

FRENCH SAVANT TELLS OF LIFE ON VENUS AND MARS

MR. EDMOND PERRIER is the Director of the Museum of the Jardin des Plantes in Paris, a member of the Academy of Science and a great authority in several branches of natural history. In addition to these distinctions Mr. Perrier has others, such as the possession of an imagination and a delightful sense of humor. His little book just published in Paris, "Life on the Planets," has attracted a great deal of attention because it is the work of a really learned man who has given himself for once to the joys of speculation. It is not often that anything so entertaining is set before the reading public.

The great question, "What is going on in the other planets?" is answered by a man who at any rate knows as much about it as anybody else, however little or much that may be. He reasons everything and shows us what we might expect to see on the journey from Mercury to Neptune with a special chapter on the Martians. He is a naturalist, more accustomed to turn his eyes toward the earth than toward the heavens, and he knows how scientists scorn speculation, but after all, why should he not allow himself his little dream? Dreams are not a crime, and in this case contradiction is difficult.

The basis of his argument is simple, the earth is a planet like the rest, presumably once a part of the sun, also like the rest. All that it has produced has been the result of the immutable properties of matter and of various forces working upon them and could not have been otherwise.

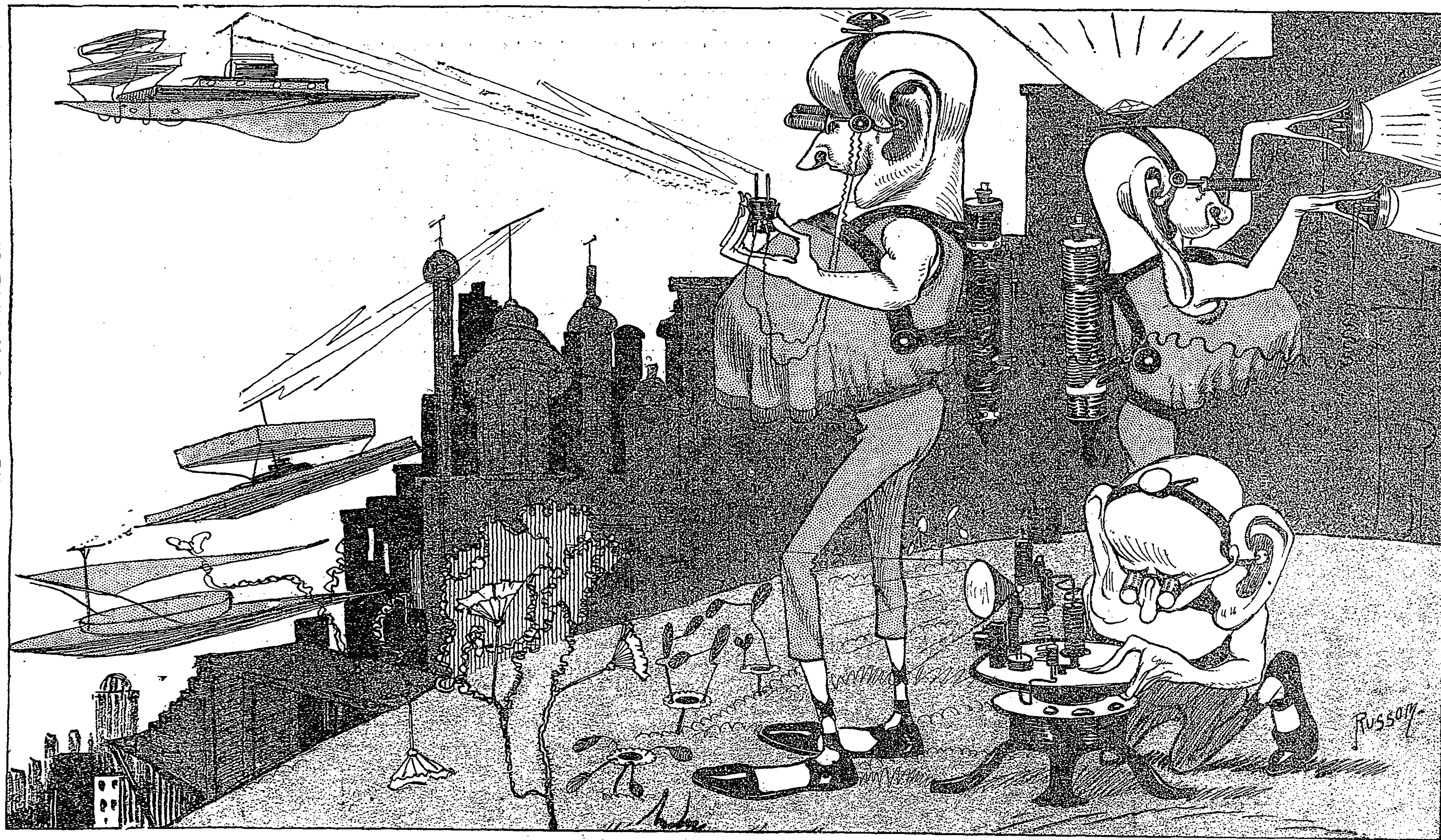
The properties of matter are known, forces can be measured. Knowing approximately the intensity of various forces on different planets, why can we not calculate their action on matter?

