades versus two billion years! If we add that the achievements of physics and the discovery of genetic codes have brought us to the threshold of an auto-evolution that no one can consider fantasy any more, and that we can expect to have bases on the planets in this century, it is evident that a half century has completely exhausted the content of a fantastic vision that strove to comprehend two billion years of existence. Moreover, those of the book's prophecies that have not yet been realized are considered permanently fictive (such as time-travel).

Seven hundred years ago, Roger Bacon wrote [to William of Paris]:

> Ships can be made that will work without rowers [so that t]he greatest river- and ocean-going ships will sail at greater speed guided by a single man than if they were filled with sailors. Coaches can be made that will travel at immeasurable speed without the power of beasts....Flying instruments can also be made: a man will sit in the center of the structure, he will turn some invention, and the artificially made wings will flap in the air like the wings of a flying bird....Instruments can be made with which man will be able to walk on the sea, and descend into the rivers to the very bottom, without any bodily danger....

This was a magnificent and bold prognosis, considering when it was made. Even so, I feel that the prediction of possible cultural formations is more difficult by an order of magnitude. The ingenuity it requires has little to do with the technical imagination.

In theory, I can see two possible modes of approach. The first is the more experimental: constructing the cultural whole on the basis of certain technological-historical changes which transform the initial conditions into the final conditions. The other is the more aprioristic: here we have available already at the outset certain finished and ready-to-use conceptions of the human, on the basis of which we select the variants of axiologically realizable cultures. Neither approach excludes the possibility that there is a certain *syntax* of cultures, in the form of compositional rules that must be obeyed. But the first approach allows us to treat the field of "culture-construction" as open, since the scientific-instrumental factors always introduce new kinds of transformations and disturbances into the structure of society, and the collective reactions that we might choose from the closed, historical mass of reactions will not be appropriate for them. The second approach, on the other hand, leads more easily to certain cyclical patterns since, according to its premises, the "human essence" is a general constant of every possible social metamorphosis.

Discussion of this sort of fantastic modelling takes us beyond the boundaries of existing SF. SF has certainly complemented Stapledon's catalogue of ideas with many grotesque ideas of its own. But I cannot agree with Brian Aldiss's statement, in his introduction to the 1963 Penguin edition of Stapledon's book, that its ideas are echoed in the best works of today's SF. No one has continued the combinatoric of culture-creation after Stapledon. In fact, no one has even outlined the task, as if it had been simply forgotten. Let us mention a few details out of context, if only to highlight Aldiss's error. Stapledon has illustrated how the signifiers of cultural values can be reversed (in the civilization of the Third Men, it is not virginity, the sexual purity of erotic partners, that is valued, but its opposite, the richness of sexual experience); how technological creations can evolve into artistic creations (again the Third Men cultivate the "vital art," which consists of transforming synthetically–evolved living organisms, sometimes creating perfectly harmonious and well-functioning animal forms, and sometimes spine-chilling monsters; these practices express some sadism, but also the curiosity that wishes to know where the boundaries of the transformability of living phenomena are); the depths to which a rational species can sink (certain tribes of the First Men, after degenerating for a million years, become the housepets of a tool-using and metal-hoarding species of monkey); how different the central symbols of religions can be (the "Holy Boy" in the religion of the Patagonians; the "musical-harmonic" religion of another human variant, etc.); which types of social, ethical, cognitive, and erotic initiatives can become the stabilizers of social structures (the Second, Third, and Fifth Men, respectively); etc.

The typical signifying virtuosity of SF lies in predicting technological inventions. But what prophet was ever able to foresee the probable social-civilizational consequences of a correctly predicted invention? In the past,

such predictions were usually accompanied by that optimistic, but quite mistaken belief, that any given invention, whether it was an airship or a spaceship, would instantly initiate the age of peaceful, harmonious co-operation. This noble, but cognitively impermissible, naïveté contrasts sharply with Stapledon's method. He demonstrates how the Third Men—who, through their "vital art," gained experience in genetic manipulation—had to confront the problem of auto-evolution, and how this problem proved to be political. Stapledon correctly perceived some of the dilemmas inherent in auto-evolutionary decision-making. For example: the question of whether the newly constructed human beings should be "specialized" or "generalized." Should we strive for the increase of reason or for the harmonious augmentation of all historically acquired qualities? Which is more proper: "to strangle and extinguish" everything in the human species that is part of our animal heritage, or to create from this animal element the functional counterweight to the spiritual-intellectual element? Even to imagine that such questions can arise in contemporary SF, along with the conflicts of attitudes deriving from them, is absurd. In fact, it's as if no one has even noticed that it is possible to formulate them.

