

ASTRONOMY

Astronomers Push Study Of Atmosphere on Planets

Other Atmospheres Do Not Reveal Oxygen, Important And Common on Earth; Carbon Dioxide Abounds on Venus

TO THE PERENNIAL discussion of the possibility of life on the planets other than the earth, recent researches at Mt. Wilson Observatory are presenting new data. As yet the astronomers are not considering the "life" question, but with telescopes and thermocouples they are attempting to discover the nature of the atmospheres of the planets.

Whether a planet can hold an atmosphere or not depends very critically on its size and its temperature. For example, an atmosphere which might remain practically unchanged on a planet at 100 degrees absolute (-173°C.) would escape in a few months if the temperature were increased to 300 degrees absolute, which is about the surface temperature of the earth.

Temperature measurements of the planets have been made by Dr. S. Nicholson of the Mt. Wilson Observatory so that we have a good idea which planets have an atmosphere and which have none. Thus, excepting Mercury and Mars, all the planets might well have a gaseous envelope which we call an atmosphere.

Moon in Vacuum

Incidentally our own satellite, the moon, is too small and becomes too warm to retain an atmosphere. The surface of the moon is therefore in a vacuum and not even liquids can exist there unless they be of extremely high molecular weight.

Even those planets which have atmospheres will differ greatly from the earth. Drs. W. S. Adams and T. Dunham, Jr., of the Mt. Wilson staff are investigating the composition of the various atmospheres. One of the most striking conclusions of their observations is that oxygen, which plays such a vital role in the earth's atmosphere, does not show itself in the other atmospheres. Elements like nitrogen, hydrogen, helium and argon are much more difficult to observe, so it is not surprising that they do not appear in the planetary atmospheres.

Venus has an extraordinary amount of carbon dioxide. This gas, which occurs to the extent of less than one tenth of one per cent. at sea level on earth and which because of its weight must be practically absent at high levels of the earth's air, gives an intense spectrum in the atmosphere above the clouds which hide the surface of Venus from our view. Only recently has Dr. Dunham succeeded in getting enough carbon dioxide into a tube to get a trace of those bands which come out so strongly in Venus. He estimates it would take a tube at least a mile long filled with CO₂ at atmospheric pressure to duplicate the spectrum of Venus.

Gases Unknown Here

The outer planets are much colder than Venus. Carbon dioxide would scarcely be a gas on them, but it would mostly condense to a solid. The analysis of the atmospheres of the outer planets is difficult. These planets are so much farther out that they reflect at least fifty times less of the sun's light into the powerful telescopes. Astronomers are forced to be satisfied at present with mere indications. The chemical compounds which would be gaseous at the temperatures of Jupiter (-135°C), Saturn (-150°C), Uranus (-180°C) and Neptune (*Turn to Page 108*)

CHEMISTRY

Three Rare Earth Elements Proved to be Radioactive

THREE NEW rare earth elements can now be listed among the radioactive substances of the earth as the result of experiments by W. F. Libby, University of California teaching fellow, and Prof. W. M. Latimer, also of the University of California faculty.

They are lanthanum, neodymium and samarium. Except for samarium which was proved radioactive by independent European research a few months ago, this is the first time that these elements

were known to spontaneously disintegrate in a manner similar to radium and uranium.

Transmutation occurs when lanthanum, neodymium and samarium disintegrate, some of their substance flying off and leaving as a residue other elements, cerium, illinum and neodymium, respectively.

The radioactivity was detected by putting the elements into a container filled with low pressure helium and recording through a radio amplifier the clicks of atomic collisions that occurred. The radioactivity of the elements increased the normal number of collisions.

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ARCHAEOLOGY

Girl Explorer Adds Ancient City to Map

RUINS of one of the remote, prehistoric cities of Mexico, familiar to its Indian neighbors for many centuries, but never located on the official map of Mexico's 1,200 archaeological sites, have been explored by Emma Reh, correspondent of Science Service in Mexico. Miss Reh earlier explored the ruins of another ancient city, Teposcolula, 18 miles away.

The city bears the Aztec-sounding name of Hualmelulpan. It lies in the mountainous mazes of the region known as the Mixteca (*Turn Page*)



THIRTEEN STONE KNIFE

The squared stone is believed by Miss Reh to be the first dated monument reported in the Mixteca region of Oaxaca. It bears the date "Thirteen Stone Knife." Beside it stands a six-foot figure with grotesquely heavy mouth and curling fangs.

MEDICINE

Bone Cancer Successfully Treated With Arsenic

A NEW CASE of successful treatment by means of colloidal arsenic of a patient suffering from cancer of the bone is reported in the *Canadian Medical Association Journal*.

The report is by Dr. A. C. Hendrick, Toronto surgeon, and Dr. E. F. Burton, professor of physics at the University of Toronto. The statement follows an announcement by the same investigators in 1931 to the effect that they had successfully treated four persons affected with bone tumor by means of injections of a colloidal solution of arsenic metal.

Details of the latest case are contained in a two-page history, which include X-ray photographs depicting the bone repair following the injections.

The patient was a married woman 22 years of age, affected with a cancerous condition of the thigh above the knee. She was first seen in November, 1930, when both bones and muscles were involved. High voltage X-ray treatment was commenced, but the condition did not improve. The thigh bone finally fractured.

