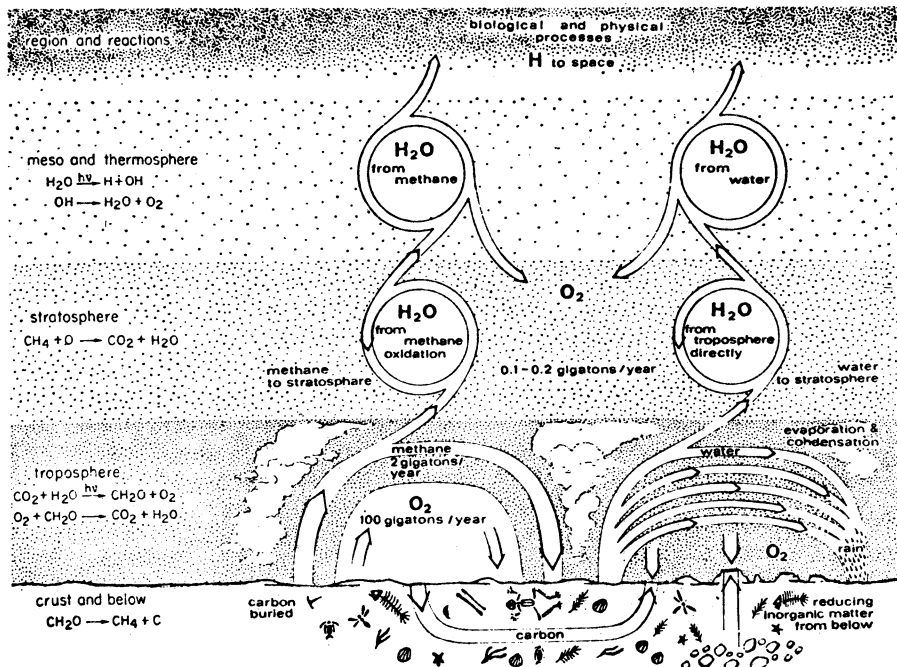


The air's link with earth's life



Margulis and Lovelock/Icarus

How methane production may regulate oxygen concentration in the atmosphere.

That the presence of life has altered the composition of the earth's atmosphere is a well-accepted point of geophysical history. A much more radical suggestion, that life is the controlling factor in the physics and chemistry of the atmosphere, is now presented by Lynn Margulis of Boston University and J. E. Lovelock of the University of Reading in England. They suggest that plants, animals and the air are linked together in a giant cybernetic system that uses feedback and control mechanisms to maintain the environment in an optimum state for the biota. They compare this to an ancient Greek belief that all living creatures on earth are part of a communal being called Gaia, and adopt the Greek name for their proposed system. The evidence and a plea for concerted investigation of the possibility are presented in a forthcoming issue of *ICARUS* (Vol. 21, p. 471).

First Margulis and Lovelock ask us to remember that the earth's atmosphere is an anomalous one. Without life it should have evolved to a state somewhere between those of Venus and Mars. "From astronomy, meteorology, physics and equilibrium chemistry, it is doubtful that we could have predicted the present environmental conditions on the earth," Margulis and Lovelock point out. "... The most conspicuous difference on the earth relative to the other terrestrial planets is the ubiquitous scum of the planet . . . , namely the biota. Presumably it is this living system that is responsible for the phenomenon we are calling Gaia."

In addition to anomaly, terrestrial conditions have shown a remarkable

stability for millions of years. In the last half billion years it seems the oceans have not altered much in salinity, alkalinity and oxidation-reduction potential. It appears that elements are recycled from the ocean through the

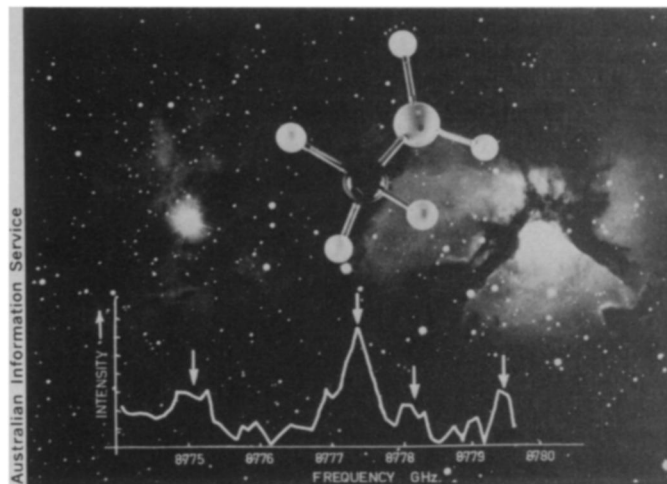
air and back to land.

Consider the temperature. This is a most important factor for the survival of life. It has been maintained in fairly narrow limits for the last 3.3 billion years. (Even the ice ages did not lower the mean temperature in the tropics by more than about eight degrees C.) And this stability is maintained in the face of a sun that has significantly increased its energy output (by as much as 70 percent according to some) over that time. "The probability that, by accident, the temperature has . . . followed the straight and narrow path optimal for life seems unbelievable. We conclude . . . that life must actually maintain these conditions." Other conditions that appear to be maintained by feedback control are the acidity and the oxidation-reduction potential of the atmosphere and the proportion of oxygen in the air.

"We are not claiming that a 'planetary engineer' was actually commissioned but rather that neo-Darwinian mechanisms of natural selection . . . have . . . operated in the origin of these . . . modulation mechanisms. Life tends to grow until the supply of energy or raw materials sets a limit. Probably a planet is either lifeless or teems with life. We suspect that on a planetary scale sparse life is an unstable state implying recent birth or imminent death." □

The 29th molecule between the stars

Model of methylamine and its spectrum superimposed on Sagittarius B2.



