I am middle-aged now, but in the autumn I always seek for it again hopefully. On some day when the leaves are red, or fallen, and just after the birds are gone, I put on my hat and an old jacket, and over the protests of my wife that I will catch cold, I start my search. I go carefully down the apartment steps and climb, instead of jump, over the wall. A bit further I reach an unkempt field full of brown stalks and emptied seed pods.

By the time I get to the wood I am carrying all manner of seeds hooked in my coat or piercing my socks or sticking by ingenious devices to my shoestrings. I
let them ride. After all, who am I to contend against such ingenuity? It is obvious that nature, or some part of it in the shape of these seeds, has intentions beyond this field and has made plans to travel with me.

We, the seeds and I, climb another wall together and sit down to rest, while I consider the best way to search for the secret of life. The seeds remain very quiet and some slip off into the crevices of the rock. A woolly-bear caterpillar hurries across a ledge, going late to some tremendous transformation, but about this he knows as little as I.

It is not an auspicious beginning. The things alive do not know the secret, and there may be those who would doubt the wisdom of coming out among discarded husks in the dead year to pursue such questions. They might say the proper time is spring, when one can consult the water rats or listen to little chirps under the stones. Of late years, however, I have come to suspect that the mystery may just as well be solved in a carved and intricate seed case out of which the life has flown, as in the seed itself.

In autumn one is not confused by activity and green leaves. The underlying apparatus, the hooks, needles, stalks, wires, suction cups, thin pipes, and iridescent bladders are all exposed in a gigantic dissection. These are the essentials. Do not be deceived simply because the life has flown out of them. It will return, but in the meantime there is an unparalleled opportunity to ex-

amine in sharp and beautiful angularity the shape of life without its disturbing muddle of juices and leaves. As I grow older and conserve my efforts, I shall give this season my final and undivided attention. I shall be found puzzling over the saw teeth on the desiccated leg of a dead grasshopper or standing bemused in a brown sea of rusty stems. Somewhere in this discarded machinery may lie the key to the secret. I shall not let it escape through lack of diligence or through fear of the smiles of people in high windows. I am sure now that life is not what it is purported to be and that nature, in the canny words of a Scotch theologian, "is not as natural as it looks." I have learned this in a small suburban field, after a good many years spent in much wilder places upon far less fantastic quests.

The notion that mice can be generated spontaneously from bundles of old clothes is so delightfully whimsical that it is easy to see why men were loath to abandon it. One could accept such accidents in a topsy-turvy universe without trying to decide what transformation of buckles into bones and shoe buttons into eyes had taken place. One could take life as a kind of fantastic magic and not blink too obviously when it appeared, bead-eyed and bustling, under the laundry in the back room.

It was only with the rise of modern biology and the discovery that the trail of life led backward toward infinitesimal beginnings in primordial sloughs, that
men began the serious dissection and analysis of the cell. Darwin, in one of his less guarded moments, had spoken hopefully of the possibility that life had emerged from inorganic matter in some "warm little pond." From that day to this biologists have poured, analyzed, minced, and shredded recalcitrant protoplasm in a fruitless attempt to create life from nonliving matter. It seemed inevitable, if we could trace life down through simpler stages, that we must finally arrive at the point where, under the proper chemical conditions, the mysterious borderline that bounds the inanimate must be crossed. It seemed clear that life was a material manifestation. Somewhere, somehow, sometime, in the mysterious chemistry of carbon, the long march toward the talking animal had begun.

A hundred years ago men spoke optimistically about solving the secret, or at the very least they thought the next generation would be in a position to do so. Periodically there were claims that the emergence of life from matter had been observed, but in every case the observer proved to be self-deluded. It became obvious that the secret of life was not to be had by a little casual experimentation, and that life in today's terms appeared to arise only through the medium of preexisting life. Yet, if science was not to be embarrassed by some kind of mind-matter dualism and a complete and irrational break between life and the world of inorganic matter, the emergence of life had, in some way, to be accounted for.

Nevertheless, as the years passed, the secret remained locked in its living jelly, in spite of larger microscopes and more formidable means of dissection. As a matter of fact the mystery was heightened because all this intensified effort revealed that even the supposedly simple amoeba was a complex, self-operating chemical factory. The notion that he was a simple blob, the discovery of whose chemical composition would enable us instantly to set the life process in operation, turned out to be, at best, a monstrous caricature of the truth.

With the failure of these many efforts science was left in the somewhat embarrassing position of having to postulate theories of living origins which it could not demonstrate. After having chided the theologian for his reliance on myth and miracle, science found itself in the unenviable position of having to create a mythology of its own: namely, the assumption that what, after long effort, could not be proved to take place today had, in truth, taken place in the primeval past.

