

**THE NEW SCIENCE REVEALS  
MAN'S ORIGINS ON OTHER  
PLANETS AND CHALLENGES  
THE OLD EARTH-CENTERED  
COSMOLOGY**

# **THE COMING OF THE GODS**

**Jean Sedy**

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Translated by Lowell Bair

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To the memory of Giordano Bruno, who taught only the truth about our congeners in the sky,  
but was burned at the stake in 1600 because his medieval ideas, to which our science is  
returning, were strongly displeasing to the humanists of the Renaissance.

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*Preface to the American Edition*

"Unreasoning awe of something mysterious; irrational or unfounded belief." No dictionary will disagree with that definition of superstition. We live in highly superstitious times. Every day we meet people who believe in what was standard knowledge thirty years ago and are afraid of mysterious tomorrows. Thirty years ago,  $e = mc^2$  was a somewhat frightening mystery, and we won a war because Hitler's scientists accepted Rutherford's authoritative judgment about the practical impossibility of obtaining energy by splitting atoms. (Rutherford died in 1938.)

There are good reasons why what is happening today is frightening for tomorrow. But our problem is to stop being unreasonably awed and try to understand the *reasons*. We can understand them only by getting rid of the "humanist" delusion, that mass of superstition which began building up some five centuries ago, with the Renaissance, and reached its climax at the end of the nineteenth century. For humanists, human will is paramount. " 'Where there's a will, there's a way' summarizes modern superstitions," wrote Carl C. Jung. We are beginning to realize that whatever our will may be, we are evidently not finding the way to build satisfactory societies, whether based on free enterprise or on socialist planning. The will to make nineteenth-century delusions work is a failure. Mankind has more problems than humanist will can cope

Giordano Bruno was burned at the stake in 1600, when everyone *knew* that our Earth was the center of the universe. What did he teach to deserve this sad fate? Just what we are discovering now: that we are rising apes, not fallen angels. How did Giordano Bruno come to know what he taught? That is what this book is about.

*An explanation formulated in the Middle Ages by Rashi (1040-1103), and still taught in Jewish courses of religious instruction, presents the "sons of Elohim" who gave sons to the "daughters of ma'as" "celestial beings accomplishing a mission" (Genesis 6:2).*

The above commentary, and the text below, are from the Hebrew-French bilingual edition of the Pentateuch published under the direction of Elie Munk, rabbi of the Communauté de Stricte Observance in Paris (Diffusion FSJU, 19 Boulevard Poissonniere, Paris).

LES FILS DE LOHIM TROUVERENT QUE LES FILLES D'HOMME ETAIENT BELLES, ET ILS SE PRIRENT DES FEMMES DE TOUT CE QU'ILS CHOISISSAIENT.

["The sons of Elohim found that the daughters of man were beautiful, and they took women for themselves from all that they chose."]

The teachings of Rashi are to the Synagogue what those of Saint Augustine and Saint Thomas are to the Church.

## CHAPTER 1

### Science and Myth

When you are waiting for a friend, do not mistake the beating of your heart for the sound of his horse's hooves.

Chinese proverb

Legend has it that one day when a storm had cut off all communication between Great Britain and continental Europe, a London newspaper carried the headline: "The Continent is isolated." When we speak of extraterrestrials, we commit the same sin of naive pride, the same error of perspective. We tacitly assume that the inhabitants of the universe are divided into two categories: (1) earthlings, the center and finest flower of Creation, and (2) the others, who have not had the good fortune to be born among us. Those others are extraterrestrials. And everyone knows that an extraterrestrial is a kind of alien. . . .

A little modesty would do us no harm. The inhabitants of the Galaxy are Galaxians, just as the inhabitants of Europe are Europeans. We're all Galaxians.

If our planet does not have the prodigious privilege of being the only one on which life has appeared, we are not alone in the universe. If the evolution of living matter is subject to laws as universal as those of physics and chemistry and if the universe contains a planetary system comparable to ours but a little older, the problems that now beset us have long since been solved there.

Let us be modest and avoid the absurdity of speaking as if "the Galaxy were isolated" because we have no communication with other Galaxians. It is we who are isolated.

We are so isolated in the Galaxy that we do not even know if other Galaxians really exist.

### Fictitious Science

We find extraterrestrials by the ton in miles of science fiction. They are always frightening because of their appearance or their intentions, or both. They are always horrible aliens whom brave earthlings drive back into those infinite abysses that made Pascal feel dizzy.

And it can scarcely be otherwise. Put yourself in the place of a science-fiction writer; imagine Visitors from the Cosmos who are not extraterrestrial aliens but Galaxians so much more advanced than we are that they go from Sirius to Proxima Centauri as easily as we go from Paris to Deauville. So far, so good: you have the first chapter of your science-fiction novel. But what next?

This is where the trouble starts. If the Galaxians are similar to us but far more advanced, why have they come to Earth? To bring us the solution to our present problems, which their ancestors overcame long ago? What solution?

Our science-fiction writer is now in the difficult situation of trying to do what Richard Feynman calls pulling oneself up by one's shoelaces. If he had the solution to our problems, he would no longer be writing science fiction: he would be awarded a Nobel Prize—like Richard Feynman. Yet even Feynman, who earned his Nobel Prize by discovering answers to incredibly difficult problems of theoretical physics, knows no more about the solution that Galaxians might bring to our problem than you, I, or the most learned sociologists and political theorists.

So our science-fiction writer does what you would do if you were in his place: he gives up trying to describe Galaxians and resigns himself to producing a story about extraterrestrials. And extraterrestrials are necessarily terrifying hybrids, since their technology far surpasses ours, but their intelligence can never

surpass that of the author who invents their acts and intentions.

If their civilization is no higher than ours in intelligence, how can it have developed such a wondrous technology? This perplexing problem is what leads our writer to foggy hocus-pocus and gratuitous assertions. Science fiction that brings in extraterrestrials is never genuine science fiction: it is either a philosophical tale or gratuitous fiction based on fictitious science.

Fictitious science is a realm where nothing prevents an astronaut from exceeding the speed of light; he has only to climb aboard an antigravitational spacecraft with an engine fueled by pure essence of ignorantium. As for gratuitous fiction, it is easy to make it credible: you describe green, three-legged extraterrestrials, to avoid being called a racist, and you give them abominable intentions which the reader's subconscious mind will automatically recognize as those of the Chinese who appear in nightmares of the Yellow Peril, James Bond was able to do without spacecraft by dealing with Chinese and Koreans directly.

## Myth

Galaxians worthy of the name are found in only one story: the Myth common to all the First Civilizations.

Let us first sweep away one widespread false idea: Darwin did not innovate when he affirmed an evolutionary link between the ape and man; he only expressed in modern language a notion that was familiar to archaic thought (the Pilgrim Monkey of the Chinese Tradition, for example). "The myth of the ancestor-monkey has roots lost in the shadows, and its fixation took place in the eighteenth century," says Andre Leroi-Gourhan, professor at the College de France, who has also established the "criteria of humanity" in a way that is now generally accepted.

We will see later in this book that modern anthropological knowledge only provides grist for the mill of the Myth. We know that *Homo sapiens* existed about 35,000 years ago, with a skeleton identical to ours. He evolved from *Homo jaber*, the product of an evolutionary process spread over several hundred million years, beginning with the most primitive forms of life.

The name of "prehistory" is given to the whole period for which we can reconstruct the life of our direct ancestors only by the methods used in determining the behavior of ancient animal species: i.e., excavations are made at sites where prehistoric men lived, hypotheses are formed on the basis of the evidence found, and objects are "made to speak." The number of explored sites and converging hypotheses is now great enough to justify regarding prehistory as a science.

History in the strict sense began when men started telling us about themselves. We no longer need to make artifacts speak; we can listen to men themselves.

Between prehistory and history is the shadowy period of protohistory. We must still rely heavily on artifacts for information, but some light has been cast on it by men who lived in early historic times. Having just emerged from protohistory, they retained memories of it that are reflected in their Myth. It was in the protohistoric period that what is known as "archaic thought" was born.

At the dawn of historic times, between 5000 and 3000 b.c., genuine civilizations arose abruptly from protohistory: the First Civilizations of the Middle East. Between 3500 and 3000 b.c., other civilizations that deserve to be called First Civilizations appeared in China and around the Greek Mediterranean. Although their appearance in history is more recent, their roots are in the same remote past as the First Civilizations of Egypt and Mesopotamia, and they too seem to have been fully developed from the time of their appearance.

These First Civilizations have in common a Myth whose point of departure is the same everywhere, from the Pacific to the Mediterranean. It can be stated as follows:

Everything we know, everything that forms our civilization, everything that makes us superior to other human communities without knowledge comparable to ours—all this we learned from the heritage left by two-legged mammals who came from the sky and departed as they had come. Those two-legged mammals were the gods whose memory we venerate and whose Tradition we transmit.

## Galaxians

The Myth thus gives the only story in which bipeds who come from the sky do not appear as nightmarish extraterrestrials, but as Galaxians who match the idea that we can reasonably form of representatives of an advanced civilization landing on a planet inhabitable for them, in another planetary system.

/ do not know if such Galaxians landed in front of our astounded primitive ancestors in protohistoric times, but I do know one thing with certainty: the Myth common to all the First Civilizations asserts that such Galaxians lived on Earth in protohistoric times.

A certain number of facts make the Myth appear plausible in the light of present scientific knowledge.

The Myth describes "gods" who eat the fruits of the earth and breathe the same air as our ancestors. If the laws of evolution are as universal as the laws of physics, the description in the Myth ("They were made like us, but more handsome") is more plausible than the monsters of fiction based on pseudo-science. The Myth also describes machines, particularly flying machines, and "divine" installations with a naivete that we find in descriptions of our own technology by contemporary primitive peoples.

The Myth does not merely say that the gods had prodigious knowledge. It also reports what men retained from the teachings of those "gods" and transmits knowledge (notably in astronomy) that is puzzling to historians of science, because they have never been able to explain how Neolithic men could have acquired it by their own means.

### Is It Serious?

Like you, I know many people who readily give the impression of having stacks of diplomas and who shrug their shoulders when they hear such talk. "You can't be serious!" they say. "Don't make yourself ridiculous with that nonsense! It's nothing but make-believe! You can tell that by just looking at the people who go in for such things!"

I met some people who seriously "go in for such things" during a stay in the United States in February and March of 1970. My purpose was to determine what is "serious" and what is not in a domain where scientists have passed from theory to concrete accomplishments—Apollo 11 and Apollo 12 have crossed the line that the Myth draws between "the realm of men" and "the realm of the gods." For all Traditions, setting foot on another heavenly body, particularly the moon, specifically means entering "the realm of the gods."

Do the men I talked with in the United States belong to the category of "serious people?" They are regarded as such in the universities where they teach, and in NASA, where they take part in the planning and analysis of the Apollo program. They will not necessarily agree with all the conclusions of this book, which was only in the state of a project at the time when I visited them, but it should be obvious that I have no desire to be contradicted and that I therefore took great account of the objections they raised with regard to some of the conclusions stated in my earlier books.

Are those men a little "visionary?" They certainly are. Leading researchers necessarily have that trait. "I hope radium has a pretty color!" Madame Curie said when she was on the verge of obtaining it in a metallic state (until then, radium had been known only by its ore).

In France today, the prevailing opinion among many academics is the one expressed by a certain professor, who had his hour of glory as a researcher, in an article published in September 1965: "It is certain that man can never visit any planetary system that may be in the vicinity of ours, even if it is only a few dozen light-years away from the sun. [. . .] It would require an expenditure of matter which would imply, at the outset, a mass on the order of that of the earth."

This same professor added nothing to his glory when, in the course of a French radio symposium

broadcast at the time of the Apollo 11 mission, he stated that it was impossible for even the most elementary living organism to survive on the moon. To the best of my knowledge, he has never publicly commented on the fact that an earthly staphylococcus survived for many months in the carcass of a Surveyor that had landed on the moon.

In the United States, the men who are now giving research its impetus say, write, and teach that it is not at all impossible for man to explore other planetary systems; "going to the stars" is NASA's expressly stated objective. And when I came to those men with the recommendation of Evry Schatzman, professor at the Paris Institute of Astrophysics, whom they regard as one of their peers, all doors were opened wide to me.

Freeman Dyson, professor at the Princeton Institute for Advanced Studies, told me that he still sees interstellar travel as a problem of biology and not of energy, as he stated in an article published in *Scientific American* in 1964. There is no serious reason to deny the possibility that other inhabitants of the Galaxy may already have carried out low-speed expeditions with a duration of something like a thousand years. The original members of such an expedition could probably have no hope of return. It would consist of a small group of scientists, men and women, who would reproduce among themselves in the hope that their descendants would be able to colonize and civilize the natives of another planetary system.

In 1960, I. S. Shklovskii, an astrophysicist of the Sternberg Astronomical Institute in Moscow, stated the hypothesis that the satellites of Mars might be artificial.

Carl Sagan, a professor of astrophysics at Cornell University, told me that he had not changed his mind since he wrote in 1966:  
It seems possible that the Earth has been visited by various Galactic civilizations many times. [. . .] It is not out of the question that artefacts of those visits still exist—although none have been found to date—or even that some kind of base is maintained within the solar system to provide continuity for successive expeditions. Because of weathering and the possibility of detection and interference by the inhabitants of the Earth, it might have appeared preferable not to erect such a base on the Earth's surface. The Moon seems one reasonable alternative site for a base.

In view of this, why is it that when for the first time I proposed a line of reasoning that led to similar conclusions (in *Les Cahiers de cours de Moïse*), a number of people who like to give the impression that they know everything worth knowing refused to see anything in it but "fiction with no scientific basis," to use Albert Ducrocq's expression? Yet my hypothesis assumed nothing more than the arrival, in a spacecraft large enough for a journey lasting several centuries (Dyson), and perhaps left in orbit around Mars (Shklovskii), of a team of astronauts whose stay on Earth is related by all the myths of protohistory, and who had an underground base, probably on the moon (Sagan), which, if discovered, will show that the "gods" of the Myth did not come from our ancestors' imagination.

I see four main reasons for this attitude (a fifth being the authoritative judgment of professors who do not believe in interstellar travel):

I am proposing a synthesis, a construction harder for conventional minds to digest than the isolated fragments proposed by Sagan, Shklovskii, Dyson, and several others who will appear later in this book.

I am not Dyson, Shklovskii, or Sagan, and as Walter Sullivan (science editor of the *New York Times*) has pointed out, it takes an impregnable scientific reputation to state astounding hypotheses and get away with it.

My *Cahiers de cours de Moïse* appeared in 1962; Shklovskii's *Universe, Life, Mind* was not published until that same year—and in Russian; Dyson wrote his article in 1964; *Intelligent Life in the Universe*, by Shklovskii and Sagan, was not published until 1966.

Shklovskii, Sagan, Dyson, and all other scientists with an international reputation that enables them to propose "astounding hypotheses" never, absolutely never, give any serious attention to the Bible. They

sometimes refer to myths, but the Bible seems to be under an unconditional prohibition.

And the Bible is my point of departure. It is in the Bible, and more specifically the first eleven chapters of Genesis, that I seek (and believe I have found) the most solid correlations between the ancient Myth and the breakthroughs of modern science.

## Biblical Genesis

We must, of course, read Genesis without regard for all the religious beliefs attached to it; we must read it as an ethnologist reads a "pagan" myth, seeking only whatever basis of historical truth it may have. Ideally, it should be read in the original Hebrew, but a bilingual edition may be used if necessary. Ordinary Bibles (which translate the Hebrew plural Elohim as "God") are about as useful for this purpose as a "faithful reconstruction" in a Hollywood film is for seizing the spirit of the time of Louis XIV.

Two questions immediately occur to a twentieth-century man:

How can anyone reasonably look for "gods" in the Bible, the monument of monotheism, of the One God?

Why should the Bible be under a prohibition that spares "idolatrous" sacred books?

Voltaire directly answers the first of these questions in the article on Genesis in his *Philosophical Dictionary*: "In the beginning God created heaven and earth.' That is how it has been translated, but the translation is inaccurate. There is no man with a little education who does not know that the text reads, 'In the beginning the gods made heaven and earth.' "

And indirectly it is also Voltaire who answers the second question:

a. In the eighteenth century, every "man with a little education" knew that the Hebrew Elohim, usually translated as "God," is a plural and can therefore be more reasonably translated as "the gods."

b. In the twentieth century, "educated people" have returned to the interpretation of those whom Voltaire regarded as uncultivated. The "God of the Bible" appears to them in the guise of a neo-Zeus who consented to give NASA a helping hand in saving the three astronauts of Apollo 13 when he was respectfully asked to do so in prayers officially recommended by President Nixon. He is, in a sense, a subcontracting God of NASA.

In the twentieth century, many people with more than "a little education" deliberately ignore the sacred book from which "usage" draws such absurdities. As for those scientists who know the Bible, they avoid making any reference to it, for fear of being thought to have enrolled in the service of the neo-Zeus.

In my earlier books I gave reasons for ridding the Bible of the God whom superstitious people have introduced into it, a God who created the world in six times twenty-four hours. I also gave reasons for seeking "Voltaire's gods" in it and making the assumption that Genesis is a coherent, rational narrative. I will not return to those subjects in this book, except when necessary for the sake of clarity.

Since my other books were published, however, there has been a new development with regard to astronomical knowledge in ancient times, which constitutes one of the strongest presumptions in favor of the hypothesis that teachings were left to our remote ancestors. I have often been asked if I was not mistaking my desires for reality in believing that this knowledge was already thousands of years old in the time of the Babylonian astronomer-priests. A recent book, admirably recommended to me by several professors at Princeton, Cornell, and Harvard, answers this objection in a way that leaves no room for doubt. It is *Hamlet's Mill*, published in 1969 by Gambit, Inc., Boston. Here are two quotations from it:

"Planetary periods, sidereal and synodic, were known and rehearsed in numerous ways by celebrations

already traditional in archaic times." (Pp. 3-4.)

"It would be possible, for example, to prepare a most informative edition of the Romance of Reynard Fox illustrated entirely with reproductions from Egyptian and Mesopotamian ritual documents. For it is likely that these documents represent the last form of international initiatic language, intended to be misunderstood alike by suspicious authorities and the ignorant crowd." (P. 347.)

The author of *Hamlet's Mill* is Giorgio de Santillana, Professor of the History and Philosophy of Science at the prestigious Massachusetts Institute of Technology, and in writing it he augmented his prodigious knowledge of the subject with research supported by a grant from the Twentieth Century Fund.

### Today's Science

There are excellent books on astronomy today, but if there were a modern equivalent of Camille Flammarion's *Astronomie populaire* it would be well known, it would be a best seller, and today's Frenchmen, contemporaries of the Apollo program, would know as much about modern astronomy and astrophysics as those who were contemporaries of Flammarion and Jules Verne knew about the knowable universe of their time.

The Einsteinian universe is, of course, more complex than the pre-Einsteinian universe in which Flammarion lived, and the indirect methods of astronomy make us feel dizzy: in our solar system, far from the center of the Galaxy, we are in the situation of the inhabitants of a speck of dust near the edge of a moving gear who try to learn by observation the diameter of the gear, its speed in relation to other gears and the nature of the mechanism in which all the gears are assembled. And analogies between the prodigiously large of astronomy and the prodigiously small of nuclear physics seem beyond the grasp of laymen when they open a book whose author is less concerned with making things comprehensible than showing off his knowledge.

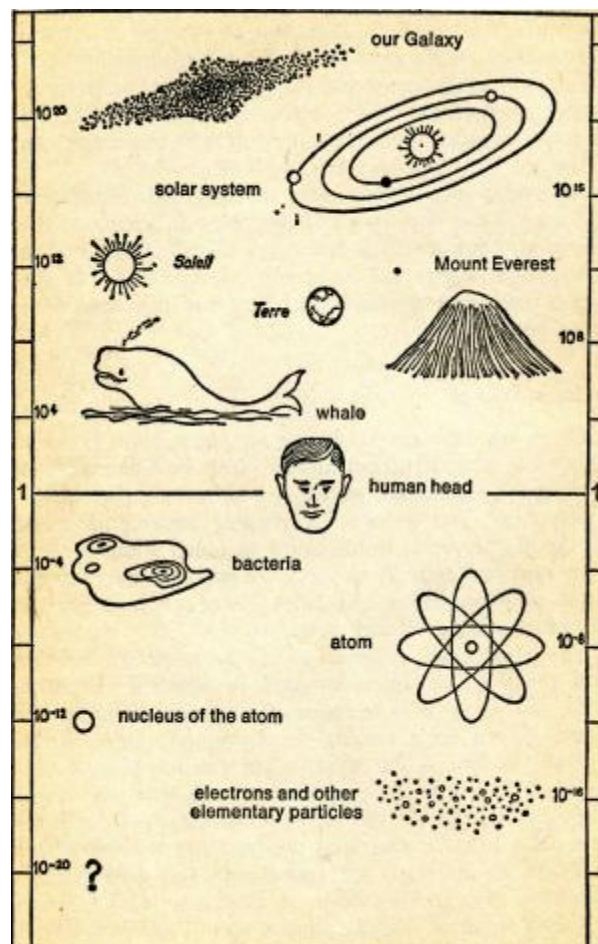


Figure 1 (D'après George Gamoto, sur une idee d'Eddington.)

But all this is quite accessible to anyone who limits his ambition to a general understanding of what is involved, especially if he reads a book written or inspired by George Gamow, who is both a first-rate scientist and the popularizer who had the idea of illustrating the continuity of the universe with a scale of sizes called a "reconsideration of man's place in the universe." Gamow has shown that, on a logarithmic scale, a human head is about halfway between the size of an atom and that of the sun, and halfway between the nucleus of an atom and the diameter of the solar system.

"That scale of sizes proves nothing!" I have been told by several very serious people (from whom I had treacherously concealed the fact that its author is George Gamow). And they are quite right; the idea is not to prove anything, but to titillate the imagination. To an imagination titillated by Gamow, the scale suggests a principle of equilibrium that gives a reassuring view of the future:

- As long as science had not succeeded in exploring beyond atoms, toward the bottom of the scale, airplanes did not exceed the altitude of Mount Everest.
- "Knowledge of the sun," whose energy comes from the relatively slow fusion of protons, and the deliberate achievement of such fusion are equidistant from the human head on the scale.
- Exploration of the solar system will require more thorough knowledge at the level of the electron.
- Exploration of the Galaxy will apparently coincide with discovery of the constituents (quarks?) of the atomic nucleus.

We are not at the center of the universe, but we do seem to be in the middle of the scale and therefore qualified to reason on the basis of an "assumption of mediocrity," which will later be discussed at length.

It is also reassuring to note that our present efforts seem to be going in the right direction:

- Before each great scientific achievement, there have invariably been a few pedants to demonstrate that it would never be possible.
- All those major achievements have shown that the pedants had simply misunderstood the nature of physical laws.
- None of them has ever revealed the slightest break in the framework of the fundamental laws of theoretical physics.

One of my ambitions in this book is to show that "penetrating the mysteries of modern science" is no harder than following the educational games that now enable children to leap directly into the theory of sets. Another ambition is to show that modern science and technology, far from clipping the wings of imagination, enable it to go much farther. We have reached the stage where we no longer need to call on magic in order to dream; we have reached the stage where the irrational should be placed in a museum, beside the agricultural implements of 2000 years ago.

The irrational is the flying carpet of Oriental stories. It is also their modern equivalent, represented by machines that "will go beyond the speed of light, just as we have already gone beyond the sound barrier."

The rational consists of trying to determine whether, within the framework of what Richard Feynman calls "the character of physical law," the hypothesis I am proposing is or is not sufficiently well grounded to make it reasonable to expect discovery in the near future of a base on the moon left by the "Celestials" of the Tradition.

Is the "light barrier" of the same nature as the "sound barrier," and is what is true of the latter true of the

former, as is often assumed on the "space-opera" level of science fiction? Certainly not. If the speed of light were not the limit shown by Einstein's equations, those same equations would not have made it possible to obtain nuclear energy.

It is true that certain pundits misunderstood the nature of physical laws and claimed that "everything would disintegrate" if the "sound barrier" were passed, but this is no justification for giving serious attention to half-baked theorizers who see no difference between interstellar travel and tourism. The "sound barrier" was never a barrier. As Arthur Clarke has pointed out, the first device capable of breaking the sound barrier was made thousands of years ago. Do you know what it is? The whip, whose cracking is of the same nature as the "boom" of a supersonic jet.

### Rationality and the Tradition

Rationality is what has made it possible to send men to the moon, to prepare to send men to Mars, to consider dispersing the opaque clouds under which Venus is hidden, to send "the spirit of man" to "move upon the face of the waters" under which Venus is "without form, and void," and to prepare the methods and means that may some day bring it to pass that there will "be light" on Venus also.

Are we on the verge of "renewing the acts related at the beginning of Genesis?" It would seem so, judging from what leading scientists and technicians believe and say.

But scientists and technicians do not necessarily read the Bible or practice the Cabala, that "oral teaching" for which the Bible is the equivalent of a detailed outline intended to help students understand a college lecture course.

"The message preserved by the Cabala concerns the correspondence between the two worlds, celestial and earthly, and their unification by man. [ . . . ] Man will renew the acts related at the beginning of Genesis," writes Alexandre Safran, Grand Rabbi of Geneva, in *La Kabale* (Payot), where he also states that "the Cabala goes back to prehistoric times; Moses only introduced it into the history of Israel."

Is it only a coincidence, this conjunction between science and the Cabala whose roots go back into the depths of time common to the myths of all the First Civilizations? Is it more rational to see it as a fulfilment of the "prophecy" that the Cabala describes as having been brought "from the sky" by the "gods" whose acts are related in the Bible, as was known by every man with a little education in Voltaire's time?

Some of our most renowned scientists are already seeking beyond the solar system for concrete evidence of other civilizations, whose existence seems to them probable enough to justify their efforts. Between April and July of 1960, Frank D. Drake, a young astronomer at the National Radio Astronomy Observatory at Green Bank, West Virginia, with the active support of Otto Struve (former president of the International Astronomical Union), had the Green Bank radio telescope at his disposal for his Project Ozma, which consisted of trying to detect, among the natural noises from space, any messages that Galaxians might be sending by radio.

But we must not mistake our heartbeats for the galloping of Pegasus.

When a scientist has reached the stage of "intuitive certainty" with respect to an idea that is still entirely un-demonstrated, the most he is willing to say is that he does not refuse to regard it as plausible. So far we have no proof of the concrete existence of other civilizations in the Galaxy.

Before launching into a discussion of what makes their existence plausible, I propose a rapid review of the fundamental concepts of astronomy and astrophysics, plus a few other concepts of the exact sciences, while we are at it. It will give us a basis for discussion and prevent us from being carried away by delusions.

What's the Use of All That?

Seeking contact with other Galaxians is not an idle pastime, a frivolous game played by eccentric

scientists who would do better to spend their time on more down-to-earth problems. It is something that vitally concerns us all.

"Man will never know the chemical composition of the stars."

The author of that monumental boner was Auguste Comte, one of the leading lights of nineteenth-century thought. When he wrote it, he was certain that he would never be contradicted.

Not only do we now know the chemical composition of the stars, but physics has established general laws concerning them, and it is precisely the possibility of making comparisons among large numbers of stars that has enabled scientists to take account of particular cases as well as general laws. This is the domain of astrophysics, which now operates on solid ground.

"Astrophysics" is a neologism that was not coined until about 1920, because until then the means of "studying the phenomena of outer space from the standpoint of physics" were too embryonic to constitute a discipline. The word "exobiology," which designates "the study of the phenomena of outer space from the standpoint of biology," is a more recent neologism that appears only in the newest dictionaries.

The domain of exobiology, however, is still nearly empty: the first hypotheses are being formulated, but they rest on nothing concrete. As long as we know nothing about the evolution of life in the rest of the Galaxy, our biologists will be limited to one particular case: earthly life and evolution.

Other areas of science and technology have unfortunately reached a more advanced stage. Man's action has become capable of bringing about major alterations in the biological balance of the planet, and because we cannot deduce general laws from one particular case, we are tinkering with life in a very alarming way.

For a relatively long time our medicine has been able to prolong the lives of invalids and old people and reduce infant mortality. It is thus abolishing the natural processes of continuous, gradual selection and limitation that once controlled human populations. Our sociology, however is not even on the way toward an artificial process acceptable to mankind as a whole. (Wars intended to impose a sociology are not an artificial process; they only replace continuous, gradual, selective limitation with sporadic, abrupt, non-selective limitation.)

If no contact with other civilizations is possible ("the Galaxy is isolated"), we can only hope that our tinkering will not lead to collective suicide, but if we some day have contact with civilizations that arose from an evolutionary process comparable to ours, are in communication with one another and have formulated general laws of biology and sociology, we can hope to emerge from our present dangerous tinkering.

Will man ever know the biological composition of other planetary systems? Anyone who wants to be Auguste Comte's successor now has his chance. In 1959 Sir Bernard Lovell said it would be "futile" to use his Jodrell Bank radio telescope for trying to receive messages sent by another civilization. In the New York Times Magazine of December 24, 1961, however, he wrote that "during the past two years or so the discussion of the general problem of the existence of extraterrestrial life seems to have become both respectable and important."

Lovell wrote that in 1961, yet university faculties, subway trains, your circle of friends and mine are still full of people who regard the whole subject as ludicrous nonsense unworthy of their attention.

Did representatives of another Galactic civilization come to live among our primitive ancestors and then leave after giving them a "Tradition" containing a prophecy of evolution spread over thousands of years, a prophecy of the same nature as our faltering anticipatory research, a prophecy that is now being fulfilled before our eyes?

In the last analysis, the object of this book is to ask you to listen; it really seems to me that it is not only the beating of my heart that I hear.

Among the countless possible forms of life, it really seems that we have congeners in the Galaxy.

P. S. Many things are less simple than they will appear to be in the first few chapters. But what would be the use of the later chapters, if not to touch up what has been roughed out in the earlier ones?

## CHAPTER 2

### Modern Astronomy Began in 1960

In the seventeenth century, Tycho Brahe, the great astronomer who was Kepler's teacher, refused to believe in the Copernican system. He died convinced that the sun turned around the earth. By 1918, astronomy had progressed considerably, and astronomers had learned more humility than those of the seventeenth century: there was no longer anyone—except in Moslem countries—who placed the earth at the center of the universe.

However, humility is a difficult virtue. In 1918, astronomers still believed that the solar system was at the center of the universe. It was not until that year that the American Harlow Shapley broke the illusion: our solar system has a location totally lacking in prestige. But there was still reason for pride, because until 1924 everyone was convinced that the Galaxy made up the whole universe.

Thus, little by little, accurate values were assigned to the importance of the earth in the solar system, the solar system in the Galaxy, and the Galaxy in the universe. In 1950, Einstein was still discussing the structure of the universe on the assumption that it had an age of 1.8 billion years. In 1957, comparison between Einstein's theory and observational data led to multiplying the 1.8 billion years by seven. "This time," writes Evry Schatzman, "the effect was not to move back the frontiers of the universe, as Copernicus's ideas had done, but to shake confidence in the determination of fundamental magnitudes."

In the seventeenth century, the age of the universe was estimated at 5,000 years. Today, estimates range between 10 billion ( $10^{10}$ ) and 20 billion ( $2 \times 10^{10}$ ) years, but contradictions are appearing between this age of the universe and present estimates of the age of the oldest star clusters in the Galaxy.

Exorcising their statement with a faint smile, astronomers like to say that their discipline did not enter modern times until about 1960. College professors who are not yet forty therefore have thoroughly obsolete ideas about astronomy, if the subject does not interest them enough to make them keep their knowledge up to date. (This has been obvious to me on more than one occasion.)

But we can now be reassured; in personal conversation, Evry Schatzman has confirmed what he wrote in 1968: "A recent discussion shows that the present scale will probably not undergo any radical alterations."

#### Synchronous Rotation

Today, any reasonably well-educated man is expected to know at least what the solar system is. Even so, to my hypothesis (presented in *La Lune, cle de la Bible*) of a concerted effort by Galaxians to "stabilize" the moon, people with an appreciable scientific education—but anterior to 1965—often oppose the argument that synchronous rotation is the rule in the Galaxy. (A heavenly body has synchronous rotation if it rotates once on its own axis in the same time it takes to complete one revolution in its orbit around another heavenly body. An example that has often been given is that of Mercury revolving around the sun with synchronous rotation.)

These are contradictors who "keep posted": they know that Shklovskii and Sagan do not reject the hypothesis of a visit by Galaxians; that is, in fact, one of the reasons why they take an interest in "such things." They are familiar with Shklovskii's ideas because they have been presented again and again in all

sorts of para- and pseudo-scientific publications. But only genuinely scientific publications, with much smaller circulations, and astronomy books published very recently, report the discoveries made by radar in 1965, showing that Mercury does not have synchronous rotation. Mercury revolves around the sun in about eighty-eight earth days and its period of rotation is about fifty-nine days.

Incidentally, it was believed until 1957 that Venus also had synchronous rotation, which is totally false.

Are we to conclude that non-synchronous rotation is the rule and that the synchronous rotation of our moon is an anomaly, either natural or produced artificially by the Galaxians of my hypothesis? No, because the four main satellites of Jupiter have synchronous rotation. But the mass of Jupiter is 318 times that of Earth, while the mass of its satellites is comparable to that of our moon. A comparison between our moon and the satellites of Jupiter is therefore no more convincing than a comparison between the moon and Mercury or Venus.

In many ways, the moon remains a mystery that has been darkened rather than cleared by the study of rocks brought back by Apollo 11 and Apollo 12. *Informations et Documents* is an excellent magazine published in French by the United States Information Service. In its issue of February 1, 1970 it reported on a current scientific controversy: According to John Smith, a mineralogist at Cambridge University, the lunar seas on the visible face of the moon were created by the pull of the earth's gravity on a liquid core that existed at the center of the moon soon after its formation. But Thomas O'Reefe, a NASA astrophysicist, and Thomas Gold, a British cosmologist at Cornell University, maintain that this hypothesis is untenable because the earth's gravity acts most strongly on the north pole of the moon, and there are no seas in that area.

Arthur Clarke, a robust scientist who sometimes expresses himself by producing science fiction based on solid scientific data, was a good prophet when he wrote in 1968, in *Promise of Space*, "As soon as we land the first two geologists on the Moon, in ten minutes they will be throwing rocks at each other in defense of their rival theories."

## Methods of Modern Astronomy

Fortunately modern astronomy does not contain only uncertainties. Evry Schatzman defines its limits: "There is no point in discussing the origin of the universe, since the universe—infinite, varied, diverse, always the same and always different, permanent and changing—has existed for all eternity. But within that universe, everything changes, evolves, and is transformed. The stars have not always existed, the solar system and the sun itself have an origin."

The age of the universe mentioned at the beginning of this chapter is the age of the universe that we can observe, before the appearance of that universe there was something else about which we know nothing except that the present universe came from it. There is no longer any reason to become embroiled in one of those metaphysical debates typified by the question, "Which came first: the chicken or the egg?" We must follow Samuel Butler in accepting the idea that a hen is only a system that enables one egg to produce another.

Science freed of metaphysics no longer flounders in sterile discussions. When an egg is brought to it, science naturally begins by formulating a hypothesis concerning the kind of animal that may come out of it (chicken, snake, penguin), to decide in which incubator it should be placed. This is the conjectural part of science. But when the egg is hatched, science passes into concrete action: it studies the animal and tries to reconstruct its family tree.

Astronomy proceeds on the basis of the same principles. It uses knowledge of remote galaxies to try to understand the birth of the solar system and knowledge of the solar system to try to understand the birth of the universe as it is now visible.

Science freed of metaphysics has one basic certainty: everything evolves, nothing is "immortal," from galaxies to bacteria, from you and me to other Galaxians. Only one thing is immutable: the total quantity of matter in the universe—or the total quantity of energy, which is the same thing, as Einstein has taught us. Freed of metaphysics, science has even succeeded in giving an image of eternity in a universe where everything is mortal. It has had only to replace metaphysics with humor: Richard Feynman points out that today's brain is yesterday's mashed potatoes. (Richard Feynman, a professor of quantum mechanics, won a Nobel Prize in physics in 1965. If you have not read his book *The Character of Physical Law*, hurry out to buy or borrow it, you have waited too long already.)

In 1937, astronomers very probably witnessed the birth of a star. At a point in the sky where there was only a barely visible celestial object ("which may not even have been in the same location as the present star," says Schatzman), the star FU Orionis appeared and became bright in less than three months. It is likely that stars were born more frequently in the Galaxy when it was younger. (We will discuss the process of the birth of stars in Chapter 5. There are still a few basic notions to become familiar with before taking up stellar obstetrics.)

### The Relativity of Time

Although the birth of "the star of 1937" was seen in 1937, the image of its birth was transmitted to us at the speed of light. To know the real date of its birth, we must, of course, subtract from 1937 the number of light-years that separate us from the newborn star. This figure represents both the distance from Earth to the star, measured in light-years, and the number of years that light takes to reach us from it.

This delay in transmission has not yet become very significant in our usual thinking. When Armstrong set foot on the moon, we saw him on our television screens only a little more than a second later, since the moon is about 240,000 miles away from the earth and the speed of light is about 186,000 miles a second. But when exploration of Mars begins, everyone will be fully aware of the delay because it will be large enough to hamper communication. The distance from Earth to Mars is about 50,000,000 miles; light and radio waves therefore take more than four and a half minutes to cross it. Between the question, "How are things going?" and the answer, "Fine, thanks," a total time of about nine minutes will have elapsed.

But this delay in transmission also has a great advantage: when we observe a celestial phenomenon 4.5 billion light-years away, the light we observe was emitted 4.5 billion years ago—at the time of the birth of our solar system. Oversimplifying a bit, we can say that astronomers may hope to witness, within a radius of 4.5 billion ( $4.5 \times 10^9$ ) light-years, the birth of a planetary system as similar to ours as one chicken is to another at the time of hatching.

When I begin to feel at a loss, I regain my balance by reading Shklovskii:

I have spent a great deal of time in the study of the solar corona and the Galaxy. I have always visualized each of them as irregular, approximately spherical bodies with somewhat the same dimensions—about 10 centimeters [4 inches] across. Why 10 centimeters? This figure is entirely arbitrary; it is convenient and easily visualized. I have sketched the outlines of the objects of my reflections in my notebook, attempting to preserve the apparent scales of the phenomena.

When I begin to feel at a loss, I follow Shklovskii's example: I make little sketches. I will include some of them in the following chapters.

## CHAPTER 3 A Mediocre Planetary System

Everyone knows the silly story about the shepherd who could find the number of sheep in a flock faster than anyone else: "I count the number of legs," he explained, "and divide by four."

The story becomes less silly when the problem is not to count sheep passing now, but to evaluate the

number of sheep that passed yesterday: there is then no other method than to count their hoofprints and divide by four. Constants become involved if it has rained since the sheep passed (the percentage of hoofprints remaining after a rain is a constant) or if we have been able to establish the constant that represents the average amount of wool lost by a sheep per mile of walking. We soon come to equations, and the equations soon become frightening to contemplate:

$N = R \cdot t$ , to take one specific example, is the equation on the basis of which 11 of the most outstanding scientists in the United States, at a conference held in 1961, studied "the number of extant advanced technical civilizations possessing both the interest and the capability for interstellar communication." Sagan, who took part in the conference, feels that the equation above represents "a simple method of computing this number,  $N$ ."

Sagan is right: the equation actually is simple, compared with others often used in making computations by means of constants; they are always variations on the method using sheep hoofprints. Evry Schatzman wrote:

The matter of which the planets are composed must have been present at the time of the formation of the 27 solar system; the stable elements, descendants of radioactive elements, tell us which radioactive elements were present at the time of that formation. Thus determining the inner structure of the planets is not only an interesting problem of physics, it is also an important study for the cosmogony of the solar system.

One of the methods to which Schatzman refers is based on the natural radioactivity of certain elements such as uranium. Slowly and steadily, uranium is naturally transmuted into lead. By analyzing the lead found in a sample of uranium ore, we can compute the time (in millions of years) during which natural transmutation has taken place. When we have thus obtained results that agree with those obtained by other methods, we are justified in assuming that the age of the earth has been satisfactorily computed. (In reality, things are less simple: the computation involves isotopes of lead, that is, the differences among lead "born" of uranium 238, lead "born" of uranium 235, and lead "born" of thorium 232.)

### Gratuitous Speculation?

Fortunately there is a simple and logical factor to reassure the layman who is perplexed by isotopes and wonders if all this may not be gratuitous speculation: the little world of scientific research is enriched every year by a new batch of young scientists who begin their careers with the ambition of making a name for themselves by demonstrating that their elders have been left behind—not to mention those elders who are not at all inclined to let the ground be cut from under their feet.

The figures I give in this book are therefore sure to be placed in doubt, and perhaps replaced some day. But since they are not seriously contested today, they can be taken as incontestable in the present state of things. In 1965 (the year of his Nobel Prize), Richard Feynman described his goal as "discovering trouble, something wrong with the fundamental laws."

### Replacing Zeros

The earth was formed about  $4.5 \times 10^9$  years ago.