Life must begin under the same conditions on all the planets. Made up of infinitesimal atoms it must have appeared throughout the planets. Wherever the necessary atoms could be brought together. The sun and the planets being in reality but one body these atoms must behave everywhere in the same manner, and wherever similar conditions are found there will be similar results. Where conditions are dissimilar results will differ in a manner that we can perhaps calculate.

Life, we may say, has appeared on all those planets the temperature of which has permitted atoms to come together to form living bodies and to grow. It is in the water that life begins. Therefore it can have developed only on planets where the water would neither freeze nor boil. For us the boiling point is twice as high as on Mars and not nearly as high as on Jupiter. We are able by calculating whether the atmosphere on a planet is lighter or denser than ours to determine this. We know, therefore, to begin with, that life could develop on Mars within more restricted limits than on earth, while the contrary would be true for Jupiter.

Now comes the question. What planets contain water neither freezing nor boiling? The conditions under which the planets were born varied greatly. In the outer circle of our system are the oldest planets, thrown off from the rim of the sun at the beginning of things. The smallest, Neptune, is fifty-five times the size of the earth; the largest, Jupiter, is 3,000 times as large as we. But Neptune is the heaviest and it weighs less than glass or any mineral found on the earth, Saturn, the lightest of these larger worlds,

Conditions Resemble Those on the Earth, Says Edmond Perrier, Director of the Museum of the Jardin des Plantes, So He Constructs a Picture of What He Thinks People, Plants and Animals There Look Like.



An Artists Idea of Prof. Perrier's Conception of the Martians.

sence of water. The planet weighs in proportion much more than the earth, and Mr. Perrier supposes it to be full of gold. The absence of water, the thin atmosphere, and the high temperature make the existence of life there impossible, and we are now reduced to three planets out of the eight which compose our system.

Venus, the Earth, and Mars show

place enough: light, weight, the aptitude of certain substances which compose living bodies, to contract under certain influences, or to feed themselves and grow and change and bring about certain chemical reactions and to transmit the characters they have acquired.

These causes are not peculiar to any one planet. They act on Mars and on Venus as on the Earth. The poles of the two

the bushes, the fields and the forest feed a multitude of animals. But all these forms of life differ from ours in details which we can, to a certain extent, define.

Venus, being almost exactly as large and as dense as the Earth, weight must have had about the same effects there as with us. But she is nearer the sun and her mean temperature is about 450 degrees Fahrenheit, so much more vapor rises from the waters than with us and the air is always misty. Animals and plants have acquired dimensions and proportions much like those of our tropics, but they are crowded in the polar regions where the temperature, at the poles, can drop to freezing point; the regions around the Equator are burned by the sun and probably are desert, unlike the Earth.

On the other hand, the orbit of Venus is almost circular, instead of elliptic, and consequently the seasons differ little from one another. Moreover, Venus is younger than the Earth. Life would seem to be in about the same conditions as on the Earth during the secondary, or even the primary, geological period. In those periods we know that our vegetation was luxuriant, even in the polar regions.

