ASTRONOMY

No Martian Men

Astronomers Now Feel Sure That If Life Exists On Our Neighbor Planets, It Is of the Humblest Kind

By FRANK THONE

See Front Cover*

FAREWELL forever, engineers of Mars!

Forever farewell, dwellers beneath the cloudy veil of Venus!

Science once gave us these romantic figures; science now takes them away.

Never, in any future Wellsian century, will a space-voyaging Columbus of the skies, rocket-sped through the millions of miles of dark and freezing void, find canals, or cities, or deep green gardens, or any other work of intelligent beings like himself, on any of the earth's neighbor-planets, great or small. Dubiously and grudgingly on one or two of them, there may be some kind of vegetation, and presumably lower animal life. But the great outer planets, Jupiter, Saturn, Uranus, Neptune, are total deserts, with no trace of anything that we would recognize as living beings, however humble.

Such is the newest verdict of astronomy, laid like a blight over the teeming romantic fancies that peopled the circling worlds which the same science had given us in its earlier days. The great globes must spin through space forever barren, not only because they are too remote from the sun and hence too cold, but because in their thick atmospheres there are lethal gases that would never let life get started at all, and would quickly snuff out any vital germs that might drift in from outer space, as some scientists have imagined this world of ours was originally colonized. And there are other gases, not deadly in themselves, whose very presence argues complete lack of that one gas essential to all life-processes—oxygen. Forever in a welter of vapors ten-thousandfold worse than the horror-imaginings of the latest war-massacre prophets, these planets are under interdict against life from the very beginning. They are the hopeless victims of a complete and indiscriminate cosmic birth control.

The detection of life-preventing gases in planetary atmospheres, and its estimation in quantitative terms, has been the work of a number of astronomers, particularly in America and Germany. The latest and most exact work has been carried out by a cooperative group at the University of Michigan and the Lowell Observatory at Flagstaff, Arizona, long noted for the special researches on the planets conducted there. It was at Lowell that much of the pioneer study of the mysterious markings on Mars, the so-called "canals" was carried out; and it was here also that a schoolboy astronomer, Clyde W. Tombaugh, a few years ago found on a photographic plate of the heavens the long-sought image of the planet beyond Neptune, which we now call Pluto.

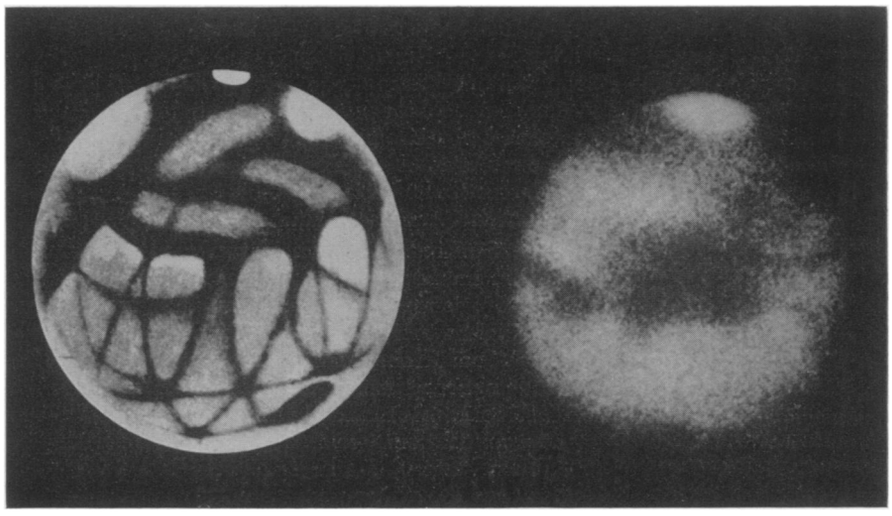
It was appropriate, therefore, that the astronomic work leading to the new scientific opinions as to the habitability of the planets should have been carried on at this observatory. This consisted primarily in taking photographs of the planets' light, after it had been split up into its component colors by the grating of a spectrograph.

When light of known color-composition is passed through a gas or mixture of gases, dark lines appear here and there in what would otherwise be a continuous rainbow-hued band. These dark lines are due to the absorption of light of that particular wavelength by the gases in question. They constitute a kind of identifying set of fingerprints, for each gas always causes the same set of dark bands—in physical-astronomical language, it has a "characteristic absorption spectrum."

This kind of chemical-analysis-at-a-distance, by the study of these absorption spectra, has been used for a long time in research on the flaming atmospheres of the sun and the other stars. A spectrographic picture of the sun, for instance, betrayed the presence there of helium, long before it was discovered on the earth.