To become familiar with this notation for large numbers, remove the multiplication sign and replace the 10 with as many zeros as are indicated by the raised figure to the right of it (the exponent), unless there is a decimal point, in which case the figure to the right of it replaces one of the zeros:  $4 \times 10^9$  is 4,000,000,000;  $4.5 \times 10^9$  is 4,500,000,000. A thousand is  $10^3$ , a billion is  $10^9$ . This notation is convenient because it spares us the effort of counting zeros, which are as bothersome as sheep legs. To write a hundred billion, for example, we can make use of the fact that multiplying can be done by adding exponents: a hundred billion, that is, a hundred times a billion, is  $10^2$  times  $10^9$ , or  $10^{11}$ .

The theory justifying this simplification is not difficult, but in this book I will concentrate on principles and their consequences, skipping the demonstrations whenever possible.

### The Assumption of Mediocrity

Was the moon formed at the same time as the earth, from the same cloud of gas and dust? Or was the moon captured, fully formed, by the earth's gravitation? One goal of the Apollo program is to answer these questions (and a number of others).

The sun is a star like many others in the Galaxy; like so many others, in fact, that it can be regarded as typical. It is an ordinary, average, mediocre star, using the word "mediocre" in its original meaning, from the Latin *medius*, "middle." It is not out of pedantry that I mention this original meaning of "mediocre," but because we must be familiar with it in order to understand the "assumption of mediocrity" formulated in America by the German astronomer Sebastian von Hoerner.

With the knowledge already at their disposal, says von Hoerner, the ancient Greeks could have determined the distances among the stars with an error of only 10 percent if they had reasoned on the basis of the assumption of mediocrity, that is, the idea that the earth is a mediocre planet at a mediocre distance from the sun, which is itself a mediocre star at a mediocre distance from the ten brightest stars in the sky.

"Although such estimates have only probabilistic character," remarks Carl Sagan, "the assumption of mediocrity will, in many cases, give a valid rough answer, when a detailed scientific justification lies beyond the present capabilities of science." The assumption of mediocrity, acting as a scout capable of exploring the terrain for the armored divisions of science, will appear often in later parts of this book.

Astronomy has enough knowledge of the universe to determine in a detailed and rigorous manner that the Galaxy abounds in stars similar to our sun. The assumption of mediocrity enables us to go further, reasoning as von Hoerner would have liked the Greeks to reason 2500 years ago.

Have mediocre planetary systems like ours been naturally formed around mediocre stars like our sun?

In mediocre planetary systems like ours, is there at least one planet that would be inhabitable for us if we could go to it?

On all mediocre planets inhabitable for us, does life as mediocre as ours appear as naturally as lead 207 appears wherever there is uranium 235?

If a mediocre planetary system is 30,000 years older than ours, does this mean that 25,000 years ago natural evolution produced a civilization that had reached the point we may reach (still remaining mediocre) in 5000 years—barring accidents?

We will come back to all this later, step by step, especially in considering the probability that natural evolution has produced brains able to think of conquering the cosmos, not in gelatinous spheres with a dozen tentacles, but in assemblages of five jointed cylinders with a spheroidal protuberance—in other words, in bodies like yours and mine. (I do not remember who first said that, or something like it.)

Let us simply note in passing that insofar as we are not exceptional but mediocre, the Myth common to all the First Civilizations appears to be perfectly compatible with what we now know about the universe: the Myth attributes the astronomical knowledge of priests to a revelation brought by Galaxians, who also taught men agriculture, writing, and a number of other things.

### Medievalism and Humanism

Did the assumption of mediocrity, which von Hoerner reproaches the Greeks for not having formulated and applied, constitute the basis of the thought of the First Civilizations, the thought that has been

transmitted since the dawn of historic times by what is called the Tradition?

! In other words, did "the Ancients" think more accurately than "the Greeks?" That is exactly what men of the Middle Ages (of whom I am one) have always repeated to Renaissance humanists, reproaching them for their determination to replace the thought of the Ancients with neo-Greek thought.

Since the assumption of mediocrity, acting as the vanguard of the most solid science, gives plausibility and even probability to the idea that Galaxians once lived among I our ancestors, why do skeptical smiles so often greet the idea that the Myth may have told the truth and that Galaxians 30,000 years ahead of us may really have come "from the sky" about 23,000 years ago? There are three main reasons for this:

1. Closed minds.
2. The charlatans and visionaries who discredit everything "extraterrestrial" by wallowing in it without knowing anything about the exact sciences.
3. The theory of Sir James Jeans. It is incompatible with the principle of the conservation of angular momentum, but astronomers who are still alive upheld it in their youth.

Against closed minds, of course, there is nothing to be done; one can only wait for them to die of old age. But against charlatans and visionaries, and for people of good faith, there is a category of books in which I hope mine will be placed: those which take stock of yesterday's ideas that are outdated today.

The Ancients professed that only the "Celestials" knew the Law of the Universe and that it was much too complicated for human understanding. (And they were right. We are only now beginning to understand it, at a time when men are traveling "in the sky," that is, doing something which until recently was reserved for the "gods" of the Myth.)

The Greeks spawned wild metaphysical ideas based on a haughty assumption of superiority which makes man the finest if not the only flower of the universe. (Aristarchus of Samos, who maintained that the earth turned around the sun, was condemned for impiety by the Greeks, but they accepted Ptolemy, who placed the earth at the center of the universe.)

The Middle Ages marked a return to humility and took its dominant idea from the Tradition: man must work on a human scale and not hope to "equal the gods" before the "time of Aquarius." (Whether it is a providential accident or a confirmation of the Tradition, we have been in the "time of Aquarius" since 1950, and since then our astronomy is beginning to be capable of understanding the formation of the universe.)

#### Descartes and Kepler

In the sixteenth century, the Renaissance made neo-Greek metaphysics fashionable. Not until Descartes would there be a vortex theory, formulated in modern scientific language for the first time, but full of resemblances to the Ancients' interpretations (formulated, of course, in "archaic language") of the teachings attributed to the Celestials.

Descartes? Can medieval thought lay claim to Descartes?

Descartes attributed his "vocation" to "prophetic dreams" and the "revelation of an admirable science." This revelation came after he had joined the Rosicrucians . . . His motivations were thoroughly medieval; they were an insult to the humanist tendencies of the Renaissance.

But Descartes was born before Kepler shattered the Ptolemaic system; at the time of his death in 1650, established doctrine was only beginning to accept the idea that the sun, rather than the earth, was the center of the system.

"To realize how far ahead of his colleagues Kepler was, in spite of the residue of medievalism in his veins," writes Arthur Koestler in *The Sleepwalkers*, "one must compare the *Epitome* with other contemporary textbooks. None of them had adopted the heliocentric idea, or was to do so for a generation to come.

Maestlin published a reprint of his textbook based on Ptolemy in 1624, three years after the *Epitome*."

Koestler is an impeccable historian. He can be faulted only for the little personal comment he slipped into his account: it was not "in spite of" Kepler's medievalism but because of it that he was the great precursor of modern astronomy. (He was the first who dared to reject the notion of the "divine perfection of the circle," which the Greeks had added onto the Tradition, and to envision elliptical orbits.)

To return to Descartes and his undeniably medieval Rosicrucians and prophetic dreams—Descartes began only with his thought (Cartesian by construction), the teachings of the Tradition that was cherished by the Rosicrucians, and his medieval certainty that Kepler was right and established humanist doctrine was wrong.

Descartes did not know the theory of universal gravitation; it was not until Newton had developed it that Kant was able to sketch and Laplace to formulate (in 1796) the nebular hypothesis that was not abandoned

until the end of the nineteenth century. "That abandonment was regrettable," writes Schatzman; "the original nebula made it possible to explain the regular distribution of revolutionary movements in the solar system, the orientation of orbits, etc."

At the beginning of the twentieth century, the theory in vogue was that of Jeans. The sun, said Jeans, had been turning all alone, without even a little satellite to keep it company, when it was struck by a wandering star; the impact tore away the matter that later formed the planets.

The trouble with this "catastrophic collision" theory is that it is in flagrant contradiction with one of the best-grounded concepts of physics: the conservation of angular momentum. But it gave the philosophical thought of the nineteenth century one great advantage: a collision between stars is such an improbable event that, if our planetary system was produced by one, we have good reason for proudly regarding it as unique in the universe.

"Jeans' hypothesis is still warmly treated in obscure encyclopedias and some rural school textbooks in the United States," remarks Sagan. In France, I have heard people who are neither obscure nor rural maintain that the theory of an initial collision is the only reasonable one because it is the only one that quashes the idea of a plurality of inhabited worlds, an idea that is "medieval and therefore absurd."

### Angular Momentum

What makes Jeans' theory totally unacceptable is the principle of the conservation of angular momentum. In discussing it, I will limit myself to its observable effects.

Sit down in a swivel chair, fold your arms and ask someone to spin you fast. As soon as you have become a rotating system whose diameter is the breadth of your shoulders, extend your arms. You now become a rotating system with a much greater diameter, and your rotation is immediately slowed down.

Repeat the experiment, holding a two-pound weight in each hand. Although four pounds is very little in relation to your weight, it will make your deceleration noticeably more rapid. The heavier the weights you use, the more rapid your deceleration will be. If you refold your arms after having extended them, your rotation will be spectacularly accelerated. This reversibility is an added proof of the phenomenon.

You are now acquainted with the conservation of angular momentum.

If you insist on having an equation to boot, I will tell you that the product of the rotating masses  $M$ , multiplied by the velocity  $V$ , and the radius  $R$  of the rotating system expresses angular momentum (angular momentum =  $M \times V \times R$ ).

Saying that angular momentum is conserved "no matter what" amounts to saying that the product  $M \times V \times R$  is constant. This is confirmed by the experiment described above, since velocity diminishes when the radius of the rotating system is increased, and it diminishes still more when weight (mass) is added to the extremities of the radii of the system.

The distribution of orbiting masses in the solar system is, of course, in perfect harmony with the principle of the conservation of angular momentum. We will later discuss the theory that best explains this distribution of masses; the same theory leads to the conclusion that the existence of planetary systems is probably the rule in the Galaxy. Stars lacking a planetary system are probably the exception—which gives one more argument in favor of von Hoerner's assumption of mediocrity.

In the present state of things, the question asked by exobiologists is no longer, "Are there other planetary systems where life has been able to appear and evolve?" but, "Has life appeared around the great majority of stars, or only around a few billion of them?"

Incidentally, astrophysicists have repeatedly checked their calculations with regard to Jeans' theory and

the result is always the same: if a wandering star should strike a star similar to the sun, even in a head-on collision, the fragments torn loose by the impact could not move more than about 600 miles away. Good-by Jeans.

## CHAPTER 4 Our Place in the Universe

It is not necessary to contemplate the starry sky in order to be an astronomer. Le Verrier, who in 1845 used calculation alone to discover the place in the sky where Neptune was located, never had the curiosity to look at "his" planet through a telescope. A general is not expected to shoot a rifle. It is also true that contemplating the starry sky is not enough to make an astronomer—but it helps.

One of the first things an observer notices in the night sky is a long, whitish, luminous streak. With a little imagination (and the shepherds of ancient times had plenty of it), it can be seen as a path, a "way to the stars." What kind of a way? As I have already said, it is whitish, milky—a Milky Way.

It is hard to make anyone take you seriously if you talk about milk that the gods poured out to mark a road in the sky. Astronomers therefore renamed the Milky Way the Galaxy—which means the same thing, but in Greek, and that changes everything.

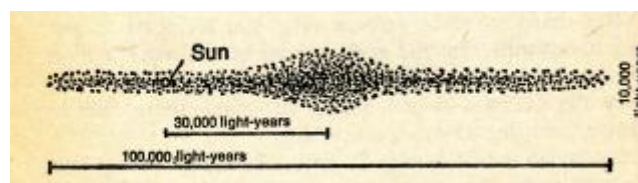
As we saw in Chapter 2, until 1924 the Galaxy was thought to be the same as the universe. Then it became known that there are different galaxies in the universe, and finally that there is an "astronomical" number of them: in the constellation of Virgo alone, several thousand galaxies, previously considered to be "rather nebulous stars," have been discovered.

Each galaxy is composed of a multitude of stars. All galaxies have a rotary motion. Those that contain many hot stars and much interstellar gas rotate rapidly, which gives them a spiral shape; those in which most of the stars are less hot rotate more slowly and have an elliptical shape. Our Galaxy is a spiral galaxy, a "twin" of the one that bears the number 31 in the catalogue drawn up by the French astronomer Messier and is therefore called "galaxy M-31." It is fairly easy to see through a telescope.

Since 1924, when the American astronomer Hubble showed that all galaxies are of essentially the same nature, astronomy has advanced with giant steps and scientific methods have confirmed what ancient astronomers like Thales and Anaximander stated on the basis of "archaic" data: that the whole universe is made of the same matter.

The clusters of stars that constitute galaxies are themselves grouped into clusters. To give an idea of the magnitudes involved, I will point out that a cluster of galaxies a million light-years from our Galaxy is called a "local group." Modern techniques make it possible to distinguish each of the stars that compose them. Galaxies more than 10 million light-years away, however, appear as luminous spots whose individual stars cannot yet be clearly discerned.

Seen from the side, our Galaxy has approximately the shape and dimensions indicated in Figure 2.



1 light-year = 6,000,000,000,000 miles.

Figure 2

In this Galaxy, which is similar enough to others to give one more justification of von Hoerner's assumption of mediocrity, our solar system has a mediocre position. There is nothing remarkable about its distance from the center of the Galaxy, and our sun is similar to most of the other stars in the Galaxy.

### An Apparent Muddle

We now enter an area where successive reshufflings of classifications give the impression of a hopeless muddle, but with a little cool-headedness we can easily make sense of it.

Stars are classified in order of decreasing temperature, from the "blues," whose surface temperature is something like 30,000 degrees centigrade, to the "reds," with a surface temperature of about 3,000 degrees. There are seven different categories, designated by letters of the alphabet. So far, everything is simple. But, as improved techniques of observation and interpretation showed up errors of evaluation in earlier classifications, the order of these letters was changed several times. At present the letters designating classes or "spectral types" of stars are arranged in this sequence: O, B, A, F, G, K, M (O for the hot blues, M for the "cold" reds). A common device for remembering this sequence is the sentence, "Oh, Be A Fine Girl, Kiss Me." Our sun is one mediocre star among others, a G whose surface temperature is about 6,000 degrees.

There are no type O stars that can be easily found in the sky by an amateur astronomer with a small telescope. Pierre Rousseau recommends Rigel for type B, Vega for type A, Procyon for type F, Capella for type G, Arcturus for type K, and Antares for type M.

Another inconsistency appears in the classification of stars by size: there are supergiants, giants, dwarfs, and sub-dwarfs; not one of the 100 billion stars in the Galaxy is presented as "normal"—or, still better, "mediocre." Why this collection of freaks? For the simple reason that today's astronomers, thinking of how often their predecessors had to recant premature generalizations, are careful not to set up any norm that might have to be abolished later.

### Hertzsprung-Russell

One of the great discoveries of modern astronomy was made by Ejnar Hertzsprung and Henry N. Russell: when all the known stars are plotted on a graph in relation to their surface temperatures (or the categories O, B, A, F, G, K, M, which comes to the same thing) and their absolute magnitudes (brightness), with the absolute magnitude of the sun having a value of 1, they fall into a pattern that can be seen in Figure 3.

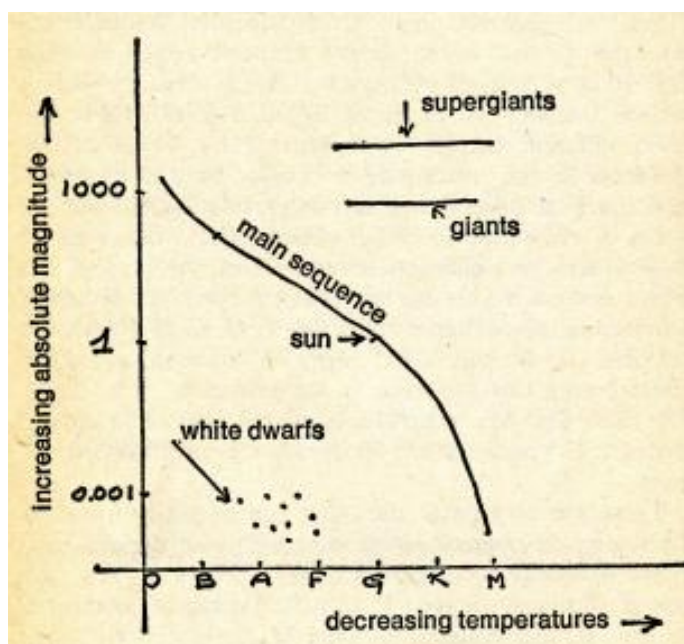


Figure 3



The vast majority of stars are grouped around the line called the main sequence; that is, the hotter the surface, the brighter they are, which seems quite logical.

Other stars are far off the main sequence, at the top of the diagram (and therefore very bright) and toward the right (and therefore very "cold"). The logic of their position is less obvious, but it is there: these stars are giants and supergiants and owe their greater absolute magnitude to their much greater surface area, with surface luminosity equal to that of a dwarf of the same temperature. Another family of stars is at the bottom of the diagram and to the left: these are subdwarfs, whose absolute magnitude is low despite their high temperature.

We can now understand the reshuffling of the letters that designate types of stars. The dwarfs in the main sequence are not equal in diameter, and some stars classified

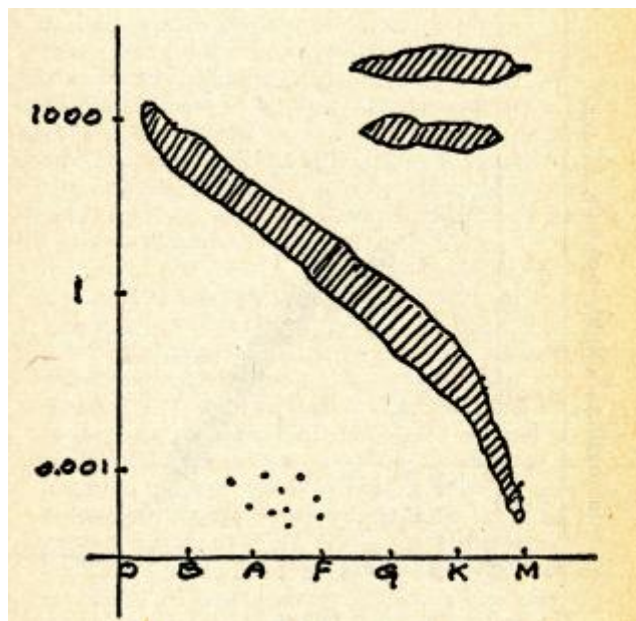


Figure 4

by early observers as "very hot," because of their absolute magnitude, have turned out to be colder but larger. Instead of rechristening several thousand stars that had already been given letters, astronomers decided it would be simpler to place the Bs before the As and Os far in front of the Ms. And while they were at it, they eliminated letters that were not indispensable, preferring to subdivide the remaining letters (the Fs go from FO to F9, the Gs from GO to G9, etc.)

In astronomy books, Hertzsprung-Russell diagrams are confusing to the layman: he has the impression that the main sequence contains as many hot stars as cold ones

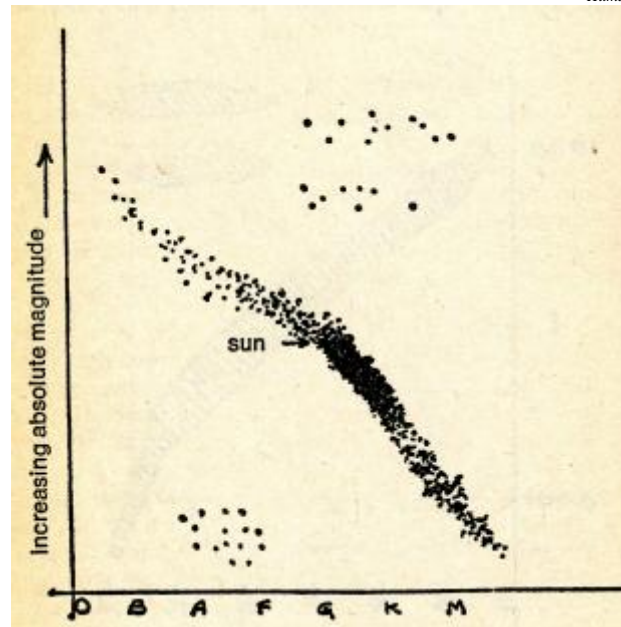


Figure 5

and that our Galaxy is packed with giants and supergiants. These diagrams have the general appearance of Figure 4.

Since my purpose in this chapter is not to train astronomers, but to enlighten the layman who simply wants to reduce the number of his false ideas to a minimum, the diagram in Figure 5 seems preferable to me. Although the arrangement of stars in it is somewhat arbitrary, it gives a more accurate idea of the distribution of stars in the Galaxy. Ninety-eight percent of the stars in the Galaxy have a temperature equal to or lower than that of our sun.

#### Life and Death of the Stars

Since we have a schematic diagram at hand, let us use it to see how stars are born and die.

Interstellar space is not a total vacuum: at great intervals there are hydrogen atoms and specks of dust. In some places, these atoms and dust particles are already assembled into clouds. A core is sometimes formed in one of the clouds and, through gravity, it attracts nearby atoms and dust particles. Little by little, a protostar is formed; it is to a star what a fetus is to a child. Here is the process, described by Sagan:

A typical star begins life auspiciously, as a bright yellow giant [it therefore appears in the upper right portion of the diagram, Figure 5], and then metamorphoses, in early adolescence, into a yellow dwarf. [In the diagram, a giant disappears and one more star appears in the main sequence.] After spending most of its life in this state, the yellow dwarf rapidly expands into a luminous red giant [since it is red, it is colder than the yellows and therefore moves back to the top of the diagram and farther right], jumps the Hertzsprung gap, and decays violently into a hot white dwarf [lower left]. It ends its life, cooling inexorably, as a degenerate black dwarf [no magnitude, hence not on the diagram].

Is this black dwarf, this corpse of a star, doomed to disintegrate until it again becomes dust in interstellar space? Is a totally different universe in the process of formation, a universe in which space will be dotted not with dust clouds destined to become stars, but with black dwarfs destined to become we know not what? We must be satisfied with the achievement of being able to ask such questions seriously about a future several billion years away; in the present state of things, we cannot expect to find answers to them.

And now, after this overall view of the universe, let us return to the history of astronomy.

But one last detail before we do: the initial cloud generally has a mass equal to that of several stars, and it seems that these clouds are fragmented, that there is a kind of "critical mass" for the formation of a star, which is one more argument for the assumption of mediocrity. Oversimplifying outrageously, we can say that stars are apparently formed in the Galaxy like drops from a leaky faucet: all fairly much alike.

## CHAPTER 5 Medievalists and Humanists

Middle Ages: the name given by historians to the period extending from 395 (dismemberment of the Roman Empire) to 1453 (the Islamic conquest of Byzantium, whose theologians discussed the "sex of the angels").

A traveler from a remote country can lie with impunity. Similarly when an astronomer relates what he has seen billions of miles away from the solar system, laymen cannot help thinking that he risks little in saying what he does since no one is likely to go and check his statements on the spot.

How do astronomers go about finding out what is happening so far away? Modern techniques are extraordinarily refined, but the basic principle of astronomical research remains simple: it is that of logic, and even of the syllogism.

You begin by looking into temperature. On Earth, a heated body turns red, then orange, then yellow, and finally bluish-white. Is it the same with stars? That can serve as a working hypothesis; you classify stars by their color, that is, by their assumed temperature.

Spectrograph provides a method of verification. In the laboratory, it's easy to see that a spectrogram of water vapor shows a spectrum with lines very close together, men, beginning with a temperature of 2500 degrees centigrade, the vapor is decomposed into hydrogen and oxygen, which the spectrogram records by distinctly showing the spectra of lines characteristic of hydrogen and those characteristic of oxygen. When heating is continued to about 20,000 degrees, the lines of hydrogen and oxygen disappear (and it has been established that at a temperature of about 20,000 degrees electrons are torn away from the nuclei of hydrogen and oxygen).

Do the same reactions take place in the stars? To find out, astronomers have studied the light of stars in spectrograms. And they have learned that the classification of stars by color corresponds to classification by spectrography. Spectrographic study has been carried further: astronomers have studied, in relation to stars, the spectra of helium, calcium, and the other earthly elements. When they saw that all the results were in agreement, they were able to take it for granted that the same elements are found in all the stars of the Galaxy, that their reactions are the same there as on Earth, and that Auguste Comte, the most authoritative spokesman of positivistic humanism, would have done better to keep quiet. The chemical composition of the stars, which Comte said was forever unknowable, is now perfectly known.

Knowing the chemical composition and surface temperature of the stars, and having established that physical laws are the same all over the universe, the astrophysicist has continued to use analogous techniques. The mass, diameter, and density of the stars have been determined with excellent precision—for their outer layers. But what happens beneath the surface? To understand this, we must use logic and the knowledge we have of the sun.

If the sun "burned" as coal does, its mass would have been enough for only a few thousand years of combustion. But there are radioactive elements in the sun, and the proportion of certain isotopes in them shows that they were formed millions of years ago. Only one phenomenon can account for this: successive transmutations, beginning with hydrogen. Are the sun and the other stars gigantic nuclear reactors?

A process like a "slow-motion hydrogen-bomb explosion" is not only consistent with all observations, but is also the only process that can account for them without contradiction. Everything hangs together, as is

suggested by Gamow's drawing in Chapter 1: we could not have understood the sun before having understood the atom.

"It is curious," writes Sagan, "that the same discovery of radioactivity which led to an accurate determination of the age of the Earth also resulted in an understanding of the solar luminosity. From the mass and composition of the Sun, it is possible to compute the pressure in its interior."

### Esoteric Astronomy

Before the advent of modern astronomy, which is scientific by definition since its domain is that of the measurable, there was what is called "archaic" or "traditional" astronomy, the astronomy of the Babylonians and their heirs.

What first strikes us in the traditional astronomy of Babylon is that everything in it has its place. Everything is in order, each star has its little story, all the motions of the heavenly bodies are explained—in archaic language, by the adventures and misadventures of a host of gods, but still explained. Nothing is left in shadow, everything hangs together.

What first strikes us in modern astronomy is its untidiness. We have already seen the aberrant order of the letters in the OBAFGKM classification and the freak show of giants and dwarfs. To avoid making the confusion any worse, I said nothing about the fact that star magnitudes increase as the number expressing them becomes smaller, or even negative.

We next note that traditional astronomy is essentially esoteric. "Esotericism" is defined by the *Dictionnaire* as "the doctrine according to which knowledge should be communicated only to a small number of disciples." For Aristotle, esotericism was "a body of knowledge that must be learned long before it is understood."

Modern astronomy claims to be the opposite of esotericism: it maintains that it is open to anyone who wants to penetrate it, it proclaims itself the heir of Greek clarity, of that humanism which professes always to make its knowledge understandable before expecting anyone to retain it.

We have here the elements of a first confrontation.

There is one obvious reason why traditional astronomy appears coherent: it had to deal only with the 5000 stars visible to the naked eye, that is, a closed set whose laws it studied. It had had ample time to put order into its collection, and before the invention of the telescope no one had any thought of disputing that order. Modern astronomy has an equally obvious reason for appearing chaotic: it never has time to set up a tidy system before a new technique comes along to overturn what was regarded as established. Modern astronomy studies an extraordinarily shifting set of data which it has never had time to put in order.

Traditional astronomy had another reason, which humanists do not find at all convincing, for teaching an "esoteric" coherence in the sense that Aristotle gives to the word (the student had to learn on trust, even if he did not understand it):

traditional astronomy claimed to have inherited teachings revealed by two-legged mammals who were made like ordinary people but had come from the sky and professed to be gods. Modern astronomy accepts the humanist postulate. "All human knowledge," says this postulate, "has come from man. It is the product of a continuous evolution that began on the day when the first effort of thought occurred on Earth beneath the wrinkled brow of the first of our ancestors who thus showed himself to be a man." The humanist postulate is humanist precisely because it rejects any idea of a helping hand "from the sky."

### Heirs or Inventors?

There is no reason why we cannot imagine the Babylonian astronomers, and the men whose work they

inherited and continued, as capable of having put order into the knowledge they transmitted. But were Neolithic men capable of first discovering all this knowledge, then inventing gods to whom they attributed it? That is entirely undemonstrated. The more aware we become of the extent of that knowledge, the less plausible its accumulation by Neolithic men appears to us.

Since Santillana published his overwhelmingly convincing collection of evidence, it is no longer possible to question the fact that this "Babylonian" knowledge was not discovered by the Babylonians and that it was acquired in prehistoric times. It is no longer even possible to maintain that the astronomy of the Tradition was based on absurd ideas, like that of the flat Earth, for example. Let us listen to Santillana:

To come back to the key words of ancient cosmogony: if the words "flat earth" do not correspond in any way to fancies of the flat-earth fanatics who still infest the fringes of our society and who in the guise of a few preacher-friars made life miserable for Columbus, so the name of "true earth" (or of "the inhabited world") did not in any way denote our physical geoid for the archaics. It applies to the band of true zodiac, two dozen degrees right and left of the ecliptic, to the tracks of the "true inhabitants" of this world, namely, the planets. [ . . . ] "Earth," in the most general sense, meant the ideal plane laid through the ecliptic; meanwhile we are prepared to improve the definition: "earth" is the ideal plane going through the four points of the year, the equinoxes and the solstices. Since the four constellations rising helically at the two equinoxes and the two solstices determine and define an "earth," it is termed quadrangular (and by no means "believed" to quadrangular by "primitive" Chinese, and so on).

Santillana accumulated proof of what he stated: the great myths that began in prehistoric times had no other purpose than the transmission (by generations who were not expected to seek and understand, but to learn and transmit) of a prodigious and coherent body of astronomical knowledge. "The mind has lost its cutting edge, we hardly understand the Ancients," wrote Gregory of Tours (sixth century a.d.), quoted by Santillana.

### The Return to Medievalism

Do our astronauts have less keen minds than the shepherds of ancient times? Despite what Gregory of Tours said, it is rather unlikely. One thing is certain, however: modern science, which arose from proud humanism, is rapidly returning to medieval humility—and to the esotericism that seems to be inseparable from it.

"I think I can safely say that nobody understands quantum mechanics. So do not take the lecture too seriously, feeling that you really have to understand in terms of some model that I am going to describe, but just relax and enjoy it," wrote Richard Feynman, thus placing what he teaches within the framework of esotericism as defined by Aristotle, with a little humor thrown in.

"Admission to the School of Science should be restricted to students capable of earning a degree in three or four years," says and repeats Marc Zamansky, who was elected dean of the Paris School of Science nine times in a row, thus placing science within the framework of esotericism as defined by the Dictionnaire Robert.

"Astronomy? Modern science? It's all Greek to me!" says the layman, thus placing science within the framework of "esotericism" with the meaning it has for people who seldom consult Aristotle or a dictionary, the meaning of "something mysterious to me."

I am a man of the Middle Ages. A man of the Middle Ages takes it for granted that "men" are not "Man." For medieval thought, men have never been an abstraction, men are not "equal," since some of them dream only of fishing while others spend their lives measuring the cosmos. For medieval thought, men are "equal in rights," which implies that restraints must be placed on evildoers who, in the name of "humanism," try to impose their personal tastes on others and give inferiority complexes to fishermen (evildoers always have other ambitions than going fishing).

According to medieval thought, the humanists of the Renaissance who wanted to "mold Man" are on the same level as the advertising men of today who make people into indebted slaves for life, when their standard of living is already much higher than that of the middle class in Marx's time. No one can savor the joy of living when throughout his life advertising explains to him that there is no happiness without a new innerspring mattress, a faster car, a prettier refrigerator, or whatever he has already decided to buy on credit as soon as the payments on his last purchase are paid. But even though I claim to be a man of the Middle Ages, do I not fall into the humanist sin by trying to make science less esoteric to the layman? Certainly not: the very fact that you have bought this book proves that your idea of happiness does not consist entirely of fishing, that you would like, if not to measure the cosmos personally, at least to understand how others measure it.

For the Ancients, for the astronomer-priests of Babylon, the universe no longer had to be measured: Pythagoras—and, through him, Plato—took up the dominant idea of the Tradition: that "numbers give the key to the universe," on the one hand, and on the other that these numbers were known to the gods and had been transmitted to earthly astronomer-priests as a heritage. Succeeding generations had the duty of learning without making any great effort to understand, until the generation that would at last "equal the gods" and understand.

Was this Tradition a vast intellectual swindle, transmitted in the spirit of "I'm not saying anything, but I know what I think," by priests who actually thought of nothing but living an easy life at the expense of the faithful? There is nothing inherently absurd in this opinion, and many humanists upheld it until the nineteenth century, which was to humanism what general paralysis is to syphilis: a culmination.

But although the Tradition spoke of a Golden Age when everything would at last be understood, this prediction was not made for some uncertain future time that was always being postponed. As far back as we can go into the past, we find the Golden Age associated, always and necessarily, with Aquarius. We will examine Aquarius more closely in Chapter 7.

#### Aristarchus, the Zohar, and Duns Scotus

Beyond the postulate of a flat earth, intended to bring problems of astronomy within the framework of a geometry that was to be codified by Euclid, did the Ancients really know that the earth was round and revolved around the sun? The nineteenth century may sneer, but the facts are there: Three centuries before Christ, Aristarchus of Samos professed that the earth revolved around the sun. He obviously had no equipment for astronomical observation better than that of the humanists who had Galileo condemned.

The Zohar is "the Hebrew book that is the basis of the teachings of the Cabala; it is attributed to either Simeon ben Yohai (second century) or, more commonly, Moses of Leon (thirteenth century)," to use the definition of the Encyclopedic Quillet. Did the Zohar teach, in the Middle Ages, that the earth turned around the sun? To verify this in the text itself, one must be able to read Hebrew. Rabbi Safran confirmed it to a skeptical listener at a lecture I gave in Geneva in 1969.

In the thirteenth century, Duns Scotus (the "Subtle Doctor" of the Franciscans) protested against the "contamination of the Tradition by Hellenistic thought" and regarded systems placing the sun at the center as so obviously true that he based syllogisms on this certainty. He wrote, for example, "Just as the sun is at the center of the spheres . . ."

And for good measure we can add the paintings of Raphael (1483-1520) who, in the Vatican, depicted God coming to a spherical Earth.

Giorgio de Santillana is right. The "Ancients" knew the universe better than Descartes' contemporaries did. The Tradition that came from prehistoric times actually transmitted, without trying to understand, knowledge that was not to be understood until the "time of Aquarius," knowledge that we are indeed beginning to understand, now that the equinoctial sun has entered Aquarius.

## The Humanist Fifteenth Century

Let us return to the fifteenth century, when sensible people had an understandable tendency to wonder if it was worthwhile to launch a Five-Century Plan and sacrifice the present to it. This century witnessed the great set-back of medieval thought, the custodian of the Tradition. Medieval thought buried itself in secret societies and left the front of the stage to the naive pride of the humanists who triumphantly proclaimed the Renaissance of Renewed Greek Thought (and replaced the austere art of the Middle Ages with glittering splendors).

By the seventeenth century, the process had been completed: the humanists were entirely in control, especially in the universities. They were able to make the Church condemn Galileo and Copernicus, who had carried on the work of Duns Scotus. In his correspondence with Father Mersenne, Descartes wrote that he was "advancing masked into the very time when he said he had "discovered an admirable science" and when he joined the secret society of the Rosicrucians.

Why that abdication of medieval thought? Why that plunge into clandestinity?

First of all, because humanism is extremely attractive. When students at the medieval Sorbonne heard their professors speak to them with an attitude that we find reflected in Richard Feynman's book, they accepted the necessity of learning first and trying to understand later.

There was no alternative. In the fifteenth century, the alternative appeared. It was brought by humanism, which set experimental verification in opposition to medieval Experimental verification is perfect in principle. But in the seventeenth century, as we will see in the next chapter, experimental verification upheld the Ptolemaic system and rejected the Copernican system. If, in your bedroom, you try to verify experimentally the transmutation of elements, you will most likely reach the (experimental) conclusion that transmutation is not possible, that it is nothing but a hazy dream in the minds of alchemists. Experimentation is not a panacea.

Roger Bacon, who lived in the thirteenth century and was one of the intellectual leaders of the Middle Ages, was the first to propose submitting certain tenets of the Tradition to experimental verification. Thirteenth-century techniques permitted certain experiments, and Bacon never went beyond their real possibilities. By the fifteenth century, when the humanist Renaissance began, medieval humanity had been lost. Its pride made it inclined to take its desires for reality. It sincerely believed that great progress had been made since Roger Bacon. This was a blatant error.

Humility must remain the dominant virtue of any experimenter. One pinch of pride and all is lost: the experimenter forgets the limitations of his equipment and becomes convinced that "what is not obviously false is necessarily true." When Claude Bernard, the apostle of nineteenth-century experimentation and humanism, declared "matter no longer has any secrets for us," it was not obviously false, according to the most advanced technical means of only a few decades ago.

Those residues of the nineteenth century who proclaim "themselves humanists, and moan that they are bewildered by today's world, are quite right: they begin with experiment "a la Claude Bernard" and seek laws. Those of us who use medieval reasoning begin with a principle and seek experimental verification of it.

The medievalists of five centuries ago gave the name of "God" to the Initial Principle? What of it? We call it Theoretical Physics.

With the equipment available to astronomers of the sixteenth and early seventeenth centuries, the Ptolemaic system was not obviously false. Therefore the humanists of the Renaissance had no qualms about burning Giordano Bruno, who supported the medieval idea that had been taken up by Copernicus. With the astronomical equipment of the time, Ptolemy's system even seemed superior to that of Copernicus in accounting for observed celestial motions.

Copernicus and Galileo had failed to realize that orbits are not circular, but elliptical. As a first approximation, this is not a serious error. By observing a great number of periods for a given planet and taking an average of all observations, one can rather easily obtain a theoretical circular orbit whose length is equal to that of the actual elliptical orbit.

It so happens, moreover, that the orbit of Venus is nearly circular, and that of Mars is so close to being circular that its eccentricity was not noticed by Copernicus or even by Galileo and Tycho Brahe, who had the best equipment available in the early seventeenth century. The eccentricity of Venus is only 0.007, that of Mars 0.093.

The eccentricity of the earth's orbit (0.017) made observations more complicated. Furthermore, the dogma that "only the circle and the sphere have divine perfection" weighed down on all minds.

Since Venus is the brightest and most easily observable of all the planets, there was a great temptation to blame errors of observation for the non-circularity of the orbits of Jupiter (0.048), Saturn (0.056), and Mars. The fact that, until Kepler, no observer even noticed the eccentricity of Mercury (0.206) shows that, to a man, the humanists all succumbed to the temptation.

Because the orbit of the planet most easily observable with the naked eye happens to be nearly circular, astronomers were all the more inclined to persist in the error of

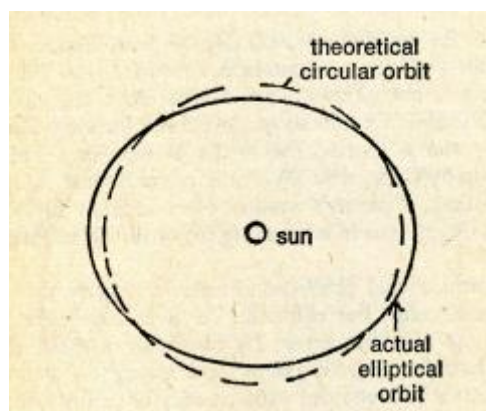


Figure 6

accepting the circularity of all planetary orbits as an axiom. From this experimental observation (its falsity is beside the point), they necessarily drew one more confirmation of the dogma that the circle was a "perfect" figure, and therefore "divine," and therefore necessary for explaining everything that happened in the sky.

That is how most false ideas are born: an unfortunately favorable circumstance imposes an observation that tallies with accepted doctrine and as long as its inaccuracy is not obvious it is considered necessarily correct. In spite of Galileo, the great Tycho Brahe remained convinced to the end of his life that Ptolemy's system was in conformity with reality and that Aristarchus and Copernicus had murky minds—medieval minds, to tell the painful truth.

In Ptolemy's system, the planets were supposed to have a double circular motion: around the earth in a circular (and therefore divine) orbit called the "deferent," and in an "epicycle," also circular, whose center followed the path of the deferent. The system can be illustrated by those amusement-park rides that consist of a rotating circular platform with spinning seats at its outer edge. The motion of the rider is like that of a

planet in the Ptolemaic system: he revolves around the pivot of the seat and, at the same time, around the center of the platform

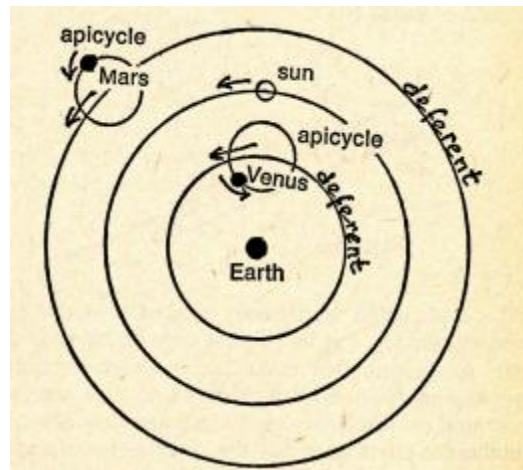


Figure 7

The Ptolemaic system had three things in its favor:

- 1- An elliptical motion can more easily be accounted for with two circles than with one.
- 2- The more complicated a theory is, the harder it is to disprove it experimentally.
- 3- A system as intricate as Ptolemy's makes God (or Zeus) indispensable. Such a mechanism could not possibly work by itself.