My use of the term mythology is perhaps a little harsh. One does occasionally observe, however, a tendency for the beginning zoological textbook to take the unwary reader by a hop, skip, and jump from the little steaming pond or the beneficent chemical crucible of the sea, into the lower world of life with such sureness and rapidity that it is easy to assume that there is no mystery about this matter at all, or, if there is, that it is a very little one.
This attitude has indeed been sharply criticized by the distinguished British biologist Woodger, who remarked some years ago: "Unstable organic compounds and chlorophyll corpuscles do not persist or come into existence in nature on their own account at the present day, and consequently it is necessary to postulate that conditions were once such that this did happen although and in spite of the fact that our knowledge of nature does not give us any warrant for making such a supposition... It is simple dogmatism—asserting that what you want to believe did in fact happen."

Yet, unless we are to turn to supernatural explanations or re invoke a dualism which is scientifically dubious, we are forced inevitably toward only two possible explanations of life upon earth. One of these, although not entirely disproved, is most certainly out of fashion and surrounded with greater obstacles to its acceptance than at the time it was formulated. I refer, of course, to the suggestion of Lord Kelvin and Svante Arrhenius that life did not arise on this planet, but was wafted here through the depths of space. Microscopic spores, it was contended, have great resistance to extremes of cold and might have come into our atmosphere with meteoric dust, or have been driven across the earth's orbit by light pressure. In this view, once the seed was "planted" in soil congenial to its development, it then proceeded to elaborate, evolve, and adjust until the higher organisms had emerged.

This theory had a certain attraction as a way out of an embarrassing dilemma, but it suffers from the defect of explaining nothing, even if it should prove true. It does not elucidate the nature of life. It simply removes the inconvenient problem of origins to far-off spaces or worlds into which we will never penetrate. Since life makes use of the chemical compounds of this earth, it would seem better to proceed, until incontrovertible evidence to the contrary is obtained, on the assumption that life has actually arisen upon this planet. The now widely accepted view that the entire universe in its present state is limited in time, and the apparently lethal nature of unscreened solar radiation are both obstacles which greatly lessen the likelihood that life has come to us across the infinite wastes of space. Once more, therefore, we are forced to examine our remaining notion that life is not coterminous with matter, but has arisen from it.

If the single-celled protozoans that riot in roadside pools are not the simplest forms of life, if, as we know today, these creatures are already highly adapted and really complex, though minute beings, then where are we to turn in the search for something simple enough to suggest the greatest missing link of all—the link between living and dead matter? It is this problem that keeps me wandering fruitlessly in pastures and weed thickets even though I know this is an old-fashioned naturalist's approach, and that busy men in laboratories...
have little patience with my scufflings of autumn leaves, or attempts to question beetles in decaying bark. Besides, many of these men are now fascinated by the crystalline viruses and have turned that remarkable instrument, the electron microscope, upon strange molecular “beings” never previously seen by man. Some are satisfied with this glimpse below the cell and find the virus a halfway station on the road to life. Perhaps it is, but as I wander about in the thin mist that is beginning to filter among these decaying stems and ruined spider webs, a kind of disconsolate uncertainty has taken hold of me.

I have come to suspect that this long descent down the ladder of life, beautiful and instructive though it may be, will not lead us to the final secret. In fact I have ceased to believe in the final brew or the ultimate chemical. There is, I know, a kind of heresy, a shocking negation of our confidence in blue-steel microtomes and men in white in making such a statement. I would not be understood to speak ill of scientific effort, for in simple truth I would not be alive today except for the microscopes and the blue steel. It is only that somewhere among these seeds and beetle shells and abandoned grasshopper legs I find something that is not accounted for very clearly in the dissections to the ultimate virus or crystal or protein particle. Even if the secret is contained in these things, in other words, I do not think it will yield to the kind of analysis our science is capable of making.

Imagine, for a moment, that you have drunk from a magician’s goblet. Reverse the irreversible stream of time. Go down the dark stairwell out of which the race has ascended. Find yourself at last on the bottommost steps of time, slipping, sliding, and wallowing by scale and fin down into the muck and ooze out of which you arose. Pass by grunts and voiceless hissings below the last tree fern. Eyeless and earless, float in the primal waters, sense sunlight you cannot see and stretch absorbing tentacles toward vague tastes that float in water. Still, in your formless shiftings, the you remains: the sliding particles, the juices, the transformations are working in an exquisitely patterned rhythm which has no other purpose than your preservation—you, the entity, the ameboid being whose substance contains the unfathomable future. Even so does every man come upward from the waters of his birth.