These are not trivial matters. They involve the problem of extending humanity's most ancient axiological debates into instrumental embodiments. In the old days, sages could contemplate the question "what should we consider the highest human value?" in purely theoretical form. But the possibility of self-transformation gives such academic questions the acrid taste of an unavoidable decision. We cannot avoid choosing; even if we abstain from all self-transforming activities, we have chosen: we have recognized that the present model of *homo* is perfect and therefore unalterable. With every significant increase of our knowledge, not only is there a decrease in our knowledge about certain concrete phenomena of our earlier conditions of helplessness; simultaneously, freedom of action appears as a great dilemma. We may feel the consequences of the resulting decisions for millennia.

Even in its boldest and best attempts, SF extrapolates only existing civilizational trends, and goes no further. When it constructs societies following a nuclear war or other cataclysms, it always lifts models slavishly from the thesaurus of actual history: quasi-medieval monarchies or rigidified, socio-static technocracies. Every one of its future societies is placed somewhere between dictatorship—as a merciless order—and anarchy. (American SF often nourishes itself on the crumbs it pecks out of Stapledon's work. In this respect, we truly can discern his "echo." But whenever SF steps beyond the framework of Stapledon's work, it never moves in the direction of anthropological philosophy. Need we explain what this reluctance means?) In every field, students must remember their masters, in order to surpass them. Compared with this book, which is almost 40 years old, SF is one great step backward. SF does not polemicize with it, nor does it defend it; it has tried neither to continue it nor to conquer it. This work, to which Aldiss refers with such complacency, should cause a pang of conscience to all those who insist on the cultural weight of SF. The situation is grave enough, in my opinion, to dwell on for a while. Since Stapledon's time, SF has increased by several million pages, yet it has raised neither the theme of

bio-evolution (in its axiological sense) nor the theme of socio-evolution to the level of ontological questions and solutions. Even little tales that seem childishly naïve beside *Last and First Men*—for example, the history of the "holy robot"—cannot expect publication in SF magazines, and an author who writes about the political conflicts surrounding "hibernation technology" will not find a publisher. If SF would only awaken to its intellectual servility, and oppose it, even if only with sterile outrage! But that is out of the question: the narrow little measure of its fate corresponds perfectly to the dimensions of its aspirations.

Stapledon has his own, particular conception of human beings and humanity as a whole. Stapledon's Man is formed by the mass of a million years' events. He is the book's theme, always the same, although he always returns in a new key and with new orchestration. The individual types (the First, Second, Third, and subsequent Men) are not related to one another merely as differences ("we've already had such and such adventures, so we must have completely new kinds"); they are subordinated to a dominant theme. In certain places, this theme appears quite clearly—e.g., in the conclusion, when the Last Men say that they are simultaneously animal and human, and to a much greater degree than any of their predecessors. In Stapledon, the element of culturalization and socialization never destroys the biological element. For him, harmony is the contradictory balance of all these elements. Man achieves the fullness of existence when he no longer suffocates, crushes, or violates any part of himself. Whether we agree with this notion or not is another matter. But SF after Stapledon has not created *any* conceptions of humanity.

Homo stapledoniensis is the unity of opposites. A sociologist might consider the essential characteristics of this species to be the extreme polarization of elements. Thus, the dynamics of historical movement that this species sets in motion proves to be monumentally static, once the external traits have been refined away. No matter which human qualities bio- or socio-evolution transforms, and no matter how mercilessly it does so, humanity remains the same in its essence.

From a *formal* point of view, then, Stapledon's panhistoricism seems to approach Borges's ahistoricism, although the principle of connecting the oppositions that form the substrate of humanity appears very differently with the two writers. With Borges, the unity of opposites always situates itself on the combinatorial axis localized within culture, and his heretic and saint, his beast-man and poet, his traitor and hero fuse into a harmonious unity only in God's inexplicable glance. For Borges, God and culture are the whole of existence; within that existence, we can perform any operations we wish, but we can never leave it. For Borges, the whole of existence is a secret, in the mythic sense. We can comment on it from the outside through parables, but we will never comprehend it, and every discursive method alienates us from it. For Stapledon, the sciences are the messengers of truth—albeit only a fragmentary and approximate truth. His narrator is situated *above culture*, a position that would be inconceivable for Borges's narrator. Further, there's a great difference in tone. Borges's principle is ironic-aesthetic, and hence ludic, combinatorics; Stapledon's is pathetic-romantic, and hence more