### Retrograde Motion

Ptolemy's system had the added virtue of being better able to account for the retrograde motion of the planets (to which horoscope makers still attribute a highly significant influence).

If we draw a line through the successive positions of a given planet, observed night after night in relation to the fixed stars, we get the disconcerting shape in Figure 8. The planet goes from left to right for a certain number of days, then turns back, then sets off again from left to right, then turns back again, and so on definitely.

Is it the hand of Zeus? No.

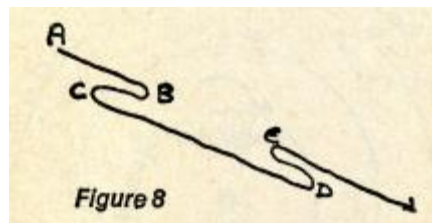


Figure 8

The explanation is perfectly simple to a man of the twentieth century. Let us take the case of Mars. In Figure 9, the mechanism that makes an observer on Earth see Mars moving from right to left is obvious: Earth is turning around the sun from right to left, and so is Mars. There is nothing mysterious about the reversal of this apparent motion either: when the two planets are on opposite sides of the sun, Mars, of course, continues imperturbably in its orbit, but the observer on Earth sees it as having a "retrograde motion." Since Earth and Mars do not have the same orbital velocity, they are necessarily on the same side of the sun at some times and on opposite sides at others.

When an observer tries to verify the Copernican system, in which orbits are assumed to be circular, he runs into a snag: the retrograde motion of Mars ought to begin "at the end" of the theoretical circle, but the observer fails to see it there because it will obviously begin only "at the end" of the actual ellipse (see Figure 10).

The Ptolemaic system, however, has no great difficulty in "saving the phenomenon," since an elliptical motion can be better accounted for with two circles than with one. Figure 10 shows how, thanks to the small circle, the large circle joins the ellipse at the beginning of retrograde motion.

The true explanation did not emerge until Kepler went back to Tycho Brahe's observations of Mars, imagined himself to be an astronomer on Mars, and finally put his finger on the flaw that had paralyzed the Copernican system: the Greek idea, the humanist idea of the divine perfection of the circle. The Hebraic Tradition forbids seeking perfection, and the Mesopotamian Tradition often associates the gods with elliptical or ovoid shapes.

I have greatly simplified the Ptolemaic system: its supporters professed all sorts of addition complications and did not hesitate to assume motions that were sometimes speeded up and sometimes slowed down. If I had not simplified, we would be in the same situation as the most brilliant humanist minds of three and a half centuries ago:

perplexed by a system that had become mysterious to everyone and continued working only by the grace of God, whose infinite goodness provides for everything. The Ptolemaic system without God (or Zeus) is like a capor sauce without capers.

In the face of such "incontestable experimental evidence," what course was open to medieval minds, for

whom experience was not a panacea and who preferred a coherent theory to chaotic experimental data? They did what Carl Sagan did after a misadventure that he relates as a humorous aside in *Intelligent Life in the Universe*.

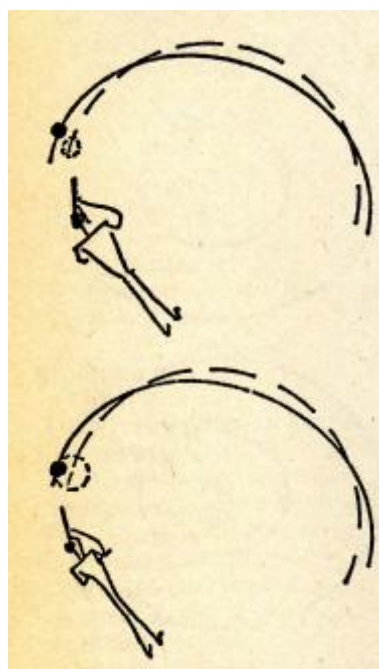
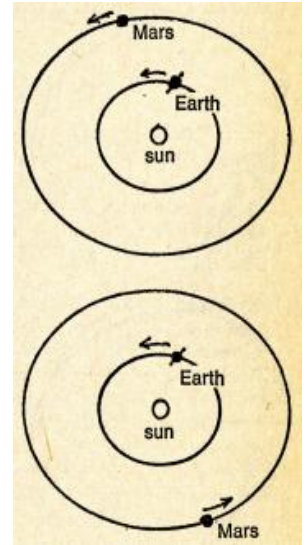


Figure 10

Having been summoned to testify as a scientific expert in the trial for fraud of a man who claimed to be a spokesman for Saturnians who had taken him aboard their flying saucer, Sagan was examined by a clever defence lawyer who made a forceful case for the idea that the defendant's alleged experience should take precedence over the theoretical conclusions of official science.

The defendant was finally indicted for fraud, but not because the prosecution had disproved his claim of having conversed with Saturnians. Aware of his inability to convince laymen of his scientific conclusions, Sagan withdrew to the "secrecy" of his university to continue his teaching and research, which are "esoteric" to those who do not reject a priori the idea that if you pull hard enough, you can lift yourself by your shoelaces.

Overwhelmed by the triumph of proud, grossly inadequate and alluringly attractive humanist experimentation, for which all men are equal and the testimony of a spokesman for Saturnians is worth as much as that of Sagan, medieval minds withdrew into secrecy and awaited the Golden Age of Aquarius.

During the five centuries that they spent in secrecy, medievalists continued meditating on the basis of the Tradition attributed to a teaching "from the sky."

We find them as "visionaries," with their "Cartesian illuminations," throughout this period, which extends from the fall of Byzantium to the entrance into Aquarius.

#### The End of the "Time of Secrecy"

In the thirteenth century, Alfonso X, King of Castile and Leon, a devotee of astronomy who was known as Alfonso the Learned, had a reaction a la Carl Sagan.

Having considered the wild profusion of overlapping circles in the Ptolemaic system, he sighed, "If I had been one of God's counselors, I would have suggested something simpler to Him."

For lack of anything better, the learned king accepted the experimental techniques of his time. But it is hard to see what might have made him "dispute" Ptolemy with such sharp irony if, for the theory of celestial motions, he had not relied on Duns Scotus and the other medievalists, for whom the teaching of the Tradition counted more than the experimental techniques of the thirteenth century.

During the five centuries when humanist experimentation was dominant, between the fall of Byzantium and the beginning of modern astronomy, relations between medievalists and humanists were comparable to those that now exist between theoretical scientists and technicians:

each group profits from the advances (and errors) of the other, and together they constitute the whole of scientific research, but they remain distinct and "do not speak the same language."

"Echoes of the conflict between the scientists and technicians of NASA after the Apollo 12 mission were widely reported in the press.

The opposition between medievalists and humanists in the progress of the exact sciences is less well known; echoes of it appear only in books dealing with the history of science, which are often hard to read.

In the mass media, top billing is necessarily given to technicians: it is they who produce the event, spectacular and experimental by definition, whether it be the appearance of transistor radios, computers or laser beams, or the realization of the Apollo program.

Scientists no less necessarily remain in obscurity:

The mass media cannot be expected to take an interest in basic research or to explain such things as Boolean algebra, the theory of coherent light, and all the esotericism of quantum mechanics.

In view of this, what is it that can incite a man of the Middle Ages to propose keys, to dismantle esotericisms to the best of his ability?

First there is the fact that we have at last entered the period of Aquarius which the medieval Tradition saw as the end of the "time of secrecy."

Next, the fact that the esoteric texts of the Cabala were published in Jerusalem some twenty years ago; since they were not to be made public until the approach of the "fulfillment of time," their revelation is evidence, drawn from the Tradition itself, that the "time of secrecy" has ended. And finally, the fact that, whether by coincidence or necessity, experimental technology is beginning to confirm the theoretical tenets of the Tradition, notably by reaching the moon—just when we have entered Aquarius.

### Premature Experimentation

Ptolemy was the Greek whom the humanist Renaissance took as its guide, but Greek antiquity was not composed entirely of humanists. Pythagoras and his disciples, Plato, and many others expressly placed themselves in the lineage of the Tradition, simply taking care not to defy prohibitions as rashly as poor Aristarchus did. One could say anything, at the cost of a few ambiguous obscurities inserted here and there. Plato did not have to wait for Descartes to suggest the idea of "advancing masked."

He has been abundantly reproached for doing it on his own initiative.

Two centuries before Christ, Archimedes stated that the circumference of the earth (which he knew was neither square nor flat) was only 300,000 stadia rather than 400,000 as Aristotle had maintained.

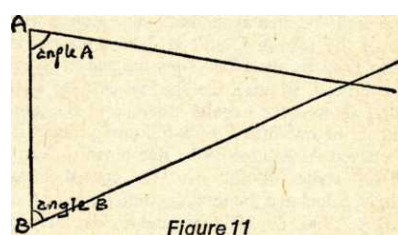
"Neither of them gave any references," Paul Couderc notes disdainfully in *Les Etapes de l'Astronomie* (Presses Universitaires de France).

What references could they have given, to make Paul Couderc happy? Aristotle and Archimedes had nothing at their disposal but the Tradition attributed to the gods (on which they relied heavily) and their logical imagination.

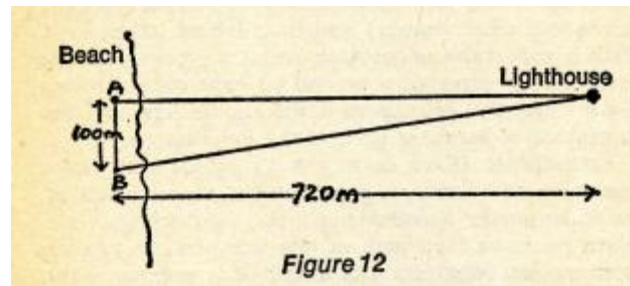
What is remarkable about Archimedes is precisely that he never tried to experiment beyond his experimental means—a humility that reappeared in the Middle Ages and was supplanted by humanist pride in the Renaissance.

Eratosthenes (third century b.c.) is the first Greek known to have made a presumptuous experimental attempt. He applied a method that is still used:

Triangulation. When we know the length of one side and the two adjacent angles, construction of a triangle is easy, since two triangles having one side and two adjacent angles equal are necessarily equal.



A practical application of triangulation might be to determine the distance of a lighthouse from a beach on which you are standing.



Place two sticks, A and B, in the sand 100 meters apart, measure the angles of sight at A and B, and you can easily determine the distance of the lighthouse. This is the principle of range finders in cameras which are so precisely made that they can determine distances up to 10 meters with an error of no more than 1 centimeter, using a base line of 5 centimeters.

If you could measure with the same describes his procedure:

‘On that day [the day of the summer solstice] every year, he knew that the full image of the sun could be seen at the bottom of a deep well near the edge of the Libyan Desert at Syene, present site of the Aswan Dam on the Nile.

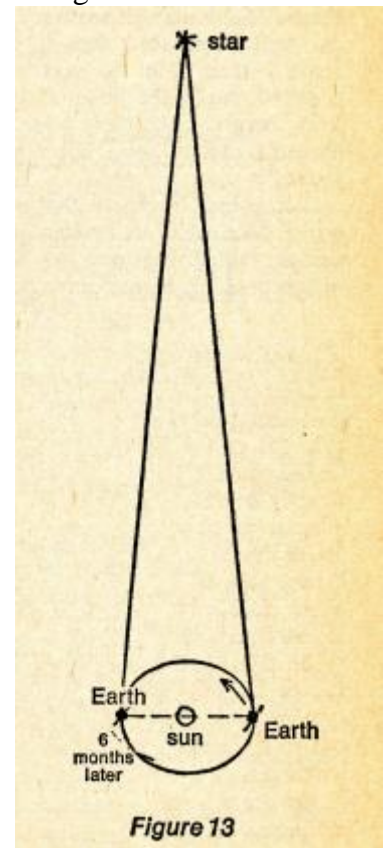
Thus the sun at Syene was directly overhead, whereas the shadow cast by a stick at Alexandria showed the angular distance of the sun from the zenith to be one-fiftieth of a full circle. Since Eratosthenes believed Alexandria to be due north of Syene and about 5,000 stades distant, over the curved surface of the earth, he calculated the total circumference of the earth to be  $50 \times 5,000$ , or 250,000 stades.

He later refined this to 252,000 stades. If one uses Pliny's version of the type of stade to which Eratosthenes referred, this works out to a circumference of 24,662 miles, compared to an actual distance, through the poles, of 24,860 miles."

Am I a vile slanderer for refusing to admit that experimentation came of age with Eratosthenes and that medievalists are wrong to accuse experimenting humanists of arrogance?

The answer is given by Paul Couderc, an astronomer at the Paris Observatory and an almost perfect representative of nineteenth-century humanism:

"This excellent correlation [between the actual figure and the one given by Eratosthenes] is accidental, for Syene is not precisely on the tropic, the difference of latitude is not quite one-fiftieth, and finally, surveyors had not measured the distance accurately."



The principle of triangulation was known and applied by the Tradition. Its technique, misleading in the hands of the humanist Eratosthenes, has become a valid means of surveying the universe.

Now that the major axis of the earth's orbit is known with precision, it is taken as the base of the triangle and the star whose distance is to be measured is taken as the vertex.

Calculation shows that with the precision of the range finder in a medium priced camera, a triangulation

using them a jor axis of the earth' sorbit as a base lineenables us to determine distances up to about six fight-years.

But in astronomy the precision is usually much greater.

Using indirect methods, today's astronomers canmeasure astronomical distances with excellent accuracy.

A recent conversation at the Paris Observatory led me to pose the problem in a way which, it seems to me, sums up the debate.

"You're right on one point," I was told. "The humanists of the Renaissance had nothing more solid to go on than the men of the Middle Ages. Neither could do anything more than formulate metaphysical theories of the universe." "Of course," I answered. "But the men of the Middle Ages based their thought on the Tradition that had come to them from the depths of time, and from it they deduced that in the 'time of Aquarius' men would transmute metals, make their voices travel all over the earth, move mountains, make flying machines, and walk on the moon."

Is it entirely by chance that medieval thought has turned out to be right in its "metaphysics" as often as humanist thought, which regarded the Tradition as a murky mass of nonsense, has turned out to be wrong?

## CHAPTER 7 Aquarius

A hundred years ago it was in Victorian England, where constipated conservatism reigned supreme, that new ideas had the greatest difficulty in becoming accepted. For anyone with a taste for new ideas, it was an advantage to be French, or at least to know the French language, because he could then benefit from the impetus given to the spirit of research by Francois Arago, who was both an outstanding scientist and a remarkable popularizer.

Arago's *Astronomie populaire* was published in 1862, the year when Camille Flammarion published his *Pluralite des mondes habites*. Following the path marked out by these two prestigious names, Jules Verne published his *From the Earth to the Moon* in 1865. The French took an enthusiastic interest in the cosmos, and international science spoke French.

What I had to go to the United States to seek in 1970 was not discoveries requiring material means beyond the capacities of a country like France. Such discoveries are reported as soon as they are made, and quickly become known to everyone. What I went to seek in the United States (and what I found there) was scientists who, starting from discoveries known to everyone, try to make new breakthroughs, exchange their ideas and publish them without being afraid of raining their careers by straying from the beaten path.

The equipment required for such research is not costly: it consists of books and periodicals to read and paper on which to calculate the limits of the possible, starting from discoveries made at great expense by others.

In the France of Arago, Bouvard had established in 1821 (on paper) that the anomalies noted in the orbit of Uranus could be explained only by the existence of an unknown planet beyond Uranus. In 1845, following Ara-go's advice, Le Verrier began an enterprise of "astronomy on paper," and on August 31, 1846 he published the results of his calculations.

Twenty-five days later, at the location calculated by Le Verrier, Galle saw that what had been regarded as a star of no particular interest was actually a planet; till then, its very slow movement (164 earthly years to complete its orbit around the sun) had caused it to be confused with the fixed stars. That was how Neptune was discovered.

It was a revolution.

"The method used by Le Verrier," wrote Arago, "differs completely from anything previously attempted by geometers and astronomers. He saw the planet at the end of his pen."

John Couch Adams, a student at Cambridge, had much greater merit than Le Verrier. Without Arago to advise and encourage him, he reached the same conclusions as Le Verrier at about the same time.

But his paper was not taken seriously by Queen Victoria's astronomers; they did not like new ideas and refused to publish such mental meanderings.

Have French-speaking scientists become incapable of producing new ideas? It would be absurd to maintain this (Santillana, who teaches at M. I. T. and publishes in English, speaks French).

But experience has shown them that a French university professor will wreck his career if he takes it into his head to publish ideas too far off the beaten path.

In France today, pursuing a new idea means gambling for double or nothing: either a Nobel Prize or oblivion.

Nearly all of the references to new ideas in this book are from American, Soviet, and British works. But, for the first-rate scientists who proposed them, none of those new ideas required equipment more costly than what was used by Adams, Le Verrier, and Konstantin E. Tsiolkov-skii, who in 1903 drew up a perfectly coherent project for an interplanetary rocket. They required only documentation, paper, and pencils.

### There Are Two "Aquariuses"

Aquarius is both a constellation and that twelfth of a circle known as a sign.

"Entering Aquarius" means entering the period during which astronomers will see the sun rise "in Aquarius" on the day of the vernal equinox.

The phenomenon of the precession of the equinoxes is involved in this fact. I have already described that phenomenon in my earlier books.

Therefore I will not return to it here. New data in Part Two of this book will bring us back to it, but here I will point out only that "entering Aquarius" can be interpreted in two ways:

The equinoctial sun has been rising in the sign of Aquarius since about 1950. In this interpretation, we are already in the "Golden Age" of prophecies.

The equinoctial sun will not begin rising in the constellation of Aquarius until about the year 2700.

In this interpretation, neither you nor I will see the prophesied "Golden Age."

Since archaic times, the Tradition has associated the prophecy of a "renewed Golden Age" with the "entrance into Aquarius." I will not waste time demonstrating this, now that Santillana has done it in a way that leaves no need for improvement. I cannot too strongly recommend reading his *Hamlet's Mill* because it has changed the whole problem.

Several years ago, when I published my first essay (*Les Cahiers de cows de Mo'ise*), the problem was to decide whether the Tradition was a jumble of superstitions, as the humanist nineteenth century maintained,

or whether it perpetuated a teaching "from the sky," as the Middle Ages maintained. But since the publication of Hamlet's Mill there can no longer be any doubt that, from the Neolithic to the present, the Tradition has transmitted astronomical knowledge which we are only now beginning to rediscover.

This is a new idea.

I will often have occasion to return to the facts assembled by Santillana and to my reasons for thinking that the time of the prophesied Golden Age is beginning now, rather than seven or eight centuries in the future.

My position has one advantage over Santillana's: if my hypothesis is false, its falsity will become obvious in the very near future.

But before we go any further, let us continue familiarizing ourselves with the realities on which my hypothesis is based.

## CHAPTER 8

### Where Are the Other Planetary Systems?

At the end of Chapter 3, we saw the principle of the conservation of angular momentum; we saw how a typical star is born.

Let us return to our swivel chair and sit down within sight of the typical star, which "begins life auspiciously, as a bright yellow giant" (Sagan).

Prodigious disturbances take place in the vicinity of the new star (and in astronomy, where the unit of measurement is the light-year—that is about 6,000,000,000,000 miles—the "vicinity" extends quite far). But these disturbances do not take place at the time of birth.

They occur when neighboring stars "see" the birth.

This is one consequence of Einstein's theory of relativity. The forces of gravity act at a distance, so that Mach (the physicist whose name has been given to the speed of sound) said that the inertia of each body in the universe is entirely determined by the distribution of all the masses in the universe. But these gravitational forces are propagated at a finite speed: the speed of light.

The new star does not, of course, create a new gravitational force. The matter of which it is made existed before its birth. But the concentration of a cloud alters the gravitational field, just as the magnetic field of iron filings scattered over a sheet of paper is altered when they are assembled into a single mass.

If a yellow giant is born tomorrow at a distance of twenty light-years from us, our sky will light up with the abruptness of a searchlight being turned on—but twenty years after the event. And it is at the precise moment when we see the sky light up that we will feel the effects of the alteration in the gravitational field that occurred twenty light-years away from us (When FU Orionis was born in 1937, the event took place much too far away for the gravitational perturbation to be felt by us.)

The new star is a giant, since it is still in its period of contraction, and its density is therefore low.

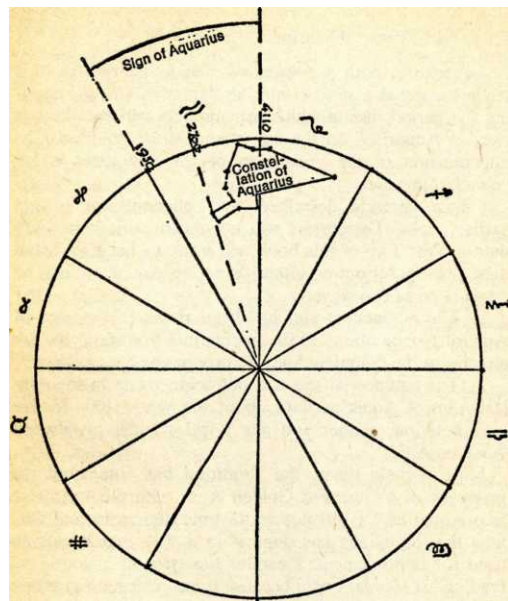


Figure 2

It is rotating very rapidly, so rapidly that at any moment there may be a rupture of equilibrium between centrifugal force and gravitational (centripetal) forces.

In other words, one or more fragments of the new star's matter, still of relatively low density, may be torn away from the contracting central mass and held within its gravitational field, These are protoplanets.

### The Conservation of Angular Momentum

Stellar equatorial rotational velocity (in km sec <sup>-1</sup> )	Percent of stars of a given spectral type with rotational velocities in the ranges given at left					
	<i>Oe, Be</i>	<i>O, B</i>	<i>A</i>	<i>F0-F2</i>	<i>F5-F8</i>	<i>G, K, M</i>
0-50	0	21	22	30	80	100
50-100	0	51	24	50	20	0
100-150	0	20	22	15	0	0
150-200	1	6	22	4	0	0
200-250	3	2	9	1	0	0
250-300	18	0	1	0	0	0
300-500	78	0	0	0	0	0

The rotation of the new star is slowed by the transfer of angular momentum to the planets being formed from protoplanets, as your rotation is slowed when you extend your arms while sitting on your spinning swivel chair.

The rotation of the new star is slowed in proportion to the mass of the protoplanets and the width of their orbit (in a planetary system, gravitational bonds act as arms holding the planets in orbit around the star).

What I have just described by its effects is a set of phenomena that are explained in the books of Schatzman, Shklovskii, Sagan, and Pierre Rousseau. It is highly probable that things happen in this way, but we have no direct, observational proof of it.

The explanation is based on a large amount of indirect evidence and on the known laws of physics.

The observed fact is that 80 percent of all stars a little hotter than the sun (F5 to F8) and 100 percent of all stars of the same temperature as the sun, or colder (G, K, M), have a slow or very slow rotation.

This loss of velocity is generally attributed to the appearance of a planetary system. (Our sun has a rotational velocity of 2 kilometers per second at the equator.)

This is shown in the table below, taken from *Intelligent Life in the Universe*, by I. S. Shklovskii and Carl Sagan, Dell Publishing Co., Inc., p. 171.

### Where Are the Other Planetary Systems?

Relation between Rotational Velocity and Spectral Type  
Is the existence of a planetary system the only possible explanation of the loss of rotational velocity?

No, the appearance of a very powerful magnetic field may also account for the transfer of angular momentum.

To sum up, the situation is as follows:

The existence of planetary systems around all stars of types G, K, and M is possible.  
The existence of planetary systems around a large number of F5 to M stars is probable.

The existence of planetary systems around some F5 to K stars can be considered certain.

"We will conclude as follows," writes Evry Schatzman in *Planetes et Satellites*: "it was in the course of its formation that the sun lost its excess angular momentum and its rotation was slowed down, while at the same time the original nebula was evolving around it."

The compression of the core of the yellow giant obviously becomes greater as peripheral particles, drawn toward the center by gravity,  
compress the intermediate tides.

Only a small percentage of its matter was lost when the ring of protoplanets was formed.

The total mass of the planets in the solar system is as insignificant in relation to the mass of the sun as the weights you hold in your hands to slow your rotation on a swivel chair are to the weight of your body.

The giant remains a giant. But the yellow giant is changed into a yellow dwarf by the effect of gravitational forces which give it greater density by compressing the particles around its core.

Having become denser, the star also becomes smaller and more opaque; it loses its brightness as its size shrinks to that of a dwarf.

It will now spend most of its life in the main sequence of the Hertzsprung-Russell diagram.

#### Optimistic Percentages

Out of 100 giants which thus enter the main sequence, two will be found in the left part of the diagram: they will be hotter and brighter than our sun (types O, B, A and F0 to F2).

But the conclusion that Schatzman proposes for the transfer of our sun's angular momentum can be applied to 80 percent of stars of types F5 to F%, and to 100 percent of types G, K, and M, that is, to 98 percent of the stars in the Galaxy (which contains about a hundred billion), provided our sun is not exceptional.

This brings us back to von Hoerner's assumption of mediocrity.

Have all stars transferred their moment of inertia to planetary systems?  
Some astrophysicists, notably Lloyd Motz, go even further.

In 1963 Lloyd Motz, then Associate Professor of Astronomy at Columbia University, stated the view that planetary systems must appear and develop around stars of a given type as uniformly as salt crystals are formed. Salt crystals are always the same, whether they are formed on Earth, Mars, or a planet millions of light-years away from us.

"By the same token," writes Walter Sullivan, "he said any star ranging in size from 5 percent smaller than the sun to 10 or 20 percent larger is bound to have

#### Where Are the Other Planetary Systems?

a system of planets one of which is orbiting roughly 92 million miles from the star—that is, at the earth's location.

In such a situation, he added, life is virtually sure to arise."

I know Lloyd Motz only through Sullivan's book *We Are Not Alone*, which I have just quoted above; I therefore do not know if he has maintained, consolidated, or reduced the estimates he made in 1963.

I do know that his conclusions seemed perfectly tenable to Sullivan and those present at the meeting where he stated them

If Lloyd Motz is right, the number of inhabited planets in the Galaxy is much greater than the number of passengers carried by the Paris subway system in ten years.

Lloyd Motz's hypothesis always startles people who, though thinking of themselves as rationalists, have not fully accepted the idea of a rigorous consistency in the universe.

If Motz is right, all stars similar to the sun have planetary systems, and life must have appeared in a similar way, and then have begun evolving.

There are 10 to 15 billion stars in the Galaxy with about the same mass as the sun. If Motz is right, imagine all the hypotheses—every one of them an insult to thenineteenth century—that will eventually be accepted! No, no, a thousand times no! A plague on Lloyd Motz! He says whatever comes into his head!

It is important to point out that Lloyd Motz does not say whatever comes into his head.

The Institute of Geophysics in Moscow bears the name of Schmidt. Schmidt was the geophysicist who formulated what can be called the theory of the harmony of distances between planets:

the square root of the distance of planets from the sun increases by a constant amount as we go from one planet to the next.

Schmidt started from the idea that the law of conservation of angular momentum is valid for all of the known universe.

Experiment has confirmed all the orbits he calculated for the solar system. Rationalists in the style of the nineteenth century have remained at the level of "Bode's law."

Bode was a German astronomer who died in 1826. A man of the nineteenth century, he began with experience and tried to draw a "law" from it. The radii of the planetary orbits were known; he sought a "mathematical" formula that would account for them "rationally." He found what he was looking for, as one always does in such cases.

If you know the length of a car, the last digit of its license number, and the age of its owner, with a little patience you can work out a "mathematical" relation between any one of those factors and the other two.

The trouble with "Bode's law" is that it is totally false for Neptune and Pluto, which is not surprising in view of the "nineteenth-century method" employed. At the time of Bode's death, Neptune and Pluto were not yet known to exist.

"Bode's law" is still included in French astronomy books. The most daring of them say that it is not really a law, but rather a "mnemonic device" that is valid only for our solar system, and not even for all of it.

Schmidt's theory has been verified not only for the planets of the solar system, but also for the satellites of the larger planets. It is therefore perfectly reasonable to assume that it applies to all stars having a planetary system—and that Lloyd Motz does not say whatever comes into his head.

Two parenthetical remarks to end this chapter:

Schmidt started from a law, that is, an abstract concept, and from it he drew conclusions subject to experimental verification. This constitutes the "medieval method." Carl Sagan believes that by 1980 we will be able to detect the planetary systems of other stars.

## CHAPTER 9 The point of Departure

Humanism: A philosophical theory which links the historical developments of mankind to mankind itself.  
Littre, Dictionnaire de la Langue Frangaise

I have quoted Littre's definition as an antidote to the common habit of depicting a humanist as a cultivated, courteous, eloquent, middle-aged gentleman who loves literature and the fine arts.

That is not what humanism is. Humanism is a metaphysic. A humanist is a dogmatic man. If you scratch his veneer, he becomes as quarrelsome as a motorist whose fender has been dented.

The credo of the atheistic humanist is that man made himself what he is without help from anyone else; the credo of the religious humanist is that the earth and man are God's finest creations.

In Littre's time there was no basis for contesting those two parallel metaphysics, both bound up with the Ptolemaic idea that the earth is the center of the universe, at least on a spiritual level. In Littre's time, it was as Obvious as a syllogism:

Man exists and is intelligent enough to wonder how he acquired that admirable intelligence which has enabled him to make steam engines.

Darwin has shown that men and apes have a common ancestor, and everyone knows that apes do not make steam engine  
Therefore, evolution from the time when intelligence first appeared gives the key to past and future evolution.

We now know that the human adventure has not been as simple, as linear, as was thought in the nineteenth century, when anyone who considered himself intelligent could produce a metaphysical sociology intended to guarantee the happiness of future generations.

In the past thirty years, the image of human evolution has become much more precise, thanks to men like Andre Leroi-Gourhan, professor at the College de France.

At the beginning of the Lower Paleolithic (600,000 to 100,000 years ago), the first real tool appeared: a stone that was simply broken to give it a beveled edge. Then came bifacial stone tools. For 400,000 years our ancestors made such tools with steady but very small improvements in technique.

Beginning in the Middle Paleolithic (100,000 to 35,000 years ago), techniques were improved more rapidly, but it was not until 18,000 years ago that the Solutrean technique was developed, marking the apex of flint toolmaking.

The Upper Paleolithic began about 35,000 years ago, when the oldest known graves appeared. There obviously cannot be funeral rites without metaphysical preoccupations. Art appeared about 30,000 years ago.

Metaphysicians though they were, our ancestors took nearly 20,000 years to perfect flint toolmaking.

Then, in about 8500 b.c., there was what Leroi-Gourhan calls an "explosion of innovation." He writes in *he geste et la parole*:

"Between 8000 and 5000 b.c. [. . .] societies took on a new form, totally different from the form they had had since their origin. [. . .] The primitive world and the world of farmers and herders are apparently so different that it seems impossible to establish a connection between them without imagining an 'invention.' "

Was each community capable, by the appearance of some impulse linked to natural evolution, of independently discovering each of the innovations that are found wherever there are men?

That is the prevailing opinion, and it is not contradicted by exchanges of information between communities having come in contact with each other.

No innovation can be assimilated without a minimum of logic which is lacking in even the most highly evolved apes. If a group of apes were left on a desert island with an abundant supply of canned food and can openers which they had been taught to use, they would probably die of either hunger or indigestion, without having planned their consumption.

Were improvements in flint toolmaking propagated by a process comparable to the propagation of electric household appliances today?

"The logic and motivations of prehistoric man are intelligible to us," teaches Leroi-Gourhan, and although Thor Heyerdahl's voyages may not have proved anything about the direction (east to west or west to east) of prehistoric expeditions, they have at least proved to those who may have doubted it that prehistoric men were capable of crossing the oceans.

### A Special Case

Natural evolution can explain the explosion of innovation that took place 10,000 years ago in the Middle East. But natural evolution cannot explain (without a cascade of perfectly gratuitous assumptions) how one lineage passed from the Solutrean technique of toolmaking to astronau-

world European explorers found societies that showed metaphysical preoccupations and knew how to use indigenous materials to make tools. But in the nineteenth century there were people who, 10,000 years after an "explosion of innovation" had brought about the appearance of farming and herding in the Middle East, still lived by hunting and food-gathering.

Our direct ancestor, *Homo sapiens*, was solidly established by 35,000 b.c. All men living today, even the most primitive of the primitives, belong to the species of *Homo sapiens* in the 20 millennia that were barely enough for other lineages to reach the stage of agriculture.

One common sleight-of-hand trick of humanist metaphysics consists of stressing the fact that 20,000 years is a short time compared with the 600,000 years that have passed since the appearance of man, and failing to mention the fact that 20,000 years represents more than half the existence of *Homo sapiens*.

Did the lineage that achieved space flight have the benefit of "help from the sky," as the Tradition of that lineage maintains, while other lineages of *Homo sapiens* were evolving naturally, that is, with leisurely slowness? Nothing permits us to assert this. But if we disregard accepted ideas inherited from the nineteenth century, for which space flight was a medieval fairy tale, everything incites us to think it, as we will see later in this book.

The exact sciences, even in the hands of religious scientists, systematically reject any "explanation by God," since "God" is not an explanation but a belief. Are we not simply pushing the problem back one notch if we imagine visitors "from the sky" who had acquired knowledge which men would have been unable to acquire by their own means? Absolutely not. Quite the contrary. The weakness of the humanist theory is that

it generalizes from one special case:

the special case of a highly improbable acceleration of evolution. It is perfectly legitimate to think that all earthlings would have reached the stage of astronautics by their own means if they had been given enough time, if they had had several tens or hundreds of millennia after the development of Solutrean toolmaking. An evolution from stone tools to astronautics may therefore very well have taken place, in a thoroughly natural manner, in a planetary system whose natives were the first to go to less highly developed planets as civilizers "from the sky."

### A Transition Period

We are thus led to a concept that draws support from two sources different enough to be regarded as complementary:

1- The laws of natural evolution.

2-The Myth that recounts the arrival among our ancestors, on the verge of achieving Solutrean toolmaking by their own means, of an expedition of Galaxians who installed their Eden in the Middle East, which was the starting point of the lineage that most obviously benefited from a prodigious acceleration of its evolution.

Between the publication of the Copernican system (1543) and general recognition of the fact that the Ptolemaic system is false, there was a long transition period:

accepted ideas never give way easily to new realities. The first characteristic of accepted ideas is that they are admirably supported by convincing demonstrations (if they were not, they would not be accepted).

The transition period is the time required for everyone to realize that demonstrations which were convincing yesterday are no longer convincing today, because of the progress of knowledge.

We are now in a transition period. The accepted idea of an evolution that dragged along for half a million years, then suddenly spurted forward, rests on countless "justifications" whose only defect is that they are totally outdated - like the "proofs" of the Ptolemaic system when, a century and a half after Copernicus, Tycho Brahe stubbornly refused to believe that the earth could be only one of several planets turning around the sun.

"Strove believed that we are on the threshold of a new view of the universe, as remarkable, in its departure from the past, as %as that of the Renaissance and the Copernican revolution," writes Walter Sullivan.

"I believe that science has reached the point where it is necessary to take into account the action of intelligent beings, in addition to the classical laws of physics," wrote Otto Strove himself.

But in the transition period in which we are bogged down, the falsity of the theory of "spurting evolution" has not yet become obvious enough. The theory still seems all the more necessarily correct because it benefits from the inertia characteristic of accepted ideas.

Yet more than ten years have gone by since Sir Bernard Lovell acknowledged that "the discussion of the general problem of the existence of extraterrestrial life appears to have become both respectable and important." We can therefore pass on to discussion of the basic problem of whether natural evolution succeeded in going from rudimentary tools to astronautics—whether it succeeded, that is, where the adventure of rational intelligence has the greatest chance of never having been given "help from the sky."

It is customary to explain the acceleration of technological progress by the fact that each generation benefits from the achievements of preceding generations and therefore "starts from higher up." This is undeniable.

The trouble comes when one tries to generalize and maintain that technology develops "in a geometrical progression."

What geometrical progression?

Advocates of the theory take perfectly arbitrary "values of progress," establish "equivalences," and from then on they have everything they need. If I told you that Gutenberg's printing press had a value of 100, the steam engine a value of 10,000, and the harnessing of nuclear energy a value of 100,000,000, I would give you a neat geometrical progression that would be quite tenable if its values were not so arbitrary as to be meaningless.

But if you examine the "equivalences" on which the theory of the geometrical progression of science and technology is based, you will find the same arbitrariness, that of the "nineteenth-century method" which enabled Bode to lay down his pseudo-law.

If there had been a geometrical progression, we would not now be "reaching the sky," as the Tradition prescribes; we would be living exponentially better than our Neolithic ancestors.

## CHAPTER 10

### From the Primitive Plowshare to Astronautics

Time respects nothing that is done without it.  
Chinese proverb

Somewhere in the Galaxy there may be creatures with silicic bodies and brains that harbor thoughts beyond our grasp. If they exist, I hope they will not be offended by the fact that I am going to ignore them.

The object of this book is not to exhaust the list of possibilities, but quite specifically to inquire whether a form of life comparable to ours, having developed a kind of logical intelligence with which we could enter into communication, may have sent to our solar system an expedition whose memory has been preserved in the Myth that deals with a sojourn of "gods" on Earth.

Is this an obvious possibility?

Yes and no. Yes, on the level of comic-strip characters like Flash Gordon. No, on the level of American and Soviet space scientists, who still have a few details to work out before they are ready to send a man to match Flash Gordon's exploits.

Before envisioning the possibility that Galaxians came to Earth during our Paleolithic period, we must accept two assumptions:

Life appears and evolves wherever the necessary conditions exist.  
The evolution of living organisms is subject to general laws whose nature is comparable to that of the laws of physics.

Once we have accepted these two assumptions, we can begin considering the degree of probability of a concrete realization of that theoretical possibility.

(Whether the processes are "willed by God" or arise from a nature without God is totally beside the point.)

Vast Amounts of Time

In order for evolution to have produced Galaxians tempted by cosmic adventure on a planet comparable to Earth, orbiting around a star comparable to the sun, the first condition required is, of course, time. (There are billions of such stars.)

The appearance of an initial one-celled organism is all that natural evolution needs in order eventually to produce thinking beings, as is proved by the fact that you and I exist.

Time is not a problem in the Galaxy, where there were already many stars of the same type as our sun several billion years before our sun had even begun forming as a protostar. But time is not everything:

it is likely that evolution is capable of beginning as it did on Earth and reaching a dead end. Let us therefore be very cautious in our estimates.

Lloyd Motz authorizes us to consider life possible in several billion planetary systems; let us limit ourselves to a few tens of thousands, or 0.00001 percent, as the number of planetary systems in which Galaxians were discussing the cosmos at a time when the sun did not yet exist. For those Galaxians, "humanist isolation" had its full force:

they were among the first living beings in the Galaxy and could expect no help from anyone else. The only absurdity-but it is fundamental-of the humanist metaphysic applied to Earth is a consequence of the idiotic assumption that man was the first thinking being ever to appear in the universe.

That is the essence of humanist arrogance. (If God existed, it would have been to those Galaxians that he gave the first helping hand.)

It is true, however, that there must have been First Galaxians scattered all over the Galaxy, since it happened 10 to 15 billion times that the mass of a protostar produced a star like our sun—that is, a yellow dwarf that probably transferred its angular momentum to a planetary system.

But we know, from bitter experience, how hard it is for a planetary system isolated in the Galaxy to achieve both technological and spiritual progress. Or perhaps our imbalance is simply a result of the "acceleration" we have undergone for the past 10,000 years, and not an inescapable law of evolution for civilizations which, lacking contacts and comparisons with neighboring systems, cannot establish general laws of bio-sociology.

But, once again, let us lean over backward to be cautious. We have already limited ourselves to a few tens of thousands of planetary systems; we will now write off most of those in that reduced number.

If civilizations have arisen unaided, in isolation, they have had all too many chances to disappear. Some will have given up, as on Earth civilizations of the Indian type have given up seeking anything but dreams in the sky, from which their Myth says that gods once came, and anything but nirvana on Earth.

Others will have persevered, like the Judeo-Christian civilization on Earth, but will not have been able to avoid the technological suicide that now threatens us.

Have the inhabitants of isolated planetary systems succeeded in developing, by their own means, civilizations that are both technological and spiritual? It is possible, but since I am unable to imagine how they might have done it, I will refrain from speculating on the subject.

### The Initial Trinity

There is a privileged region in the Galaxy:

near the center. "Stellar density in the Milky Way is not uniform," writes Shklovskii. "The brightest region, which has the densest aggregation of stars, is the Galactic nucleus, where, according to the latest data, there are approximately, 2,000 stars per cubic parsec.