The flora and fauna of Venus can then be inferred, and Mr. Perrier, from the store of his learning, gives a careful description of the animals which filled our earth ages ago, and which probably crowd the seas and forests of Venus today. In the ocean the coral insects labor and sea-horses and fishes, which are more like sharks than like our ordinary fish, swim about. On the land enormous batrachians flourish. Birds are hardly born yet, and there are at best only a few little mammals, who give no promise of what they will become.

All the variations which require time have not yet appeared. In one respect, however, Venus probably surpasses us. The year is only 224 days long, but because the seasons are so much alike insects live a long time, develop slowly, and reach large proportions. Since they live long, one generation comes to know another, the older teaches the younger, and they become intelligent, after the fashion of our bees, wasps, and ants. The psychologist would not have to differentiate, on Venus, between intelligence and instinct.

The dampness of the atmosphere on Venus favors the growth of ferns. The development of flowers from the more primitive forms of plants must be slow and probably has not yet been accom-

plished on Venus. This lack means the absence also of bees, butterflies, perhaps of ants and of other insects which depend partly or entirely on flowers for their food.

Venus, then, is the home of insects like grasshoppers, or dragon-flies, or roaches, grown to an enormous size; of large batrachians, frogs as big as our cows, of innumerable and gigantic reptiles like

without chirpings or rustlings in the forests, but in the oceans there must gleam innumerable phosphorescent creatures.

Although Venus is nearer the sun than the Earth is, and will always be warmer than our planet, there is no reason to doubt that step by step she will become more like us as we are to-day. The forces at work on her are the same that developed us, and they work under similar

Earth. Her Winters are more severe and her Summers warmer comparatively than ours. The year is longer, and its seasons are more marked. The Northern Hemisphere has a much longer Summer than the Southern, and there must be considerable difference between their flora and fauna. It is a country of extremes.

The sea animals are much like ours, except that coral insects are few, and that the fishes are more modified and even better adapted to their environment than with us. Eels and lampreys and sharks have given way to fishes like the cod and the perch, with the sense of hearing.

On Venus, with its steady temperature and mild seasons, birds and mammals, animals whose blood retains an invariable temperature, would not be likely to appear so early as on the earth. On Mars, on the contrary, they would probably appear sooner than on the earth, and would soon push out the great reptiles, being better able to withstand atmospheric changes.

The extreme variation of the seasons on Mars favors the development of things which quickly mature. These are in the animal kingdom, insects and, in the vegetable kingdom, flowers. Mars is the land of flowers and butterflies. Since the light and the heat are less than on the earth, the colors are those of our northern regions rather than of our tropics, and since the seasons are longer than ours, they grow larger. Grass, too, grows higher and fruit bigger.

The force of gravity is comparatively weak on a small planet like Mars so little effort was necessary to walk or to run, and reptiles were soon able to raise themselves and hop about as they did on the earth in past geological periods. Because of this lack of weight birds appeared early and have therefore developed in great variety.