The 29th molecule to be discovered in the gas clouds of interstellar space is both large (seven atoms) and organic. It is methylamine (CH_3NH_2). It was found by an Australian-Japanese collaboration. Methylamine signals in the four-centimeter-wavelength region of the radio spectrum were observed by Nicholas Fourikis using the 64-meter radiotelescope at Parkes, Australia, and by Misaki Morimoto of Tokyo Astronomical Observatory using equipment at the Tokyo observatory. K. Takagi

of Toyama University had done laboratory observations on methylamine to discover its characteristic wavelength.

The new compound was found in Sagittarius B2, one of the dense clouds near the center of our galaxy, and in the Orion nebula. Both of these locations are rich in a large variety of interstellar molecules.

Methylamine provides another possible link in a chemical chain that could lead to the production of living beings. Many scientists now feel that planets

are seeded with organic material from the interstellar clouds so that the origin of prebiotic matter, if not living creatures, lies in extraplanetary space. Methylamine can react with formic acid, also present in the interstellar

clouds, to form glycine, the simplest of the amino acids. Fourikis says the clues to the search for glycine in space are very clear. He expects the next two years of observation to be "very critical" in that regard. □

Alaskan archaeology: In the hole

In the Upik Eskimo language, says John Cook of the University of Alaska, the word for "archaeologist" translates as "grave-robber." In the history of outsiders' dealings with Alaskan natives, points out Dartmouth's Robert McKennan, "the philosophy by and large has been, 'Get rich and get out.'" But the suspicion of the natives is only a fragment of the tangled mass of difficulties facing researchers trying to probe the history of the northernmost state.

Last week, as most members of the Society for American Archaeology met in Washington to discuss topics ranging from Mayan pottery to getting a mummy X-rayed, the Alaska specialists spent their entire half-day session wrestling with the uniquely thorny problems of simply trying to work in their chosen region. All of the archaeologist's traditional hassles seem to loom larger in Alaska's 586,000 square miles. Near-Arctic weather permits a "digging season" of only two to three months; the accelerating tempo of development has caught the archaeologists flatfooted with no state professional society or other body to effectively further their research; and perhaps most critical of all, the yet-unresolved jurisdictions of the Alaska Native Claims Settlement Act pose often baffling bureaucratic questions of just who really owns the land.

"In a sense," says Cook, "it belongs to everybody—but in what sense?" The Bureau of Land Management's latest jurisdictional map of the state shows an incredible collage of ownership categories, made all the more frustrating by the fact that the largest areas are in domains whose boundaries have yet to be finalized. Only a tiny fraction, most of it concentrated around Cook Inlet in the south, is firmly established as "patented" state land. Perhaps 10 times as much is branded "state selections pending." The largest areas are vast expanses that have been withdrawn from public domain to be reclassified into a variety of Federal categories such as National Parks and public interest usage.

All of these uncertainties will be resolved sooner or later, but for archaeologists they represent a no-man's land full of tortuous convolutions that ham-

Ivory artifact from the Thule Eskimo culture. A baffling mass of physical and jurisdictional problems plague archaeologists in the northernmost state.



per the way to the required digging permits that make their work possible. Even in clearly assigned domains, getting a permit requires permission from the National Park Service, from the relevant one of the 12 regional native corporations into which the state was divided by the Claims Act in 1971, and from the local village whose land may include the site. Where matters of dominion are "tentative," "pending," "possible" and "awaiting classification," requests for permits may wait in abeyance for months or years while jurisdictions are resolved.

The formation of the regional native corporations has, in some ways, added to the archaeologists' problems, and not only by providing another bureaucratic

layer to deal with. The corporations cover 12 geographic regions, "with each region," according to the act, "composed as far as practicable of natives having a common heritage and sharing common interests." They were established to give a louder native voice in dealings with government, control of development and minimization of exploitation, but to archaeologists they have sometimes posed particular problems.

"The establishment of corporate structures," says Robert Ackerman of Washington State University, "has altered the world view of native groups to a considerable degree. They have adopted our territorial concepts and have become more adept at controlling the use of their resources by white entrepreneurs. The archaeologist, as a scientist and an exploiter in his own right, is now faced with the problem of explaining to an awakened native population why his research is any different than other forms of land use, and what possible advantage his investigations will bring to the local people." In some areas, says Ackerman, there is considerable native interest in restoring historic artifacts such as totem poles and clan houses, but virtually none in the less dramatic findings from prehistoric sites. Even when there is a plan in the works for a museum that could hold such finds, Ackerman says—and insistence on confining artifacts to local museums is another of the archaeologists' woes—"they don't want my 10,000 chips."

Several of the archaeologists at last week's meeting described their efforts to inform local populations about the importance of their work, through classroom lectures, reports to villages on their results and other methods. But some of the speakers pointed out that a state archaeological society and some sorely lacking publicity could add a great deal. "We as professionals," says Allan McCartney of the University of Arkansas, "have stayed down in our archaeological holes, perhaps, a little bit too long." □

Salvaging artifacts: A legislative boost

Fourteen years ago, a law was passed requiring Federal agencies building or licensing the construction of dams to first notify the Interior Department, which would then survey the area for possible archaeological finds, and salvage them if necessary. It was a first step, but a small one, and for the last six of those years, archaeologists have been urging that the bill be radically broadened. This week came the first real sign that their

efforts may pay off.

The idea has been to expand the bill to cover all Federal and federally assisted construction projects, rather than just dams. A key point has been to authorize any Federal agency involved in such a project to use its own funds for survey and salvage operations, rather than wait out the possibly critical delay of working through the Interior Department.

"In the past," says Carl Chapman