This is much greater than the average star density in the neighborhood of our own Sun." Within a radius of ten light-years of the sun there are only eleven stars. Near the center of the Galaxy, the same amount of space contains several hundred thousand stars

Unfortunately there are a number of reasons for thinking that the conditions necessary for the evolution of life would not all be present in such a dense concentration of stars. So let us move outward to a region that is still quite close to the center, but where there are only a few thousand stars within a radius of ten light-years ... no, let us be extremely cautious and go to a region where there are only a few hundred.

Determining whether or not a given star has a planetary system is not easy, but, as we saw in Chapter 8, it is already nearly within our reach. Once it has become possible to detect nearby planetary systems, however, establishing contact with them by radio or laser, if they are inhabited, is relatively easy.

When contact has been established, exchange of information makes it possible to compare the "options" taken by natural evolution in each particular case, and to deduce general laws from them. (The problem of language is not serious;

Sagan points out that harder problems have already been solved in deciphering the Rosetta stone.)

Having reached the stage of space travel, the First Civilizations of the Galaxy did not have to set off at random for the first adventure of intelligence.

Their first astronauts knew where they were going. It took them only a few years to reach another planetary system, a few light-seconds away, where they were probably met by a reception committee with which contact by radio (and why not by television?) had been established during the journey.

When one has time, one can envision achievements that time will respect.

If a civilization is in no hurry, if it can let a century go by between the first contact by radio and the first direct contact by astronauts, that will be plenty of time to enable the astronauts to arrive with a knowledge of their hosts' language and customs.

A civilization that developed less rapidly than ours, one that took 300,000 years, rather than 10,000, to go from the primitive plowshare to radio, will have learned patience in the process. We may even reasonably assume that it acquired an effective sociology before discovering nuclear energy.

If I had been one of natural evolution's counselors, as King Alfonso would have liked to be one of God's counselors, I would have suggested something simple: I would have suggested placing three stars near each other in a region of the Galaxy where the laws of physics make such nearness probable. And I would have limited my ambition to those three stars.

It is probable that natural evolution has had no need of my advice. It is highly probable that life has appeared in 10,000 times three planetary systems similar to our solar system. Natural evolution is very wasteful.

Rather than advising evolution, then, I will follow its example and be wasteful without a qualm. Out of the billions of acceptable candidates, I will take only three, the three stars that are necessary and sufficient for the adventure, and I will name them Theos 1, Theos 2, and Theos 3.

From this initial trinity, the rest follows logically:

-When they have invented the telescope, the inhabitants of the planetary system of Theos 1 study the sky and determine which nearby stars have planets. When they have invented the laser or radio, they send messages.

-When the inhabitants of the systems of Theos 2 and Theos 3 have reached the same stage, the first radio contacts are made.

- When they have invented spacecraft, the three Theosite civilizations begin visiting each other, without ever having had to wonder if their expensive space programs were futile.

-When close relations have been established among the three civilizations, the next step seems obvious to them:

they must go to other planetary systems, one by one, all the way to the outer limits of the Galaxy, and bring them the civilization that was born at its center.

It is 50,000 light-years to the outer limits of the Galaxy. It is enough to confront the figures to see that such an ambition is not inherently impossible to achieve.

We have already seen that the appearance of the "Theosite Trinity" is plausible at a time when our sun was not yet formed, more than five billion years ago. But I do not want to rush natural evolution.

I will give it a margin of two billion years and place the Theosite astronauts at three billion years ago. At that time, life had already appeared on Earth, evolution was already seriously at work, and man already existed in a potential state, like a Greek god in a block of marble beneath a sculptor's chisel.

Depending on whether the sculptor is a bungler or a Praxiteles, the result will be either a wonder or a fiasco.

Until we have made contact with other Galaxians, we cannot know our value on the Galactic market.

Wisdom therefore advises us to scurry back to von Hoerner and consider that, pending further information, we are "mediocre," no better or worse than most other Galaxians.

Our mediocre planetary system is 30,000 light-years from the center of the Galaxy. To reach us in three billion years, the colonizing Theosites must travel at a hundred-thousandth of the speed of light, or less than two miles a second. A trifling speed, even at our level.

### A Journey in Stages

The Theosites had no reason to hurry. In all the planetary systems where they stopped over before reaching ours 23,000 years ago, they must surely have given the primitive natives the impression that they had all eternity before them.

The Theosites could afford to make all the detours they wanted. They could turn aside to visit a planetary system which, from a distance, seemed to have been particularly favored by natural evolution, as a motorist makes a detour to find good food and lodging.

They could also be mistaken and find that they had stopped at a detestable place. They could . . . Among all the possibilities open to the Theosites, I will limit myself to those that directly concern my subject.

But first, to make our ideas more specific, let us find a region of the Galaxy that is plausible for the beginning of the adventure, the appearance of the Theosite Trinity.

For a certain number of reasons that are obvious to an astrophysicist but would be uselessly complicated to explain here, the most plausible region is in the constellation of Sagittarius, which is not at the center of the Galaxy, but is near it.

It happens that Sagittarius (the name means "archer") has an important place in the Myth common to the First Civilizations. In the Hebraic Tradition, the sign of the "covenant" between the Elohim and Noah is a bow (keseth in Hebrew) left "in the cloud."

As soon as the zodiac emerged from the depths of time, dividing the sky into regions, it appeared with Sagittarius in the position occupied by the figure 1 on our clock dials.

I have not arbitrarily imagined the stages I am proposing in the journey that brought the "Theosite revelation" from the center of the Galaxy toward its outer limits.

They consisted of sojourns lasting tens of thousands of years, among natives brought slowly from stone tools to astronautics.

Our Aquarian science is finally making such stages plausible, and their existence seems necessary to the coherence of the Bible when we read in the thirty-eighth chapter of the Book of Job:

"Where were you when I laid the earth's foundations [. . .] when the morning stars sang together and all the sons of God [Elohim] shouted aloud?" \*

Is the Bible a historical account of events that could not be explained rationally as long as man had not succeeded in renewing the acts attributed to the gods and traveling "in the sky?"

I think so, because if we read the Bible as a historical narrative we find a coherence much too great to be explained by chance

Only a superstitious humanist can see in the Bible a childish story of a God creating the earth from nothing, in six days.

Is the "singing of the morning stars" an esoteric description of congratulatory messages sent by the "sons of the Elohim" who had remained behind in planetary systems already visited and civilized?

The evidence amassed

\* All Biblical quotations are from The New English Bible, Oxford University Press, 1970. (Translator's note.) by Santillana in Hamlet's Mill shows that this interpretation is perfectly in keeping with the very special style of the Myth.

But I am not saying that this is what we must understand when we read the Book of Job. I have not yet reached that point in my book.

I am still going back to the sources, following a guiding thread that is in the very Tradition I am attempting to retrace.

It goes without saying that the Bible cannot be expected to give more than it has. It can by no means be regarded as a scientific text, if only because of the archaic style and the esoteric method which were essential for assuring that the substance of the Myth would be transmitted through the millennia by primitive societies.

"I had once looked at Dupuis' L'Origine de tous les cultes," writes Santillana. "[. . .] I had dropped the forbidding tome, only jotting down a sentence:

'Le mythe est ne de la science; la science seule l'expliquera.' ['Myth is born of science; science alone

will explain it.] I had the answer there, but I was not reach to understand."

The Bible and the Tradition can only be the guiding thread. If Galaxians really did live on Earth, the Bible cannot have preserved anything more than a historical account of it—but the account may be genuinely historical.

Ezekiel describes a flying machine which makes us think of a spacecraft. If astronauts had taken the trouble to pay a special visit to Ezekiel, they would have given him some of their knowledge, and he would have exercised an influence in the world that he did not in fact exercise.

Ezekiel therefore did not see any astronauts. (He lived in the sixth century b.c.) But Ezekiel's whole life shows that he was not a charlatan. He was a scholar of the Tradition.

What Santillana says about the possibility of illustrating the Romance of Reynard Fox with Mesopotamian documents (Chapter 1) is equally true of Ezekiel:

"He is deeply impregnated with Babylonian imagery," writes E. Dhorme. Ezekiel's description of a flying machine can be compared to the description of a car that might be given by an Amazonian Indian witch doctor after studying an illustrated catalogue found in a missionary's house. The Amazonian has never seen a car or a motorist.

It would be naive to try to build a car on the basis of his description, but it would be even more naive to conclude, from his inconsistencies, that there are no such things as cars or catalogues that describe and illustrate them.

Ezekiel found correlations between the Hebraic Tradition and Babylonian illustrations. It was an "illumination," a "revelation," and that was what he described.

Did the Celestials of the Myth travel in flying machines, naively described by Ezekiel but in conformity with the nature of the physical laws that have enabled us to build our spacecraft? Does the Tradition transmit dreams or a historical account of a reality? That brings us to the basic problem:

Is our intelligence open to the same logic as that of Galaxian astronauts, or are we to them what gorillas are to us?

### Humanist Masochism

It is possible, of course, to think that elsewhere in the universe there are civilizations whose science is to ours what ours is to the intellectual capacities of a gorilla.

If we believe what certain witnesses tell us about the ability of flying saucers to materialize and dematerialize instantaneously, we must necessarily assume that their occupants are able to manipulate space-time in a way so far beyond our understanding that it puts us in the same boat with the gorillas.

Some people believe what these witnesses say, and from it they conclude that such civilizations exist. From this another conclusion follows logically:

that our ideas about the nature of physical laws are false. Others feel that our present accomplishments, rudimentary though they may be, are sufficient to show that we are right about the nature of physical laws.

They conclude that the need to attribute manipulation of space-time to the occupants of flying saucers

greatly reduces the credibility of those who claim to have seen them.

I will refrain from taking a position in this debate, for two reasons: first, my knowledge of the subject is insufficient; and second, my efforts are strictly limited to seeking reasons for thinking that the Tradition constitutes a historical account of a sojourn by Galaxians with a science which, though far superior to ours, was nevertheless based on physical laws whose nature is in conformity with what we are discovering about them now that we are "in Aquarius." I am seeking congeners.

The Tradition tells us that in Aquarius we must be able to "renew the acts related at the beginning of Genesis," the simplest acts at first, such as sending "the spirit of man to move above the clouds beneath which Venus is formless and without light."

That has already been done. I believe I may conclude that we are on the right track, that we are on the verge of equaling the Galaxians of the Tradition.

Do I lack humility? Imagining civilizations for which we are gorillas is not medieval humility:

it is humanist masochism. Medieval humility?

If a gorilla were capable of it, medieval humility would prompt him to try to "equal the simplest acts of human beings." And he would succeed. And he would be on the way to humanization—which experiment shows that he is not.

Medieval humility is creative. It dares to try, as soon as it feels it has a reasonable chance of success. Humanist masochism is stultifying. It can only give itself alibis to avoid seeking seriously beyond accepted ideas.

Twenty-four hours a day, in all countries, radars scrutinize the sky. Every night, all over the world, thousands of professional and amateur astronomers scrutinize the sky.

It takes naivete thick enough to cut with a knife to imagine that beings in our image (even if they are green) can pass through that network in their magnificent flying saucers without being detected.

There are genuine scientists who sometimes seem to support this naive idea, but actually they do not.

The scientists in question are humanists clutching at straws. What they pretend to be seeking is a universe in which intelligent beings "manipulate time and space and materialize and dematerialize themselves at will" (the scientist who wrote that does not want me to name him). They pretend to seek a universe beyond the reach of today's science, beyond the reach of any science they can reasonably expect to see in their lifetime—which is reassuring for someone who wants to seek without finding.

On the whole, the scientists in question prefer to associate themselves with naive laymen rather than with rationalists motivated by medieval humility.

They are similar to many Christian believers who consent, on the whole, to regard the Catholicism of the pope and the cardinals as lending support to the most naïve practices of devout superstition, rather than listening to Pius XII.

In the encyclical *Humani Generis*, Pius XII states that "the first chapters of Genesis are, in a genuine sense which it is incumbent upon exegetes to specify and define more thoroughly, historical accounts."

The scientists in question are aware of the bankruptcy of humanism, but they cannot bring themselves to abandon their investment in it. In the last analysis, their behavior indicates a frustrated religiosity:

they need to be someone's gorillas.

## CHAPTER 11 On a Few Absurdities and Contact by Radio

In France, people like to keep their feet on the ground.  
O. de Sirius

In 1888, the German physicist Heinrich Hertz experimentally verified Maxwell's theory of the identity of electromagnetic and luminous phenomena.

In simpler language, instead of making a lamp and transforming electricity into light, Hertz made a device that could transform electricity into radio waves.

I have devised an amusing experiment. You take an average humanist, preferably a university professor, and briefly describe Hertz's experiment to him, then you look him straight in the eye and say, "Similar discoveries have probably been made countless times on other worlds, during the lifetime of our Galaxy."

If your intellectual guinea pig does not smile or snicker, you give him a gumdrop.

I have had to hand out very few gumdrops since I began making the experiment. And I have often been amused, because the test sentence was written by Carl Sagan (*Intelligent Life in the Universe*, p. 379 of the Delta edition) and *Who's Who in Science* has an article on Sagan as long as your arm.

Appealing to Sagan's authority constitutes an "argument from authority," and an argument from authority is not an argument. But someone who considers himself a cultivated man and takes on a look of amused superiority at the mention of Galaxians who know how to make radios is a humanist:

what happens where there are no human beings interests him very little, and in such matters he relies on the accepted ideas of people who are "Authorities in Their Field." He is therefore fair game for an opposing argument from authority.

For lack of "authorized" openings in countries where pseudo-scientific infra-literature sells best. This maintains a balance.

On the one hand, University Authority, staggering beneath a load of honorific titles, solemnly states that man will never be able to visit any nearby planetary systems which may exist, and that the most elementary forms of life cannot survive on the moon.

On the other, a benign idiot sells 100,000 copies of a book in which he has boldly written (p. 87) that "the physicist Gnolls, of the European Nuclear Research Center, ascertained the formation, in a cloud chamber, of particles that were cubic and not spherical. [ . . . ] The aberrant formation corresponded to a parallelepipedic mass whose sides were imaginary, that is, depending on the order of  $\$ - 1$ ."

### Rockets in a Vacuum

I am too lazy to look up the names of the physicists who were regarded as Authorities and demonstrated (with "obvious" arguments) that a rocket could not propel itself in a vacuum:

"In a vacuum, the gas expelled by a rocket has nothing to push against. What could be clearer than that?"

Since I have found lingering aftereffects of this "demonstration" in several letters from readers, I may as well dispose of it once and for all.

When you fire a rifle, you feel its recoil; if you are wearing roller skates, the recoil will set you in motion; if you fire several shots in a row, your acceleration will be increased each time (to keep your balance, hold the rifle under your arm and point the muzzle behind you).

You will note that the recoil pushing you forward is unaffected by what happens to the bullets after they leave the rifle:

it will be the same whether they hit a wall (and "push against it"), perforate one of your fellow citizens, or hit nothing at all until they fall to the ground.

You will also be moved forward if you fire blank cartridges. The effect of recoil is produced in the rifle.

The burning gases "push against" the inertia of the gases that have just been burned.

Rockets work on the same principle. It is only natural that they should function perfectly well in a vacuum; there is nothing mysterious about it.

How could "scientific authorities" deny anything so obvious? This is a question to be asked of those people to whom you did not give a gumbump.

When you have been disappointed by "authorities," there is a great temptation to listen to the backyard inventor who advocates propulsion by antigravitational suppositories.

Fortunately, simple logic shows us a way between official pundits and witless amateurs. The rockets that carry satellites into orbit and men to the moon have never contradicted any law of physics. They contradict only the warped, second-hand ideas propagated by pontificating professors devoid of curiosity and imagination.

Chance undoubtedly plays a great part in discovery. Pasteur liked to say that "chance has a tendency to favor researchers with a thorough knowledge of their predecessors' work." He should have added that knowledge is good but understanding is even better.

### No Explosive Can Lift Itself Away from the Earth

The French, of course, do not have a monopoly on resounding bloopers. Arthur Clarke gives this quotation from a speech by Professor Bickerton before the British Association for the Advancement of Science in 1926:

This foolish idea of shooting at the moon is an example of the absurd length to which vicious specialization will carry scientists working in thought-tight compartments.

Let us critically examine the proposal. For a projectile entirely to escape the gravitation of the earth, it needs a velocity of 7 miles a second.

The thermal energy of a gram at this speed is 15,180 calories. . . . The energy of our most violent explosive-nitroglycerine-is less than 1,500 calories per gram.

Consequently, even had the explosive nothing to carry, it has only one-tenth of the energy necessary to escape the earth. . . . Hence the proposition appears basically impossible. . . .

Bickerton was right: no explosive or rocket propellant has enough energy to place itself in orbit. He had overlooked only the essential point.

"What does it matter if the nitroglycerin (or other propellant) contains only a fraction of the energy

necessary to lift itself away from the Earth? It never has to do so," writes Clarke.

How was Professor Bickerton's "basic impossibility" overcome? Without asking anything of inspired backyard inventors, the Russian Tsiolkovskii, the American God-dard, and von Braun simply used logic within the framework of known physical laws.

Quite rationally. All it takes is a clear mind. As the propellant lifts the rocket, part of it is burned-and the weight to be lifted is decreased.

When a Saturn 5 is launched, nearly all its propellant is burned in the first few seconds, the time when a rocket is struggling against the inertia of the mass to be lifted.

Once it is off the ground, it is much lighter, its inertia is in motion and it has only to accelerate. When it reaches escape velocity, it no longer contains any propellant.

The propellant has indeed never lifted itself away from the earth's gravitation; but it has lifted the rocket and its payload. (In the case of a Saturn 5, the weight of the burned propellant is 13 times that of the hardware placed in orbit.)

This, too, is an answer to several letters I have received from readers, which leads me to think that scientific popularization still has some progress to make in France.

### Armstrong's Horoscope

The success of the Apollo program will pose serious problems for horoscope manufacturers.

The "influence of the moon" is one of the bases of their industry, but they never say anything about an "influence of the earth." This has now been placed in question.

For Armstrong and other astronauts who spend time on the moon, does the moon lose its influence as soon as they set foot on it, just as the earth is assumed to have no astrological influence in the horoscopes of people who live on it?

(The earth is not a heavenly body for horoscope manufacturers.) But for inhabitants of the moon, even temporary ones, the earth is a heavenly body.

Does the earth have any influence on them, in conjunction with Mars or Venus? If so, what kind of influence? And on Mars it will be worse: from there, the earth will be seen to have retrograde motion.

But we have spent enough time on the absurdities of a bygone era when one could teach in a university and say that man would never reach the moon, and when one could make horoscopes as though nothing had changed since Ptolemy. Let us return to serious matters of today's world.

### Taking It the Hard Way

When the scientists of one of the three Theosite civilizations had invented radio, they did not have to solve the problems that now impede our astrophysicists:

they had long had telescopes powerful enough to show which nearby stars had planetary systems capable of supporting life.

They did not have to wonder in which direction they ought to seek contact. In the above paragraph there are three implicit assumptions.

It would be inelegant to leave them in that state.

First, Theosite civilization. I do not know if the three Theoses are actually in the constellation of Sagittarius, where I placed them to make my ideas more precise and because several factors made me more inclined to place them there than elsewhere.

But, of all the countless worlds where radio has probably been invented, the chances that to the cosmos, France has become one of the

three of them are close together are so great that there is no need to speak of the idea in hypothetical terms.

Next, telescopes. There is a certain hierarchy in inventions. On Earth, radio was invented before the laser, but that was only by chance:

the laser could have preceded radio. The telescope, however, is necessarily invented before radio and the laser in any technological civilization.

Finally, the detection of stars having an inhabitable planetary system

In 1916 the astronomer Barnard discovered a barely visible star six light-years from the sun, a red dwarf of type MS, now known as Barnard's star.

It was later discovered that Barnard's star has a "companion." Is Barnard's star a double star or one with a large planet? Astronomers are now nearly certain that the companion is a planet.

Since Barnard's star is an MS, it has a slow rotation that permits the assumption of a planetary system (see Chapter 8); but type MS is so "cold" that we cannot reasonably expect to find intelligent life comparable to ours in its planetary system.

The Theosite civilizations had one great advantage over ours: it seems probable that in a region where stars are "packed tightly together," a civilization that had reached the stage of the telescope would soon identify several planetary systems within a radius of only a few light-months, and that as soon as it had reached the stage of the laser and radio, it would establish contact with those of its neighbors that had reached the same technological level.

But let us take it the hard way and reason as if, in their first attempts to make contact with other civilizations, the Theosites had to solve the same problems that now face us. But taking it the hard way will actually simplify things for us, since we will have only to consider what has been attempted by earthlings:

-The affair of radio waves coming from CTA-102 has confirmed the fact that the Russians are working on the problem, although they surround their efforts with secrecy.

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-There is an abundant literature telling us about the efforts that American scientists are making to establish such contact.

Contact by Radio

In 600,000 years of existence, men have become so accustomed to seeing clearly in the daytime and perceiving stars at night that the emission of light-waves by the sun and the other stars seems "natural" to them.

It was not until the time of Maxwell that they began wondering if the stars might not emit radio waves just as naturally. Until Hertz, it was possible to doubt it. Today, everyone knows that stars radiate in the band of radio frequencies as well as in the band of light frequencies, but it is sometimes hard to accept the idea that it is equally "natural"-we have had only a few decades to get used to it.

"Radiating radio" is as natural as "radiating light:" a neon sign does both.

The dish antennas of radio telescopes, which everyone has seen in photographs without necessarily knowing what they are used for, "look at" radio waves as telescopes "look at" light-waves.

The primary object of radio astronomy is to know more about the chemical nature of the stars.

Many new things have been learned about the sun since it was established that its power of emission in the 10-centimeter radio band is equivalent to that of a non-luminous body at a temperature of 50,000 degrees centigrade.

(An electric razor is a "blackbody" and it emits radio frequencies, as well as infrared.)

A secondary object of radio astronomy is to try to determine whether, among all the natural radio emissions of the cosmos, there are any articulate emissions, that is, emissions necessarily sent by intelligent beings.

We can make a comparison with the domain of light, which is more easily accessible to the imagination.

If you are at the seaside on a clear, moonless night and, among all the natural points of light from the stars, you see a 102

### The Coming of the Gods

series of long and short flashes on the horizon, you will confidently conclude that you have just seen a message in optical Morse code sent from one ship to another.

Several years ago the Soviet astronomer G. B. Sholomit-skii had the impression that he had detected a message in radio code from the cosmic radio source designated as CTA-102.

In 1960, Project Ozma mobilized the resources of the National Radio Astronomy Observatory at Green Bank, West Virginia for 150 hours in a systematic search for messages from the cosmos.

All over the world there was naturally an outcry of humanist indignation against a project so medieval in spirit. But, following the excellent principle of tit for tat, the "authority" of its adversaries was opposed by the superior authority of Otto Struve, who assumed responsibility for the project. Otto Struve is one of the Very Great.

Struve did not give up, did not hide behind the alibi of a simian intelligence incapable of understanding other Ga-laxians. He was looking for congeners in the Galaxy.

### Fading Difficulties

The difficulty-insurmountable at present-of any undertaking like Project Ozma comes from the fact that there are a hundred billion stars in the Galaxy and contact can be established only by chance.

Within a radius of 22 light-years around us, there are only twenty stars of a type close enough to that of the sun (F9 to K5) to make it reasonable to suppose that they have planetary systems in which life comparable to ours could evolve, and, as we have seen, we must wait a few more years before our technology will be able to determine with certainty whether or not they actually have such systems.

So far, none of these stars has sent us a message that we have detected with our radio telescopes. But, as the American astronomer Harlow Shapley points out, a civilization passes very abruptly from the stage of no

radio at all to the stage of radio astronomy.

If Galaxians sent us a message 100 years ago, they wasted their time: a message  
On a Few Absurdities and Contact by Radio 103

sent 100 years ago from a planetary system twenty light-years away would have reached us in 1890, when Hertz's oscillator was two years old. We would have had no way of knowing it had been sent.

But in half a century our planet has acquired a characteristic that cannot have passed unnoticed if another civilization has been observing us. From an intensity of emission in radio frequencies that was practically zero, Earth has passed in fifty years to an intensity equal to that of the sun in a calm period.

All our radio and television broadcasts of commercials, sports events, news reports, and stupid or brilliant programs have made Earth pass from the "mediocrity" of planets where nothing of interest to Galaxians is happening, to the "mediocrity of Galactic civilizations."

It is therefore time to change our view of the universe, now that we have become "perceptible" to other Galaxians.

It is hard for the imagination to grasp astronomical distances. We must remember that Galaxians living twenty-some fight-years away from us have only just now perceived our progress in this area (if they have been keeping a rather close watch on us).

By the time they analyze the results and send us a message, another quarter of a century will have gone by.

We must also consider the cost of such an enterprise. Here, fortunately, there is no problem. With only a three-watt transmitter, Mariner 2 sent back decipherable messages over a distance of 50 million miles.

Even if we add the respectable number of zeros made necessary by the fact that received intensity decreases in proportion to the square of distance, establishing contact with other civilizations is already within our means.

But that law of the square of distance recalls the enormous advantage that the civilizations of Theos 1, Theos 2, and Theos 3 had over us because they were very close to each other.

Our astrophysicists are still hesitantly envisioning the establishment of contact over great distances, knowing that they have only a minute chance of succeeding, but the three Theosite civilizations were able to make contact with relative ease, without ever having had to wonder if the attempt was worthwhile. The Otto Struve of Theos was lucky.

Frequency in hertzes (cycles per second)	"Concrete" manifestations of radiations or "waves"
20 to 25	Household and industrial electric current
16 to 22,000	Audible band
100,000	Radio band (long waves)
300,000	Radio band (medium waves)
3,000,000	Radio band (short waves)
1,000,000,000 (10 <sup>9</sup> )	Radar (decimetric band)
10 <sup>10</sup> to 10 <sup>12</sup>	Band used only in laboratories (centimetric and millimetric waves)
10 <sup>13</sup>	Infrared
to	Visible light
10 <sup>17</sup>	Ultraviolet
10 <sup>18</sup> to 10 <sup>20</sup>	X-rays
10 <sup>22</sup>	Gamma rays (transmutations)
10 <sup>23</sup>	Cosmic rays

## CHAPTER 12

### The Laser and Flying Saucers

Radiations are sometimes indicated in frequencies, as in this table, and sometimes in wavelengths. To transpose, you need only to know that a wavelength of 1,000 meters corresponds to a frequency of 300,000 hertz, that is, 300,000,000 hertz corresponds to a wavelength of one meter.

I was recently invited to something that was flattered by being called a symposium (the buffet was delicious).

A few well-known science writers and reporters, some others who were less well known, several public-relations men, and other concerned people gathered to discuss the transmission of scientific information from laboratories to the public.

When the subject of the laser was brought up, the participants had to acknowledge that Nicolas Skrotsky's excellent articles on basic research into coherent light had not caused a great stir in the general public.

The laser has attracted widespread attention only through its most improbable use: in Goldfinger's threat to castrate James Bond.

I stated the opinion I have held for a long time: that when the impact of a scientific development is produced by a science-fiction film, the reviews should not be written by ordinary critics, but by sciencereporters. I persist in thinking that this would be the best way to bring the popularization of science out of its little corner, which is as narrowly specialized as philately.

In France, it comes out into the open only for such spectacular events as the Apollo missions.

Science fiction is snubbed, but it is avenged by a kind of immanent justice. One of the witless amateurs mentioned in Chapter 11 was preparing a book at the time when James Bond's genitals became a subject of public concern.

He therefore felt it was his duty to speak of the laser, and he was right:

the remarkable success of his book shows that many Frenchmen are interested in "such things," notably the laser.

What he wrote about the laser, however, is rather unfortunate:

"The laser is a magic ruby which receives a flash of low-intensity light and emits it a thousand times more powerful, that is, with truly dangerous intensity and luminosity. This feature has had an extension which occultists are studying carefully."

The ludicrousness of what he wrote should not obscure the effort he made: he tried to gather information and he learned that flashes, rubies, and intensities were involved.

Blame for the fact that everything was muddled in his head must go to those science reporters who face science fiction with the outraged air of a Christian virgin facing the temptation of sin.

Before speaking of the laser, it is better to know what it is—as any "mediocre" science reporter could and should have explained at the time when Goldfinger appeared on movie screens. He would then have cut the ground from under the feet of the occultists.

The "father" of the laser is the American Charles Townes. When he began thinking about "stimulated emission," the idea was in the air.

The Soviets N. G. Basov and A. M. Prokhorov were also thinking about it, and so was another American, Joseph Weber. In 1954, Townes, Gordon, and Zeiger performed the first successful experiment with a maser (the laser comes from the maser). In 1960, a researcher for private industry, Theodore Maiman, built the first ruby laser, which emitted a light ray with barely enough energy to cook an egg, but capable of piercing a rather thick sheet of iron.

Miracle, mystery, or occultism?

No, also, occultism has nothing to do with it.

The laws of physics are rigorously respected, as they always are when "Official Science" makes a discovery and occultists explain its use.

The laser, of course, gives back much less energy than it receives. It expends energy.

The laser simply concentrates the energy of light to the point where the density of energy, at emission, is several billion times greater than at the surface of the sun.

A similar phenomenon can be produced with a pin. Its sharp point can easily be made to pierce your skin, but if you insist on piercing your skin with the head of a pin, you will have to use a hammer.

The whole "mystery" lies in the "concentration" of "piercing energy" in the point.

When I was in high school, during the summer of my first cigarettes, I used to amaze the girls with a magnifying glass that could light a cigarette by concentrating the energy of sunlight on it.

The principle of the laser is the same—except that between the concentration of natural light by a magnifying glass and the concentration of coherent light by a laser, the difference is of the same order as that between a firecracker and an atomic bomb.

Only the nature of the laws of physics remains the same.

There is nothing "occult" about coherent light. If you were ever in the infantry, you know that troops are not allowed to walk across a bridge in cadence.

A bridge that can support the weight of a thousand soldiers would collapse, like a piece of sheet iron attached by a laser, beneath the concentrated energy of their feet attacking it "in phase." And so, as they are approaching the bridge, the sergeant orders them to break step.

The coherent light of a laser is light in which the photons are in phase, like soldiers marching in step; in natural light, the photons mill around like civilians.

What holds for people holds for photons:

a few dozen aimless strollers can block a long, narrow corridor, whereas a whole army can march through it without difficulty if all the soldiers walk "in phase."

In a recent interview in U.S. News and World Report, Townes told of comparative experiments which show the practical difference between ordinary light and coherent light in the area of space research.

From a region of the earth plunged in darkness, laser beams of only two watts were aimed at a Surveyor that had landed on the moon.

The spot of light registered by the camera of the Surveyor was brighter than the luminous halo formed above Los Angeles and New York by lighting that absorbs millions of watts.

We now have at least a casual idea of the principle and possibilities of the laser.

### The Laser and Communication between Civilizations

From the experiment performed in 1962 between the earth and the moon, can we extrapolate the possibility that other civilizations have tried, and are still trying, to make contact with us by sending laser messages?

If the humanist to whom you did not give a gumdrop in Chapter 11 sneers again, you can again point out to him that he ought to be a little more careful before he sneers.

The idea that other civilizations may have tried to attract our attention by means of lasers was stated by Charles Townes.

In *We Are Not Alone* (from which I have taken some of the information in this chapter), Walter Sullivan gives an excellent summary of an article in which Charles Townes and Robert N. Schwartz discussed the possibility of constructing, in the near future, lasers capable of being used to establish contact between planets of stars a number of light-years away from each other.

They considered two possible methods: System A, requiring that the message transmitter be placed outside the atmosphere (on the moon or an artificial satellite) and System B, which could be effectively used on the surface of the earth, despite the obstacle of the atmosphere.

(This same plan of Townes and Schwartz is described in *Intelligent Life in the Universe*, by Shklovskii and Sagan, but with figures and details that are of no interest to a layman.)

With System A, a power of only 10 kilowatts would be enough to produce, at a distance of 10 light-years, a brightness comparable to that of the faintest visible stars that can be seen with the Mount Palomar telescope.

(I am here using Sagan's figures.) Sagan has also calculated that the concentration of the laser would make it possible to achieve a spectral intensity twenty-five times greater than that of the sun. Still the principle of the pinpoint.

### Flying Saucers

In 1965, in *Les dieux nous sont nés*, I suggested the possibility that other civilizations might have probed the earth to see if we had passed the stage of the perfected gorilla, and that they might have used lasers for their probing.

The principle was still the same, the one that authorizes us, at the approach of the Golden Age, to reason as if we were they.

Let us put ourselves in the place of Galaxians who do not know if we are still at the stage of the primitive plowshare or if we are approaching the stage where they can speak to us and receive a coherent reply.

We have already sent a radio message to the earthlings, but to no avail: they did not acknowledge receipt of it. So they have not reached that stage.

We must send them a message by laser: if they have not become blind, they will see it. What kind of a message? Code? Very well, we send them a message in optical code, by laser. The earthlings do not answer, do not acknowledge receipt.

As a last resort, we must send them something that cannot give rise to any confusion; we must send them images. Perhaps we should send them an image in relief, a hologram; the laser is well suited to sending holograms.

What image shall we send? Why not a hologram of a galaxy? Yes, that is what we will send.

A hologram of a galaxy has the shape of a flying saucer.

I suggested that in 1965. A friend of mine, a laser specialist, had pondered my little idea, made a few calculations, considered several descriptions of flying saucers and concluded that although the project was far beyond our technological possibilities at the time, it fitted perfectly into the framework of known physical laws. (A hologram that can be "decoded" into natural light is still only a theoretical possibility for us.)

Since 1965, nothing has changed in this area: my little idea has been neither proved nor disproved. Meanwhile, however, lasers have made progress and our technicians are approaching the stage where we too will be able to send a hologram of a galaxy into the cosmos-or a hologram depicting men. It is in other areas that things have changed. In 1965, I did not know Sullivan's book or the theme of the article by Ronald N.

Bracewell that is summarized in *We Are Not Alone*. (Bracewell, the author of a basic book on astrophysics, teaches at Stanford University.) In 1965, I did not know that determining which planets of our solar system are inhabited is one of the things that Charles Townes considers quite possible for an advanced civilization of the Galaxy.

#### Hypotheses in Suspense

I am well aware that the end of this chapter, which ends Part One, may bewilder the lay reader to whom I promised to make accessible all the subjects discussed in this book. To follow the subjects I have just touched upon, it is helpful to have read Shklovskii, Sagan, and Sullivan for the scientifically established data, the books of Aime Michel for "orthotenic lines," and even my own *Les dieux nous sont nés* (which is out of print at present).

But I ask forgiveness of the reader who does not follow the end of this chapter. Exploration of the moon is under way, and NASA is planning to draw up an atlas that will contain a map of the moon's gravitational anomalies.

Exploration of Mars is not far off, and, in 1977, NASA intends to carry out an exploration of the entire solar system, including Pluto, as von Braun confirmed in an interview in *Paris Match* (no. 1098, May 23, 1970).

My only purpose at the end of this chapter is to present a summary of hypotheses that are waiting, in suspense, for verification that is unforeseeable but by no means impossible.

A probing device may now be in our solar system, trying to make itself be detected. It may have been designed for a wait of thousands of years. If so, it is equipped with effective protection against damage by radiation and meteorites.

It may have been programmed to wait until narrowband radio emissions announce the appearance of a civilization that has reached the stage of communication.

I hope that by now you have become used to the traps it is so amusing to set for upholders of conventional views, and that in reading the above paragraph you realized that it does express speculations which originated in my own head. The ideas in it were stated by Ronald N. Bracewell and he has more than enough authority to exasperate a humanist who does not deserve to be given a gumdrop. Speaking only for myself.

I will add that for such a probing device the best protection against radiation and meteorites would be a location beneath the surface of the moon. It would then be invisible but detectable as a "burning bush" by means of its sporadic emissions, perhaps set off by the appearance of narrow-band radio emissions, or perhaps by something else, such as the radioactivity of the upper atmosphere.

But if something has already set off an automatic radio transmitter in the solar system, we have not yet discovered it.

Project Ozma probed the stars, but not the moon or planets known to have no intelligent life on them.

If, however, something has already set off an automatic transmitter of laser holograms that has been tracing in the earth's sky those "orthotenic lines" which Aime Michel ascertained by connecting points on a map representing observations of "luminous circles and ovals moving and veering at acute angles without slowing down," we have seen the holograms repeatedly.

And totally misunderstood them. Toward the end of Chapter 10, I wrote that I had no opinion on reports of flying saucers that abruptly materialized and dematerialized.

That was pure hypocrisy; the context made it necessary for me to mention those flying saucers, but I had to wait for the context of this chapter before discussing them at greater length.

I used what is Known as a literary artifice.

If an automatic probing device, set off by the appearance of some recent technological development on Earth, has been sending us holograms representing a galaxy, and perhaps holograms representing bipeds that have turned a bit green in transmission, the functioning of a simple automatic switch is enough to explain the materializations and dematerializations of "saucers" observed by trustworthy witnesses, and we can leave manipulation of the space-time continuum to masochists who enjoy being,

"someone's gorillas," rather than accepting, like Otto Struve, the idea that we are on the threshold of a revolution in our concepts—a revolution that will in no way contradict the nature of the laws of physics, but will cover with shame those who profess certainties based on a misunderstanding of those laws.

Rational men tend to assume that all other men are rational. This is not only a false but a dangerous assumption.

### Chapter 13 The End of the Night Has Come

Commenting on this statement by an American statesman (whose name he does not give), Dr. Glenn T. Seaborg, Chairman of the U.S. Atomic Energy Commission, expressed his concern at the Nobel Symposium held at Stockholm on September 17, 1969.

"If we do not at some point—and, admittedly, on faith-trust in the power of reason and act accordingly, we will either end up living under the worst kind of organized tyranny or in a physical and spiritual jungle."

Dr. Seaborg, who has the longest notice in *Who's Who in Science*, and has, of course, won a Nobel Prize, has the reputation of being an optimist.

At the age when I was studying Latin, and even more at the age when I had to comment on the thinkers

of Antiquity, the world seemed incoherent to me.

Those men were capable, more than 2,000 years ago, of denouncing the weaknesses that still afflicted the minds of my contemporaries.

They were models of perspicacity, paragons of lucidity, landmarks in the history of thought, precursors of rationalism-yet they behaved like respectful and faithful adherents of idolatrous religions.

The facts were undeniable. At the height of her glory, Athens had no lack of idols, prayers, and sacrifices; and later, Emperor Augustus obtained the active support of Virgil and Ovid in his attempt to restore worship of Venus, Mars Ultor, and Apollo.

Was this only seemingly incoherent? Was the intellectual elite of Antiquity systematically hypocritical? Was it true, as Lenin said, that religion was the opium of the people? Was the purpose of my education to make me admire narcotics dealers?

I spent years wondering whether my teachers were long-winded imbeciles or shameless accomplices of phi-losophers who had devoted their lives to selling corrupted beliefs whose absurdity they could not fail to see. And what did they think I was? A naive fool who would accept those beliefs, or an apprentice accomplice who would eventually become a merchant of spiritual opium? I was cynical, as befits adolescence.

Since I had the good fortune to be an adolescent guided by classical studies, I knew that Diogenes, the most illustrious of the Greek Cynic philosophers, had been sold in a slave market.

I 115 even knew that when a prospective buyer asked him, "What do you know how to do, slave?" Diogenes had answered haughtily, "I know how to command men." I was an educated cynic.

Commanding men? I asked for nothing better. And like any normal adolescent, I felt perfectly capable of it. There was only one detail that I still had to work out:

which orders I would give to men with the lofty authority of the degrees I would acquire by following the usual course of university studies.

I never acquired those degrees. The farther I advanced in the system, the more its incoherence seemed obvious to me, and the orders I would have to draw from it became more and more elusive.

Fortunately there was mathematics. And, by way of mathematics, I fortunately encountered men who, through Pythagoras, sought coherence in the Tradition. And then there was Gustave Cohen, who, at the Sorbonne, taught the great clarity of the Middle Ages.

It was thus that, little by little, I learned not to be surprised at finding Antiquity peopled by men who were as remarkable for their intelligence as for the incoherence of their accepted ideas.

It would seem that man needs superstitious certainties as much as a statue needs a pedestal.

Ptolemy and Virgil attributed the fundamental knowledge of their civilization to the gods of Olympus. And natural evolution, which has not improved intelligence since Pythagoras, could not have reduced man's need for superstition in a mere 2,000 years. Therefore, when Claude Bernard and Auguste Comte attributed all the advances of the human race to the efforts of men alone, with no help "from the sky,"

their lucidity and their need for superstition were neither stronger nor weaker than those of Virgil and Ptolemy.

It took me a long time to realize that the problem which disquieted my adolescence-"God or materialism?" -is a false problem, and that the real problem is: "Are we or are we not the first intelligent

beings in the Galaxy?"

I would have had a less anxious adolescence if I had been taught in high school that humanism is a superstition like any other, that is, a body of reasoning based on an unverifiable assumption erected into a Certainty, a Dogma.

The Dogma of ancient Greece-"Men owe all their knowledge to the teachings of Hermes"-gave the Ancients' concepts a coherence neither better nor worse than the coherence that the Dogma of the nineteenth century-"Man has found everything by himself"-gave to the ideas of Claude Bernard and Auguste Comte.