Spectrographic astronomy has even got into modern classic poetry. The great nineteenth-century English poet, Francis Thompson, whose scrappy formal education included part of a pre-medical course, was always tossing bits of science into his verse. In one of his most noted compositions, "Sister Songs," we find this:

"As the metallic vapors, that are swept



SEEN BY EYE AND CAMERA

An observer's sketch, left, and a telescopic photograph of the planet Mars. Very little of the webwork of "canals" appeared on the unimaginative photographic plate. But the white cap at the planet's North Pole, quite conceivably snow, was undoubtedly there.

*The photograph on the front cover is of a painting of Mars as it might look viewed from Phobos, one of its moons, and is used through courtesy of the American Museum of Natural History.

METHANE AT PLAY

An explosion, started by the ignition of methane in a demonstration tunnel of the U. S. Bureau of Mines, roars out of the opening like the blast of a great cannon. Note the intense whirlpool effect in the center of the cloud.

Athwart the sun, in his light intercept
The very hues
Which their conflagrant elements suffuse."

But although the spectrograph long ago began the task of telling us about the gaseous envelopes surrounding stars thousands of light-years away, the instrument was not quite up to the task of probing the atmospheric secrets of our nearer neighbors the planets. This was due partly to the fact that the planets' light is not really their own, but is reflected light, borrowed from the sun. However, the instruments at the Lowell Observatory, in the hands of Dr. V. M. Slipher, gathered the many-lined pictures of the light of the four giant planets, Jupiter, Saturn, Uranus and Neptune. These were checked against similar spectrographic records made by Dr. Arthur Adel in the physics laboratories of the University of Michigan, of certain gases in tubes under high compression, to simulate the density of the great planets' atmospheres under the pull of their enormous gravities, which are naturally far greater than that of the earth.

The upshot of these studies was the discovery of high concentrations of two life-forbidding gases, methane and ammonia, on Jupiter and Saturn, and rather convincing evidence that the same two gases are also abundant in the atmospheres of Uranus and Neptune.

No one who has ever got a strong whiff of ammonia vapor up his nose needs to be told that it is unfriendly to animate life. In low concentrations it makes one choke and cough and wipe his eyes; and the most feared accident in ice-manufacturing plants, where ammonia is used in the refrigerating coils, is a leak or break in the machinery which would flood the plant with strong ammonia gas.

With massive quantities of ammonia suffusing the atmosphere, the four major planets can obviously offer no home to any living things resembling man or his domestic animals.

But if this were not enough, the presence of methane would clinch the argument against animal life with double finality. Methane is the same stuff that sets off disastrous coal-mine explosions, under the aliases of "fire-damp" and "marsh-gas." Oozing out of the wet muck of swamps and meeting the oxygen of the air, it dances as the flickering flames known variously as "will-o'-the-wisp, Jack-o'-lantern, and *ignis fatuus* or "fools' fire."

Methane is not confined in its earthly activities to causing disasters in mines and bewildering wayfarers on the marshes at night. It has a highly useful work in the world, and does it every day for a very large proportion of the American people. Methane is the most important constituent of natural gas. Some natural gases contain 90 per cent. of their volume in methane.

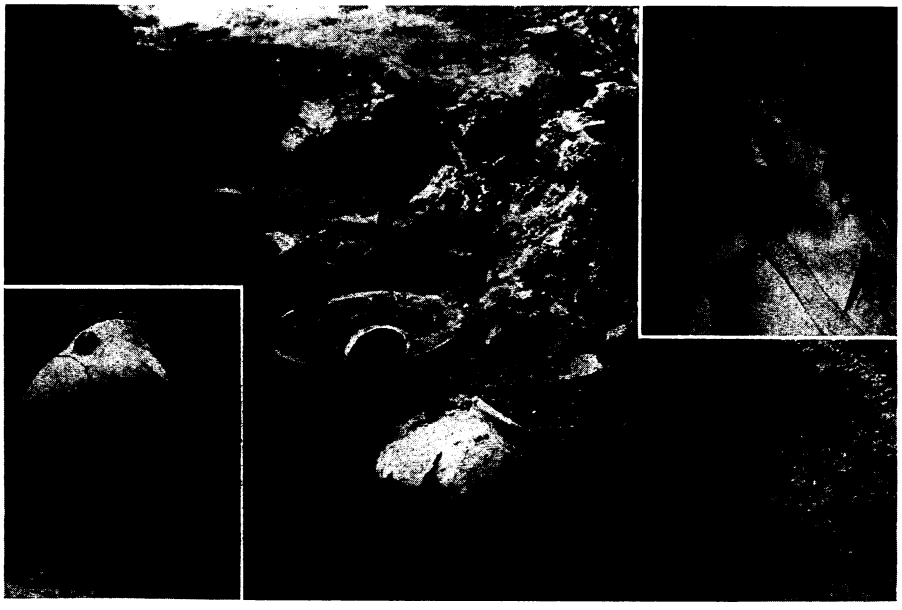
Methane is not in itself particularly harmful to animate life, as ammonia is. But the fact that its keen appetite for oxygen makes it at once a useful servant in the kitchen and a menacing enemy in the coal mine is a solid argument that there is no uncombined oxygen on the planets where methane is present in large quantities in the free atmosphere. For if there were oxygen available, the methane would at once combine with it. From this union would be born carbon dioxide and water, for methane is composed of carbon and hydrogen.