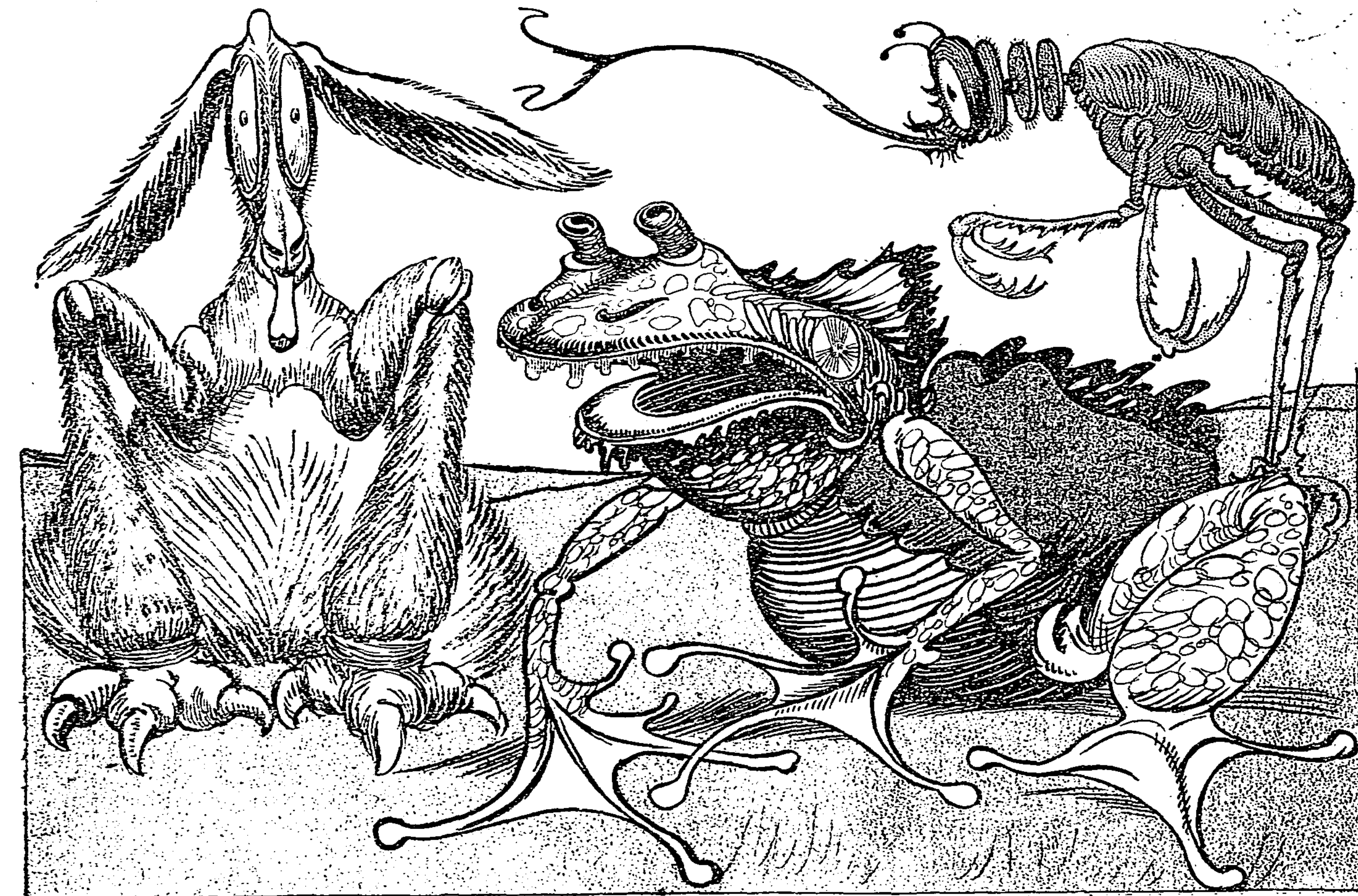
The changeable temperature of the planet and the rapid evaporation of water (which boils at about 100 degrees) undoubtedly called for thick skins or heavy plumage or fur, so that we may infer the existence on Mars of birds and animals gorgeous in the wealth of their coverings, but our heavily built animals do not exist. The animals of a planet where gravity is so slight would not need muscles and would resemble graceful creatures like antelope. As for the birds, they must, in the thin atmosphere, have developed large lungs and be capable of wonders of song.

This is the Martian landscape as drawn by Mr. Perrier. There are flowers and birds and insects of a beauty undreamed of among us, and in a light like that of our most exquisite dusk there are songs such as we can never hope to hear. It is the planet of grace and beauty.

Are there men like ourselves to enjoy this charming home? Indeed yes, says Mr. Perrier, or, if not exactly like us, at least obviously our first cousins. If, in Wells in "The War of the Worlds" made his Martians like cuttle-fish, with round gray bodies, a sort of face with a chin and long groping tentacles. He did them great injustice, says Mr. Perrier.

The forces at work on Mars would no more pull the cuttle-fish out of the sea and develop its intelligence than they did on the earth. The cause which made man on the earth have created a similar being on Mars.