But as soon as it appears out of the question that Neolithic men could have acquired by themselves the scientific knowledge transmitted by the Tradition, the humanism that survived into the nineteenth century loses all prestige. We see it laid bare, shabby, as outmoded as the worship of the idols of Venus and Mars Ultor.

### The Dividing Line

In the nineteenth century, the humanist system was quite defensible. There was no reason to believe seriously that men would some day succeed in "renewing the acts related at the beginning of Genesis." On the contrary, everything seemed to indicate that the acts attributed to the gods were on the same level as fairy tales.

Humanism reached its apogee in the nineteenth century. Claude Bernard, a professor at the College de France, was both the undisputed master of scientific experimentation and one of the most influential thinkers of his time.

Auguste Comte, the founder of Positivism, held no official teaching position, but he counted men as respectable as Littré among his disciples, and John Stuart Mill held him in high esteem. He was a kind of nineteenth-century Jean-Paul Sartre.

Humanism reached its apogee when Claude Bernard proclaimed that "matter no longer holds any secrets for us" and Auguste Comte asserted that "man will never know the chemical composition of the stars.

" Comte and Bernard could conceive of man's place in the universe only within the framework they had inherited from the humanists of the Renaissance:

under forever unknowable skies, man had succeeded unaided in penetrating all the secrets of nature. There was now proof that everything had begun with man, continued with man, and culminated in man.

Auguste Comte died in 1857, Claude Bernard in 1878. In 1896, Henri Becquerel experimented with uranium and discovered radioactivity. And that was the end of humanism.

Ever since Becquerel, medieval aspirations-which humanists regarded as obscurantist drivel-have been reaching fruition: man now transmutes metals, sends his voice across the oceans, makes flying machines, destroys a city or blows up a mountain by pressing a button, walks on the moon, and is preparing to go to other civilizations in the Galaxy.

Humanism has ended, but its effect still lingers on. We are afflicted with humanist superstitions as an old man is afflicted with gout long after he has stopped overindulging in food and drink.

By means of the "simulated time" of cybernetics, a researcher can take any working hypothesis and study its logical consequences in the future as easily as a demonstrator in a planetarium can project an image of the sky as it will appear on March 21, 2017, yet how many of our contemporaries realize that this

"simulated time" enables us to travel in time as though eternity belonged to us?

The strange part of it is that the dividing line appeared in about 1950, the year when the equinoctial sun began rising in Aquarius, which the Tradition has always associated with the Golden Age when, according to prophecy, men would renew the acts of those who came from the sky.

### The Sources of the Tradition

Above Ptolemy, the Middle Ages always sought the sources of the Tradition through the Pythagoreans. Medieval thought, of course, is also based on an assumption, a postulate that must be accepted without proof. But an assumption is not a Dogma. Like a tree, an assumption is judged by its fruits.

The medievalist assumption is that of rationalism: that human reason is capable of understanding the universe. "If the Catholic faith cannot be proved by reason, it cannot be true," wrote the Franciscan Raymond Lully.

The humanist Church of the sixteenth century condemned him, but the medieval Pope Martin V had expressly supported him in his papal bull of March 14,

Today, when our science has stripped the skies of everything supernatural beyond the reach of rationalism, the initial assumption of medievalism is confirmed by fact and the conclusions that medieval thought drew from this assumption seem more and more plausible to rational minds freed of outdated superstitions.

The great clarity of the Middle Ages came from the conviction that the Tradition is a heritage "from the sky." This clarity is best justified by our contemporaries who claim to be humanists, through the inconsistencies that their humanism forces them to accept. Let us take Shklov-sku as an example, in his own preface to his *Universe Life, Mind*:

The idea that intelligent life exists not only on our Earth, but also in a great number of other worlds, has emerged from prehistoric times. [. . .] It is found in the ancient Indian Vedas. [. . .] We cannot fail to be astonished by the brilliant intuition of the Greek philosophers. [. . .] Thales taught that the stars are made of the same matter as the earth. Anaximander stated that worlds appear, then disintegrate. [. . .] Epicurus taught the plurality of inhabited worlds, of worlds similar to the earth in every way. [. . .] It must be stressed that in this teaching the "worlds" in question were not only planets, but also many heavenly bodies distributed in the infinity of the universe.

How can anyone profess to be a humanist after having wondered at such a flagrant superiority of the "Ancients" over the humanists of the Renaissance? The answer is quite simple. It is enough to recall that men are men and not abstractions.

It is not possible for one man to fight on all fronts at

once. Shklovskii, Sagan, Feynman, and Santillana have already overturned a good number of accepted ideas, each in his own domain, and their only ambition is to be able to continue unimpeded along the same path.

They have no time to waste. They have no reason to contest things which, in their environment, do not hamper their research. In Shklovskii's book, there are Marxist fanfares which Sagan refutes in a quieter tone (political orthodoxy is less touchy in the United States than in the Soviet Union). In the sixteenth century, a researcher who wanted to be left alone had to be a monk. Giordano Bruno became a Dominican. "I have not concerned myself very much with theology," he said at his trial. "I have devoted myself primarily to philosophy."

In the sixteenth century, rationalistic scientific research was called "philosophy," as distinct from

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"theology," whose purpose was to discuss metaphysical dogmas. Today, it is discussion of metaphysical dogmas that is called "philosophy." Giordano Bruno's successors have followed the changes in the meanings of words: today's scientists do not concern themselves very much with philosophy; they devote themselves primarily to science.

Philosophers and sociologists, accepting the requirements of their occupation, teach that our age is humanist and democratic, and that "humanist" and "democratic" are synonyms of "modern." Why argue with them? Mal-raux is right: "For men of the thirteenth century, it was the Gothic that was modern." The Soviet scientist and the American scientist are both humanist and democratic —each in the manner of his own country.

When I point out to a scientist that his work lies essentially within the framework of medieval thought, he first looks at me in surprise, then reflects for a moment and concludes, "Yes, that's basically true ...I hadn't thought of it before." And five minutes later he has forgotten it. He would be much more upset if I told him that he was wrong to wear argyle socks with his tuxedo, and next time he would remember it.

There are scientists who go straight along their path like a horse wearing blinders. Others, those on whom I rely, go equally straight but wear no blinders. They sometimes stop to push aside the bushes bordering their path, admire a beautiful clearing and talk about it. Then they set off again, leaving the opening behind, perhaps with the intention of returning to it later.

That is where I come in. I have no evangile to propose. I only look through openings left behind by scientists who wear no blinders, who are medievalists in the same way as Monsieur Jourdain spoke prose: without realizing it. What I see through the openings is simply that they all converge on the Vedas, Thales and especially the Bible read with even less theological concern than Giordano Bruno professed.

### A Treacherous Test

I insidiously slipped a treacherous test into my quotation from Shklovskii. If you are entangled in humanism, you noticed nothing. If you were startled, you are already liberated from the night.

"We cannot fail to be astonished by the brilliant intuition of the Greek philosophers," writes Shklovskii. Brilliant intuition? Here we see humanist pride showing through in all its horror, with its smug, implicit syllogism:

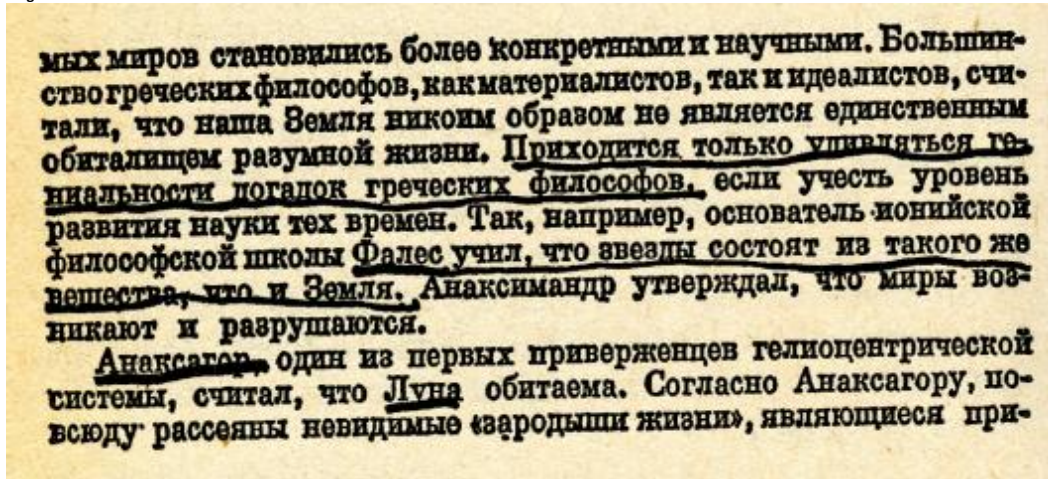
Antiquity had no means of determining that the stars are made of the same matter as the earth, or that intelligent life is not limited to the solar system.

Thales, Anaximander, Epicurus (and the Middle Ages) taught this quite expressly. Therefore, not having been able to determine it scientifically, they necessarily "guessed" it "intuitively."

Call the alleged intuition "brilliant" and the trick is done. Good night, Thales.

Brilliant intuition, my foot. Thales, Anaximander, and the Middle Ages always attributed their knowledge to a teaching "from the sky." No one has any right to call them intuitive liars—even to save the humanist Dogma.

It is rather remarkable that Sagan reacted as a medievalist. I scrupulously translated Shklovskii's sentence from: the Russian edition of his Universe, Life, Mind :



In *Intelligent Life in the Universe*, Sagan revises Shklovskii's statement as follows (p. 3): "Considering the limitations of science at that time, these early philosophers displayed great originality and ingenuity."

Verily, I say unto you that leading scientists are changing their tune, and they need only a little push to make them explicitly declare their return to medievalism.

#### The Door Opened by Struve and Drake

Project Ozma's chances of success were practically nil when Otto Struve used his prestige as a past president of the International Astronomical Union to enable young Frank Drake to carry out his idea. It would have been a truly providential stroke of luck if two or three of the planetary systems nearest to us had been sending radio messages on the 21-centimeter band during the 150 hours when the Green Bank radio telescope was listening for them, especially since the existence of civilization in those two or three systems was entirely undemonstrated. Otto Struve and Frank Drake, of course, knew this better than anyone else.

"Do we really expect a superior community to be on the nearest of those stars which we cannot at the moment positively rule out?" Ronald N. Bracewell wrote in 1960, when Project Ozma was taking shape. "Unless superior communities are extremely abundant, is it not more likely that the nearest is situated at least ten times farther off, say, beyond 100 light-years?"

Dyed-in-the-wool humanists ran no great risk when they prophesied the failure of Project Ozma. Why, then, did they not gloat when their prophecy proved to be accurate? Because one fact had just become obvious: the long humanist night was over. The end of the humanist delusion came with Project Ozma. Thanks to the authority of Otto Struve, only superstitious humanists now dare to sneer at the medieval idea that voices may come to us "from the sky" and that the solution to our most serious problems may also come "from the sky."

Yet I still know scientists who reason like Emperor Augustus. They try to restore the humanist religion and promise science reporters who support their prattle a glory equal to that of Virgil and Ovid. Are they necessarily wrong? Giordano Bruno will answer that question for us.

The humanists of the triumphant Renaissance burned Giordano Bruno at the stake in February 1600, to begin the seventeenth century with a flourish. He preferred to die in their flames rather than disavow his medieval concept of the universe.

#### CHAPTER 14 Giordano Bruno

One can never be too wary of accepted ideas.

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Contrary to statements in even recent outlines of science, Galileo did not invent the telescope; nor the microscope; nor the thermometer; nor the pendulum clock. He did not discover the law of inertia; nor the parallelogram of forces or motions; nor the sun spots. He made no contribution to theoretical astronomy; he did not throw down weights from the leaning tower of Pisa and he did not prove the truth of the Copernican system. He was not tortured by the Inquisition, did not languish in its dungeons, did not say "eppur si muove"; and he was not a martyr of science.

Arthur Koestler's *The Sleepwalkers*, from which I took the above passage (p. 353), was published in 1959. Those who already knew all this were glad to see it published with supporting evidence. Those who did not know it have not changed their minds:

"What Mr. Koestler says may be all well and good but I was always taught the opposite."

"He gives his evidence, his sources. . . ."

"What of it? I'm not a historian or a scientist—how can I check on him? I might take his word for it if he'd won a Nobel Prize, or if he were the president of a university. . . ."

If the argument from authority (which is not a serious argument) were not so impressive, humanism would long since have been relegated to some backroom in the museum of history, along with Apollo Decrepid and Mars who is no longer Ultor. *Hamlet's Mill* is by Giorgio de Santillana and Hertha von Dechend. She teaches at the J. W. Goethe-Universität Frankfurt and she may be a genius, but let us not mince words: if I had not put the accent on Santillana, a professor at the prestigious M. I. T., would you have read my quotations from their book with the same respectful attention?

"The shadows of the Middle Ages are only the shadows of our ignorance," wrote Gustave Cohen. He was not an aggressive man, he did not want to hurt anyone's feelings. He courteously gave the name of "ignorance" to the systematic brainwashing that his humanist colleagues inflicted on their students.

"Everyone knows" that Copernicus, Bruno, and Galileo were "heroes of the Renaissance who were victims of medieval obscurantism." That "everyone" ought to do a little mental housecleaning.

In the Middle Ages, Nicole Oresme (1330-1382) taught that the earth turned around the sun. Was he an obscure, minor figure, this Oresme? Not really. "A scholar and a theologian, Grand Master of the College de Navarre, then Bishop of Lisieux," says the Encyclopedic Quillet. The Middle Ages never contested his ideas, and he enjoyed great prestige at the court of Charles V. Historians of science tell us that he introduced methods of calculation that prefigured integral calculus. He "based his theory on much sounder physical grounds than Copernicus, as an Aristotelian, could do," writes Koestler.

It was these medieval ideas, found in the *Zohar* as well as the writings of Duns Scotus and Nicole Oresme, that Copernicus took up. When the Copernican system was published in 1543, the humanist Renaissance had been in power for scarcely a century. It had not yet had time to place its supporters everywhere, and medieval ideas could still be upheld with no greater danger than in the time of Oresme. No one condemned the Copernican system when it was first published. The Jesuits even taught it in their missions in China.

Copernicus's system was not condemned, and his book was not placed on the Index, until 1615. By then, the humanists were able to do as they pleased. They could black out the great clarity of the Middle Ages with impunity. Fifteen years earlier, they had burned Giordano Bruno.

More than three and a half centuries have gone by since then. You who are reading this book, what do you know about Bruno?

## The Trial of Giordano Bruno

The official record of Bruno's trial "deals exclusively with his astronomical doctrine and shows his refusal to repudiate what constituted the basis of that doctrine and could not, according to him, be accused of heresy, since it concerned neither dogma nor theology," writes Emile Namer in his book *Bruno*.

University brainwashing being what it is, Bruno's doctrine is systematically juggled away, by Koestler as well as others: "He was a poet and a metaphysician, not a scientific writer, and thus does not enter into this narrative," he has the nerve to write in *The Sleepwalkers* (P.444).

Any summary of Bruno's doctrine that I could give might be (or be regarded as) biased, so I will turn to the *Encyclopedic Quillet*, whose objective neutrality in such a debate cannot be placed in doubt:

Bruno's prodigiously rich thought is a synthesis of all the great ancient philosophies, and even of the mystic Tradition. [. . .] Although he was a Dominican, he believed he had found the truth in a pantheistic philosophy. [. . .] He was rejected by secular authority everywhere, and fought by the Church.

Giordano Bruno was born in 1548 and died in 1600. It was in the midst of the Renaissance, then, that he was rejected by secular authority as well as by the Church. It would be hard to imagine a better victim for humanist obscurantism, so there is no reason to be surprised by the silence with which the sanctimonious hypocrites of humanism surround him.

You think I am exaggerating? Go into a good bookstore and ask what books there are on Bruno. You will not be given many titles, and it is unlikely that the books will be in stock.

Bruno was born in a humanist century, therefore he was a humanist? A fine piece of reasoning! By that standard, I would be a humanist too.

A few quotations from Bruno's interrogations and writings will show why that medieval mind, nourished by the Tradition, was odious to the Renaissance humanists who burned him, and why he is still odious to today's humanists, who prefer to talk about something else.

Worlds are infinite, comparable to our Earth, a heavenly body which, with Pythagoras, I regard as similar to the moon, the planets and the infinite stars. I have maintained that all these bodies are countless worlds disseminated in infinite space, and that is what I call the universe.

There are countless constellations, suns and planets; we see only the suns because they are luminous; the planets remain invisible because they are small and dark. There are also countless earths turning around their suns, neither worse nor less inhabited than our

This takes us far beyond the possibilities of the intuition (even if it is brilliant) alleged by Shklovskii. And far beyond the metaphysics alleged by Koestler. We are at the opposite pole from Auguste Comte with Bruno's certainty, which he maintained in the face of death at the stake, that the Tradition transmits genuine information and that when one finds in it the statement that the chemical composition of the stars is the same as that of the earth, one can be sure it is true.

It is only natural that humanists should regard Bruno as an empty-headed dreamer:

He did not base his doctrine on any of those experiments that make men like Paul Couderc salivate with happiness. He based it only on the assertions (still unverifiable 50 years ago) of the Tradition.

Solomon, Pythagoras, and Avicbron

I have held to the Pythagorean concept, in conformity with that of Solomon.

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Democritus and the Epicureans stated that matter is of a divine nature, as was said by an Arab named Avicbron, in a book entitled *The Well of Life*.

The Encyclopedic Quillet is right: Bruno formed a synthesis. We can note in passing that conformity with the tradition of the Zohar served as his touchstone: Solomon had more authority than Pythagoras. And the "Arab named Avicbron" was a Jew living in an Arab country, an eleventh-century Cabalist also known as Solomon ibn-Gabirol. Bruno was not a racist.

I have kept in my possession books by condemned authors, such as Raymond Lully.

Raymond Lully? Louis de Sala-Molins' book on him is considered authoritative, but it is the work of an admirer so I will again turn to the Encyclopedic Quillet:

"A Spanish alchemist (1235-1315). At the age of thirty he renounced the world and became a Franciscan. In 1276 [that is eleven years after becoming a Franciscan] he published his *Great Art* [a famous treatise on alchemy] His neo-Platonism was mingled with preoccupations that were already scientific."

The heavenly bodies are revealed to us as the infinite effect of an infinite cause, as the true and living vestige of an infinite energy. 5

Evry Schatzman has written essentially the same thing in modern scientific language. And there is no justification for using some (brilliant) intuition or metaphysics to explain the identity that Bruno expressly stated between the matter of the heavenly bodies and the initial energy.

In the Golden Age, men were no more virtuous than beasts are now.

The Golden Age is the time at which the Tradition situates the effect of the helping hand given by civilizing Galaxians. If that Golden Age is only a web of legends produced by primitive imagination, Sartre is right: we live in an absurd and incoherent universe where a species no more virtuous than monkeys can discover nuclear energy without any help "from the sky," where we have no "bow of the covenant" to seek.

But thanks to Giordano Bruno, who preferred death to even a purely formal surrender to the humanists of his time, any medieval mind is justified in considering Sartre as a bag of hot air. For a medieval mind, the universe is not incoherent, the universe is perceptible to any rational mind; and no rational mind can accept the idea that the Tradition from which Bruno took his doctrine could have arisen, with its astrophysical knowledge, from a few Neolithic brains, however intuitive and brilliant they might have been. To a rational man, even if he is not yet ready to ally himself with medieval thought, it is obvious that the doctrine for which Bruno died can be more rationally explained by an incursion of Galaxians than by humanism.

### Jupiter, the Gods and Henry IV

Jupiter added that the gods had given man intelligence, and his hands had made him similar to them by granting him a faculty that placed him above other animals.

Yes, "the gods": Bruno did not need Voltaire to tell him that the "Elohim" in the Bible is a plural. Yes, man's hands placed him above other animals: Bruno did not Giordano Bruno need Darwin and Leroi-Gourhan to tell him that man is one animal among others, that his hands are as important as his intelligence, and that he is not a species created apart from the rest of nature. It took humanists to believe that man was apart from the rest of nature-and to persecute Darwin when he rediscovered what Bruno had known.

It was, of course, to an incursion from the sky that Bruno attributed the acceleration we are now observing in human evolution, the passage of man "no more virtuous than beasts" to man who knows that he has

civilized congeners "in the sky."

If your humanist friend sneers and says that I have no right to appeal to a Dominican monk for support of my hypothesis from which religion is totally absent, demand that he give you a gumdrop as indemnity, after making him read this quotation from Bruno's interrogation interrogation:

I said that the King of Navarre was a Calvinist and a heretic only out of political necessity; for if he had not professed heresy, he would not have had anyone to follow him. I even expressed the hope that after having pacified the kingdom, he would have confirmed the orders of the preceding [Catholic] King, and would have granted me the same favours concerning public lessons.

To men of the Middle Ages, like me, the Tradition is both historical narrative and a transmission of teachings "from the sky" Religious believers can attribute it to a God who suits them, and rationalists can – at last – openly attribute it to Galaxians, now that a whole host of leading scientists have authorized us to say openly, without fear of being sneered at, that like Bruno we are convinced of the existence of "countless earths turning around their suns, neither worse nor less inhabited than our globe."

We have just discovered the Tradition in the thought of Giordano Bruno in the sixteenth century. We will now see how it appeared before the beginning of the long humanist night.

## chapter 15

### Tradition at the End of the Middle Ages

A man knows he is contemptible before others know he deserves contempt; a kingdom collapses beneath the blows of the enemy only if it was tottering before the assault.

Confucius

It was in the fifteenth century that the Renaissance put medieval thought "under the bushel," to use the consecrated expression. The humanists triumphed without difficulty: The medieval edifice was tottering.

At the time of the fall of Byzantium in 1453 the Tradition was in a situation comparable that of politics during the lowest modern periods: hordes of imbeciles discussed it endlessly, each one adding his own grain of salt to the soup. If, in the fifteenth century, the Tradition had not become the abominable brine that modern university prattle continues to identify with all of the medieval thought, Bruno would not have had to accept martyrdom to uphold the idea that the Tradition taught knowledge of the universe – knowledge that our twentieth century is rediscovering, and that only a highly developed technology could have assembled.

Were we contemptible, in our tottering kingdom?

The fifteenth century, when what historians call the Middle Ages came to an end, was the century that imposed the experimental method of which humanists are so proud. Between the argument from authority, which refers to the Tradition, and experimental verification, humanists prefer experimental verification every time.

Theoretically they are right. In practice, it is less obvious. Experimentation is like democracy: it requires steadfast virtue. The slightest concession and all is lost.

Humanists have always cooperated admirably in glossing over the errors of the experimental method on which they base what they call truth. The case of the discovery of America sticks out like a sore thumb, but whoever thinks about it?

Christopher Columbus set out to find the "western route" to India, which Marco Polo had reached by the

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"eastern route." To make experience say what they wish it had said, humanists proclaimed that Columbus and his successors had succeeded.

Succeeded in what? They had gone off to find the magnificent palaces described by Marco Polo and they found wigwams instead. But that was no problem: all they had to do was call the natives of America "Indians." When you have a monopoly on information, you can eat roast beef on Good Friday and call it trout.

Until the fifteenth century, medieval thought had maintained a de facto division within what are now known as the exact sciences:

The "profane" sciences, in which experimentation had been encouraged since the time of Roger Bacon (1214-1294).

The "sacred" sciences, which were to be transmitted as they were taught by the Tradition until the "time of Aquarius" when men, finally having become capable of "equaling the gods," would be able to understand them and submit them to adequately developed experimental procedures.

The "profane" sciences included medicine, mathematics, and everything we call technology. Roger Bacon, a Franciscan and a disciple of the alchemist Pierre de Maricourt, made important discoveries in optics and chemistry. On a practical level, he invented eyeglasses and demonstrated the use of saltpetre in making explosives. Raymond Lully, also a Franciscan and an alchemist carried out further experiments with saltpetre and discovered nitric acid. Any book on the history of science will show the steady progress made in this "Profane" area, in which the Middle Ages experimented freely and continually.

Roger Bacon and Raymond Lully did not limit their activities to the "profane" sciences. They had a high reputation in the "sacred" sciences, but discussed them only with other "adepts," away from indiscreet ears.

The "sacred" sciences were the domain in which medieval experimentation knew that its techniques were inadequate and therefore misleading. The "sacred" teaching was not meant to be divulged. It was reserved for minds subtle enough to prefer abstract speculation to clumsy puttering—so clumsy that astronomers who preferred humanist observation to medieval speculation were led to uphold Ptolemy against Aristarchus, Oresme, Copernicus, and Bruno.

We have seen in Chapter 5 that, like Oresme, Aristarchus and Duns Scotus transmitted the teaching found in the Zohar and took it for granted that Earth is an ordinary Planet revolving around the sun. But it has become customary to ignore the fact that Duns Scotus, Oresme and Bruno were famous and did not make speeches to small coteries of visionaries. Their disciples, whose names are unknown to us, never stopped discreetly perpetuating the teaching drawn from the Tradition, all through Song night under the humanist bushel.

That teaching sometimes came out into the open, but only rarely—with Bruno facing death at the stake, for example, or with Descartes who preferred to "advance masked."

Leonardo da Vinci, whom the humanists have taken over, made a sharp distinction between the "profane" sciences, based on experience, and the "sacred" sciences, based on speculative research in the Pythagorean Tradition. Paul Valéry was the prodigious prestidigitator of this dichotomy. His writing on da Vinci became crystal-clear when we have that key—which he himself gives us in his preface to *Le Nombre d'Or*, by Matila C. Ghyka:

A kind of mysticism and an esotericism (which may have been necessary) once reserved for themselves these very delicate truths, so difficult to establish. Did they, by this restriction, hinder the progress of research, or did they fortunately maintain until our time the results of experiments that had become traditional principles and might have perished in the course of the ages if it had not been for that occult

transmission of powers?

Experimental verification is superior to arguments drawn from the Tradition, in principle. But not always. This is what the humanists of the nineteenth century were unwilling to admit, and it became increasingly hard for them to admit it as they became more and more enmeshed in the difficulties they had created for themselves.

The nineteenth century rejected as "medieval speculation" everything that a university professor did not know, and especially everything that he could "experimentally" prove to be absurd: the transmutation of metals, space travel, knowledge of the chemical composition of the stars, Bruno's doctrine that "the heavenly bodies are revealed to us as the infinite effect of an infinite cause, as the true and living vestige of an infinite energy."

Between the fifteenth and nineteenth centuries there was the long night during which the superhuman knowledge included in the Tradition was presented as supernatural, for the invalid reason that matter as Claude Bernard knew it could not be transmuted in the laboratories of the Ecole j Polytechnique in which Auguste Comte was educated.

Today, not everyone is yet aware that humanism is tottering, even though its defenders are by no means all contemptible. But it is enough to read the humanist Sartre or his humanist detractors, who defend "Western values," to realize that they are perfectly well aware of it.

### The Tottering Kingdom of Today

For a rational mind, today's problem consists in determining how, in the sixteenth century, Bruno was able to conceive a structure of the universe that was still an in suit to accepted ideas only fifty years ago. This problem can be reduced to two alternatives: either Bruno succeeded by pure, brilliant intuition, or he only correctly interpreted the Tradition three and a half centuries before the beginning of the "Golden Age of Aquarius" in which according to the Tradition itself, this correct interpretation would impose itself on everyone.

Bruno obviously did not lack "Cartesian intuition." But the quotations I gave in the preceding chapter are enough to show that it could not have been a matter of "poetic inspiration. He made precise statements, based on writings known to his judges, and he maintained and justified them until his death at the stake.

When we read the abundant quotations in Emile Namer's book and even more when we read the complete record of Bruno's interrogation, it becomes strikingly clear that his death was like the suicide of a man who had lost all hope of ever being understood by his contemporaries- a man who had given up; a man who was too disheartened to go on struggling against humanist obscurantism.

It is remarkable that at no time did Bruno claim the slightest "domination." He answered every question with reasoning based on interpretation of the Tradition.

All the witnesses summoned to his trial, notably the Carmelite Prior of Frankfort, knew him well. They all testified that he had never contested Catholicism. To escape death, and no doubt regain his freedom also, like Galileo, he would have had only to say that he accepted the Ptolemaic system. But not for one moment was he willing to separate his view of the universe from his interpretation of the Hebraic Tradition. And that is the key to the whole Bruno

The nineteenth century could and did maintain that Bruno was right to prefer the Copernican system to the Ptolemaic system, but that the rest of his ideas about the universe were the ravings of a visionary. It was only in the 1920s (see Chapter 2) that the exact sciences began confirming those ideas. Only since 1950 have they been seen to be completely accurate. And in 1969 Santillana demonstrated that they were actually in the Tradition.

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Expressed in coded, esoteric language. (If you have any doubts, you can buy a copy of Hamlet's Mill. Santillana's work is a delayed-action bomb that has not yet exploded.)

It can no longer be seriously maintained that the astro-physical doctrines which led Bruno to the stake were drawn entirely from his intuitive imagination. But what Santillana says about Bruno in Hamlet's Mill is surprisingly brief. He mentions him only twice. Here are the two passages in their entirety:

That the cosmos might be infinite seems to have remained beyond the threshold of awareness of human-kind up to the time of Lucretius, of Bruno and Galileo. (P. 48.)

And on page 342, after pointing out that the idea of an infinite universe was so hard for the human mind to accept that even Copernicus and Kepler recoiled from it:

That is why one sees Aristarchus, Bruno and Galileo not simply as bold generalizers or investigators of regularities, but as souls of superhuman audacity. Aristarchus remained a loner, neglected in his time even by the sovereign mind of Archimedes. Twenty centuries later, Bruno was less a thinker than an inspired prophet of God's infiniteness, identical with the Universe itself.

It is brief, but it admirably poses the problem: for humanists, the fact that Bruno said he had found his doctrine in the Tradition of the Bible is enough to place him in the category of "inspired prophets" and deny him the status of a "thinker."

Humanists are enclosed within a dogmatic syllogism by their Dogma itself:

The Biblical Tradition attributes its knowledge to a teaching "from the sky."  
The humanist Dogma rejects the idea that anything concrete could have come "from the sky."

Therefore, anyone who examines the Biblical Tradition for evidence of "angels"

who were made like men and brought a Galactic civilization to Earth cannot be regarded as a thinker worthy of humanists.

And Here Is the "Why"

We are finally beginning to see the underlying reason for the prohibition on the Bible that I mentioned in Chapter 1. The Bible and the Tradition of which it is a part cannot be dissociated from the Elohim to whom the teaching "from the sky" is attributed, whereas it is quite easy, in "idolatrous" Traditions, to show that the gods represented by idols are a product of primitive imagination, and to conclude that our Neolithic ancestors acquired their knowledge without help, then invented their gods later.

A humanist can believe in a God who "breathed knowledge into men," an immaterial God who used the same kind of supernatural aerosol for instilling the scientific spirit in man as for impregnating the Virgin Mary. But a humanist cannot accept the idea that the Elohim of the Bible were congeners, Galaxians who had come from a civilization that was a mere 30,000 years ahead of ours.

To accept such Elohim, one must reason like the Byzantine theologians who called them "angels" and said that they had all the basic attributes of men, including sexuality. Or one must reason like Bruno. Or, today, one must accept the reasoning I am proposing.

But you and I, and the scientists on whose work I base my system, all know that interstellar travel is part of our probable near future and that millions of other civilizations exist in the Galaxy. If we assume only that a few dozen of those civilizations reached the stage of space travel before we did, the historical truth of the Bible becomes extremely probable.

Can one consider it plausible that highly civilized Galaxians visited our remote ancestors, yet persist in denying that I have been able to reconstruct that event on the basis of the Bible? Certainly. Scientists who still cling to the humanist Dogma succeed in doing so. But they succeed only at the cost of increasingly acrobatic contortions and increasingly eloquent silences.

Why is it that, on bookstore shelves crowded with studies of obscure thinkers, it is hard to find any works on Giordano Bruno? Why do Santillana and Koestler take only those two authors whom I respect and whose work I admire-dismiss him with only a few sentences?

Simply because it is impossible to study the Bruno affair without reaching the conclusion that the humanist Dogma is dead. It has been killed by astrophysics, which confirms not only Bruno's ideas but medieval thought in general, for which the Elohim of Genesis were Galaxians, sexed like you and me. This causes a normal reaction of self-defense in humanists. As in the case of the "Indians" discovered by Columbus, they try to solve the problem by refusing to admit it exists.

The resurrection of medieval thought is taking place before our eyes. The humanist kingdom is so rickety that one fine day we will wake up and find that it has collapsed. Maurice Ponte is a member of the Academie des Sciences and director of the Agence Nationale pour la Valorisation de la Recherche. In *L'Information*, a beautifully clear little book.

he writes, "The countless mechanisms conceived by Leonardo da Vinci crowned an intensely inventive age which, at the end of the Middle Ages, produced most of the mechanisms used today." (*Italics mine.*)

I am a man of the Middle Ages. I therefore do not hope to find anywhere but "in the sky" the solution to the problems for which humanists are trying to concoct makeshift solutions, the problems that give rise to the threat of a suicide of the human race. But I may as well say once again that in my system there is nothing supernatural about the "sky" and that I seek only possibilities of contact with Galaxians whose development is ahead of ours, with the inhabitants of the "countless earths turning around their suns, neither worse nor less inhabited than our globe."

I am a man of the Middle Ages. In the twentieth century, I am seeking congeners "in the sky."

## CHAPTER 16 Are We Gods?

For the thinkers of the Middle Ages, the key problem was to determine whether the passage in the Bible (Genesis 1:27) in which man is fashioned in the image of Elohim should be taken literally or figuratively, and also whether the plural "Elohim" designated gods or the OneGod.

Everyone knows that currents from two Traditions are mingled in Christianity: the Hebraic and the Greek. It is tempting to conclude that translating "Elohim" as "the gods" corresponds to the Greek current, and as "God" to the Hebraic current.

The misleading temptation must be resisted. The multiplicity of the Olympian gods by no Immaterial Principle to which both men and gods are subject.

The Hebraic Tradition is inseparable from the Zohar which I mentioned in Chapter 5. In the Zohar (I, 272 b) we read, 'Scripture says that man was created 'in the image of Elomm, which means that all members and all parts of the human body are images of sacred forms.' And we also read (I, 15 a) that the first three words of Genesis, Bereshith bara Elohim,"

which are usually translated as In the beginning [bereshith] Elohim made (bara) can be perhaps be better translated as 'the beginning made the Elohim'

I do not intend here to enter into a debate that is still open, a debate in which the most erudite scholars have not succeeded in reaching agreement.

My only purpose in giving the above quotations from the Zohar is to show what basis medieval, rationalistic minds like Bruno, reasoning from the texts of the Tradition, could have for maintaining that the Bible does not say that heaven and earth were created from nothing by a supernatural God.

According to certain exegetes who are well versed in the Zohar, the first sentence of the Bible should be read as, "By the Beginning were created the Elohim, the sky and the earth," which implies that Genesis does not speak of the origin of the universe, but of the opening phase of an adventure that began with the arrival of Galaxians, the Elohim, who were an "emanation of the Beginning" and first made "our skies," then our planet, enter into the great adventure of intelligence in the Galaxy.

We have here the key that enables us to understand how medieval minds can find a historical narrative in the Biblical Tradition, a concrete report that involves nothing supernatural.

The two quotations above are not, of course, the only ones that could be given. At the level of this book I am simplifying greatly.

To avoid the accusation of having taken two truncated extracts, however, I will point out that the Zohar (II, 75 b and II, 76 a) stresses the idea that "the very form of the human body conceals a supreme secret" and often speaks of an Adam Kadmon who lives "in the sky" and "prefigures" Adam Rishon, the "first adam," our direct ancestor. In modern language, we might say that Adam Kadmon is the prototype of that ancestor.

Adam Kadmon is found in many other texts, notably in Philo's *De Allegoris Legum*, I, 12. But the "face" which Moses sees (Numbers 12:8) and whose "figuration" is forbidden to the ordinary run of mankind, is that of YHWH (Yahweh).

This shows the distinction that the Hebraic Tradition expressly makes between the Elohim, in whose image man was fashioned, and the Immaterial Principle, ineffable for man, which can be "heard" only by men who have "equaled the Elohim." If we are to believe the Gospel of John (10:35), Jesus said, "Those are called gods to whom the word of God was delivered."

"I refer you to Scripture, which says, 'I said: You are gods,'" wrote Meister Eckhart (1260-1327), one of the most illustrious theologians of the Middle Ages.

### The Gods of Aquarius

Meister Eckhart did not, of course, mean his words to be taken literally. Men of the fourteenth century were obviously not "gods," since they were unable to accomplish even the most elementary acts of the "gods" such as flying through the air.

It does not matter what may have been believed by imbeciles or pseudo-initiates with second-hand instructions. None of Eckhart's direct disciples misunderstood him.

He was simply saying that in his opinion Christianity was on the right path, that those destined to equal the gods when "time had been fulfilled" would be the direct descendants of those who received the teachings of the medieval intellectual leaders.

Does our Aquarian civilization support Eckhart's optimism? Have we become like the gods of the Tradition, now that the equinoctial sun has entered Aquarius, which

according to the Tradition, was to mark the "fulfillment of toe? Yes and no. Eckhart could not have foreseen the long night of humanism.

Technologically (that is, on the level of the humanist sciences), we are not far from equaling the gods of the traditionIntellectually and spirituallyis, it is another matter.

But let us begin with the technological aspect, hmiting ourselves to what Carl Sagan regards as possible within the framework of theoretical physics, even if it is technologically beyond anything conceivable today.

"Let us assume that the essentials of the knowledge of mankind are contained in one million books composed of ten chapters each," writes Shklovskii. "There are in general some 50,000 printed signs per chapter.

The total num-ouer ot such signs in one miUion books is then  $4 \times 10^{13}$  each sign is coded in a binary system, and the transmission ol information is prefaced even by a vast linguistic introduction, the total number of binary bits transmitted would

Be about  $3 \times 10^{13}$  'And sagan and shklvskii comment

jointly: ' We wish to emphasize that a linguistic systembased upon these fundamentals would be far easier to decipher than many of the written languages of ancient civilizations which have been deciphered by archaeologists."

We are now far away from the naive enterprise that consisted, a dozen years ago, of burying somewhere in the United States a "pyramid for the future" containing a sampling of the manufactured objects of which the buriers were proudest.

Shklovskii's  $3 \times 10^{13}$  binary bits are a "bow of the covenant" that we might leave as testimony to our stay on Earth, for generations starting the undertaking over again, if our civilization should commit suicide in the near future.

Technologically, we have also achieved the ability to go to the moon, where, for reasons I have presented in my earlier books, there is justification for believing that we may some day find the "bow of the covenant" which the Tradition says was left "in the cloud" for us by the Elohim. A "bow" of perhaps  $3 \times 10^{20}$  bits.

But despite its rational basis, the reasoning above is acceptable only to someone who accepts the three fundamental assumptions of the medieval mind:

- 1-The universe is coherent, and its coherence can be fully understood by human rationality.
- 2-The Tradition represents a collection of rational knowledge inherited from rational Galaxians.
- 3-Despite our technological feats, we are only a "mediocre" link in the great adventure of intelligence propagating itself through the Galaxy.

As we saw in the preceding chapter, an atheistic humanist cannot accept the second of these assumptions without denying his Dogma (his Dogma rejects civilizing Galaxians). A religious humanist cannot accept the third.

There is certainly a divine intention in Creation. The earth can be regarded as the matrix of the solar system. If space flight is considered in that way, perhaps it will be assumed that man may very well bring the spark of life to the universe.

Whose profession of faith is this? Wernher von Braun's, in his interview with Philippe de Beausset {Paris-Match, May 23, 1970).

Von Braun, a scientist convinced that the coherence of the universe is within man's reach, is a religious believer for whom the Bible necessarily has a supernatural origin. The humanist von Braun cannot reject the

fundamental credo of humanism, the

■ Dogma that gives earthlings primacy in the universe.

It is no news that a humanist is not necessarily an atheist and a medievalist is not necessarily a religious believer, but it is useful to see the mechanism on which all this hinges.

### Every Conviction Has Its Symbolism

Technologically, then, since the entrance into Aquarius we have become capable of "equaling the gods," as the Tradition promised. Intellectually, the matter seems less clear-cut, within the framework of humanist thought.

Either the correlation between the "renewal of the acts of the Elohim" and the entrance into Aquarius is entirely accidental, and in that case the deviation from the laws of probability is such that the universe is less rational than we thought (which seriously reduces our chances of understanding and penetrating it), or the promise included in the Tradition is not the work of "inspired prophets" but a rational inheritance from rational Galaxians, and in that case the first thing we should seek "in the sky" is the promised "bow of the covenant" (hoping that it will give us a solution to the problems posed by our spiritual unreadiness, which is flagrant).

We saw in Chapter 10 that some serious scientists who have become aware of the situation prefer to place man on the same level as the gorilla, rather than accept his identification with the gods.

Anything, so long as the humanist Dogma is saved. . . .Are there scientists who seek in the medieval path, who accept the medievalist assumption as von Braun accept

who proclaim it publicly, with the calm self-assurance of von Braun. That is understandable.