Yet if at any moment the magician bending over you should cry, “Speak! Tell us of that road!” you could not respond. The sensations are yours but not—and this is one of the great mysteries—the power over the body. You cannot describe how the body you inhabit functions, or picture or control the flights and spinnings, the dance of the molecules that compose it, or why they chose to dance into that particular pattern which is you, or, again, why up the long stairway of the eons they dance from one shape to another. It is for this reason that I am no longer interested in final particles. Follow
them as you will, pursue them until they become nameless protein crystals replicating on the verge of life. Use all the great powers of the mind and pass backward until you hang with the dire faces of the conquerors in the hydrogen cloud from which the sun was born. You will then have performed the ultimate dissection that our analytic age demands, but the cloud will still veil the secret and, if not the cloud, then the nothingness into which it now appears, the cloud, in its turn, may be dissolved. The secret, if one may paraphrase a savage vocabulary, lies in the egg of night.

Only along the edges of this field after the frost there are little whispers of it. Once even on a memorable autumn afternoon I discovered a sunning blacksnake brooding among the leaves like the very simulacrum of old night. He slid unhurriedly away, carrying his version of the secret with him in such a glittering menace of scales that I was abashed and could only follow admiringly from a little distance. I observed him well, however, and am sure he carried his share of the common mystery into the stones of my neighbor's wall, and is sleeping endlessly on in the winter darkness with one great coil locked around that glistening head. He is guarding a strange, reptilian darkness which is not night or nothingness, but has, instead, its momentary vision of mouse bones or a bird's egg, in the soft rising and ebbing of the tides of life. The snake has diverted me, however. It was the dissection of a field that was to occupy us—a dissection in search of secrets—a dissection such as a probing and inquisitive age demands.

Every so often one encounters articles in leading magazines with titles such as "The Spark of Life," "The Secret of Life," "New Hormone Key to Life," or other similar optimistic proclamations. Only yesterday, for example, I discovered in the New York Times a headline announcing: "Scientist Predicts Creation of Life in Laboratory." The Moscow-date-lined dispatch announced that Academician Olga Lepeshinskaya had predicted that "in the not too distant future, Soviet scientists would create life." "The time is not far off," warns the formidable Madame Olga, "when we shall be able to obtain the vital substance artificially." She said it with such vigor that I had about the same reaction as I do to announcements about atomic bombs. In fact I half started up to latch the door before an invading tide of Russian protoplasm flowed in upon me.

What finally enabled me to regain my shaken confidence was the recollection that these pronouncements have been going on for well over a century. Just now the Russian scientists show a particular tendency to issue such blasts—committed politically, as they are, to an uncompromising materialism and the boastfulness of very young science. Furthermore, Madame Lepeshinskaya's remarks as reported in the press had a curiously old-fashioned flavor about them. The protoplasm she
referred to sounded amazingly like the outmoded *Urschleim* or *Autoplasm* of Haeckel—simplified mucoid slimes no longer taken very seriously. American versions—and one must remember they are often journalistic interpretations of scientists' studies rather than direct quotations from the scientists themselves—are more apt to fall into another pattern. Someone has found a new chemical, vitamin, or similar necessary ingredient without which life will not flourish. By the time this reaches the more sensational press, it may have become the "secret of life." The only thing the inexperienced reader may not comprehend is the fact that no one of these items, even the most recently discovered, is the secret. Instead, the substance is probably a part, a very small part, of a larger enigma which is well-nigh inscrutable as it ever was. If anything, the growing list of catalysts, hormones, plasma genes, and other hobgoblins involved in the work of life only serves to underline the enormous complexity of the secret. "To grasp in detail," says the German biologist Von Berta- lansffy, "the physico-chemical organization of the simplest cell is far beyond our capacity."

It is not, you understand, disrespect for the laudable and persistent patience of these dedicated scientists happily lost in their maze of pipettes, smells, and gas flames, that has led me into this runaway excursion to the wood. It is rather the loneliness of a man who knows he will not live to see the mystery solved, and who, furthermore, has come to believe that it will not be solved when the first humanly synthesized particle begins—if it ever does—to multiply itself in some unknown solution.

It is really a matter, I suppose, of the kind of questions one asks oneself. Some day we may be able to say with assurance, "We came from such and such a protein particle, possessing the powers of organizing in a manner leading under certain circumstances to that complex entity known as the cell, and from the cell by various steps onward, to multiple cell formation." I mean we may be able to say all this with great surety and elaboration of detail, but it is not the answer to the grasshopper's leg, brown and black and saw-toothed here in my hand, nor the answer to the seeds still clinging tenaciously to my coat, nor to this field, nor to the subtle essences of memory, delight, and wistfulness moving among the thin wires of my brain.