The hand of man, which helped him to climb and helped him to fight, is the cause of his superiority on the earth. He did not have to use his jaws to de-



Frogs as Big as Cows and Enormous Grasshoppers and Huge Insects on Venus.

would float on our ocean, were our seas large enough.

We do not know the temperature of these planets, but their lack of weight makes it seem probable that they are composed largely of gases and liquids. It is possible to believe that these planets cooled less rapidly than the earth, and still have great internal heat. The oceans of Neptune and Uranus would, perhaps, be capable of producing life, so far as heat is concerned, but it is to be doubted if the chemical composition of those oceans would constitute a suitable environment. The elements which have been necessary for life on the earth planet, and therefore presumably are necessary in the others, seem not to be present.

The four great outer planets are, then, uninhabited, according to Mr. Perrier. They may become inhabited in time, but he thinks it improbable if their light weight were due to an intense temperature, capable of keeping the elements which compose them in a state of vaporization, then, indeed, life would in time develop. But if that were the case they could be luminous in themselves, while as a matter of fact they can only reflect the sun. The light weight means, most likely, the absence of the chemical elements which are essential to the growth of life.

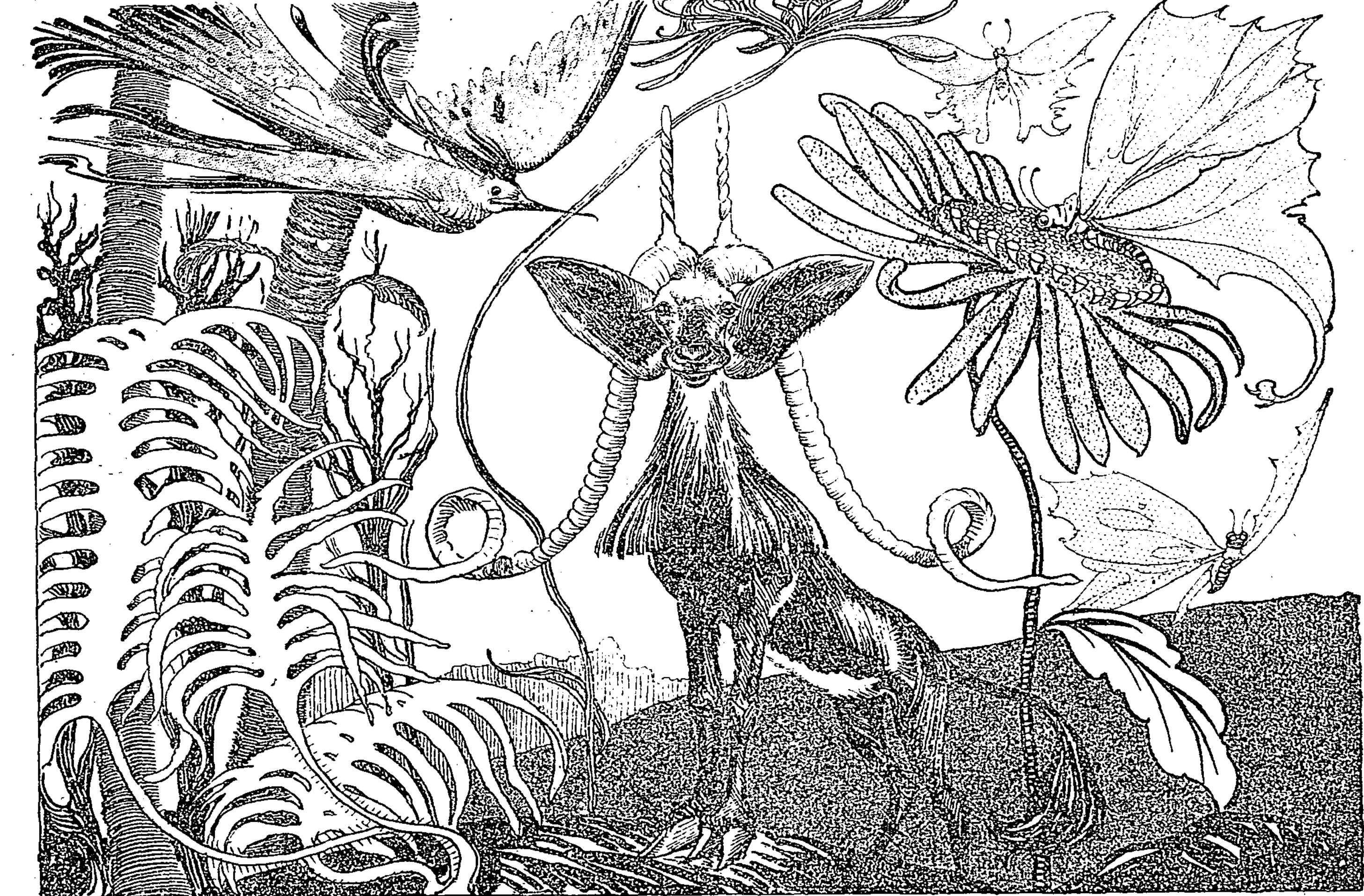
The four inner planets, Mars, the Earth, Venus, and Mercury, are separated from their larger sisters by an enormous distance, and by the light of the asteroids. They were born much later, when the sun had apparently passed through a period of transition and of contraction. At any rate, the planets within the ring of the asteroids suddenly became quite different from those without the ring. They are much smaller, have few or no satellites, are surrounded by an atmosphere, and are made up of solid masses on the surface of which appear, except on Mercury, a number of oceans.