assertive. Borges is the master artist of precise miniatures. He crafts his sentences artfully, he chisels their meanings, etching recursive levels and cunning depths into them. Stapledon, who uses a shovel to heave his paints onto his gigantic canvas, has nothing like Borges's sovereign mastery over his lexical material. His ardent monumentalism is occasionally amateurish and even borders on melodramatic kitsch. Yet we can recognize these two authors' kinship on a level that commercial SF never attains. It is a foolish misunderstanding for contemporary criticism to admire Borges and to know nothing of Stapledon.

Because of its essayistic character, Stapledon's book has been exiled beyond the boundaries of literature. No doubt, Stapledon would have profitted by studying more of the history of science and physics, and less Spengler. But even so, his book is a singular achievement. He understands the terrible disproportion between human effort, no matter how intense it is, and the infinite indifference of the universe that accompanies humanity's historical struggles. Stapledon honestly subordinates human existence to all the real forces of biology, climate, and geology. And finally, he shows the historical origin and relativity of all norms, legal codes, dogmas, and values. Though his book may creak here and there, the light of truth flashes in it; and because of this we must neither forget it, nor catalogue it among the many volumes of SF.

When he was read more frequently, Stapledon was considered a pessimist, probably baselessly. After all, his humanity received the ill-starred treasures of cognition only very gradually; he scattered the contents of Pandora's box over millions of years. Can this be pessimism, when, as we have seen, this box has already emptied most of its contents in our own century, when one generation must make decisions willy-nilly about how to deal with the avalanche of fateful gifts that burden thousands of generations in Stapledon? For him, fate resembles a statistical factor, the ruler of every possible development, rather than an "immanent evil" latent in history or human nature. He depicts the future as the movement of gigantic, millennial waves, raising cultures up, then tossing them into the darkness of cannibalistic destruction. It is the number of these defeats that inspires the most resistance—but let us recall that basically they do not occur often. And there is no self-evident connection between the character of the successive cultures and the character of the abysses they plunge into. Sometimes humanity destroys itself, but more often it is destroyed by the blind cosmic flux, the burst of a nova, a collision with the Moon, an invasion from Mars. Stapledon's Man is neither a self-destructive savage nor a galaxy-striding titan. He always points beyond himself. He has such enormous potentiality that only a small part of it can be realized by each concrete historical formation. He has built every possible type of culture—promethean, dionysian, apollonian—and each one is smashed to pieces; he is stripped to the hard seed of chromosome-energy, which in its blind and indefatigable evolutionary expansion always begins the same process again. Stapledon's Man always strives towards the cosmos; at times the cosmos even supports his efforts. This is how he expresses it at the end of *Last and First Men*: "man is a fair spirit, whom a star conceived and a star kills." It is a very pathetic

image, precisely because it is tragic. A less pathetic image might represent human fate with the tale of the spider trying to climb out of the bathtub: the higher it climbs, the farther it falls.

The most dubious part of the whole construct is that the historical "bludgeonings" always denude humanity to its biological seed. The successive great regressions never peel only one stratum of culture away from humanity, they strip them all. Because of this, socio-evolution in Stapledon isn't a single process, but a series of isolated stages, connected only by the continuity of the genetic and evolutionary transference of the chromosome chain. I see Spengler's influence in this profound fragmentation of the course of history. But let us keep in mind that another vision, in which the species' cataclysmic degeneration is not so profound—in other words, in which there would be some continuity in the current of civilizational transformations—would have made it impossible to write the book. For the ascent that follows exponentially from this premise would surpass the capacities of any artist's imagination. This means that even if the fate of humanity is not at all tragic, we are incapable of plausibly foreseeing—in the very distant future—different qualities of being, other than the tragic. On the level of civilization and culture we can always conceive of the tragedy even of beings very different from us. But the existence of future generations totally transformed from ours would remain an incomprehensible puzzle for us, even if we could express it.