It is difficult to imagine any part of the solar system as being wholly without oxygen. But if there is any oxygen present on these methane-ammonia-immersed planets, it must be locked up in some compounds, possibly deeper within their massive bodies.

There are other reasons, longer known, why life on the great outer planets is improbable. Though they are huge, their mass is not proportional to their bulk. Their average density is much less than that of the earth. It is quite possible that they do not have anything like the earth's solid crustal surface, on which life can find a foothold.

Again, if life were present, it would have to be a flat and crawling kind, for the attraction due to gravity is of course many times that of the earth. Creatures with entirely different kinds of muscle and bone would have to be evolved, to stand up against its terrific pull.

These outer planets are so remote from the sun that plants, on which animals depend for food, might have trouble catching enough light to carry on their existence. The temperatures also may be so low, because of their dis-



TROY'S HEROES BURIED IN URNS

An American expedition has discovered the long-sought cemetery where the Trojans lie buried. Paris, who kidnaped and fought for the beautiful Helen, his brother Hector, his step-father King Priam, or other heroes made famous by Homer may be among the unmarked remains in the rows of funeral urns. The jars contain only ashes and remnants of burnt bones and a few small pottery objects and ornaments that survived the funeral pyres.

tances from the central stove of the planetary household, that life would not be possible.

However, the discovery of methane has set a lower limit to possible surface temperatures. Dr. Henry Norris Russell of Princeton University pointed out that at a temperature of 161.4 degrees below zero Centigrade, this gas becomes a liquid, unable to betray its presence through reflected rays. Of course, under the different gravity and atmospheric-density conditions on the great planets this low boiling point of methane might be different. Nevertheless, methane's existence as a gas on the outer planets is at least some indication that their surfaces are not absolutely frigid.

If the absence of any of the familiar life-gases on the outer planets, and their replacement by death-gases, set a puzzle to the speculative science of "astrobiology," the presence of a great deal too much of one of them, carbon dioxide, has recently upset the claims of one of the inner planets, Venus, to be the most probable extra-terrestrial abode of life.

On earth, green plants find the fraction of one per cent. of carbon dioxide in the atmosphere sufficient to supply raw materials for food-making. The most recent of the Lowell Observatory-University of Michigan studies indicates that the atmosphere of this brightest-shining of all the planets contains a concentration of carbon dioxide about ten thousand times greater than that in the earth's!

That looks very like much too much of a good thing. At too-high concentrations, carbon dioxide is not an inert gas but an active poison to animal tissue. If plants exist on Venus, they must find their work exceedingly easy. If animals (or men) live there, it can be only because they have evolved a super-earthly tolerance to this waste-product of respiration. Besides, there has been no evidence yet that free oxygen and water vapor are found on Venus; and you cannot have life without these things.

Mercury, the innermost of the planets, and newly-discovered Pluto, remote on the frontier of the solar system, are given short shrift as homes for life, and partly for the same reason. They are both quite small, so that their force of gravity has not sufficed to hold any atmosphere at all. They are as dry and breathless as our own moon. Furthermore, Mercury is so close to the sun that it was burned crisp ages ago, while Pluto suffers from the opposite ill of too great remoteness from the central source of light and heat.

There remains Mars, old reliable mysterious planet of the "canals." Oxygen is known there, and what may be clouds of water vapor sometimes appear on its face. White polar caps, that may be snow, appear and vanish with the proper seasons.

All this looks promising. But the planet's small mass suffices to hold only a thin blanket of atmosphere over its surface. Oxygen may be insufficient for full breathing, water may be lacking for full slaking of thirst. Through the thin air the sun beats down without mercy by day, making things very hot indeed. Through the same thin air the day's captured hoard of heat quickly escapes at night. Daily temperature ranges from the Equator to the South Pole are not encouraging to the higher life.

Life on Mars? Perhaps—lichens, mosses, bacteria and such small fry. But a race of super-braintrusters, constructing mazes of titanic canals? Highly dubious, to say the least.

So far as we have any real scientific knowledge, the earth is the only one of the planets with life on it. And we do not know, we cannot even guess, whether any of the uncountable millions of suns visible in our share of space has so much as a single planetary offspring.

This article was edited from manuscript prepared by Science Service for use in illustrated newspaper magazines.

Science News Letter, December 15, 1934

MARINE BIOLOGY

Barnacles are Crustacea Not Mollusca

THROUGH error, the photograph on the cover of last week's SCIENCE NEWS LETTER (SNL, Dec. 8) was captioned "Maligned Molluscs." These interesting creatures belong to the division of *Crustacea,* which also includes the lobster and the crab.

Science News Letter, December 15, 1934