Mercury's atmosphere is thin and so clear that we can suppose the ab-

conditions much alike. Mr. Perrier can see no reason to doubt that life exists on our nearest neighbors as it does here, and since everywhere the same laws are at work, modified by the same forces, he constructs a picture of both those planets.

We know the causes that underlie the Earth development. They are common

planets have caps of ice which melt regularly; both have an atmosphere, a little lighter in Mars, a little heavier in Venus; salt oceans, rivers, lakes of fresh water; it rains, it snows, it hails, it thunders, it storms as with us. Seaweeds live in the oceans, grass and trees have invaded the land wherever there was enough water to support vegetation and



Huge Flowers and Butterflies and Buds of Beautiful Plumage on Mars.

those which once filled our earth, ichthyosaurs, pterodactyls, iguanodons. Man is absent; indeed the race of mammals may not yet have appeared, in even the humblest form.

Life on Venus is not beautiful. Without butterflies, flowers, or birds, it has also no moon and through its misty air no stars can be seen. The night is silent,

conditions. She is pre-eminently our sister planet.

Mars, on the other hand, is quite different from us in many respects. It is much further from the sun than Venus and twice as far from the sun as our sister planet. The mean temperature of Mars is about 40 degrees, but it varies between much greater limits than that of the

find himself or to carry things, so by degrees his jaws grew small and the shape of his head altered, giving the brain room to grow. The same causes worked, inevitably, on Mars.

The Martian is like us, therefore, with some differences which we may infer. He is very tall, because the force of gravity is so feeble; he is very fair, with blue eyes, because there is so little light or heat; his jaws are narrow and the top of his head is large, because he has been evolving away from the animals for a much longer period than we. The Martian noses would be long and the ears large. The Martian's lungs and consequently his chest would be enormous, on account of the thin atmosphere, and his legs would be very slender, because little effort is needed to walk. There would be small beauty about them, to our way of thinking, except for the intelligence of their expression.

Intelligent they are, of course, far beyond anything we can imagine, since Mars is so greatly our elder. The forces of nature we are just discovering have been utilized by them for untold generations. Even proportionately to their age they are probably more civilized than we, for the struggle for existence on the narrower limits of Mars must have been fiercer than on the earth.

But there is no struggle now. Masters of nature, they can restore the waste of the body by chemical means and are independent of the fruit of the land, except for their pleasure. Disease has long since been conquered and old men know the hour when their forces will fail, and await the end calmly, as sages should.

Poverty and war, the folly of ostentation, the need of law and government no longer are known. The planet holds now all the population it needs and all are philosophers and brothers. Perhaps, however, speculates Mr. Perrier, some Martian Wagner has drawn a picture of the almost mythological past when there was violence and hate and greed and has made a splendid tetralogy in which, at least, we dropped suddenly on Mars, we might find ourselves at home.