It is a law of civilizational dynamics that instrumental phenomena grow at an exponential rate. Stapledon's vision owes its particular form and evenness to the fact that its author ignores this law. Stapledon's historical clocks all measure the same time. The gap separating the era of rafts from the era of steamships is roughly the same as the gap between the beginnings of biotechnology and its later application to auto-evolution. But the process of discovery can never be so even, not in any age or any world. Technological development is an independent variable primarily because its pace is a correlative of the amount of information already acquired, and the phenomenon of exponential growth issues from the cross-breeding of the elements of the mass of information. Naturally there are human minds wherever such fertile crossings occur; no matter how many encyclopedias we set side by side, they can't create anything by themselves. Nonetheless, these minds are the loci of inevitable information-encounters, so to speak, and the greater the amount of empirical information that participates in them, the more energetic and productive these encounters are. Hence, the moment of the chromosome structure's discovery cannot be separated by "long millennia" from an increase in knowledge that would permit, for example, the species to direct its development.

This state of affairs is not the result of humanity's intentions. It is a completely objective quality of the world, independent of human beings. Human beings were formed by millions of years of struggle to satisfy their existential needs in an environment that they were only just discovering how to conquer. They struggled in this way for thousands of years before they became sufficiently conscious of the general outlines of their existential condition to give it a name. This work, the need for physical and intellectual exertion, has

not ceased. But when as a consequence of this work automatized technologies (or at least their elements) appear, then the thinking being begins to view the struggle with nature and the exhausting labor of wresting subsistence from the environment as a transitional stage full of obstacles, which must be surpassed in order to reach the threshold of the land of eternal serenity and perfect fulfillment, where all conflict and weariness will be left behind.

It is an attractive vision, and sufficiently unreal to discourage us from examining it objectively. In the past, it simply appeared to be utopia. Today we believe that even if it were realizable, it would not be worth realizing.

We have not yet learned how to think in a state of complete freedom. Deep in our hearts, we would prefer it if such an automatic paradise were impossible—not, however, because of a choice freely made of humanity's own will, but rather as a result of the necessary, unalterable nature of the world. After all, except for a happy few, humanity has suffered from every kind of want, and hence the symmetrically perfect opposite—where one need only snap one's fingers to have the Good pour out in superabundance—appears, at least to naïve people, to be the Promised Land. And so it seems absurd to imagine that, after the centuries' long struggle to achieve an easier life through technology, we might want to make what we have made too easy more difficult (perhaps even by technological means). This image haunts us fairly universally, but we don't recognize the acuteness and primary importance of the problem because the proportions of inequality on our planet are not decreasing. We may then believe that we are speaking of an achievable utopia, after all.

But if, with cautious optimism, we believe that humanity may not perish in the 20th or 21st century, it is clear that there must be a comprehensive regulation of realms where only spontaneous factors have ruled until now (such as the sphere of demographic growth, international relations, and connections between science, the supplier of information, and technology, the realizer of information and therefore the link in the chain which embodies and disseminates every theoretical discovery). Beyond a certain level of civilizational complexity, there is no room for the self-regulation of spontaneous processes. Spontaneity and impulse within a very complex structure is like dynamite placed next to a fire. Humanity is a rational species; it cannot build its dreams of paradise with the same impulsive reflexes as a fruit-fly. The fruit-fly is oriented towards maximum reproduction. If it could overcome the obstacles to the exponential increase of its progeny, then in a single summer a layer of fruit-flies a mile deep would cover the Earth, block out the Sun, destroy the plants, poison the waters, and end the "perfect fruit-fly paradise" wherein the insects reproduced to the full extent of their inbuilt biological potentiality. This would be the consequence of breaking those loops of negative feedback which regulate, and hence balance, the ecological hierarchy of the biosphere. Once these regulating loops have been broken, the consequences must be dealt with; the process creates a new freedom which is inextricably entwined with a new necessity (the necessity of regulative decisions). The condition of freedom means, above all, solitude. We can no longer ask Nature about the right course of action and the right choices. Nor

can we depend on the automatic character of techno-evolutionary gradients; that would be to escape from slavery to elemental needs, into slavery to the tools invented to liberate us from those needs. Left to itself, techno-evolution is aggressive. At first, the snuff-box exists for the nose. Then it is quickly discovered that a better, more automatic snuff-box should have a different sort of nose, obviously an automatic one. Since we are not little chicks hypnotized by a serpent, there is no justification for technology to have such a "hypnotic" effect on us to allow it to gobble us up. This is why we must firmly refer to the immanence of *cultural* values. (And this is why the evolution of technology is causing a crisis; for technology, by substituting comfort for values, gnaws at and devours culture like a termite.)