We are still under the humanist yoke. In today's society, believing in the fundamentalist God is permissible, but believing in the sources that inspired Bruno is not. Several times, however, I have met scientists who seek the guiding thread in the Tradition. There are some in Israel and France.

In private conversation, they make no secret of their views. In the United States, I never ventured to ask the question, but it seems to me that I saw a wink here and there. One of those winks is in the public domain.

In the conquest of space, it was obviously the Soviet Union that chose the "sensible" path, in the humanist sense of the word. Beginning by establishing a station in orbit around the earth, and from there going on to other planets, and to the moon in passing, is much safer and more economical than heading straight for the moon.

The American option was taken by John Kennedy. Since this option may very well be explained by Kennedy's highly developed sense of the spectacular, there is no justification for offering another explanation without having solid reasons for doing so.

I do not think the reasons I can offer are strong enough to warrant asserting that Kennedy was influenced by men who follow the thread of the Tradition, but they do seem strong enough to make me wonder if Kennedy was inspired by such men. Here are those reasons.

From among the available astronauts, three had to be chosen for Apollo 11 and three more for Apollo 12. There was nothing mysterious about this choice; it was made by computers that analysed the data fed into them. "Garbage in, garbage out" is an established principle of cybernetics.

The British elections of June, 1970 demonstrated that a computer can only draw false conclusions if it is given badly formulated data to work with. But the quality of the crews selected for the Apollo missions proves that the data digested by NASA's computers had been supplied by impeccably logical minds. Having said that, I will open a parenthesis.

Dozens of Cabalistic works point out that the Book of Genesis begins with the letter B (beth, in "Bereshith"), the second letter of the Hebrew alphabet, because the first letter, aleph, which corresponds to our letter A, represents the One, the Unity of the Principle that is ineffable for men.

You can believe this or consider it obscurantism; that is not the point at issue. The point is that the works in question exist, that they affirm what I wrote above, and that men intellectually equal to von Braun base their beliefs on that affirmation. The same works also state that when "the time has come," man will be able to know and understand what aleph symbolizes. Close parenthesis.

The men in NASA who are believing Christians and humanists manifest their presence by Christian symbolism—they pray or make the sign of the cross, which surprises no one.

If there are Freemasons in NASA, they saw to it that a Masonic sign, recognizable to Freemasons all over the world, accompanied the flight of the first men to the moon, thus showing that Freemasonry was not absent from the enterprise.

If there are men in NASA who follow the guiding thread of the Tradition, the symbolism that enabled them to signal their presence to kindred minds all over the world was necessarily a symbolism unmistakably drawn from the Tradition, something which signified, for example, By going to the moon, man has equaled the Elohim. Aleph is no longer unknowable and ineffable."

The first two men who set foot on the moon were two alephs":

Armstrong and Aldrin. This may, of course, have been a coincidence, though it was strange enough to prompt *Scientific American* to comment on it. But no one, so far as I know, has pointed out that the same coincidence occurred with Apollo 12-B and C (Bean and Conrad) walked on the moon while Gordon remained in the capsule orbiting above them.

A, B, C. This may be explained, aside from any hypothesis of symbolism, by a kind of humor that is relished by scientists. But consider this-if there was humor involved, it proves that the data fed into the computer could be bent to make Bean and Conrad be chosen rather than Smith and Jones.

If you have accepted the idea of an intervention by humourists, you cannot reject the idea of an intervention by Cabalists.

The alternatives are clear:

either the two /4s, the B, and the C came out of the computer entirely by chance (and that is highly improbable), or the computer was "rigged" to designate astronauts with names beginning with A, B, and C. If the latter is true, the problem is to determine who "rigged" the computer, humorists or Cabalists.

We have another datum: Gordon. In the Hebrew alphabet, the first three letters are not A, B, C, but A, B, G (and in the Greek alphabet also). Was Gordon's mission more important than those of Bean and Conrad?

The "Planete Method"

The press, including even specialized publications, said very little about what Gordon was doing while his two companions were gathering rocks on the moon.

We know that he was in a low orbit, well placed for taking photographs, and that he did take photographs.

I know of nothing more exasperating than the "Planete\* method," which consists of slyly suggesting something without putting it in the form of an explicit statement that might be disproved.

So I will say explicitly that I am not suggesting that Gordon's mission was more important than those of Bean and Conrad, because I do not know if it was or not.

None of the information I have been able to obtain from NASA would justify me in making such a statement. But I do not suggest, I assert that the "sign of the Tradition" seems to have been displayed as conspicuously as the "Christian sign" was displayed on Christmas 1968, when a Christian prayer was sent to Earth

\* Planete was a luxuriously-produced monthly which skillfully exploited the scientific ignorance of a segment of the French population who had become well off since the war but had relatively little education. It finally died from having been caught too often in the act of deforming reality. (Footnote for the American edition.)

from a lunar orbit (and as conspicuously as the "Masonic signs" recognized by Freemasons).

If the humanist who is still sneering beside you, and has not yet succeeded in deserving a gumdrop, will read this with a minimum of good faith, he will see that I have announced my intention of showing only one thing- that men who use the symbolism of the Tradition displayed winks and "signs in the sky" on the occasion of flights to the moon.

That is all I have tried to show, so let no one say that I intended to do anything more. As Shakespeare says in *The Tempest*, "Our revels now are ended "

We live in a democracy. You have an inalienable right to consider it a coincidence that the first men on the moon had names beginning with the first three letters of the Latin and Hebrew alphabets.

## CHAPTER 17

### The Conceivable through the Tradition Seen "Hologrammatically"

From the beginning we considered calling this essay "Art of the Fugue." [. . .]The subject has the nature of a hologram, something that has to be present as a whole to the mind.

Giorgio de Santillana

My chances of being burned at the stake are so slim that no one can in good faith accuse me of thinking I am Giordano Bruno.

I can therefore take him as my model without misgivings and try to reconstruct the past as it is rationally conceivable through the Tradition.

Bruno did not know that his vision of the universe had "the nature of a hologram." He knew only that study of the Tradition by a rational mind had led to that vision.

Experimental verification of that rational vision of the "sacred" domain would have to wait for the Golden Age, three and a half centuries later. Having no hope of being able to refute the humanists experimentally with the equipment of the sixteenth century, Bruno preferred their stake to their condescending friendship.

The three and a half centuries have passed. Experimental verification of Bruno's vision is an accomplished fact.

A hologram, which can be produced by means of the coherent light of a laser, is an image in relief, each point of which is illuminated from all sides simultaneously.

To offer a "hologrammatic" view of a problem is to show all its sides illuminated simultaneously. That is the kind of illumination I will try to give from here on, occasionally coming back to points that we have already seen, when a new illumination gives them fuller meaning.

#### Tradition and Traditions

Because of having been embellished by poets from generation to generation, the "idolatrous" Traditions have diverged so widely from the Hebraic Tradition that it is now hard to see their connection with it.

The Hebraic Tradition known as the Cabala has always maintained that changing so much as a single letter of the sacred text is the abomination of abominations, the most infamous of sins.

We saw in Chapter 1 how Alexandre Safran presents the Cabala: "The Cabala is more ancient than the Chinese Revelation. It goes back to prehistoric times; Moses only introduced it into the history of Israel. [. . .] The common designation of the Cabala is shalshet ha-Kabala, 'chain of the Tradition.' "

Safran and Santillana thus agree on the point of departure: the Tradition goes back to prehistoric times and was transmitted by "initiates" who "formed the chain." And the point of departure takes on hologrammatic relief in this double illumination, scientific and theological. Science and theology state that Neolithic men had more accurate astronomical ideas than the humanists of the Renaissance.

For Santillana, lacking a better explanation, Neolithic men must have discovered all that because some

of them had brains worthy of Einstein. For Safran, their knowledge was given to them by a supernatural Revelation.

For me, they simply told the truth when they attributed the origin of the Tradition to congeners who came from the sky and were far in advance of them, and it was from this same Tradition that Bruno drew a vision of the universe which we are now rediscovering in the "time of Aquarius," that is, at the time predicted and announced.

Hamlefs Mill is a dense work that must be read and pondered. I have given only quotations from it that concern facts demonstrated by Santillana, and not his opinions. Since I do not share his humanist convictions, any summary of them that I could offer might be biased. Only those who have read both his book and mine can compare his humanist initial assumption with my medieval one.

From Safran also, I have borrowed only facts that he asserts; I have a block against any mode of thought that involves even a trace of the supernatural, so I would be incapable of presenting such thought fairly.

I can only note its use by men as remarkable as Alexandre Safran or Louis de Broglie, who wrote in his *Physique et Micro-physique*, "We might suppose that at the origin of time, shortly after some *Fiat lux*, light, having at first been alone in the world, gradually engendered by progressive condensation the material universe as we can now contemplate it by means of that same light."

In noting the existence of the humanist option and the religious option, I am pointing out once again that I do not intend to bring a new certainty, but another option; I can never point that out too often. A syllogism can be drawn from my medieval option:

The Tradition promises a "bow in the cloud" to those men who will have maintained its "chain," as soon as the development of their technology has enabled them to "renew the acts related at the beginning of Genesis."

At the predicted time Aquarius, the spirit of man moved above Venus "without form and void." Therefore, according to that Tradition, as I interpret it, we are on the verge of finding the "bow in the cloud."

Am I taking a risk in saying that if the "bow of the covenant" is not found on the moon it will prove that I have misinterpreted the Tradition and that I have more in common with the gorilla than I thought? Yes, of course. But what of it? Bruno took a much more serious risk in the days when humanists could back up their arguments with fire.

## Ethnology

In 22,000 b.c., there were about a million people on Earth. This number remained constant through the millennia, like that of all animal populations incapable of significant action on their environment.

Once it has reached the number of individuals that can live in biological balance with their environment, a species neither increases nor decreases as long as some new factor does not intervene.

If there are so many tigers and so many people in a given region, one can statistically predict the number of children the tigers will eat and the number of tigers the men will kill; any numerical increase in one species will facilitate the work of the killers in the other.

In 22,000 b.c., men already had an intelligence that was inclined toward metaphysical preoccupations, as is shown by the graves they left. Some authors believe that men worshiped bears, because excavations have uncovered the skeletons of bears that seemed to have been buried in accordance with rites.

Other authors feel that these "bear graves" are too rudimentary:

if men had worshiped bears, they would have given them better-built graves. In both views, humanist pride shows through in all its monstrosity. No humanist has envisaged a humbler, more medieval hypothesis:

that bears, like men, might have been developing toward an intelligence with metaphysical inclinations, but were blocked in a dead end because their hands are less agile than those of man (whose importance Bruno stressed) and also those of Adam Kadmon, our "prototype in the sky."

Natural evolution is much less simple than Darwin thought. If a mutation were to produce a brain worthy of Einstein in a dog, we would never know it:

the poor animal would die at an early age from scraping his muzzle on the ground, under the weight of a brain that could be supported only by a species standing upright. One must read Leroi-Gourhan to realize that humanization did not begin with the brain but with the feet, and continued by means of the hands. Man is one animal among others. Bruno was right and the humanists were wrong.

Man is an animal privileged by his physical conformation (in conformity with the "sacred" prototype) as much as by his intelligence "fashioned" by the Elohim.

Modern knowledge (not to be confused with the surviving superstitions of nineteenth-century humanism) inclines us to believe that in any planetary system comparable to ours, initial life must have appeared as it did on Earth, and evolved according to the same general laws -with special cases and options each time.

An intelligence equal or superior to ours may very well appear in a species with a different conformation. The case of the dolphin, to take a well-known example, is by no means settled. But that same modern knowledge also inclines us to believe that no species can develop a civilization with a technology capable of space travel unless it has a conformation more or less like yours and mine-unless it has Adam Kadmon as its prototype.

## Glaciation

Did a glaciation plunge the earth into a chaos surrounded by opaque clouds in about 22,000 b.c., by the process that I described in *La Lune, cle de la Bible!* It is neither proved nor disproved by any serious geological findings.

There would be no reason to speak of such a cataclysm if the whole first chapter of Genesis were not devoted to an account of a very slow restoration of order and biological equilibrium by our congeners from the sky.

Between the "maybe yes" and the "maybe no" of geologists, is it sensible to choose the "yes" for the sole reason that a story which goes back into the mists of time states that the cataclysm took place? It would not be sensible at all if that were the only reason. But there are others, based on logic.

In *Those Gods Who Made Heaven and Earth* (Berkley, 1972), with one chapter for each "Biblical day," I drew up an inventory of the "work of seven days"; that "work" corresponds exactly to the program that would be carried out by our own future astronauts if they landed on a chaotic planet in a system so far away that they had to make do with the means at hand, which would force them to proceed slowly.

Here are the alternatives: either Neolithic men imagined a cataclysm that never took place (but is plausible) and Galaxians who never existed (but are plausible), before conceiving a restoration of order to the planet by a series of rational processes, or they only transmitted a historical account of events that actually took place.

My assumption of a rational universe, intelligible in terms of human logic, forces me to choose the second alternative.

## Astronautics

The Tradition tells us that a handful of Galaxians arrived at the time of chaos following the cataclysm. Geology tells us that, if there was chaos, it occurred during the Wiirm III glaciation in about 22,000 b.c. In the next chapter we will see that zodiacal symbolism (which is as natural to the Tradition as Christian symbolism is to Christianity) supports the view that Galaxians arrived in about 22,000 b.c.

Was it fifteen couples, or twenty, who arrived in the solar system? In any case, the natives numbered about a million. Within the framework of known physical laws (which is the framework of my system), it would be absurd to imagine a massive arrival of tens of thousands of celestial colonizers.

We can imagine as many as 200, however. But since that would make no appreciable difference in the ratio of civilizers to natives, I will postulate fifteen couples, which has the virtue of keeping us within the bounds of what is now conceivable. For fifteen couples with their elders and their children (the population of a hamlet), self-sufficient life is possible in an area of something like ten or twelve square miles—that is, the inside of a hollow sphere with a diameter of about two miles.

In 1960, Shklovskii stated the hypothesis that Phobos and Deimos, the two satellites of Mars, might be hollow, therefore artificial. Judging from photographs sent by Mariner 5, Phobos seems to have the shape of a potato, about thirteen miles long and ten miles wide. If Phobos and Deimos are only large meteorites captured by the gravitation of Mars, my system will gain a great deal of simplicity.

I could not ignore Shklovskii's hypothesis. Even at the cost of an annoying complication, I had to determine whether the presence of artificial satellites around Mars was compatible with my system or not.

I ascertained that there was no incompatibility. Phobos and Deimos could be the two spacecraft in which the Galaxians arrived. But that forced me to consider an inexplicable abandonment of the original spacecraft and the construction of others for departure. If Phobos and Deimos are only big rocks, however, my system regains its simplicity:

the spacecraft left the solar system with the direct descendants of those who had arrived in them. And that brings us back to the core of the Biblical Tradition:

the "bow of the covenant," which is more likely to be on the moon than on Mars. It is also worth noting that the very low orbits of the two Martian satellites, and the almost equatorial plane of their orbits, constitute two anomalies that have still been given no better explanation than "pure chance."

## Colonization

When fifteen couples arrive on a planet populated by a million primitives, their first concern should be to build a fortified Eden and have it taken care of by a group of natives selected from among those most intelligent and best suited to having their minds fashioned. And that is exactly what the Galaxians in the Bible did:

"The Lord God [Elohim] took the man and put him in the garden of Eden to till it and care for it." (Genesis 2:15.)

Once the garden of Eden had been established and staffed, the Biblical text makes no mention of a "creation from nothing." It shows Galaxians engaged in a rational restoration of the biological equilibrium that had existed before the chaos:

"The earth yielded fresh growth, plants bearing seed according to their kind and trees bearing fruit each with seed according to its kind." (Genesis 1:22.) "God made wild animals, cattle, and all reptiles, each according to its kind." (Genesis 1:25.)

Reptiles and wild animals, not to mention microorganisms; their existence was unsuspected by Moses's contemporaries, but they are there, making biology a discouragingly complex science. The Almighty, if it was His doing, should have followed the advice given by King Alfonso and made something simpler; He should have created a universe comprehensible to Claude Bernard, for example, a universe which, according to Claude Bernard, worked very well.

But if the Elohim were the rational Galaxians of my system, they could not have recreated biological equilibrium without restoring the mosquito and the leopard, which were considered useless as late as the nineteenth century—except in atheistic arguments against a God who, if he existed, could have created them only out of cruelty, to harass human beings.

Does it not seem a little strange to find Elohim concerned with such rational scientific matters in a story that has come to us from the mists of the remote past? As they "resuscitated" the various species, showing a concern for biological equilibrium that was incomprehensible in the nineteenth century, our Superior Congeners must have wondered if the animals they had thus brought back to life were the same as they had been before the cataclysm.

The best way to find out was to consult the natives and at the same time learn a few words of their language. That was exactly what the Elohim of the Biblical text did:

"So God formed out of the ground all the wild animals and all the birds of heaven. He brought them to the man to see what he would call them, and whatever the man called each living creature, that was its name." (Genesis 2:19.)

Incidentally, the above passage shows that man did not appear at the end of "creation," but before the "creation" of animals.

Are you beginning to see the humanist Dogma wavering, but are you still afraid I may be trying to put something over on you? Even an ordinary translation of the Bible is good enough for the first three chapters of Genesis:

you have only to bear in mind that "God" is the word used to translate the plural "Elohim." And you can see for yourself that I am not skipping any passages that would embarrass me.

The way in which Adam and Eve are shown committing "original sin" under the nose of the Lord of the Elohim, who was "walking in the garden at the time of the evening breeze" (Genesis 3:8) is either an instance of "naive anthropomorphism," to use Dhome's expression, or a coherent and plausible account of what happens to civiliziers who relax their attention after six "days." But "naive anthropomorphism" is scarcely compatible with the precision of the scientific knowledge transmitted by the Tradition.

If our remote ancestors did not see flesh-and-blood Galaxians restoring order to a chaotic planet, they certainly did a good job of giving that impression.

When a rationalist liberated from humanist superstition hears a primitive talk about vehicles that move all by themselves, he does not admire primitive imagination:

he assumes that the primitive has probably seen a car somewhere. I am suggesting that you do the same with regard to the coherence of the Biblical narrative.

## Biology

Their first concern, as I have said, was to build an Eden. But nothing in the Bible or in modern biological knowledge gives any reason to imagine the Elohim landing and exclaiming, "Well, here we are! Now we can take it easy and enjoy ourselves!" We can leave that to comic strips. The Bible shows the Elohim

spending a whole "day" bringing light back to the earth.

Each of those "days," as I have shown in my previous books, corresponds to the time it takes for the precession of the equinoxes to make the equinoctial sun pass from

one sign of the zodiac to the preceding one, that is, 2,160 years. (We saw this briefly in Chapter 7 and we will see it again, from another viewpoint, in the next chapter.)

The second "day" was devoted entirely to establishing a condition of torrential rains.

It was only at the beginning of the third "day" that "God said, 'Let the waters under heaven be gathered into one place, so that dry land may appear.' " (Genesis 1:9.) Then began a phase of the program that required a visit to the site. And it was in the course of this third "day" that "the Lord God formed a man from the dust of the ground" (Genesis 2:7) and placed him in Eden to till the soil.

When we have reached the stage of "reconditioning" Venus, the first explorers will not venture to come down to its surface until light has been brought back to it, dry land has been made to appear and everything has cooled for a few centuries. And men will go to Venus as neighbors, with all the industrial power of their home planet at their disposal.

We have seen that for Freeman Dyson the hardest problem of interstellar travel is a problem of biology, not of energy. Today, we would not even know how to begin if we had to conceive concrete means of sending fifteen couples of astronauts on a journey that would last several centuries.

We are still not sure that our biological techniques are capable of enabling men to live three months in orbit around the earth.

Rationalistic reasoning is here faced with a situation comparable to the one we saw with regard to the Wiirm III glaciation: nothing justifies either affirming or denying the possibility of sending two-legged mammals to colonize a planet in another planetary system with means derived from our present technology and without going outside the framework of known physical laws.

Here again, between a "maybe yes" and a "maybe no," only a narrative whose coherence cannot be explained if it is not historical inclines me to choose the "yes."

We are in the situation of Amazonian Indians convinced of the reality of automobiles by stories they have heard from missionaries, but having no idea of how to go about making one (and struggling against the dogmas of their witch doctors).

A thousand-year journey would require genetically pure couples in whose descendants consanguinity would not cause degeneration. This is both a complication and a simplification of the problem.

A complication because it assumes previous experimentation with human beings subjected to genetic surgery and raised in a specialized laboratory (a distasteful reminder of the "stud farms" in which the Nazis tried to create Aryan supermen).

A simplification because seclusion in such scientific installations eliminates the problem of volunteers: the first couples to volunteer would thereby commit their descendants to the project, since they would live in an environment from which the temptation to return to the outside world would be excluded.

We are not in the realm of science fiction. Professor Khorana, winner of a Nobel Prize, recently succeeded in producing a gene by synthesis. Can we already envision turning out geniuses at will? Well. . . . But I am not concerned here with anything like that. I am concerned with the possibility of creating lineages of men with genes pure enough to avoid physical degeneration. Intellectually and spiritually, the level of a

Franciscan monastery in the Middle Ages would be more than adequate for them—and they would have women. Women of the same intellectual and spiritual level.

The "race of the gods," thus stabilized through several generations and intended for a thousand-year journey in the cosmos, can be created only under the same conditions in which it will be used: a spacecraft about two miles in diameter with a layer of soil inside it, and the proper plant and animal life for maintaining the indispensable biological cycles; a spacecraft kept in orbit for the number of generations necessary for the race to be created and stabilized. (By "biological cycles" I mean the processes by which urine becomes drinking water and fertilizer, and excrement and corpses become fodder, then cows, then milk and meat, then human cells, and so on.)

Becoming gods does not seem like a pleasant enterprise? It is a matter of prejudice: we already drink purified sewer water, and strawberries take on their best color when they have been fertilized with manure. The only appreciable difference is that on Earth time and distance are great enough to enable us to forget that mineral water is the urine of our ancestors. Astronauts purify and drink their own urine and sweat.

So much the worse for the idyllic, gemutlich dreams of the Nazis who saw sunny, grassy breeding farms. It is necessarily in orbit that the race of the gods is born. We can heave a sigh of relief. We are far away from the "pure Aryans" of the naive Adolf, whose theorists could not have misunderstood the Indian Tradition more thoroughly if they had read it backward.

Without going outside the framework of known physical laws, but with a bold omission of details, let us say that our fifteen couples have set off into the cosmos. There is nothing "human" about them, in the rather sloppy sense that our sentimentality gives to that word. They could not have begun their journey if they had not been theorists who, through many generations, had been deliberately transformed into theorems, intellectually and spiritually adapted to living in very weak gravitation, with no temptation to return to their home planet.

I do not know if their departure actually took place. But—excuse me for repeating myself—I do know that the Biblical text says that two-legged mammals arrived on Earth twenty-some thousand years ago.

In the spacecraft, generations succeed one another (in a thousand years, there are as many as from Hugh Capet to us). Long before the end of the journey, all personal communication with the astronauts' home planet has ceased. When they are a dozen light-years away, a quarter of a century goes by between the sending of a question and receipt of its reply; under those conditions, communication is reduced to exchanges of scientific data.

(A few bold theorists are feverishly working on the hypothesis of a mathematical space that would do to Einstein what he did to Euclid. It is my understanding that if they are right it will be possible to send messages faster than light. This would be an important advance, of course, but it seems that making a manned spacecraft equal or surpass the speed of light is still out of the question.)

## Psychology

Living in a closed cycle inside their spacecraft-village, with each mouthful the astronauts eat molecules of which their direct ancestors were made. (On Earth, you and I eat molecules of Saint Louis, and the Count of Paris, his descendant, eats molecules of commoners.) The cycle of ancestor-fertilizer-plant-cow-astronaut is closed. The astronauts who arrive are the same as those who left, despite the centuries in between.

When the spacecraft reaches its destination, its occupants are aware of being eternal, which increases their dehumanization. In a thousand years, with a constant acceleration equivalent to a tenth of the moon's gravitation, one can travel far in space. And the expenditure of energy for such an acceleration is not prohibitive, especially if energy is taken from planetary systems on the way. Interstellar space is not so empty that one cannot find enough matter to transform into energy.

Dozens of astrophysicists have calculated this, for dozens of hypotheses. Several of these calculations have been published in scientific periodicals and discussed by popularizers.

When the spacecraft reaches its destination, its occupants have only an abstract knowledge, derived from books, of life in the open air, that set of incredibly complex interactions which seems so simple to us. The normal ambitions of men living in contact with strangers, threatened by all sorts of diseases, subject to changing seasons—all these horrific details seem as appalling to the astronauts as a whole lifetime in a spacecraft seems to me when I try to imagine it. Our motivations are as alien to them as theirs seem inconceivable to us. They are aware of being "eternal," of constituting a caste that has no equivalent even on their home planet. Even though they are made as we are, with the same kind of brain, they are "extraterrestrials." Yet they are Galaxians, patterned on the same prototype of "Adam Kadmon," and you have a good chance of being one of the direct ancestors of Gal-axian astronauts.

These Galaxians are "gods" and "eternal" as long as they live in a closed cycle, perpetuating the molecules that were present in the spacecraft when it departed. They eat only what has grown in the soil aboard the craft, which also serves as their cemetery. Their cows and chickens also live on that same soil, which for the convenience of the story we can call "sacred." This means, of course, that the total weight of the astronauts, plants and animals can never go beyond its initial figure. They are "unique." But to remain "unique" and "eternal" it will not be enough for them to spread out their village on the surface of the planet they have reached: they will have to avoid leaving their excreta beyond the sacred soil; but since they cannot avoid dispersing their sweat and entering into symbiosis to some extent with the air and water of the planet, their "eternity" will be of limited duration.

But when the divine portion began to fade away, and became diluted too often and too much with the mortal admixture, and the human nature got the upper hand, they then, being unable to bear their fortune, behaved unseemly, and to him who had an eye to see, grew visibly debased, for they were losing the fairest of their precious gifts; but to those who had no eye to see the true happiness, they appeared glorious and blessed at the very time when they were full of avarice and unrighteous power.

That is from Plato's *Critias*. Yes, as the natives find them more gracious and likable, the Galaxians lose the inhuman detachment that made them "gods." In the *Critias* and the *Timaeus*, Plato transcribed the Tradition as he was able to reconstruct it, just as Bruno expressed his own interpretation of the same Tradition.

The *Timaeus* is, openly, explicitly, one great myth and nothing else. Is it them "unserious," as Plato perversely would like to have certain scholars believe? They have walked into the trap, for Plato not only has put into his piece all the science he can obtain, he has entrusted to it reserved knowledge of great import, received from his archaic ancestors, and he soberly adjures the reader not to be too serious about it, nor even cultural in the modern sense, but to understand it, if he can.

The above passage is by Santillana. It is like an echo of the passage by Richard Feynman that I quoted in Chapter 5: "So do not take the lecture too seriously, feeling that you really have to understand in terms of some model what I am going to describe, but just relax and enjoy it."

When the spacecraft reached its destination, its occupants were fully gods, without having ceased to be physically like you and me. They were not necessarily even handsomer. Confirming the Tradition that Plato transcribed, Genesis 4:3-4) shows us that by the seventh "day" the Elohim had become so adapted to earthly life that Abel and Cain brought them products of herding and farming practiced outside of Eden. Plato was right: they had lost "the true happiness." They were no longer gods they were heirs.

### The Fluctuating State of "Eternity"

It is highly probable that no genetic stabilization could, through many generations, prevent the appearance of rebellious individuals. But in a spacecraft in which the total weight of the Galaxians must

remain constant within one or two hundred pounds, all squeamishness is necessarily excluded: as soon as the slightest deviationist tendency appears, the individual who exhibits it must be eliminated, to avoid endangering the whole community. In the present state of our biological knowledge, we may assume that his brain, his liver, his genitals, everything in which the defective genes are lodged, must be jettisoned into space.

When the spacecraft reached its destination, either there was no longer any life aboard it or it was populated only with rigorous conformists, fully aware of the fluctuating and hazardous nature of their state as eternal beings.

No, I am not letting my imagination wander. In the Biblical text, the plural "Elohim" is always followed by a singular verb: the Elohim does this, the Elohim decides that. I offer my explanation for whatever it may be worth: they were such inflexible conformists that all their decisions were made unanimously and they acted "like one man."

The internal logic of the Tradition also gives an answer to a question that will occur to any unprejudiced reader of the Bible: When excessive mixture with the "mortal" element had perverted the minds of the Superior Congeners, and when they had degenerated to the point where one of them, Lucifer-Satan, led our ancestor Adam into "sin" under the very nose of the Lord of the Elohim, why did they need to wait through the whole seventh "day" before they left the planet?

If things happened as I am proposing, they needed many centuries to "recreate" from themselves—minus Lucifer-Satan, who was left on Earth—a "divine" race capable of setting off again into the cosmos for another thousand-year journey.

## Good and Evil

The conformism that was fashioned by centuries of living in a closed cycle and maintained for a dozen millennia in our solar system, is a conformism of survival situated within such a narrow range that its main features can easily be delineated.

"The gods," said Plato, "have no destiny." It is when they weaken, when they feel the need of a "destiny," that they begin to develop the "human" avarice and unrighteous power mentioned by Plato.

For the Galaxian "gods," time obviously did not count. They were "eternal"; their goal was not to "succeed in life," but to find a task superhuman enough to occupy their whole lives, before going back into the "sacred" soil and returning their molecules to the "cycle of divine molecules."

"Their only ambition was to avoid being a weak link in the chain, an individual whose liver, marrow, and genitals would be refused burial in the "sacred" soil.

The Tradition shows the Galaxians resisting temptation for thousands of years of life in the open air, in contact with many generations of our ancestors. Thousands of years went by between their arrival and the day of sin, when the Lord of the Elohim, "walking in the garden at the time of the evening breeze," learned that a native gardener had disobeyed his orders.

"Sin?" Yes. The disobedience of Adam and Eve was more than a crime. The whole enterprise of civilizing the primitive natives would be wrecked if they learned what the Elohim called "the knowledge of good and evil."

Was the difference between our ancestors and the Galaxians, the Theosites, as great as between us and the gorilla? Yes and no. Yes, since it was enough for our ancestors to discover what the Theosites regarded as "good" and "evil" to overturn the enterprise of civilizing them. No, since the Tradition shows that our ancestors were capable of understanding what they had unfortunately discovered, whereas the gorilla is completely impervious to our moral and logical concepts.

In all the illuminations provided by a "hologrammatic vision," the humanist concept of the universe is

equally incompatible with the medieval concept. For humanists, other Galaxians are almost necessarily incomprehensible to us, to the point of having created a physics that lies outside the nature of physical laws as we know them.

For medievalists, the Galaxians spoken of by the Tradition are necessarily superior to us, but they act on the basis of a logic that is accessible to us and they accomplish only things which, since the entrance into Aquarius, we have been quite able to place within the framework of our theoretical physics.

### Recapitulation

Exegesis intended to make the Bible say that a supernatural God in the image of Zeus created the world in six days, from nothing, has confused things so thoroughly, and the passing centuries have given that confusion such a solid status as an accepted idea, that it is essential to re-establish the chronological order that appears from an unprejudiced reading of the Bible.

Grass, bushes, and other vegetation rose from the soil on the third "day." (Genesis 1:14-13.) It was when "there was neither shrub nor plant growing wild upon the earth, because the Lord God had sent no rain on the earth; nor was there any man to till the ground" (2:5) that "the Lord God formed a man from the dust of the ground" (2:7), "planted a garden in Eden" (2:8) and "took the man and put him in the garden of Eden to till it and care for it." (2:15.) All birds were "created" on the fifth "day" (1:21). As the Lord of the Elohim "formed out of the ground all the wild animals and all the birds of heaven," he "brought them to the man to see what he would call them" (2:19).

Read without prejudice, the Bible tells us clearly that our ancestor appeared between the third and fifth "days." What did not begin until the sixth "day" was the enterprise of forming man in the "image and likeness" of the Elohim (1:26).

That is most likely how we would have proceeded if we had been in their place:

first, restore inhabitability, while preparing for our adaptation; then bring back plant life, while perfecting our adaptation; then make laborers of the natives who had survived the cataclysm that had caused the chaos; then make animals reappear; then learn the language of the natives. Only then, when biological equilibrium had been restored, could we devote ourselves to slowly bringing a few selected natives to the stage where they would equal us.

And we too might relax our attention, and. ...So much for macrobiology. But we are still not out of the woods.

One thing more: can we seriously speak of "resuscitating" species after a glaciation that made them extinct? In the nineteenth century, having found frozen mammoths in a perfect state of preservation, explorers ate meat from them with no ill effects.

If those mammoths had been found in our time, biologists would have taken ovules and spermatozoa from them and tried to resuscitate the species

## CHAPTER 18 The Era of the Gods

For Galaxians passing from one planetary system to another, or simply from one planet to another within a given system, large animals are much less dangerous than microorganisms.

Not only are there more streptococci than tigers, more microbes than primates, but their means of aggression are much more insidious.

Astronauts returning from Mars will be subjected to a very careful quarantine, and they will have taken all possible precautions during their exploration; but it is hard to imagine them taking guns with them.

Do the little men, usually green, who are sporadically reported to visit Earth come in flying saucers that are far in advance of our rockets? Their outdated ideas in microbiology would seem to indicate that they come to us from the nineteenth century:

they breathe the air of our planet with the casual unconcern of Pasteur's contemporaries who did not believe in microbes.

Does this ignorance make them all die before they have time to contact our scientific, political, military, or religious leaders?

It does not take long to state what we know about the microorganisms that await us on an inhabitable planet in a system similar to ours:

we know nothing about them, except that the problem exists. But when mathematicians venture into the domain of astronautics, they sometimes give the impression that their knowledge of microbiology dates from before the time of Pasteur:

as if, once astronauts have reached their destination in another planetary system, the rest will be nothing but\* trifling details.

It is generally acknowledged that, although our general

configuration is quite plausible as a model for the end-product of an evolution that has produced intelligent Galaxians with enough technological development to have achieved space travel, it would be naive to imagine that the paths followed by evolution in two similar planetary systems were parallel.

It is probable that the astronauts of one planetary system resemble those of another in the way a French car resembles an American one, without any parts being interchangeable between the two.

We see the Galaxians in the Biblical text acting with such deliberate, cautious slowness that we are tempted to say that they knew the difficulties of adaptation.

They waited until the third "day" before making their first contact with our ancestors, who were Galaxians "formed from the dust of the ground" (a Biblical definition to which our science has returned).

All the atoms of which you and I are made come from the loose layer that covers the earth's crust (the proportion of meteorite dust is insignificant).

The Biblical text is more compatible with today's scientific ideas than with the beliefs of Darwin's contemporaries, who regarded everything you have just read in this chapter as medieval nonsense.

Think about it! Only a medieval obscurantist is willing to believe that we descend from fish. Did life begin with plants directly nourished by minerals, then continue with herbivores feeding on plants, and finally lead to carnivores feeding on herbivores? You might as well believe in magic!

The Biblical text says that the first contacts between the Galaxians and the intelligent natives did not take place until the third "day." It is now time to speak about the duration of those "days."

"Days" 2,160 Years Long

In Hebrew, "one" is "ehad" and "first" is "rishon." There can be no confusion between the two words.

There is no "first day" in the Hebrew text. It reads: one day, second day, third day, and so on.

When we know the relentless zeal with which, ever since Moses, the guardians of the Tradition have maintained the accuracy of the text, we cannot attribute such an anomaly to the carelessness of a copyist.

In the whole history of Judaism, not one commentator has ever failed to meditate, speak and sometimes write about that obvious "anomaly"-which has not prevented the translators and commentators of "dubbed versions" from doing away with it. French translations of the Bible usually read "first day," including those sold in the Maison de la Bible in Geneva; but the Russian translation sold in the same Maison de la Bible reads "one day."

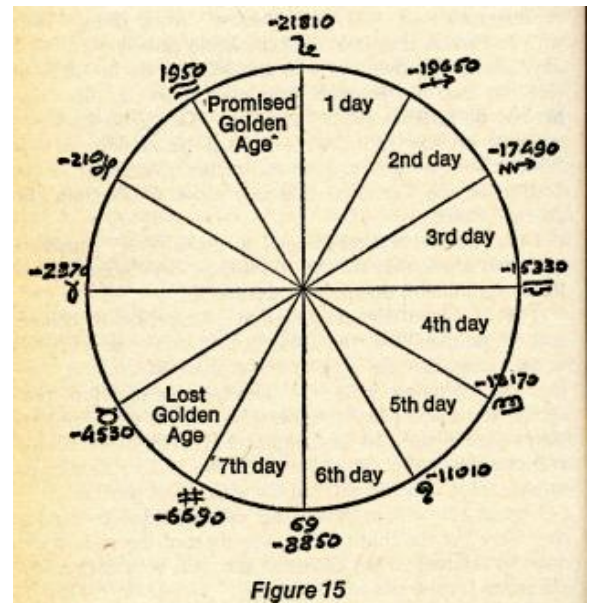


Figure 15

This is an excellent example of how little you can trust translations of the Bible when you are seeking an unaltered account, a reflection of the Tradition that has come to us from the depths of time.

Does the Hebrew text intend to make "day" a unit of time and show that all the following "days" represent a fixed, specifically determined duration?

That is one of the reasons that prompt me to believe that "Aquarius," for which the Golden Age was promised to us, designates the sign and not the constellation, and that the beginning of the Golden Age was therefore predicted for about 1950, rather than 2070 as Santillana states (see Figure 14 in Chapter 17). The other reason is more pragmatic: in about 1950 we did in fact begin renewing the acts related at the beginning of genesis.

Figure 15, which shows the correspondences among the "days" of the Biblical text, the signs of the zodiac and dates in relation to the Christian era, will be a convenient reference for the rest of this book.

This is nothing new to readers who know my previous books, particularly *Those Gods Who Made Heaven and Earth*, which can be consulted by anyone not familiar with the subject. Here, I will limit myself to a brief summary:

The place in the sky where the sun rises at the vernal equinox is called the vernal point. ("Vernal" comes from the Latin "ver," "springtime.") This vernal point is ascertained in relation to the fixed stars. Because of a terribly complex set of phenomena, a little less than a year goes by between two successive appearances of the sun at the vernal point. Since it appears at the vernal point a little before a year has gone by, the equinoctial sun precedes the end of a full year's cycle. This constitutes the phenomenon known as the precession of the equinoxes. There is nothing else that needs to be understood.

This phenomenon of the precession of the equinoxes (by a mechanism illustrated by drawings in my previous books) will cause the vernal equinox, which entered Aquarius in 1950, to enter Capricorn in 4110, since it takes the vernal point 2,160 years to move back from one zodiacal sign to the preceding one (1950 + 2160 = 4110).

We will return to these astronomical data in Chapter 21. I know they seem surprising to anyone who has taken his ideas from astrologers, but it is not necessary to understand the mechanism to follow the rest of this book: it is enough to know that it exists.

To simplify things for themselves, astrologers have decided to give the name of Aries, once and for all, to the month when spring is born. Figure 15 shows in which zodiacal sign the equinoctial sun actually rose during each of the "days" of prehistory and protohistory, beginning with the "Day One" when Genesis says

the Elohim arrived.

In eight years of contact with readers by letter and during discussion periods after lectures, I have come to realize that the reader who is afraid he has not "understood very well" nearly always sins by excess modesty. It is much easier to understand the precession of the equinoxes than to realize that you have understood it. It has acquired such a reputation for complexity that it gives many people an inferiority complex. It goes without saying that the precession of the equinoxes is explained in all astronomy textbooks—but usually in a way which, it seems to me, tries to say too much.

The dates indicated in Figure 15 are more or less those accepted by most astronomers. The duration of a complete precession cycle has not yet been determined with absolute precision.

### A Missing Key

It is out of the question that the "work of Day One," bringing back light, could have lasted 2,160 years. No form of life could have survived 2,160 years without light. It is inconceivable that even a handful of men could have survived long enough to be found by the Galaxians when they arrived. Such a long period without sunlight would also have left traces that could not escape our geologists.

And even our rudimentary technology already allows us to envision a much shorter time for dispersing the opaque cloud layer that surrounds Venus.

But a gap of two or three centuries in the evolution of more than 20,000 years ago could very well leave no discernible trace if a systematic effort was made to restore the situation exactly as it had been before the cataclysm. As we saw in Chapter 17, the Biblical text says that, as the Elohim "created" animals, they had the natives "recognize" each of them. We can envision as much as four centuries, or even five. It is hard to believe that it could have lasted much longer.

And this is where I lack an essential key: it was not the return of light that lasted "one day," it was the whole initial "creation." And "creation"—in a sense that will surprise no one familiar with the Cabala, but cannot be justified in a book like this one—includes the entire enterprise: the decision made on the home planet, the choice of another planetary system as the goal of the expedition, preparation for the journey, the journey itself, and finally, after arrival, dispersion of the clouds and the return of light. There are three factors: the preparation, the journey, and the work of bringing back light. Knowing the duration of two of these factors gives the duration of the third. That is a key which I lack.

### Adaptation

The little we know about prolonged sojourns in space inclines us to believe that a minimum of artificial gravitation is essential to the survival of Galaxians.