Radiation was discontinued in July, 1931, when the first doses of arsenic were given. An X-ray picture the fol-

lowing October showed that the fracture had re-united. Three months later, the tumor had receded still more, and repair of the limb with new bone lime became apparent on the X-ray plates.

Examination of the patient's lungs last November showed that no secondary cancerous growths had occurred. This fact is considered of importance in view of the rapid course which the disease ordinarily runs. Usually, fragments of a bone sarcoma growth are distributed by the blood stream and produce tumors in other parts of the body. The report says of the patient's present condition:

"She is in good health, free from pain, and is carrying on her usual household duties."

Of the four cases treated in 1931, two are still alive.

Medical aspects of the research were handled by Dr. Hendrick. Dr. Burton was responsible for the preparation of the colloidal arsenic medicine, a delicate laboratory procedure.

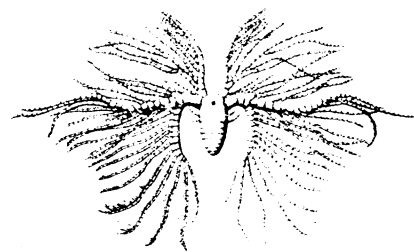
Dr. G. E. Richards, associate in radiology at the University of Toronto, who has been in close touch with the work since its inception, made this comment:

"It must be remembered that cases of bone sarcoma have also been cured in the past by means of surgery, X-rays and radium. This new case with arsenic treatment is of definite interest because for the first time the results are well authenticated and fully reported. I am entirely satisfied with the diagnosis.

"Too many conclusions, however, should not be drawn from a single case, but if the arsenic treatment does no more than relieve pain, and eliminate the need for drugs, it will still be a great boon. The final test will come when there are many more cases, all carefully controlled and thoroughly checked, just as is necessary with any other new clinical treatment."

The indications are that colloidal arsenic will find its greatest use in cases of advanced bone sarcoma. The colloidal solution is now being given a large scale trial in the Toronto general hospital, from which later developments may be expected.

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SOFT-SHELL TRILOBITE?

PALEONTOLOGY

Puzzling Fossils May Have Been Soft-Shell Trilobites

LACE CRABS, strange, delicately-constructed fossil creatures that lived in the primal seas half a billion years ago, may have been merely the "soft-shell" stages of trilobites, extinct relatives of lobsters and crayfish that dominated the waters of that epoch.

This new solution for an old riddle of geology has been suggested by Dr. Rudolf Ruedemann of the New York State Museum. Working with a specially constructed microscope, Dr. Ruedemann has found evidences that the "lace crabs" had shed an outer shell, as lobsters and crabs shed their shells today. In this "soft-shell" stage they looked like creatures of an entirely different order, with wide-apart eyes on their unprotected heads, and the delicate lacy limbs that have given this fossil group its name.

The principal deposits of "lace crabs" have been found in fine-grained shales, hardened out of the mud into which the unprotected moulting trilobites settled for shelter while their new shells were forming, and where many of them were trapped and killed by pockets of water over-charged with carbonic acid.

The "lace crabs" were first described by the late Dr. Charles D. Walcott, secretary of the Smithsonian Institution. Dr. Ruedemann's suggestion that they were "soft-shell" trilobites is set forth in a recent Smithsonian publication.

Science News Letter, February 18, 1933

From Page 99

(less than -200°C), might be unstable at earth temperatures and they would thus be unknown here. The indications are that Jupiter contains ammonia gas in considerable amounts. Saturn, weaker in ammonia, seems to show methane. The outer planets have other absorp-

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tion bands which have not yet been interpreted.

Astronomers would like to know of what the solid parts of the planets are composed. But the heavy clouds which cover them prevent them from seeing. The clouds themselves provide a mystery because they give no sign of their structure. Even the rings of Saturn defy us by reflecting the sunlight exactly as it comes. Unless a substance absorbs some of the light which falls on it, there is no way of knowing what it is.

The researches of Drs. Adams and Dunham help tell of climatic conditions on the planets, of temperature and density distribution, as well as chemical composition of the atmosphere. So far there is no reason to assert that the other planets vary greatly from the earth in the elements they contain. Which elements are found most readily in the atmosphere of a planet is decided by how big it was at its beginning, how hot, how far from the sun and how far from us it is now. Such accidents in its history probably determine whether it too supports some sort of life.

Science News Letter, February 18, 1933

SEISMOLOGY

Quake Reported Itself Seven Weeks Ahead of News

CHINA'S Christmas earthquake disaster, whose deaths in Kansu Province were recently variously reported by cable as numbering from a few hundred to 70,000 sent its own reports by much faster methods, and they were read and correctly interpreted by scientists on the day of the catastrophe itself.

Within a few hours after the earthquake occurred, eight seismological stations in widely separated parts of the world wired and radioed the facts of their instrumental records to Science Service. Scientists of the U. S. Coast and Geodetic Survey interpreted the data, and stated that they indicated a "very severe earthquake that was probably extremely destructive to life and property" in the interior of China. The latitude and longitude as thus calculated correspond exactly with the locations now being reported by cable.

This is the second time that a disastrous earthquake in that same region has sent its own report, via the sensitive instrument in seismological observatories, weeks ahead of the delayed cable news. On May 22, 1927, an even greater catastrophe, in which a hundred

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