Stapledon did not notice any of this. His cautious pen never drove the narrative to "techno-orgiastic escalation," and his societies are never threatened by hedonism. He saw the contradictions of existence elsewhere, not in the paradoxical fact that we long for the leanness of the past because of our overly satisfying present. He did not notice the treacherous possibility of the "pampering technological paradise," which stupefies human beings when it takes over their intellectual labor after it has taken over their physical labor. Stapledon saw the contradiction in the expansion of human culture and its inevitable distortions. The higher humanity reaches, the more pathetically it plummets back into the abyss from which it had laboriously pulled itself up. It never need fear stagnation, since it is condemned to eternal struggle: it survives only as long as it struggles. It is Sisyphus—a solitary Sisyphus, moreover, who does not establish contact with a single other form of rationality. (We can easily understand why: such contact would definitely disturb the tragic vision.) Stapledon did not see Man as a creature able to subordinate history to himself permanently, to rule it as a sculptor rules clay. To the end, Stapledon's Man is unable to come to grips with his own history. However long the cycle, ultimately history always tramples Man, and casts him into the darkness from which he will rise again, but only after vegetating for a million generations.

What the Earth was for Antaeus, the biological womb is for humankind. Aesthetically, this is an often exploited image, reminiscent of Rilke's ideal: the being who grows greater with each of its ever greater defeats. For nature must introduce ever mightier, ever more astronomical fluctuations as agents of destruction to deal with the ever-higher ascending human species. At first, it's sufficient for humanity to handle new forms of energy awkwardly; then there's an invasion of living beings; then there's a collision with the Moon; and finally the whole Sun must become a supernova to deal a mortal blow to the last civilization. But as we list these interferences, we can recognize at last the *non-accidental* character in the whole so-called series—and at the same time, the author's design for his historical fiction. We can't oppose to this prognosis any other prognoses that would have incontestably higher cognitive value. We know only what is not true in Stapledon. We've mentioned it: he has invalidated the real factors of exponential growth, which obstruct all long-range predictions; we can't see anything from the present moment beyond the horizon of the 21st century.

Predictions beyond 80 or 100 years inevitably fail. Beyond that range lies the impenetrable darkness of the future, and above it, a single definite sign indecipherable, but impinging on us all the more: the Silence of the Universe. The universe has not yielded to the radiance of civilizations; it does not scintillate with brilliant astro-technical works—although that is how it should be, if the law of psychozoic beings were an aspect of the exponential ortho-evolution of instrumentality in cosmic dimensions. This is absolutely certain, and it is worth keeping in mind.

It is also worth considering the significance of the fact that the innovations Stapledon distributed over immeasurable time are already real, that decades have already completed Stapledon's Billion Year Plan. This means that everything that 40 years ago was imaginable only with the greatest exertion of fantasy will be realized eventually. What we have not realized, we have considered impossible; but in fact we no longer consider anything to be absolutely and finally pure fantasy. Every automobile driver who has driven long and fast in the night has experienced how the stretch of road lit by the headlamps seems to shrink, how this space, which at slow speeds appears to be quite large, seems to careen towards the car as the vehicle accelerates. Something like this happens with civilization as well. After the store of information that has accumulated over centuries—analogous to fuel—finally ignites, it takes off with an explosion and picks up speed. We have an ever greater need for prognoses, since ever smaller periods separate those places where we must make the right decisions from those where every decision is already too late. At the same time, the accuracy of predictions lessens, especially in the long range. Stapledon did not appreciate the possibility and global significance of the information explosion or the problems of the second and third Industrial Revolutions (there is no trace of robots in his vision).

Stapledon depicted a certain variant of human nature and history, and the history he described has a certain harmony. The message of *Last and First Men* may change, in the sense that it will be a book written about humanity's past, not its future. The extrapolative intent produced not a prediction, but a retrodiction. The growth of humankind is attended by the growth of many of its afflicting weaknesses. Perhaps only aesthetic values withstand the test of time. In that case, the book will not be a "scientifically" produced portrait, but the transposition of the image of Man to the intertwining languages of ethical values and artistic paradigms, and thus an attempt "to do justice to the human world." Stapledon strove to leave every one of humanity's characteristics intact. He did not denigrate the "animal legacy," nor did he want to exalt it. For me, this is the value of his solitary effort.