Gravitation inside a spacecraft can be obtained in two ways: constant acceleration, or rotation of the spacecraft, which creates a centrifugal force that presses the occupants (and all unattached objects) against the wall.

In the preceding chapter we saw that a constant acceleration equal to a tenth of the moon's gravitation is conceivable. It would give a 165-pound man the sensation of weighing about three pounds. A reasonable speed of rotation could bring this sensation of weight up to seven pounds, but anything beyond about 13 pounds would not be feasible.

When they arrive in the solar system, Galaxians accustomed all their lives\* to such minimal gravitation would have a feeling of being crushed on Earth, and even on Mars. Would they be able to adapt themselves directly to the gravitation of our moon? Would they have to live for a few generations on one of the moons of Mars in order to proceed by stages? What our present knowledge inclines me to think is that, with or without a first stage in an underground base on Phobos or Deimos, the Galaxians were obliged to live for

several of their generations in a base (necessarily underground) on the moon, and that next they probably stayed provisionally on Mars (whose gravitation is only 38 percent as strong as Earth's) before they were able to feel at ease with Earth's gravitation.

The experience of the astronauts of Soyuz 9 in June 1970 showed that two weeks of weightlessness is enough to make one feel crushed by terrestrial gravitation. When, to the time necessary for adapting generations to weight, we add the time necessary for determining the microbiology of the earth and adapting the bodies of astronauts born in a spacecraft, we easily get a total of thousands of years—which is precisely what the Tradition indicates.

Incidentally, this seems to confirm that the Elohim were made like us, on the prototype of the Adam Kadmon. What the Biblical text describes is a slow adaptation of organisms in perfect conformity with the data of biology. The Elohim behaved like Galaxians who knew that they could live in the open air only on a planet with a gravitation of the same order as the Earth's, that strong enough to retain an atmosphere containing a sufficient quantity of light molecule.

All the arguments that nineteenth-century science invokes against the hypothesis of two-legged, mammalian civilized beings now appear, to our Aquarian science, as so many arguments in favor of that hypothesis.

### The Logic of the Biblical Text

For a logical interpretation of the Biblical text with regard to the restoration of order in place of the chaos that the Galaxians found on their arrival, I refer you to *Those Gods Who Made Heaven and Earth*. And if you have already read it and noticed that I passed over a difficulty, that of justifying the necessity of long millennia for the restoration of order, I can now recommend *The Doomsday Book*, by Gordon Rattray Taylor.

Taylor shows that certain imbalances which our abuses have produced in the earth's ecology cannot be corrected without efforts spread over several centuries—and we have not yet brought about anything comparable to the chaos described in the Bible, which was produced by natural forces. To justify the millennia implied in Genesis, someone had to write the book that Taylor wrote, and I was happy to translate it into French.

I must point out that I am not at all in agreement with some of Taylor's personal conclusions. He is a humanist, and therefore offers sketches of solutions that seem Utopian to a medieval mind. But no one in Britain or the United States contests the extreme seriousness with which Taylor (who produces scientific programs for the BBC) verifies his information.

Can we really envision the necessity of millennia to repair the damage that our still-rudimentary technology is already inflicting on our environment? Here is an example too recent for Taylor to have cited in his book: according to an article in *Le Monde*, August 20, 1970, 160,000 acres in Nevada have been contaminated by plutonium since 1958, and it is estimated that the effects may continue for thousands of years.

But in this chapter I will limit myself to the probable action of the Theosites on men and, more precisely, on the selected human beings who were taken to Eden. We have seen how the Theosites were made superhuman, to some extent, by their long journey in the cosmos. They were superior to us, insofar as being liberated from the ambitions and restrictions that we call "human" constitutes a superiority. If Galaxians with minds conditioned in that way were to land among us tomorrow, they would dominate us without effort (probably for our own good, but that would not necessarily be pleasant).

To the dehumanized Theosites, the primitive earthlings were like animals on which experimentation was perfectly permissible.

If the promises of the Tradition are well grounded, now that we are in Aquarius the rational logic of the Biblical text should be obvious to those of us with a mentality sufficiently influenced by Judeo-Christianity, whose stated purpose was to bring its adepts to "equal the gods." Let us try.

Men, who had come from the dust of the ground, saw the Theosites, who had come from the sky, as supernatural gods, since they wielded lightning, communicated with each other over great distances, traveled in flying machines, and worked all the other miracles of a highly developed technology.

There were only about thirty of the Theosites, and they were centuries of traveling time away from their home planet. The earthlings numbered about a million. As long as they worshiped the Theosites as gods, everything went well. They tilled the fields, scrupulously respecting the rites: ordinary implements for the fields from which they drew their food, "sacred" implements for the "sacred" soil in which the "sacred circuit of sacred molecules" took place. They also provided labor for the construction of laboratories, strictly obeying the orders of the "gods," who could therefore allow them to go everywhere.

Let us now put ourselves in the place of the Theosites.

Are we exploiting the handful of men we have selected to serve us? It is only a question of semantics. They are much better off in our Eden than their fellow men who live outside it, subject to the law of the jungle, with wild animals eating their children. We experiment on the men we "exploit," but we are not cruel; we do not practice vivisection on them unless we have first anesthetized them (put them "into a trance," says Genesis 2:21). We perform experiments in genetic surgery on them, but it is painless and it is for the good of their descendants that we condition them.

The advantages they give us cost us much less than the work they do to supply us with commodities, but what we call "good" is efficiency and intelligence, and "evil" is primitive inefficiency. The knowledge of good

and evil that we are inculcating in them is priceless. In a few thousand years the natives will become "like us," and we can then reveal the knowledge of good and evil to them. Now, however, it would only upset them if we were to let them know that the morality of the "gods" has no common measure with the morality of men.

But why not leave them as they are, with their primitive mentality? You are forgetting that in the morality of the "gods," "good" means efficiency. Our lineage will eventually weaken; it is from native human material, and not from our lineage, which becomes more adulterated with each generation, that new "gods" will be created. Their astronauts will carry the message of civilization, which originated in the Theo site Trinity, a little farther toward the outer limits of the Galaxy. We are only a link in the chain, one small phase of the great adventure of intelligence in the Galaxy.

I hope I have convinced you of the moral legitimacy of the colonization of men by the Theo sites. But I have not convinced Lucifer-Satan. Lucifer wants to bring light to men without delay. Satan wants them to know everything immediately.

At this point the Tradition shows that disobedient men were less responsible than the Theo site named Satan for the "sin" that overturned the experiment. If the Pavlov Institute someday succeeds in conditioning a diabetic dog to the point of making him refuse to eat sugar, and if he later eats sugar despite his conditioning, the culprit will be the laboratory worker who tempted him, not the dog himself. But the victim will still necessarily be the dog, even if the laboratory worker is "cursed."

Let us go back to the third chapter of Genesis. Only a Theo site could have known what the "serpent"

The Coming of the Gods knew, only a Theo site could have done what he did. The "serpent" knew that "eating the fruit of the tree of knowledge" would not make men die, but would make them "like the gods." He had enough authority to incite "Eve and Adam" to doubt the leader's authority.

At the end of the third chapter, the Lord acknowledges that everything the "serpent" had promised was true, since no one had died and men had become "like the gods": "He said, 'The man has become like one of us, knowing good and evil.'" (3:22).

The Lord had lost all authority over men. They had become what in modern language is known as a "political danger."

### Plotinus

Read from a rationalistic viewpoint, the Biblical text continues to appear as imperturbably coherent as it appears absurd when read from the humanist viewpoint.

No religious humanist has ever found a satisfactory answer to the common objection: "A good God would never have done that!" No religious humanist has ever found a satisfactory answer to the question raised by the fact that God not only lied, but was forced to acknowledge that he had lied. No atheistic humanist can get around the difficulty by claiming that the Bible is a mass of nonsense: primitives would have about as much chance of imagining an account so compatible with our Aquarian science as they would have of pulling themselves up by their bare toes.

The sophist who enabled humanists to gloss over the flagrant contradictions in the third chapter of Genesis was the philosopher Plotinus (205-270). In Rome, he professed a hodgepodge of Alexandrian Gnosticism, Neoplatonism, and Christian doctrines. It was he who introduced into exegesis the idea, as attractive and false as the Ptolemaic system in astronomy, of a difference in nature between man before original sin and man afterward. Before the sin, taught Plotinus, man was of a purely spiritual nature; after it, he became mortal, and God therefore had not lied.

Plotinus ignored the fact that the "sin" had made men "like the gods": he taught in Rome and his disciples read Genesis in translation. He had smooth sailing.

In the eleventh century, Plotinus's reputation was so great that Solomon ibn-Gabirol, whom Bruno admired and called "an Arab named Avicbron," was contaminated by it and introduced even into Jewish theology the idea of "spiritual beings before the sin," which many rabbis accepted.

### The Ground from Which He Had Been Taken

Let us take up the Biblical text again, without letting go of the key that gives it its coherence as a historical narrative. When "the man" living in Eden had discovered knowledge of what the Elohim considered good and evil, "the Lord God drove him out of the garden of Eden to till the ground from which he had been taken." (Genesis 3:23.)

Plotinus's sophistry worked wonders all through the centuries when the Biblical text was incoherent—and it is incoherent when it is approached without the scientific knowledge of our Aquarian age. The Tradition has always stressed the idea that the text would remain incomprehensible until the time of Aquarius, when men would finally be able to equal the Elohim. To make the Biblical text appear in relief, like a hologram, it is enough to make the effort of considering each of its points in the Ughting that now comes to it from several directions at once.

Figure 15, at the beginning of this chapter, shows that the seventh "day," when according to the Bible man was sent away from Eden "to till the ground from which he had been taken," began in about 8850 b.c.; and it was in about 8500 b.c. that the first farmers appeared among men.

To make the Biblical text appear with the relief and coherence of a hologram, there are four conditions to be met: first, you must know the Bible; second, you must know the possibilities and limitations of astronautics within the framework of today's physics; third, you must have some clear and recent knowledge, even if it is elementary, of biology, prehistory, history, and evolution; and fourth, you must reject any "explanation by the inexplicable," that is, any intrusion of the supernatural.

There is also a fifth condition, an implicit one: you must have accepted the assumption of a universe intelhgible to human reason. But that seems to me a matter of course, like the need to have legs in order to walk.

I hope I have given enough light on the four initial conditions to decipher the hologram I am proposing.

### Terminology

The Galaxians who came from the sky may be called Celestials, but that inevitably suggests the Chinese Tradition, which I know only from such a distance that I cannot draw on it directly. They may be called Elohim, and I do call them that when I am discussing an activity described by the Bible, in which they bear that name. It might have been simpler to stick to Theosites, a word that I coined from the Greek "theos," "god," and a suffix intended to be a reminder of the need for skeptical caution. I have a distinct preference (a fatherly weakness) for this term, and if I had lived in the sixteenth century I would have used it exclusively, but today, when experimental testing of my hypothesis is near, it seems better to use the various syn-onymns almost interchangeably, pending proof or disproof of the concrete existence of the Galaxians they designate.

## CHAPTER 19

### The "Day" of Incoherences

The seventh "day" was the "day" of incoherences, a whole festival of incoherences. The religious humanist attributes them to "God's mysterious ways," badly transcribed in a human text. The atheistic humanist sees them simply as specific examples of the general incoherence of the Bible. Here are a few of them:

- If man was a spiritual being before the sin, good-by Plotinus: it makes no sense to speak of sending a spiritual being back to "the ground from which he had been taken."
- It seems highly inconsistent of God to have driven man away as soon as he discovered good and evil and became ashamed of his nakedness.
- When God says that "man has become like one of us" (Genesis 3:22), that "us" is as bothersome as a demon in a choir of angels.

To a medieval mind, the incoherencies result from the situation foolishly created by Satan, and the Bible presents them with rare objectivity.

Leaving humanists to settle their disagreements among themselves, let us return to the Biblical text in the medieval spirit and read it as a historical account destined to be fully understood in the time of Aquarius. Incidentally, I would like to remind the uneasy Catholic reader of the encyclical *Humani Generis*, which expressly states that "the first chapters of Genesis are, in a genuine sense which it is incumbent upon exegetes to specify and define more thoroughly, historical accounts." And I cannot too strongly recommend Robert Koch's book *Grace et liberte humaine*, published by Desclee.

The Lord's anger shows that Satan's awkward initiative had jeopardized a program of major importance. The Lord obviously felt that the human lineage conditioned in Eden was not yet ready to reign over those who had been left to natural evolution outside of Eden. The story soon shows that the Lord was right and Satan wrong: Cain kills Abel.

Everything we know about man, prehistoric or modern, indicates that killing members of his own species is as natural to him as it is to other animals. (Reading Konrad Lorenz's *On Aggression* and Desmond Morris's two books, *The Naked Ape* and *The Human Zoo*, will give a clear picture of our similarity to other animals.)

The Biblical text makes no mention of any violent crime committed by men living in Eden, which seems to indicate that non-violence was being "breathed into" the lineage in the process of being conditioned there. And the context makes it clear that "knowledge of good and evil" had no relation to that morality on a human scale. The good and evil which man was forbidden to know were therefore related to a scale of values that was meant exclusively for the Elohim and was not to have been revealed to man before completion of his conditioned maturation.

The difference between us and the primitive Amazonians is certainly smaller than the difference between the civilizing Galaxians and our ancestors of 10,000 years ago, but we can already begin to conceive of a situation comparable to that of the seventh "day." No one would dream of letting Amazonians do cleaning chores in a nuclear power plant unless it was certain that they regarded the engineers as gods incapable of lying and believed that disobedience to their orders would result in instant death and eternal punishment.

Because of what Satan had done, man discovered that the Elohim were not divine, that they were of the same nature as man. "Adam" therefore became a potential danger. He had just learned three things: first, that disobedience did not bring death, and that it even brought knowledge; second, that outside the honest but puerile morality he had been taught ("Thou shalt not kill," etc.), there was a superior good and evil which marked off a scale of cosmic efficiency and had no relation to the honest but puerile morality; and third, that he had only to acquire certain knowledge (though he was unable to realize its extent and difficulty) in order to equal the Elohim, whom he now saw more as his congeners than as gods.

If an Amazonian discovers that the engineers of the nuclear power plant do not light it at night by a divine miracle, but by pulling a switch, he may become convinced that he knows as much as the engineers—and pull a switch that will blow up the plant.

Adam's expulsion from Eden appears logical when we read the Bible as a rational historical narrative. But the Bible appears logical only when it is read from that viewpoint.

### Improving the Conditioning

The Lord of the Elohim therefore had to expel from Eden the lineage he had been conditioning for the purpose of forming a lineage of priest-kings who would inaugurate a Golden Age all over the earth.

For a technologically superior civilization, there are two ways of imposing its policies on a technologically inferior people: colonialism in the style of the nineteenth century, which sent administrators whose function was to draw direct, immediate profit from the colonized people, and the method that is now beginning to take shape, consisting in forming native elites to administer the countries from whose soil they have been taken.

The system described in Genesis is, of course, the system that is increasingly favored in the world of today. Having been taken from the soil and fashioned in Eden, the lineage of "Adams" was intended to found a dynasty of human kings, after imposing itself on all "nations" by divine miracles" that could easily be performed by means of the technology learned in Eden. The only profit that the Elohim expected from the operation was an acceleration of human development: it is more pleasant to be the gods of a civilized planet than of a jungle.

The very fact that the Elohim's selfish motives are quite apparent makes their altruism less open to suspicion. Their goals were the same as those that our own scientists see in their wildest daydreams: peace and freedom from interference, unlimited resources for research, universal esteem.

Through Satan's mistake, Adam's lineage lost 2,000 years of conditioning. And in 2,000 years many things can be done with barbarians.

The Christian Church inherited the Tradition only in a second-hand version that had been obscured by centuries of sound and fury, and its authority was constantly flouted, but it nevertheless succeeded in making barbarians build a civilization which, though precarious, surpassed the high civilizations of China and Persia while they remained stagnant, and has achieved what the Hebraic Tradition regarded as the essential accomplishment: it has reached the sky at the beginning of the time of Aquarius. Did the Church occasionally lie to the barbarians it guided, as the Lord of the Elohim lied in Eden? Certainly. But if you will look in the twentieth chapter of Exodus you will find the Ten Commandments, and you will see that although it is forbidden to "give false evidence against your neighbor," lying as such is not mentioned as a reprehensible act.

When we realize what such a precarious Church was able to do in 2,000 years, we can understand the anger of the Lord of the Elohim. With 2,000 more years in Eden, he could have made Adam's lineage a royal dynasty that would have spared us the effort of progressing toward the Golden Age of Aquarius laboriously, awkwardly and by our own devices. And the Elohim would still be among us.

What you have just read is nothing more than a transcription in modern rationalistic language of the concept that medieval thinkers professed in the language of their time.

### Countless Possibilities

In Genesis 6:4 we learn that on the seventh "day" the sons of the Elohim "had intercourse with the daughters of men and got children by them." For exegetes who translate the plural "Elohim" as "God," this is a flagrant incoherence. They thus condemn themselves to contortions worthy of Ptolemy, to mask the incoherence. But if we read the Bible without prejudice, the text appears clear and coherent.

I must open a parenthesis here. Spacecraft accelerating to a speed near that of light and reaching a planetary system 1,000 light-years away while their occupants age no more than 20 years—all this certainly belongs in the realm of the possible, since von Braun, Arthur C. Clarke, and several others have calculated it without encountering any fundamental impossibilities. But my object is not to draw up an inventory of possibilities. As I remind the reader two or three times in each of my books, my object is solely to determine whether or not the Tradition and the Biblical text give a rationally plausible account of a sojourn by Galaxians.

Nothing in the Tradition or the Biblical text gives any reason to assume that our planet received a quick visit which only travel at extremely high speed could make possible. On the contrary, everything in them indicates that Galaxians arrived for a prolonged sojourn, probably intended to be permanent, in about 21,000 b.c. The text prompts us to see successive generations of those Galaxians working toward the fulfillment of a great program that was disrupted by a serious incident in about 8500 b.c., then abandoned in about 6500 b.c., when the Theosites left Earth and destroyed their installations with a "Deluge" because they felt it would be unwise to leave them in the hands of men. Close parenthesis.

By the seventh "day," had the Elohim remained immutable? Everything in the Biblical text incites us to think that Plato was right when he affirmed the contrary.

Had thousands of years of life on Earth, in symbiosis with earthly microorganisms, altered the genetic makeup of the Elohim until it was compatible with that of men? Had they deliberately brought about genetic modifications in themselves in order to become integrated with the natives of a planet they intended never to leave? Had they simply succeeded, by altering specimens of their own semen, in impregnating women by artificial insemination? In the present state of biology, nothing warrants venturing an answer to such questions. But since biologists have tried to impregnate female apes in all sorts of ways, they are in no position to throw stones at someone who asks such questions.

One thing seems certain, however: after thousands of years of life on Earth, the Elohim were no longer capable of setting off on a journey of several centuries. They had to begin by reconditioning themselves into an "astronautic race," an enterprise that takes hundreds of years, as we saw in Chapter 17.

When they all wanted to leave, did they find a compromise solution by impregnating "the daughters of men" to produce hybrids capable of running the earthly installations while the Elohim reconditioned themselves for space travel in a spacecraft used as a "breeding farm in orbit?" It seems to me that this is compatible with the text as well as with our science.

If things actually happened in this way, it is understandable that the 2,000 years of the seventh "day" were necessary for preparations for departure. During those 2,000 years, the fourth to ninth chapters of Genesis show the Lord of the Elohim coming down to Earth, going back up into "the sky," coming down again, giving orders, constantly changing his mind, deciding to destroy everything that had been "created" on Earth, changing his mind again, and finally letting Noah try his luck with the indispensable minimum of equipment.

As I understand the text, the Elohim had written off their adventure on Earth as a failure. They gave Noah a chance. If he succeeded in establishing a lineage capable of arriving "in the sky," so much the better: at the foreseen time, when the equinoctial sun had entered Aquarius, that lineage would find a "bow of the covenant" in "the cloud," in other words, the earth's nearby suburb—the moon.

Anyone can quickly sink into ridiculousness if he uses subtle sophistry to interpret a passage that is hard to fit into the system he is proposing. I will try not to sink. I know nothing about the "waters" of the "flood" which is said to have destroyed all life (in the region under consideration) except in Noah's "ark." The text says that the "flood" lasted 150 days and that Noah spent the time in a closed structure which translations call an "ark," but which in Hebrew is a *tebah*. A *tebah* is a container. An Apollo capsule is a *tebah*.

And when you think about it ... a closed ship in archaic times? Archaic ships could be propelled only by oars, or by a sail when there was a wind from astern. They were incapable of sailing into the wind. Archaic ships were necessarily open . . .

The authors of the Tradition needed a great deal of imagination to invent a closed vessel laden with genetic material, and thus produce a narrative compatible with Aquarian science, if they did not have a historical narrative as the canvas for their embroidery!

## CHAPTER 20 The Lost Golden Age

Humboldt, that wise master, said it long ago: First, people will deny a thing; then they will belittle it; then they will decide that it had been known long ago.

Georgio de Santillana

When you and I walk into a cafe in which all the tables are occupied but we see no one we know, we say, "There's nobody here!" When Noah and his sons came out of their "ark," they saw that there was no one on earth. No one at all, or no one they knew? Since Noah and his sons were soon to concern themselves with "the nations of the earth," it seems logical to assume that they had simply seen no one they knew in their vicinity.

They also saw that the Elohim had "destroyed everything." When the Americans left the Pacific bases they had established in 1942, they destroyed "everything," that is, everything the natives might have misused, such as explosives and dangerous medicines. But they had no thought of destroying the natives' personal belongings. For what purpose?

This is not a more or less gratuitous interpretation of the Biblical text, but a statement of an obvious fact: when the text speaks of "men," it is always referring to men who have a name. Our history books do the same when they speak of "Napoleon's victories." No one takes this to mean that Napoleon was a giant capable of wiping out an archduke's armies with his own two hands.

Whenever there might be doubt, the Biblical text specifically says that is intended. In the sixth chapter of Genesis, when the Lord becomes "grieved at heart" and decides to wipe men off the face of the earth, he specifies that he means the men whom he created. The difference between ordinary men and created men is that the created ones have a name. The names of the created ones take up the whole fifth chapter. The "daughters of men" impregnated by the sons of the Elohim in the sixth chapter were born among these men mentioned by name in the fifth chapter.

In all archaic Traditions (as Santillana often reminds us), every word counts: a child asks for "a story;" the better he knows it, the more raptly he listens to it; if you replace one word with another, he will immediately correct you. From archaic times to the appearance of writing, the Tradition was transmitted by storytellers to listeners who insisted on having every word remain the same. It was with the appearance of writing that Traditions began to be altered—with the single exception of the Tradition transmitted by the Hebrew, for whom each letter has always been sacred.

Noah, says the Bible, had always "walked with God" (Genesis 6:9). When the Elohim had all left, Noah came out of the "ark." There was "no one" left on the earth— except, of course, for the anonymous millions who were taught the rudiments of herding and farming first by Abel, then by Seth, who was "granted" to Adam to replace the murdered Abel.

Was Noah now the only "created man," the only descendant of Adam? Had the Elohim eliminated all the others, as scientists destroy the rats that have been used in an abortive experiment? It seems so. The "gods" described in "idolatrous" Traditions are probably descendants of Ham. The interpretations that make Ham the progenitor of the black race and Japheth the progenitor of non-Semitic whites are absurd. In that case, where did the Chinese and Indians come from? In the nineteenth century, the question was glibly dismissed by saying that the Hebrews had never seen a Chinese or an Indian. Was Ham cursed because he was a hybrid who tried to pass himself off as a Celestial? That would not be incompatible with either the Bible or Plato. And that son of Noah had no reason to be a Negro—elven if he was "blackened" by the curse. The Biblical text was not written for the purpose of convincing nineteenth-century humanists. Its only purpose was to set down specific points for men who knew the general outline of the story from the oral Tradition and who sought enlightenment from it, not pretexts for quibbling.

Noah had the material in the "ark" at his disposal, but all the earthly installations of the Elohim had been destroyed. And Noah had accepted the challenge of trying to make men do what the great program of the Elohim had been intended to make them do: to equal the Elohim when the necessary millennia had passed, when the equinoctial sun was finally in Aquarius. Noah and his sons had been reminded, moreover, that they had been made "in the image of God" (Genesis 9:6) and that their mission was to "be fruitful and increase, swarm throughout the earth and rule over it" (9:7).

When a humorous touch seems to be the best means of engraving an esoteric datum in the memory of men, the Biblical text uses humor. Noah, we read in Genesis 9:21, began by getting thoroughly drunk. Anyone else in his place would have done the same.

His drunkenness marks the beginning of the eighth "day," the eighth phase of the great program, destined to last 2,160 years, like the others. Figure 15, at the beginning of Chapter 18, shows that this happened in about 6690 b.c. and that the equinoctial sun was then entering Gemini. We will see in the next chapter how zodiacal symbolism supports the interpretation I am proposing.

We have here an excellent opportunity to see the method by which I pass from the Biblical text and the Tradition to the system I articulate in modern language.

Adam disobeyed and his lineage was expelled from Eden at the beginning of the seventh "day," in about 8500 b.c. Since he had been conditioned in Eden all through the sixth "day," he was considerably more advanced than the communities left outside of Eden. They had developed naturally, that is, very slowly. He could teach them farming and herding.

Leroi-Gourhan notes that in about 8500 b.c. there was an explosion of innovation in the region where the Bible situates Eden: "The primitive world and the world of farmers and herders are apparently so different that at first sight it seems impossible to establish a connection between them without imagining an 'invention.' "

The Biblical text and modern anthropology coincide. My system scores a point. We will see many others in the next chapter.

Noah was descended from Seth, that is, from a lineage born outside of Eden. But the text says that Noah had always "walked with God," that is, he had been directly educated by the Elohim, whereas Seth's other descendants (and, all the more so, those of Cain) had progressed more or less by self-education. And Noah was set apart, especially since it was he and his sons who were expressly given the mission of ruling over the earth. And all the "life material" in the "ark" was placed in his keeping.

If it had not been for the incident of the "sin," would all of Adam's descendants have had complete equipment for civilization at their disposal? Would the Elohim have remained on Earth, always available for advice and help? The text makes me inclined to think so. But it stresses one point: Noah is the link between the Elohim and men, and therefore the first link of the Tradition.

#### Determination of Dates

In *Les Cahiers de cours de Moïse* I made a mistake worthy of an idolater: my bias against the zodiac, which I felt had been discredited by horoscope manufacturers, had impelled me to seek correlations of dates outside the rigorous Tradition. I later corrected my aim; in *Those Gods Who Made Heaven and Earth* I situated the lost Golden Age in the eighth "day," between 6690 b.c. and 4530 b.c. I am glad to note that my conclusion agrees with Santillana's: "In the Golden Age, when the vernal equinox was in Gemini, the autumnal equinox in Sagittarius, the Milky Way had represented a visible equinoctial colure."

We must not make Santillana say anything but what he says explicitly, because he has cogent reasons for what he asserts. He considers it well established that men acquired by their own means, with no help "from the sky," the knowledge that has been transmitted to us by the Tradition. But he also considers it well established that they acquired it when the vernal equinox was in Gemini. On the basis of the Tradition, I have concluded that they acquired it during the same period, but that it was an inheritance from the Elohim.

This correlation of dates drawn from such different assumptions makes it risky to deny the possibility of establishing a correlation between zodiacal symbolism and the "days" of Genesis, and consequently between those "days" and the years of our calendar.

So the sneering humanist reading over your shoulder should stop denying my system as a whole; he should begin belittling it instead. But make him reread Humboldt's remark at the beginning of this chapter: it is time for him to change his tune and mutter that all this was known long ago.

#### Diffusion of the Tradition

Noah had many descendants who went off to "swarm throughout the earth." They founded different nations, each of which, according to the tenth chapter of Genesis, had its own language. But the eleventh

chapter begins with

the statement that "all the world spoke a single language and used the same words."

This is either an inconsistency (but archaics and children are reluctant to tolerate inconsistencies) or an indication that between the tenth and eleventh chapters Noah's descendants did good work and succeeded in making the nations, each speaking its own everyday language, except that "single language" which Santillana calls the "international initiatic language" of archaic times.

What does Santillana think of that diffusion, reasoning from assumptions diametrically opposed to mine? Referring to the "Lord of the Golden Age, the Once and Future King," he says that "this essay [Hamlet's Mill] will follow the figure farther and farther afield, from the Northland to Rome, from there to Finland, Iran, and India; he will appear again unmistakably in Polynesian legend."

Noah's descendants were successfully meeting the challenge that their ancestor had accepted from the skeptical Elohim. They were unifying the human race, composed of primitive communities, under the rule of priest-kings who were learned in astronomy and other sciences and strengthened their authority with "divine miracles" (as nineteenth-century explorers did, by striking matches, for example).

To meet the challenge with complete success, would they have had to continue their rule until Aquarius, with all human societies subject to a Central Authority, a Lord of the Golden Age, described by his bishop-kings in the form most accessible to each society? I think so.

### The Awkward Age

All Traditions affirm that this Golden Age was lost, and its crumbling away is indeed obvious. As we saw in Chapter 1, Santillana feels that the Egyptian and Mesopotamian ritual documents probably "represent the last form of international initiatic language."

The Golden Age had already been lost when the First Civilizations, to which those ritual documents belong, appeared in history. This takes us to about 4500 b.c., when the vernal equinox was entering Taurus.

In *Those Gods Who Made Heaven and Earth*, I explained my reasons for believing that the affair of the Tower of Babel marked the collapse of the Golden Age. To summarize very briefly, I think that a heresy led the custodians of the Tradition (perhaps the sons of Ham) to try to get ahead of schedule. Without waiting for Aquarius, while they were still in Gemini, they attempted to reach the "bow of the covenant" by means of a tower "with its top in the heavens" (Genesis 11:4), like the launching towers at Cape Kennedy.

I know of no authors who agree with me on this point, so my conclusions are worth only as much as my reasoning.

But let us return to the consequences of the loss of the Golden Age. It is well established that at the dawn of historic times there was no longer the Tradition, but as many interpretations of it as there were First Civilizations. The only point they all have in common concerns the origin of their knowledge: they all say that it came "from the sky." As Maspero said, "in the time of Moses there were as many sole gods as societies."

At the dawn of historic times the international initiatic language, the "single language," was lost. Mankind entered the "tale of sound and fury" that can be regarded as its Awkward Age, sandwiched in between the lost Golden Age of Gemini and the promised Golden Age of Aquarius. "As things were in Noah's days, so will they be when the Son of Man comes," Jesus says in Matthew 24:37.

What is he referring to? A "flood?" Communication with the Elohim? Both? I cannot say. But what I know is that, directly or indirectly, medieval interpretations of the Apocalypse were always inspired by this statement in Matthew. And I also know that, now that we are in Aquarius, a suicidal "flood" and

The Coming of the Gods communication with other civilizations in the Galaxy are both real possibilities.

## CHAPTER 21 Zodiacal Symbolism

*Geographie sacree de la Grece*, by Jean Richer, with a preface by Francois Salviat, clearly shows the magnitude of the Greek attempt to reproduce on Earth the "sacred geography of the sky," that is, the zodiac. The orientation of temples, figures on sacred vases—everything related to the cosmogonic concepts of the Greeks is rigorously fitted into zodiacal symbolism, into a grid of guide marks obtained by drawing three zodiacal wheels with centers at Delphi, Sardis, and Delos.

Jean Richer's book shows that comparisons between the zodiacal grid and the symbols on both sides of an ancient Greek coin makes it possible to determine with certainty which city issued a given coin.

You can tell the exasperating humanist beside you that he ought to tone down his sneering. When Jean Richer's book appeared in 1967, Andre Delmas devoted two highly favorable columns to it in *Le Monde*, and the Jean Richer in question is the one who, with Albert Beguin, established the text of the complete works of Gerard de Nerval.

Anyone who has read Jean Richer's book will acknowledge that Plato is right when, in the *Timaeus*, he makes Solon say that in ancient and forgotten times Athens performed admirable feats, superior to Egyptian accomplishments, on the basis of institutions related to those of the Egyptians. Even if all the knowledge claimed to be enclosed in the pyramids actually is enclosed in them, it is small potatoes compared to what the Greeks achieved in archaic times.

If you have read my previous books, you know that I am in no position to belittle ancient Egypt. Jean Richer has simply made me realize that the work of the Greeks is even more prodigious—prodigious in the full meaning of the word, because there is no way for us to understand how, in a time so remote that all memory of it was already lost in the time of Solon (seven centuries before Christ), the Greeks had succeeded in establishing their "sacred triangle," Delphi-Sardis-Delos, in such a way that Delphi and Sardis are on the same parallel and Delos forms an almost perfect isocoles triangle with them. (A look at a map will show that Delphi is northwest of Athens, Sardis is east of Smyrna, on the other shore of the Aegean Sea, and Delos is an island.) And how were they able to orient the temple of Mount Ida, on the island of Crete, toward the temple of Mount Olympus, in northern Greece, with very great precision? How were they technically able to do that and several other extraordinary feats of the same kind? And, still more puzzling, what could have given them the idea of attempting such technical exploits? The key word is "religion."

### Religion

"Religion" comes from the Latin "religio," meaning "bond." Since Lenin said that religion is the opium of the people, it has become common to forget that the etymology of the word accurately states the initial purpose of religion: to maintain the bond between "the sky" and the earth.

This purpose is obvious in the First Civilizations as soon as they appear in history. The origin of the First Civilizations is lost in the mists of time. Our knowledge of it consists mainly of what the First Civilizations say about it. And they all say the same thing: that when men were just emerging from animality, Celestials physically similar to them arrived from the sky; and when, after a semi-failure, the Celestials went back into the sky, they gave a body of knowledge to a small, select group of men and instructed them to manage it to the best of their ability.

When historic times begin, the First Civilizations are there, amazingly advanced and disarmingly modest, attributing all their knowledge to the Ancients who had personally known the gods.

If the priests had merely wanted to lull their peoples with spiritual opium in order to dominate them more

thoroughly, why should they have made such incredibly great efforts to preserve the zodiacal astronomical knowledge that was part of the alleged heritage? Why should they have made the even more incredible effort of materializing in stone a complex esoteric symbolism whose meaning could not be grasped by illiterate peoples? In primitive societies, witch doctors do not go to such lengths (and they would be incapable of it if they wanted to). In primitive societies, witch doctors give the name of "sacred" to whatever they choose, and that is all they need to do. In the First Civilizations, however, architecture, rites, and a whole symbolism are rigorously bound to a body of knowledge. No one has ever been able to explain how that knowledge could have been established by men in archaic times, though now and then a Jean Richer discovers part of its structure.

The religion of the First Civilizations was a religio. Its priests were mathematicians, astronomers, and architects, absolutely convinced of the need to maintain the bond between the earth and the sky. They devoted their lives to the study of that bond and to a quest for better understanding of the Tradition.

If the religion of the First Civilizations was an opium for the people, the modern equivalent is scientific research. The astronomer-priests of ancient times were the spiritual fathers of today's scientists, who devote their lives to the study of the bonds between our planet and the rest of the universe.

Today, the coherence of the universe is attributed to what Einstein called a "mathematical orthodoxy"; in Antiquity, that coherence was attributed to "the law of the God of the gods." In both cases what is involved is a belief, a belief in an immaterial principle. And such a belief necessarily leads to a life of study on the one hand, and on the other to a firm resolve to convince the masses, who cannot see its significance, of the need to maintain "pure research" by giving researchers adequate salaries and the necessary costly equipment and facilities, for "at the end of this research there is knowledge of the universe."

### The Possible and the Impossible

In all the First Civilizations, the bond between the sky and the earth was always assured by zodiacal symbolism. Let me make one essential remark at this point:

There can be no confusion between a people that worships an animal totem and a society whose religion establishes a bond with the sky by zodiacal symbolism.

Whenever an animal appears among the symbols of a zodiacal religion, it is always an animal drawn from the zodiac and it always has a supplementary symbol, the symbol diametrically opposed to it; when you encounter a symbolic scarab, if the symbolism is "orthodox zodiacal" a Capricorn beetle is not far away.

We must begin by understanding what the zodiac represented to an observer in ancient times, who observed with the naked eye. His telescope was the "poor man's telescope," the line of the horizon, with a few "raised stones" whose pointed ends constituted the line of sight. The privileged region of the sky was naturally the east, where the sun rose each morning. Before his line of sight the observer saw the constellations turning in the direction indicated by the arrow in Figure 16. When a constellation which had appeared in the east at first observation reappeared in the east, the observer noted that the cycle of seasons had begun again on the earth.

Even the most primitive observer is capable of noting that spring returns when the sun rises at a place in the sky where its rising hides the stars of a certain constellation, and determining the duration of a year as the time it takes for the sun to return in front of a given star in that constellation. A year determined in this way is called a sidereal year. Its duration is 365 days, 6 hours, 9 minutes, and 9.6 seconds.

But, as we saw in Chapter 18, things are less simple: the sun appears at the horizon (and at the vernal point) a little before the sidereal year has ended. The difference of time, 20 minutes and 20 seconds per year, constitutes the phenomenon of the precession of the equinoxes.

But this is something Observer sees the zodiac turning.that the observers of Antiquity could not have determined; they were unable to discern its principle, much less measure the time involved.

When I say that the observers of Antiquity could not have determined it, I am obviously going out on a limb. But I am not alone in this belief. Until 1969, when Santillana's book opened up the question, all historians of science agreed in maintaining that discovering the existence of such a slow, complex Phenomenon was beyond the capabilities of ancient astronomers, and they drew an apparently logical conclusion: if the Ancients could not have discovered something, they did not know it. Therefore they did not know the precession of the equinoxes.

But before examining that conclusion, let us take a look at the reasons which led all historians of science to profess that the principle of the precession was not discovered until 128 b.C., by Hipparchus, and that its duration was not seriously established until the sixteenth century. Historians of science have given many reasons for this. Here are the most obvious ones:

- Since the sidereal year does not have a whole number of days, the annual difference of more than six hours is quite visible, whereas the difference added by the precession is so small that it almost necessarily passes unnoticed.
- Although it is true that at the end of about seventy years the difference due to the precession amounts to a whole day, it still remains concealed within the major annual difference of 6 hours, 9 minutes, and 9.6 seconds, which at the end of seventy years comes to more than four and a half days.

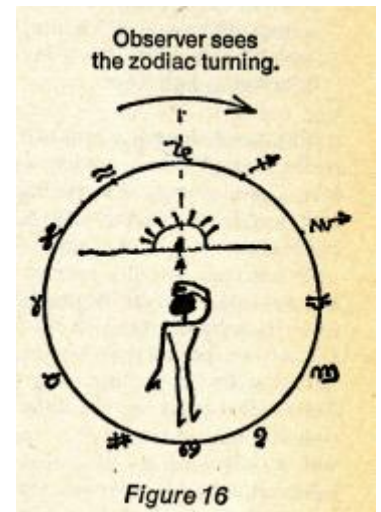
The same thing happens with your car. If something is really and obviously wrong with the engine, it does not even occur to you that perhaps the trouble was made a little worse by a station attendant who put regular gasoline in the tank instead of high-test.

In any case, seventy years is a long time. Assuming that our ancient observer begins his career at the precocious age of 10, by the time he is 80 his eyes will no longer be as sharp as they were in his youth, but he will have formed disciples, and those disciples will in turn form disciples. After a few centuries the difference caused by the precession will be too large to go unnoticed: the birth of spring will be advanced by several days, five days in three centuries. But could observers without precise scientific writing have determined the existence of the precession on the basis of observations made by successive generations? It seems impossible that they could have accomplished such a feat.

Even in historic times, men did not have a calendar that was accurate through the centuries, or timekeepers accurate enough to support observations at night (when sundials are asleep), or any of the other things that historians of science consider necessary for discovering the precession. When they noted that the birth of spring had "slipped," they attributed it to inaccurate determination of the number of hours that the sidereal year has in addition to its 365 whole days—unless they blamed it on some whim of the gods.

To these technical reasons, historians add others established by their discipline. In some countries, the time of sowing can vary a week or so without ill effects, but in Egypt exact determination of the equinox was essential, since the fertilizing flood of the Nile was directly related to the vernal equinox, and therefore to its precession. The Egyptian astronomer-priests were therefore forced to measure the sidereal year with remarkable precision.

Beginning their year on the day of a flood of the Nile, they precisely predicted the day when the next fertilizing flood would come, and thus assured a period of "fat cows" for the rest of their days. But in less than a century a difference appeared, a flood came a day in advance of the prediction and "lean cows" came on the scene. The priests ordered prayers and sacrifices, and wars if necessary, to win the gods' favor. The



gods remained hostile, things continued to get worse and after a century of prayers the difference had increased to two days.

The priests with the ineffective prayers were thrown out. They were succeeded by others who established the first day of their calendar by actual observation of the flood and began accurately prophesying the day of the next flood. Then, less than a century later, the whole process had to be repeated.

Historians of science (and I, behind them) therefore do not go out on a very long limb in saying that the astronomer-priests of ancient Egypt in historic times did not know the precession of the equinoxes and were incapable of discovering it.