I suppose that in the forty-five years of my existence every atom, every molecule that composes me has changed its position or danced away and beyond to become part of other things. New molecules have come from the grass and the bodies of animals to be part of me a little while, yet in this spinning, light and airy as a midge swarm in a shaft of sunlight, my memories hold, and a loved face of twenty years ago is before me still. Nor is that face, nor all my years, caught cellularly as in some cold precise photographic pattern, some gross,
mechanical reproduction of the past. My memory holds the past and yet paradoxically knows, at the same time, that the past is gone and will never come again. It cherishes dead faces and silenced voices, yes, and lost evenings of childhood. In some odd nonspatial way it contains houses and rooms that have been torn timber from timber and brick from brick. These have a greater permanence in that midge dance which contains them than ever they had in the world of reality. It is for this reason that Academician Olga Lepeshinskaya has not answered the kind of questions one may ask in an open field.

If the day comes when the slime of the laboratory for the first time crawls under man's direction, we shall have great need of humbleness. It will be difficult for us to believe, in our pride of achievement, that the secret of life has slipped through our fingers and eludes us still. We will list all the chemicals and the reactions. The men who have become gods will pose austere before the popping flashbulbs of news photographers, and there will be few to consider—so deep is the mind-set of an age—whether the desire to link life to matter may not have blinded us to the more remarkable characteristics of both.

As for me, if I am still around on that day, I intend to put on my old hat and climb over the wall as usual. I shall see strange mechanisms lying as they lie here now, in the autumn rain, strange pipes that transported the substance of life, the intricate seedcase out of which the life has flown. I shall observe no thing green, no delicate transpirations of leaves, nor subtle comings and goings of vapor. The little sunlit factories of the chloroplasts will have dissolved away into common earth.

Beautiful, angular, and bare the machinery of life will lie exposed, as it now is, to my view. There will be the thin, blue skeleton of a hare tumbled in a little heap, and crouching over it I will marvel, as I marvel now, at the wonderful correlation of parts, the perfect adaptation to purpose, the individually vanished and yet persisting pattern which is now hopping on some other hill. I will wonder, as always, in what manner "particles" pursue such devious plans and symmetries. I will ask once more in what way it is managed, that the simple dust takes on a history and begins to weave these unique and never recurring apparitions in the stream of time. I shall wonder what strange forces at the heart of matter regulate the tiny beating of a rabbit's heart or the dim dream that builds a milkweed pod.

It is said by men who know about these things that the smallest living cell probably contains over a quarter of a million protein molecules engaged in the multitudinous coördinated activities which make up the phenomenon of life. At the instant of death, whether of man or microbe, that ordered, incredible spinning passes away in an almost furious haste of those same particles to get themselves back into the chaotic, unplanned earth.
I do not think, if someone finally twists the key successfully in the tiniest and most humble house of life, that many of these questions will be answered, or that the dark forces which create lights in the deep sea and living batteries in the waters of tropical swamps, or the dread cycles of parasites, or the most noble workings of the human brain, will be much if at all revealed. Rather, I would say that if "dead" matter has reared up this curious landscape of fiddling crickets, song sparrows, and wondering men, it must be plain even to the most devoted materialist that the matter of which he speaks contains amazing, if not dreadful powers, and may not impossibly be, as Hardy has suggested, "but one mask of many worn by the Great Face behind."

A native of Lincoln, Nebraska, LOREN EISELEY was born into a family which homesteaded in that region when it was still a territory. His first contact with nature lay in the salt flats and ponds around Lincoln, and in the mammoth bones hoarded in the old red brick museum on the campus of the University of Nebraska. Receiving his A.B. degree there, he completed graduate work in anthropology at the University of Pennsylvania. Returning to the Midwest for his first academic job, he taught at the University of Kansas. He later became head of the Department of Sociology and Anthropology at Oberlin College in Ohio, then returned to the University of Pennsylvania in 1947 to head the Department of Anthropology. He also was Curator of Early Man in the University Museum.

Dr. Eiseley lectured at a number of universities, including Harvard, Columbia, and the University of California. He was president of the American Institute of Human Paleontology, and a contributor to many leading scientific journals as well as periodicals such as *Harper's, American Scholar,* and *Gentry.*

For a number of years he was active in the search for early postglacial man in the western United States, and worked extensively in the high plains, mountains, and deserts bordering the Rocky Mountains from Canada into Mexico.

At his death in 1977, Dr. Eiseley was Benjamin Franklin and University Professor of History and Science at the University of Pennsylvania.