The passengers of a mailcoach, and even the coachman, may allow themselves to doze off now and then; the civilizational equivalent of this is utopian reverie with no empirical status. But race-car drivers may not lapse into reveries, and it does not matter whether they are sweet or horrible; they must be alert for each curve in the road scantily lit by the headlights. In the same way, a civilization like ours may not content itself with fantastic visions, no matter whether they are rose-tinted or black as soot. Good prognoses are a matter of life and death.

The total rigidification of a dynamic system like humanity as it develops over several billion years is inconceivable. We have not seen a single process with that degree of stability in the whole observable universe, if we are speaking of truly complex processes. Earthly civilization as a whole has never achieved uniform stasis; and this is probably why the idea haunts us that it would be the peak, the state of equilibrium, of the dynamic process of perfection, which, once reached, will sustain itself automatically. But all new data that cause the restructuring of systems can disturb the previous equilibrium. The information-content of science is like the liquid that fills a syringe, and the introduction of civilization into life (i.e., the instrumental utilization of acquired theoretical knowledge) is like the injection itself; obviously, not every injection is absolutely beneficial, let alone a gift, merely because it is new. The histories of science and technology teach us that only the most direct consequences of the "injection of the new" can be foreseen in general terms. The later, and more far-reaching, consequences are unpredictable. At least they have been in the past.

We can conclude, then, that the image of the future as a paradise of automatic fulfillment is a mirage; just as the image of civilization submerging into swamps of hedonistic pleasure is also an illusion. It is a recent distortion of the cognitive content of forecasting, produced by the illusion of perspective, in which there appears to be a point on the horizon where the rails converge. We are ensnared by the same illusion when, seeing the possibility of "consumer-overindulgence" in contemporary trends, we imagine a world filled up by technologies interlocking to form a closed system. Just as the rails do not actually meet at the horizon, so the newly emergent technologies will not converge totally. The nature of the world, so far as we know it, is different; namely, it is open—at least in the inexhaustibility of possibilities that can always renew themselves.

This is why I prefer a non-cyclic, non-recursive, non-repetitive image of the future—which is also rational. It is very unlikely that the future will repeat the past—neither in literal reproductions nor intensified into parody or tragedy—unless, that is, we ourselves divert it onto those wrong tracks. Forecasting thus becomes an increasingly difficult profession, if only because with every decade it will become more unprofitable to look for finished paradigms from the historical chronicles to aid our prognoses. A similar situation would develop if we were to use the method of futurological forecasting on a single part of the whole tree of biological evolution—based on the construction of a single part of the tree whose development has already been completed.

We might use models taken from one evolutionary branch of the class of primates to orient ourselves, at least in general terms, about the scale of transformations and variability of another branch of primates. But we can not extrapolate from the hominid group to Man: the new evolutionary factor that arrived with *Homo sapiens* invalidates the whole biological paradigm. This did not occur instantly, of course. It is the same with the great, future-oriented "technoeruption and technological start" that is our lot in the 20th century. Not every model and analogy that we might still draw from the historical past will be instantly worthless. But they will lose their value by

degrees. When humanity safely escapes from the crises of unification, which optimists would like to place in the next century, the illusion that history is cyclic, like a treadmill that goes helplessly round and round, must necessarily dissolve.

NOTES

1. We have omitted the chronological chart that appears at this point in Lem's text because it is basically a reproduction of the diagram found towards the end of *Last and First Men*.

2. There is, of course, an error in Lem's account here. Stapledon deals with 18 species of *Homo* in all, not 16; and in the following sentences, "Sixteenth" should read "Eighteenth" except in the first instance. (We conjecture that Lem was relying on Stapledon's diagram to refresh his memory—a diagram which leaves a gab between "Fifteenth Men" and "Last Men.")

RÉSUMÉ

Stanislaw Lem. **Les derniers et les premiers *de Stapledon.***—*L'oeuvre monumentale de Stapledon crée un modèle étonnant pour l'histoire future de l'humanité. C'est dans l'ensemble de l'oeuvre que résident l'originalité et l'importance du roman. Les grandeurs et décadences successives des civilisations humaines sont dépeintes comme des oscillations apériodiques contrôlées par la probabilité et non par une loi immanente de l'évolution historique.*