But Santillana does not say that those priests knew, or had discovered, the principle of the precession. What he says is that the precession was known before historic times. And he does not simply say it, he proves it—just as he proves that Traditions other than the Hebraic Tradition had nearly lost that knowledge in historic times.

It is here that I rejoin Santillana: what I maintain is that the Judeo-Christian Tradition, and it alone, has never lost the guiding thread, and that this thread is its "religion-bond" with "the sky."

### Only the Tradition of Israel

Alexandre Safran states that the Hebraic Tradition, that is, the Cabala, has its roots in prehistoric times. This is reassuring for a rationalistic mind: Safran, Grand Rabbi of Geneva, and Santillana, professor at M. I. T., agree on the time at which the knowledge appeared.

This Tradition, which belonged exclusively to the Hebrews during the whole period ("day") when the vernal point was in Aries, was claimed by the "New Covenant" from the time when the vernal point entered Pisces.

The Church claims to be "the real Israel," and this is categorically denied by the Synagogue, which claims to be "the only Israel." There is no reason to enter into that debate here, but we can draw one conclusion: the Tradition that is often called "Judeo-Christian" can more simply be called the "Tradition of Israel" or "Jacob's Heritage," now that we have just had a glimmer of the astronomical knowledge, superior to that of the Egyptians, which Joseph must have taken from it when he won Pharaoh's favor by restoring the art of accurately predicting the floods of the Nile and "bringing back the fat cows."

Let us enter that Tradition with Moses, that is, at a time recent enough to spare us the need to reason on the basis of hearsay. We know beyond question that the two symbols of the religion of Moses are the ram (Aries) and the scales (Libra). Since it is often forgotten, I will point out that the scales are a completely incongruous symbol for justice. But in Moses's time the equinox was in Aries, and the diametrically opposed symbol is Libra. Moses therefore observed the rule of "opposite symbols" that I mentioned above.

Is there a logical reason for that rule? Yes, to show that one has esoteric knowledge of the zodiac (that is, of the precession) is to show that one has not lost the thread of the Tradition. When the Greeks lost the key to their sacred geography, they lapsed into idolatry and lost their primacy. Plato said so, and history confirms it. Moses was the spiritual heir of "Joseph of the Fat Cows."

Moses reproached Pharaoh, essentially, with having forgotten Joseph's teachings, having fallen into idolatry, having come to regard the abstract symbols of the zodiacal religion as idols to be worshiped.

Yet Pharaoh's religion had made an excellent departure: during the 2,000 years when the equinox was in Taurus, the pharaohs had worshiped the Apis bull and, at least at the beginning, the rule of opposite signs

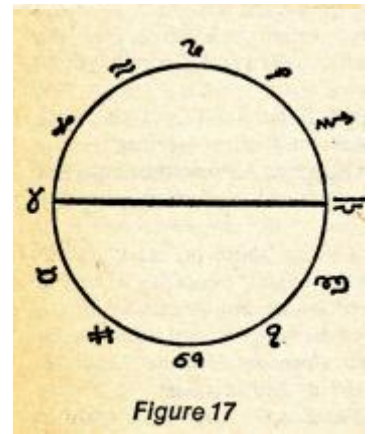


Figure 17

was observed: Pharaoh's wife wore a boldly erect scorpion on her headdress.

But, at the same time as they lost the art of calculating the equinoctial floods, Pharaoh's priests fell into idolatry. A scorpion is an unpleasant animal. Having lost the thread of the Tradition, they were tempted to replace it with a more likable insect. A scarab beetle, for example, which is one of the figurations of Cancer. The scarab was adopted, and zodiacal orthodoxy was violated.

It might have been considered idolatrous to make the scarab a sacred symbol while the equinox was in Taurus, but the objection was forestalled by deciding that the livy you by deluging you with so many facts that you cannot sort them out, so let us stop here to take our bearings. What have we established so far in our survey of zodiacal symbolism?

Moses certainly used zodiacal symbolism. Such a great number of correlations cannot be attributed to pure chance.

Moses had not only observed that in his time the equinoctial sun rose in Aries (that was easy), but he had also understood the mechanism of the precession, which caused the equinoctial sun to rise in Taurus in the time of Apis, and in Gemini in the time of Noah.

Historical data and scientific reasoning show that this mechanism, known to Moses, was no longer known to Pharaoh's priests.

Moses added the finishing touch of the "Calf, son of the Bull."

Can we infer from all this that there is no difference between the symbolism of the "Hebrew God" and that of the "Pharaonic God," and then conclude that the "Christian God," identical with the "Hebrew God," is only an avatar of the "Pharaonic God?"

### The Christian God

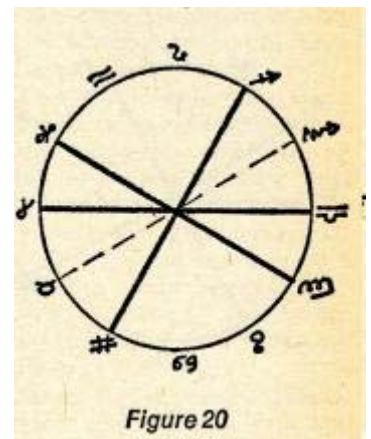
When the vernal point leaves Aries it enters Pisces. When the passage from Aries to Pisces is near, any "Wise Man" can find the star which, when the vernal point reaches it, will enable him to cry out, "Hosanna, we are now in Pisces!"

There were three of these Wise Men, and their story is well known. They announced the beginning of the "day" of the New Covenant and brandished the zodiacal symbolism which had not changed since the origin of the religion of Apis. Christ took the Fish (Pisces) as his main symbol, and the Virgin (Virgo) as his supplementary symbol.

You do not feel that the Virgin is completely incongruous in Christian symbolism? If you do not, you are less of a humanist than you claim to be: all the thinkers in whom the Renaissance took pride, including Calvin, derided this symbol and made jokes about it that were not always in the best of taste. I cannot blame the humanists here. The Virgin is as incongruous as the bow in the cloud, as the Scorpion in Apis, as the Scales to represent justice for Moses. I cannot blame them any more than I blame a dog for pissing wherever he feels like it. They do not know what they are talking about. The Virgin is necessary as a supplementary symbol to the Fish in the zodiacal religion of Christianity—and incongruous only if Christianity is not a zodiacal religion.

Let me point out something that escapes many amateur theologians: just as the exodus from Egypt repeated a traditional theme, the birth of Jesus repeated that of Dionysus, son of Zeus and Semele, a virgin of royal blood. The New Covenant was concerned to link itself with both the Greek and the Hebraic Traditions.

We also find a "confirmation in the form of a denial" of what I am proposing: the Pharisees rejected the



New Covenant. They refused Jesus the right to "take man's burden upon himself." They clung to the symbolism of the Fish, they maintained that it was the obligation of the entire Chosen People to spread throughout the earth like the Fish in the sea. There still remained the Virgin.

For the Pharisees, it was out of the question to accept Mary, whom the Hellenized Essenes had made into an avatar of Semele. For the Pharisees, the Virgin was Eve, and her function during the "day" of Pisces would be to give birth to the Messiah of Aquarius.

Have I dragged you into those quicksands of the imagination liberated by Freud, who saw a phallus in everything straight and a vagina in everything rounded, and who could find justification for any symbol in any demonstration?

In Hebrew, "Eve" is written in three letters (heth, waw, he) whose total numerical value is 19. During the nineteen centuries between the dispersion of Israel over the face of the earth (70 a.d. ) and the deliverance of Jerusalem (1967) there have been two interpretations of zodiacal symbolism. This would lend support to human-53s ists who bristle at medieval thought if the two interpretations were not perfectly parallel: the Church has always affirmed that Christ came to take man's burden upon himself; the Diaspora of the people who refused to let Christ take their burden lasted nineteen centuries. The two interpretations therefore remained parallel for nineteen centuries.

Israel is no longer dispersed and the State of Israel has regained Jerusalem. For the "Pharisee branch," everything has happened as predicted by zodiacal symbolism.

And the Church? If the rigorous parallelism that was obvious all through the nineteen centuries of the Diaspora is to remain rigorous (exact parallels never meet), the Church will have to envision an "event" comparable, for its theology, to the deliverance of Jerusalem, which was a theological event for Israel. Perhaps the Second Coming.

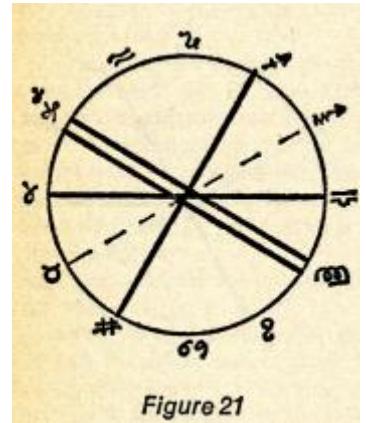
Almost Too Good to Be True

During the nineteen centuries of the Diaspora, the interpretations of the most eminent Cabalists had to be (and were) kept secret. For the past twenty years or so (since the entrance into Aquarius), those texts have been published in Jerusalem. During those nineteen centuries, Cabalists offered many interpretations of the relation between the figure 19 and the Diaspora. And nineteen centuries after the destruction of Solomon's Temple, the Hebrew people occupied a delivered Jerusalem. By "the Hebrew people" I mean the Israelis, a people whose practical spirit and concrete accomplishments would be hard to explain in terms of some superstitious aberration.

At this point, it seems to me that things become almost too good to be true. Are we to attribute that deliverance of Jerusalem, almost exactly nineteen centuries after the beginning of the Diaspora, to a determinism whose mechanism was known to the authors of the Tradition—which would give a sorry image of what we call our free will? Are we to attribute it to the surreptitious action of men following the guiding thread of the Tradition—and thus give support to those who claim that the world is run by the Church, or the Freemasons, or the Mafia, or the Seventh Day Adventists, and so on down an endless list?

I am unable to offer an answer. I am not suggesting anything. I back down whenever I am asked how I explain that correlation among "prophecy," zodiacal symbolism and recent events, between the entrance into Aquarius, on the one hand, and the conquest of the moon and the deliverance of Jerusalem, on the other. I do not understand. The correlation is too perfect. Giordano Bruno, Meister Eckhart, Nicole Oresme, Pythagoras and Moses knew too many things, and prophesied them too explicitly for the Age of Aquarius, when they are now being confirmed before our eyes.

And my perplexity is made worse by the fact that in 1962 (in *Les Cahiers de cows de Mo'ise*), starting



from the working hypothesis that the Tradition is not meaningless, I found a correlation of the same order between the facts and a list of popes which can be dated with certainty from the sixteenth century. Since the sixteenth century, the motto attributed to Paul VI is "De Mediate Lunae," and Paul VI is indeed the "pope of the moon." The motto of his successor will be "De Lahore Solis," and it is indeed plausible to assume that the controlled fusion of hydrogen, reproducing on Earth the "working of the sun," will be achieved during the reign of Paul VI's successor. (Paul VI introduced a new notion, that of retirement for the high dignitaries of the Church. There is no reason to be concerned about his health.)

Let us go farther. We are in Aquarius. Respect for zodiacal symbolism requires that the symbol of Pisces (Fish) be "effaced" and that the symbols of Aquarius and its "supplement" Leo (Lion) be brought into greater prominence. And it would seem that the popes have advisors moved by an interpretation of the Tradition parallel to mine, and restrained by a similar incredulous caution: if the Tradition is verified experimentally, the Vatican will have "taken an option;" if not, the decisions made can be attributed to *aggiornamento*. Under John XXIII, the Council took a first step toward suppression of the worship of Mary.

Paul VI abolished the rite of fish on Friday, the day before the Sabbath. Pius XII gave quantum mechanics, whose modern symbol is the same as that of the zodiacal Aquarius, an approval so incongruous that a Soviet writer, Danil Danin, wrote about it scathingly in his *The Necessity of the Strange*:

It is hard to understand why quantum mechanics should have been more to the liking of the pope and his theologians than classical mechanics. Adapting the idea of God to probabilistic causality was incomparably difficult. Why should the Almighty have needed such bad laws as the probabilistic laws of chance?

I have no answer for Danin, but I am forced to acknowledge that Pius XII's decision satisfied zodiacal symbolism. I hope that the answer to the questions I have just raised will be found in the "probabilistic laws of chance," because one must believe in something, and I believe in rationalism.

I will borrow the conclusion of this chapter from Giorgio de Santillana:

"And universality is in itself a test when coupled with a firm design. When something found, say, in China turns up also in Babylonian astrological texts, then it must be assumed to be relevant, for it reveals a complex of uncommon images which nobody could claim had risen independently by spontaneous generation."

But what is found in China that would give significant support to the Biblical narrative?

There are abundant similarities between the Tradition of Israel and the Chinese Tradition, but unfortunately I have access to the latter only through translations whose accuracy I cannot check, and furthermore I do not know if those translations were made by Chinese or by Europeans who, perhaps unconsciously, might have added small touches of their own to bring out a resemblance where there actually is none. I can nevertheless quote a passage from *La Chine antique*, by Henri Maspero. Maspero reports that in China embankments and other earthworks are so old that the Chinese attribute them to "heroes of remote antiquity who, at the origin of the world, following instructions from the Lord on High, came down from the sky to put the earth in order and enable men to inhabit it."

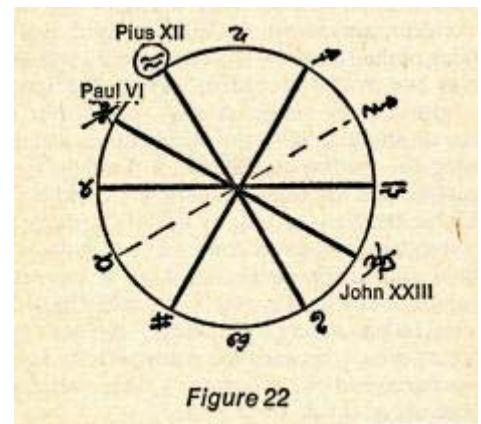


Figure 22

## CHAPTER 22 Thirteenth Guests

In several chapters of this book I have come upon passages like the unlucky thirteenth guest at a table who, even if what he says is interesting, still seems out of place. They interrupted my train of thought, and I could do without them quite well. But I like them anyway, so I have grouped them in this last chapter.

## Alchemical Language

If I told you about Venus changed into a she-bear and courted by Jupiter, you would accuse me of talking the gibberish of alchemy. But it is not gibberish; it is a language, and it would be futile to reproach its users for using it. Anyone with a classical education knows that the metal of Venus is copper and that of Jupiter tin. And it is enough to look at the sky (or Figure 23) to see that the gibberish users are official astronomers, who give the names of Ursa Major (Great Bear) and Ursa Minor (Little Bear) to the two groups of stars in which simpler souls (including alchemists) see the shapes of a big and a little dipper. "Venus as a she-bear courted by Jupiter" is a "tin-plated copper dipper."

The usefulness of alchemical language in speaking of dippers is not obvious. But if, when you were in high school, you never asked a waiter to bring you a glass of H<sub>2</sub>O, if you never used that chemical language to designate ordinary tap water, if you did not learn to joke about your knowledge while you were acquiring the rudiments of it, there is a good chance that you have become an abominable pedant now that you are an adult.

Alchemical language is not used only in joking, however. In the days when learning that you had syphilis was likely to be demoralizing, hospital doctors who had just diagnosed a case of it would say to their students, in front of the patient (who was assumed not to understand), that he was "a specific." A case of tuberculosis was a "K. B.," in honor of the Koch bacillus.

We also find alchemical language in the Tradition—and in the Gospels.

## The Cursed Fig Tree

The purpose of the Gospels was to bring barbarians to knowledge of the Tradition. The Evangelists had accepted the need to "speak in tongues," not only in the sense of speaking to different nations in their own languages (saying Mass in Latin in Rome, for example), but also in the sense of not bewildering barbarians with abstract considerations. I do not know to what extent the idea of "doing to Pharaoh what Jacob did to Esau" helped to make the Hebrews rally around Moses, but it is obvious that the idea of an Abstract God became more acceptable to barbarians when they were told that this God had followed Zeus's example by begetting a son with a mortal woman. This "miraculous birth," so troublesome today, was a proof of divinity to the barbarians who were to be converted. But Christ is not Dionysus.

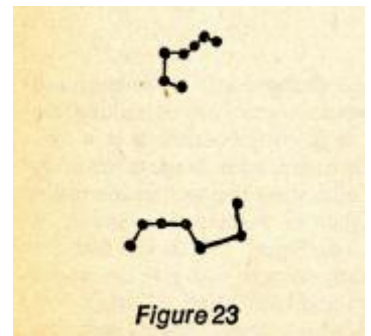


Figure 23

And while it was being suggested to the barbarians that Christ was "like Dionysus," the Pharisees had to be shown clearly that Jesus had no intention of adhering to an idolatrous Tradition, appearances to the contrary. Esoteric language, which alchemists were later to use so extensively that it is sometimes called alchemical language, was designed precisely for this kind of situation, which would otherwise have been impossible to resolve.

We find gibberish in Matthew (12:19-21), Mark (11:13-14), and Luke (13:6-9) when they speak of the "cursed fig tree." Matthew, Mark and Luke give us three versions that are apparently divergent, but are perfectly complementary to anyone who compares them and has the key to the language used. Since it was not the season for figs, the poor fig tree could not be blamed for not satisfying Jesus's hunger. Jesus cursed it nevertheless, and made it wither immediately. As long as he was going to work a miracle, why could he not have made the tree become covered with figs as easily as he made it wither?

But this question misses the point. The symbols of Dionysus, the "god on earth," were necessarily symbols of fertility: they were the vine and the fig tree. "If you have ears, then hear." (Matthew 11:15.) JeSus is not Dionysus. His symbols are also fertility symbols, but they are the vine and wheat/not the ying and the fi&iree. "For nothing is hidden unless it is to be disclosed, and nothing put under cover unless it is to come into the open." (Mark 4:22.)

## Giordano Bruno and Martin Luther

Events showed that Giordano Bruno could not have chosen a better time: in 1600, a few years before Kepler forced humanist experimenters to give up Ptolemy's idolatrous concepts, Bruno gave dramatic proof that the Tradition not only knew more about astronomy than Kepler, but also had a clearer view of the cosmos than the astronomers of the nineteenth century. As we saw in Chapter 3, it was not until our own time that Jeans' theory, which made our planetary system an exceptional case in the universe, was swept away and replaced by acceptance of the "countless earths turning around their suns, neither worse nor less inhabited than our globe" whose existence Bruno had discovered by studying the Tradition.

Was the time chosen by Luther for lifting the veil of another "esoteric secret" equally opportune?

Luther's knowledge was medieval; he knew that, according to Matthew (12:46-50), Mark (3:33-35), Luke (8:19-21), and John (7:5-6), Mary and Joseph had other children after Jesus, in the ordinary physical manner. Luther must also have sensed that Jesus' "miraculous birth," which had been a powerful argument in inducing barbarians to become Christians, would be a powerful argument against the Church for the rationalists of the Age of Aquarius, who would reach the sky, deliver Jerusalem, and reject all irrational obscurantism.

But I think Luther committed that "sin of prematurity" which is the mark of humanists: the world of the early sixteenth century was still closer to barbarism than to astronautics. It seems plausible to assume that if Luther had been content to teach discreet disciples and instruct them to wait until men's minds had achieved greater maturity, the doctrine of Lutheranism, "uncovered" only at the end of the seventeenth century, would have constituted a "revolution" comparable to the "Keplerian revolution," rather than propelling Europe into tribal wars of religion. Luther was a medievalist, but he was contaminated with humanism.



### Solomon's Seal and Plato's Tradition

In the Greek Tradition, the god who transmitted the gods' knowledge to men is called Hermes. One of Hermes' essential teachings is that "what is above [in the sky] is like what is below [on earth]."

The "countless inhabited earths" of which Bruno spoke are in keeping with this teaching of Hermes, and also with the Hebraic teaching, for which the Adam Rishon, or "first earthly Adam," was made on the prototype of the Adam Kadmon, the typical Galaxian.

This identity between "what is above" and "what is below" is reflected in Solomon's Seal: two identical triangles, with the "triangle of the sky" pointing upward and the "triangle of men" pointing toward the earth, intertwined to recall the promised "covenant."

What the Hebraic Tradition teaches by a symbolism of language, the Greek Tradition has always tried to express by mathematical symbolism. Plato used mathematical symbolism to express in Greek style the kinship between his Tradition and that of the Hebrews. Here is how, in the *Timaeus*, he explains what was done by "the eternal god," thinking of "the god that was to be," when he fashioned the world in which spirit and matter were to be indissolubly bound together:

First of all, he took away one part of the whole [1], and then he separated a second part which was double the first [2], and then he took away a third part which was half as much again as the second and three times as much as the first [3], and then he took a fourth part which was twice as much as the second [4], and a fifth part which was three times the third [9], and a sixth part which was eight times the first [8], and a seventh part which was twenty-seven times the first [27].

You will note that the figures between brackets, added by the translator, form this series: 1, 2, 3, 4, 9, 8, 27, and that the 9 appears before the 8. This is arithmetical esotericism. No one contests that. The Greeks often used such devices.

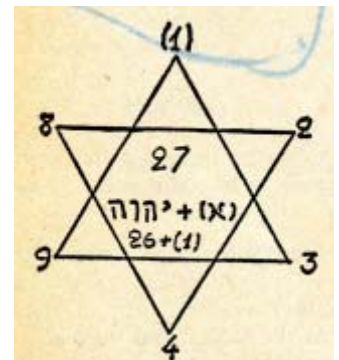
The figures are those of the first two geometrical progressions: 1, 2, 4, 8 . . . and 1, 3, 9, 27. . . . This is so obvious that, in his French translation of Plato, Emile Chambry points it out in a note without bothering to justify it. Nor does he feel any need to justify the fact that the two progressions are "interwoven": since the god's purpose was to bind spirit and matter together in-dissolubly, the "interweaving" is quite in conformity with the Greek mentality.

So far, all is well; Plato, Chambry, and I are entirely in agreement. But then things become less harmonious.

If a message is written in coded form, each term must be interpreted in order. Plato was careful to make sure that no one, whether a copyist or a commentator, could overlook the fact that the 8 comes before the 9. But Emile Chambry ignores this; neither he nor any other humanist has ever understood its significance. As a good humanist, he concludes that it is insignificant. For him, there is no mystery: Plato gave a series covering "four octaves plus a major sixth." (Yes, I have quoted him word for word.)

Making Plato into a music teacher without mystery is a fine example of the reproach I make against humanist university professors. Their humanist methods have not changed since Ptolemy: all you have to do is squeeze the facts into your mold.

But let us leave Chambry and return to Plato, who, as Santillana has shown, transmitted more esoteric knowledge than octaves and major sixths. Let us take Solomon's Seal and give its points Plato's numbers in order. It immediately takes on coherence—coherence in esoteric language, of course. The "triangle of the gods," of those gods whom the Ancients often described as "liking odd numbers," becomes the triangle 1-3-9; the "triangle of men" is 2-4-8; the sum of  $1+2+3+4+9+8$  is 27.



It can never be repeated too often that symbolic language is subject to very strict rules, as strict as those of a crossword puzzle (and theoretical physics): the terms must fit together without any gaps, without having to be squeezed into place. This rigor is the only way of making sure that the message is not interpreted as a coincidence, or as a false symbol, or as a trap. Here are a few confirming examples.

All Hebrew exegetes point out that Genesis begins with the letter B (in "Bereshith"), whose numerical value is 2, because 1 is superhuman knowledge, whereas 2 marks the beginning of human initiation. Whether this is true or not is beside the point: it is what the Hebraic texts say, and it is what appears in Plato's "riddle." The "triangle of men" begins with a 2.

The Hebrew numerical system has a base of 10, for everything that concerns the earth. The base of the "triangle of men" is 10 ( $8+2$ ).

In ancient times astronomy, which studies "the sky," always had a special numerical system with a base of 12. The base of the "triangle of the gods" is 12 ( $9+3$ ).

By reading the figures at the points of the triangles in the order given by Plato—and not in the order arranged by Chambry—we find indications concerning "the work of the god."

The reasons that make Cabalists regard the number 1 as ineffable for men are unfortunately too complex to be condensed. But it is a fact that Cabalists do regard it as ineffable for men and knowable only to the Elohim.

For the Hebraic Tradition, the One constitutes the Sacred Name, which is written YHWH and pronounced

"Sacred Name" or "Tetragrammaton;" it is forbidden to pronounce YHWH "Yahweh," as it would seem logical to do. I no longer pronounce it "Yahweh" since I found a logical reason for the prohibition. Like everyone else, whenever I say a word or a name I form an image of it; since I have been conditioned by nineteen centuries of Christianity, each time I say "Yahweh" the image that appears to me is that of a bearded Zeus, which is not sacrilegious, but is obviously stupid. Therefore I no longer say it. The Greeks were not so reticent: they wrote "Zeus" and pronounced it "Zeus."

The numerical value of YHWH (yodh, he, waw, he) is 26. When the unknowable 1 is added to 26, the sum is the 27 of Plato's "riddle."

### The Limits of the Possible

We saw in Chapter 21 that until the publication of Santillana's *Hamlet's Mill* in 1969, all historians of science agreed in maintaining that Hipparchus discovered the principle of the precession of the equinoxes in 128 b.c., and that its duration was not seriously determined until the sixteenth century. Because of Santillana's authority and the mass of evidence he has presented, it is no longer possible to deny that Neolithic men knew not only the principle of the phenomenon, but also its duration. And we have seen that, unless it was aided by a Providential Chance unacceptable to reason, the Hebraic Tradition never lost that knowledge, which Moses rightly reproached Pharaoh with having forgotten.

If someone objects that a logical line of reasoning cannot be based on a liturgical quarrel between Moses and Pharaoh, I will not argue. But here is what Santillana has to say on the subject: "There is good reason to assume that he [Hipparchus] actually rediscovered this [the precession], that it had been known some thousand years previously, and that on it the Archaic Age based its long-range computation of time."

Are we to conclude that the Archaics were incomparably more intelligent than men of historic times, as Gregory of Tours said, and that they discovered the phenomenon by observations so astute that the Egyptian and Babylonian astronomers were unable to repeat them and modern astronomers are unable to explain them?

This is hard to accept, and Santillana is so well aware of it that he gives the conditions under which the precession could have been discovered in archaic times: "The shift of 1 degree in 72 years, piling up over centuries, will produce appreciable shifts in certain crucial positions, if the observers have enough intentness of mind and know how to keep records."

Were those men capable of keeping astronomical records before the invention of writing? And, assuming the existence of those unlikely records, were they capable of protecting them from men and animals through the centuries that Santillana considers necessary for empirical determination of the phenomenon?

Assuming that those two combined improbabilities have been overcome, can we imagine archaic men logical enough to have extrapolated, on the basis of observations spread over several centuries, the mathematical necessity of a continuous, regular motion through thousands of years?

If, with the support of your humanist who has still not earned a gumdrop, you prefer to accept this cascade of improbabilities rather than admit that the Ancients were telling the truth when they attributed their knowledge to a teaching "from the sky," you have not reached the end of your difficulties: you must still explain how a "prophecy" already thousands of years old at the dawn of historic times, was able to predict accurately that men would "renew the acts related at the beginning of Genesis" in the Age of Aquarius.

(For the Tradition, as it appears to a rationalistic mind, the fulfillment of the "prophecy" at the time indicated does not constitute an enigma; it simply shows that the Galaxians had enough knowledge of evolution to make a close estimate of how long it would take men to achieve the necessary development.)

The flaw in humanist reasoning is now obvious: the humanists of the sixteenth century rejected the idea that Copernicus and Bruno could have drawn an accurate view of the universe from the Tradition, and today, with the same stupid obstinacy, humanists reject the idea of a Tradition inherited from Galaxians who came from another planetary system.

Does Santillana sanction this stupid humanism? Of course not: he demonstrates that the Ancients had that knowledge and simply refrains from denying the humanist assumption that whatever archaic men knew was necessarily discovered by their own means.

I think that the "bow of the covenant" is waiting for us in a lunar base. We saw in Chapter 1 that Shklovskii and Sagan do not regard such a hypothesis as absurd. And now, for good measure, I will quote Arthur C. Clarke, in *The Promise of Space* (1968): "The abandoned debris of interstellar expeditions, perhaps even scientific instruments deliberately left behind to monitor and report the progress of events in the Solar System—these are some of the things we may find when our own explorations begin."

If such a discovery is made, what will remain of Santillana's book? Everything that he set out to demonstrate. Nothing more. It will be enough to withdraw the humanist assumption from *Hamlets Mill*, and then those interested in the sidelights of history may wonder whether Santillana was really convinced that the men of archaic times discovered the precession of the equinoxes by their own devices, or whether he accepted the humanist assumption as Bruno became a monk, as Shklovskii slips praise of Marxism into a scientific treatise, and as Sagan contests Marx in the name of American liberalism in his contribution to Shklovskii's book.

If I were a professor, that is, if my whole career depended on my superiors' opinion of my mental state, would I have the courage to make a direct attack on the humanist assumption? It is a question that I do not like to ask myself.

#### A Negative Mascon on the Moon

In an article published in *Atomes* in April, 1968, A. A. Mikhailov, member of the Soviet Academy of Science, wrote that the moon is much more homogenous than the earth. When the Americans found that its "gravitational form" was even more complicated than had been suggested by its triaxial ellipsoidal shape (in other words, that it was less homogenous than they had thought), P. M. Muller and W. L. Sjogren had the brilliant idea of using the Lunar Orbiters as direct accelerometers. Harold C. Urey published a long article on the subject in the *Bulletin of the Atomic Scientist*, September 1969.

It was in this way that the presence of mascons (short for "mass concentrations") on the moon was discovered. These are large areas whose density is so much greater than that of surrounding areas that it produces gravitational anomalies which can be detected by Lunar Orbiters programmed as accelerometers. They are located in the five circular seas; irregularly-shaped seas had little effect on the speed of Lunar Orbiter 5.

Much has been written on these mascons since Urey's article, and as far as I know there is agreement on only one point: the areas must be studied more directly and cores must be taken from them by astronauts of the Apollo program. All astrophysicists who have an idea on the subject and believe they will some day be able to say, "You see, I was right!" have prepared for that day by publishing their hypotheses.

But these are not the only mascons. There is also a "negative mascon," an area beneath which there is either matter much less dense than the rest of the moon, or simply a large cavity. Yes, if "my" underground base on the moon exists, this is where it ought to be. This time, of course, I am really going out on a limb. In September 1969, Harold Urey wrote that this "negative mascon" was the only one of its kind. In November, a report on the work of the Jet Propulsion Laboratory (where Muller and Sjogren work) described a "dynamic model" with four points at which deceleration reaches —175 milligals. (*JPL Space Programs Summary*, 37-60, Vol. II.) The latest work on the subject that I know of came from W. L. Sjogren's computer in April,

and was sent to me with a notification that the figures were not definitive because the study was still in progress. It shows that, with the unit this time being the "micromoon," four points go below —4.0 and three go below —5.0, but only one goes to —8.1, at about 56°N 75 °W.

I agree with you: dragging the non-scientific reader into such technicalities is almost indecent. But unless you began this book at the end, you know that these last pages of the last chapter are the only place where I have taken the liberty of speaking esoterically. I ask you to excuse me for two reasons:

Readers who begin a book at the end are usually perverse readers.

I had to justify, to a certain category of perverse readers, the option I am taking on the negative mascon, so that if Dr. Sjogren's study of data transmitted by Lunar Orbiters leads to discovery of a cavity under the surface of the moon, and if "my" base is found there, I will be able to say, "You see, I was right! And I wasn't right by accident."

One more point: the negative mascon is such a strange, incongruous phenomenon that there is little chance it will not be examined directly before the end of the Apollo program.

### My Place As a Man in the Universe

I wish I could be a racist. I would be delighted to be a racist on a planet where skin color made it possible to recognize, at first glance, scientists, pleasure-seekers, authors, imbeciles, ascetics, bicycle thieves, and all other categories of individuals, with, if possible, combinations of colors to distinguish, for example, a homosexual and athletic writer from one who likes abstract painting and buxom women. Unfortunately, this is a pipe dream. I will die without ever having succeeded in being a racist.

Am I to conclude from this that all men are equal?

I constitute an organized set of 10<sup>13</sup> cells, each of which has an individual "program" integrated into the coordinated program of the whole. All of the 3.5 X 10<sup>9</sup> human beings living on our planet can boast of possessing the same prodigious mechanism. You find that a little abstract? You are right. Things become much more concrete when I accidentally drive a splinter into my thumb. My cellular program immediately goes into action, like NASA's computers when Apollo 13 had signaled a wound in the module. Blood flows, washing the wound. White corpuscles hurry to the scene and begin fighting pathogenic bacteria. If the splinter has broken off under the skin and the flow of blood has not succeeded in washing it out, lubricating pus will be formed around it to aid in its expulsion. If the splinter still remains in my thumb, my brain will be notified by throbbing pains that will signal the need for external intervention. As soon as the foreign body has been removed by my teeth, a needle, or a knife and the wound has been cleaned, a program of cellular reconstruction will be set in motion and the process of closing up the wound will begin.

The complex design of my thumbprint will be restored without error: I am therefore unique. The process by which it is done is the same in all of my three and a half billion fellow human beings. I am therefore as "mediocre" in the human race as our sun is in the Galaxy. NASA's computers are only a pale copy of the mechanism called "a man." Carl Sagan has calculated that "the information contained in a single human sperm cell is equivalent to that of 133 volumes, each of the size and fineness of print of Webster's Unabridged Dictionary"

But all this obviously does not constitute a complete definition of "a man." Every living thing on earth, plant or animal, has a "cellular program," more or less complex according to the degree of evolution since the beginning of life, but always based on the same principle. To be justified in feeling that he is "in a class apart," man must have something else, something possessed by no other living thing on earth. Man does have something else. Its seat is probably in his brain, and it has given him a unique place on earth: he belongs to the only species that has given itself means of acting on its environment to an extent which is

becoming comparable to that of natural forces.

In the sentence you have just read, apparently innocuous and reasonable, I treacherously inserted the humanist delusion, the counterfeit coinage underlying the morality we inherited from the nineteenth century, which is now crumbling before our eyes. Significant action on the environment is not produced by "man;" it is produced by a relatively small group of men. And this forces us to pose the problem of man in non-humanist terms.

To say that all the individuals of a species are equal because they have the same information in their cells is certainly true at the very bottom of the evolutionary scale, probably true for cattle, probably false for dogs, and certainly false for human beings. Equality among men disappeared tens of thousands of years ago; it disappeared with the appearance of one man who was more intelligent than those around him.

The problem now beginning to arise is whether equality of rights, that "equality before the law" whose full achievement has always been hopefully projected into the future, may not also be disappearing.

It would have been difficult for men of the nineteenth century to become aware of this problem. They saw the apogee of the industrial revolution, whose goal was to amplify the muscular strength of man, of all men: behind the steering wheel of a car, the genius and the imbecile are equal; thanks to the machine, they have the same power—that is, the same horsepower. The industrial revolution reached its apogee when the imbecile and the genius became equal for the sole reason that they both belonged to the only species with a brain capable of understanding the functioning of machines.

We have now entered the cybernetic revolution. No, cybernetics is not what accountants think it is; the computer is not an improved version of the adding machine or the slide rule. The computer amplifies the possibilities of the brain, as the machines of the nineteenth century amplified the possibilities of muscle. The Pentagon reportedly has a film showing the outcome of a "war game" based on a hypothetical nuclear exchange between the United States and the Soviet Union, with the consequences of the exchange worked out entirely by computers. In the Paris Planetarium, the demonstrator has only to manipulate his keyboard to make the sky appear above you as it was at the time of Jesus' death, or as it will be a thousand years from now, or as it was or will be at any time you choose to specify, with the stars and planets in their exact locations. It is all done by means of a computer whose memory has been stocked with astronomical data that have long been public knowledge. The demonstrator in a planetarium moves through time at sixty years per second as easily as a motorist on a highway moves through space at sixty miles per hour.

Cybernetics is what makes it possible to subject any war game or peace game to the test of "simulated time." If you feed into a computer all the data of a problem that concerns you, it will tell you the consequences, in a week or 10,000 years, of each of the solutions you have envisioned for your problem.

This is true in theory; in practice, cybernetics has not yet developed perfectly reliable methods of solving problems. Fortunately and unfortunately. We may consider it fortunate that cybernetics has not yet reached that stage because when it does, men will live in a rational society, that is, one in which most presently accepted ideas will be obsolete. We must certainly consider it unfortunate that cybernetics has not yet reached that stage because a certain number of people, scientists or others whose decisions affect your life and mine, have a tendency to believe that it already has, to make decisions on the basis of projected consequences that computers have deduced from the data fed into them.

Can cybernetics enable scientists belonging to a highly developed civilization to project the course of evolution 10,000 years into the future, and leave a Tradition which includes conclusions that will be verified by experience? If I did not think so, I would not have written this book.

Cybernetics is not yet a panacea, not because computers are inadequate, but because men are still a long way from being infallible in selecting and analyzing the data they feed into computers. If I see you with a woman I would like to have in my bed, I can ask a computer how to go about getting her there. The computer will tell me what to do—within the framework of the problem as I have defined it. If I have

analyzed the situation incorrectly, if I have told the computer that the woman in question is with a spineless imbecile, whereas you are actually very intelligent and aggressive, the computer will get me into serious trouble. A computer is an amplifier of logical reasoning.

What may seem terrifying about cybernetics is the certainty that people with a logical intelligence will become a hundred thousand times more intelligent, while those who lack logical intelligence will not be able to benefit from the cybernetic revolution. To take an analogous example, we have seen that even though some underdeveloped countries are making considerable progress, the gap between them and the industrialized nations continues to grow, since the progress of the have-nots is necessarily slower than that of the haves. Similarly, cybernetics will rapidly increase the gap between logical intelligences, amplified by computers, and minds that have little logic to be amplified.

When the results of this process have become highly pronounced, it is not certain that the term "man" will be considered applicable to any set of 100,000,000,000,000 cells produced by any couple who made love while thinking of something else; it is possible that "man" will become a kind of trademark, reserved for the products of couples with logical minds who practiced family planning and did not produce a child until they had assembled all the conditions necessary for giving that child a good chance of becoming an adult with an intelligence capable of being amplified by a computer.

That is the problem which will soon have to be solved: the definition of "man," and determination of his place in the universe. It is a problem of sociology.

"Sociology" is a word coined in the nineteenth century by Auguste Comte, whose ambition was to create a "social physics," that is, in his own words, to "study societies simply in order to know and understand them, as physicists, chemists, and biologists study the phenomena which concern them."

Determining the general laws of sociology without being able to study any societies but earthly ones was a very reasonable ambition in the nineteenth century, when the same Auguste Comte stated, without being contradicted, that "man will never know the chemical composition of the stars," and when physicists were convinced that they would succeed in determining the general laws of physics without ever being able to study matter anywhere but on our planet. That was nineteenth-century humanism in its hour of glory.

Today, we know that the general laws of physics could not have been established without comparison between laws discovered on our planet and those governing the rest of the universe. It therefore seems highly improbable that the general laws of sociology can ever be established as long as laws discovered on our planet cannot be compared with laws discovered by sociologists living in other planetary systems, specifically those systems where evolution has followed a course similar enough to its course on Earth to make comparison possible. As long as our sociologists are condemned to extrapolate general laws from their observations of the particular case of terrestrial evolution, they will be condemned to empirical, makeshift research. This fact marks the end of the humanist delusion.

In other words, we can hope to find solutions to our problems of sociology—and a few others, notably the problem of the survival of our species—in only one of two ways: either we must find them by our present empirical means, and in that case we have little reason to be optimistic, or we will find them "in the sky," where they were left for us by Galaxians if my hypothesis is correct, and in that case we are justified in having boundless hopes.

But your reasons for sharing my optimism are in direct proportion to the degree of credence I have persuaded you to give to my system. It is the system of medieval thought expressed in modern language, which means that it hopes to find salvation only "in the sky"—a sky that has now been emptied of all supernaturalism, is already accessible to our physicists and will soon be accessible to our biologists and sociologists.

## The Eighth Psalm

In the Hebrew text, the eighth Psalm thanks YHWH (the ineffable principle) for having made the son of Adam almost equal to Elohim.

The Russian Bible thanks "the Lord our God" for having made "the son of man" a little lower than "the angels."

And here are the variations in three French translations:

The Dhorme Bible thanks "Yahweh our Lord" for having made "the son of Adam" a little lower than "the Elohim."

The Second Protestant Bible thanks "the Eternal our Lord" for having made "the son of man" a little lower than "God."

The Bible of the French Rabbinate thanks "the Eternal our Lord" for having made "the son of Adam almost the equal of the divine beings." \*

Were those "divine beings," those "Adams Kadmon" (Chapter 16), really so admirable in their superiority to man? Well. . . . Here is what Rashi says in his comments on the sixth chapter of Genesis: "They took women

*\* In the King James version the terms are "O Lord our Lord," "son of man" and "a little lower than the angels;" in the New English Bible, "O Lord our sovereign," "mortal man" and "little less than a god." (Translator's note.)*

from all that they chose, even a married woman, even a man, even a beast."

You do not know who Rashi was, or in what context this strange comment appears? It serves you right for having begun this book at the end. If you had begun at the beginning, you would know.