

News Release

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BERKNER-MARSHALL ATMOSPHERIC STUDIES TURN TOWARD GENERAL THEORY FOR
ATMOSPHERES OF EARTH-LIKE PLANETS; NATIONAL SCIENCE FOUNDATION MAKES GRANT

Develop a broad theory for the history, including variations and stability, of what makes up the atmospheres of planets like the Earth. That's the assignment ahead of Profs. Lloyd V. Berkner and Lauriston C. Marshall at the Graduate Research Center of the Southwest in Dallas.

They'll extend their studies of the past four years in the new program. Thus far, their work has put into a single scientific concept a wide range of facts from geology, paleontology, evolutionary, and astronomical fields.

The basic theories are that oxygen was formed first (on Earth) from volcanic gases that provided water vapor which raw sunlight could break up to free some oxygen; secondly, by the presence of nitrogen, which would help an ozone (three oxygen atoms) blanket to form, and thirdly by early life itself, in shallow and protected waters.

Screened by both the ozone and water from the murderous ultraviolet portion of sunlight, but able to use some visible light to make oxygen, the primitive organisms also were able to convert their way of living from fermentation to respiration when there was one-hundredth of today's amount of oxygen in the Earth's atmosphere.

When this critical point was reached, about 600 million years ago, life branched out in a variety of forms in oceans, rivers, and lakes. There were large shellfish, as much as three feet in diameter, among 1, 200 North American species that appeared within 20 million years.

With life itself making more oxygen, living things kept reaching for the open air. But the ultraviolet glare kept them below the water's surface, until there was one-tenth of today's amount of oxygen available, and a much deeper protective blanket of ozone.

At that place in time, some 400 million years ago, life reached out to the land. In about 20 million years more, there were plants, animals, and great forests.

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LAURISTON C. MARSHALL

Oxygen production increased even more. Perhaps there was an "overswing", with more oxygen in the Earth's atmosphere than there is today, and a reduction in carbon dioxide.

The lack of carbon dioxide, acting as another blanket to keep Earth's own warmth from going into space, may have caused the ice ages of 200 million years ago. With this "correction", oxygen production would drop as living organisms felt the harsh climate, and the supply and use of oxygen would have to come back into balance again at a new level.

If it could be proved that the great toothed birds and dinosaurs built larger lung capacities before they disappeared suddenly some 100 million years ago, this would support the theory of cause of the ice ages.

In summary, Professors Berkner and Marshall theorize that critical stages in Earth's oxygen level, reached from time to time in history, set off great new opportunities for life, to which organisms could and did respond.

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To continue their studies, and extend them to other planets, they will look further into the parts played by nitrogen and carbon dioxide in Earth's atmospheric history. New and improved mathematical models of ozone concentration for various geological ages will be derived. Calculations will be extended to atmospheres which have 100 times more carbon dioxide than Earth's, to link them with the atmospheres of Mars and Venus.

The new studies may take five years to complete. At present, a two-year grant of \$114,700 has been made by National Science Foundation to continue the program.

The concepts reached so far have been published on a world-wide basis, beginning April 8, 1963, at the Institute for Space Studies in New York City. Other major presentations include several in Washington; at the International Scientific Radio Union meeting of September, 1963, in Tokyo; at the Faraday Society meeting of April, 1964, in Edinburgh, Scotland; at Bohemian Grove, Calif., and the Western National Meeting of the American Geophysical Union in Dallas, September, 1965. The University of Miami and University of Chicago have also been hosts to the co-workers.

GENERAL THEORY FOR EARTH-LIKE PLANET ATMOSPHERES

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Several papers have been published, including references in the 1965 edition of the Encyclopedia of Earth Sciences and "The Origin and Evolution of Atmospheres and Oceans," published by John Wiley and Sons, Inc.

Major magazine publications have included articles in "New Scientist", published in London, and "Saturday Review".

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Professor Berkner is now chairman of the Board of Trustees of the Graduate Research Center. He was GRC's founding president, and served as scientific director during its four early years.

Professor Marshall, who brought the initial GRC faculty together in space and earth sciences, mathematics, and biology, as director of scientific personnel, has recently been named director of the Materials Sciences Laboratory.

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