Bien qu'il contienne des prophéties technologiques prescientes, le roman, Les derniers et les premiers, *est supérieur à la plupart des oeuvres de SF qui lui succèdent. Ces oeuvres ne se préoccupent pas des phénomènes sociaux ou de civilisation qui opèrent au niveau des changements matériels et techniques et tout particulièrement des conflits engendrés par ces changements auxquels la civilisation doit se mesurer. La SF a la propension uniquement d'extrapoler les tendances actuelles. La supériorité du roman* Les derniers et les premiers *est due à la conception qu'a l'auteur d'une humanité vue dans sa totalité; une unité faite d'opposés dont les moyens sont si grands que chaque civilisation ne peut qu'en développer une partie. Stapledon et Borges sont des maîtres de la philosophie fantastique. Mais certains critiques sérieux de littérature ont injustement ignoré Stapledon parce que son roman s'apparente à l'essai et également à cause de la nature fruste de son style.*

Le roman a de nombreux défauts et la partie la plus faible de l'ensemble réside en la façon dont chaque civilisation humaine est entièrement réduite à son aspect biologique de base laissant ainsi aux facteurs génétique et évolutif de l'humanité le soin de lier les diverses incarnations évolutionnaires. De plus, Stapledon ignore la loi qui affirme que les phénomènes contributifs se développent à un taux exponentiel et que la découverte d'une nouvelle technologie est rapidement suivie de son exploitation. Ainsi, il ne décrit pas les civilisations où la régulation globale du développement technologique est nécessaire afin de contrôler «l'escalade orgiaque de la technologie». Bien au contraire, Stapledon considère l'humanité dans l'univers comme un Sisyphe qui, sans arrêt, émerge péniblement du vide pour y replonger à nouveau.

Le roman de Stapledon souligne quelques problèmes inhérents à la prophétie prospective. Bien d'innovations sociales et technologiques prédites par Stapledon sur un laps de temps de deux milliards d'années ont déjà vu le jour depuis la publica-

tion de son livre. Mais malgré tout il fut incapable d'en apprécier certaines autres. L'importance du roman ne réside pas dans son aspect prophétique mais plutôt dans sa manière rétrospective de peindre, par des paradigmes éthiques et esthétiques, une humanité restée entière. Cette projection de l'histoire est juste car elle affirme l'ouverture du monde et décline la possibilité d'une utopie automatisée aussi bien qu'une chute définitive vers l'hédonisme. Néanmoins, les paradigmes historiquement stables seront de moins en moins utiles pour prédire l'avenir à mesure que la civilisation reçoit des quantités plus grandes d'informations nouvelles. (IC-R)

Abstract.—*Stapledon's monumental novel creates a fantastic model for the future history of humanity. The originality and greatness of the book lie in Stapledon's total design, in which the successive rises and declines of human civilizations are depicted as an aperiodic fluctuation governed by probability, not by an immanent law of historical evolution.*

Although it is filled with prescient technological predictions, Last and First Men *rises far above most works of SF that come after it. Most SF ignores the social-civilizational aspects of material-technical change and especially the dilemmas created for civilization by such changes. SF tends only to extrapolate existing trends.* Last and First Men*'s superiority to most SF ultimately lies in Stapledon's individual conception of humanity as a whole: a unity of opposites whose potentiality is so great that each civilization can realize only a part of it. Stapledon shares with Borges the status of a master of fantastic philosophy. He has been unjustly ignored by serious critics of literature because of the essayistic character of his book and a certain stylistic crudeness.*

The book has many flaws. The most dubious part of Stapledon's design is the way each human civilization is reduced completely to its bare biological seed, thus allowing only the genetic and evolutionary aspect of humanity to link the various evolutionary incarnations. Further, Stapledon is ignorant of the law that instrumental phenomena grow at an exponential rate, and that the discovery of a technology cannot be long separated from its application. Consequently, he does not describe civilizations in which global regulation of technological development is necessary to control "techno-orgiastic escalation." Instead, Stapledon views humanity as a lonely Sisyphus in the universe, constantly emerging from the void with great effort, only to plummet back again each time.

Stapledon's book also points out some of the inherent problems of futurological prediction. Stapledon envisions many socio-technical innovations over the span of two billion years which have already been realized in the few decades since the book's publication. At the same time, he was unable to appreciate some others. The book's value is ultimately not predictive, but retrodictive, depicting through ethical and aesthetic paradigms a humanity with all its characteristics intact. This image of human history is correct in that it asserts the openness of the world and denies the possibility of both an automatized utopia and a final decline into hedonism. Even so, finished historical paradigms will become less and less useful for prediction as more and more new information is injected into civilization. (IC-R)