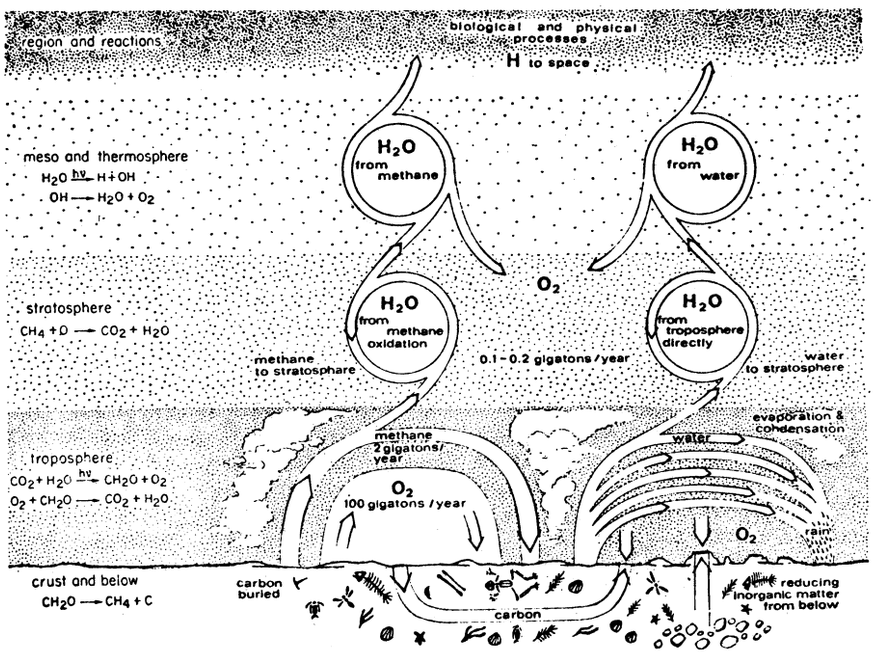
The air's link with earth's life



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).

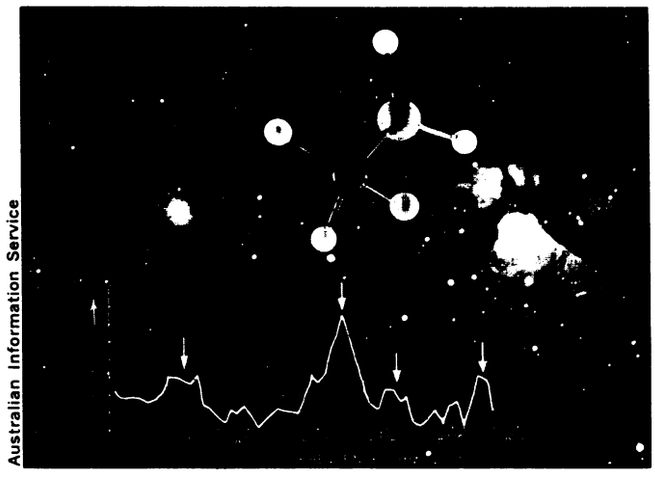
First Margulis and Lovelock ask us to remember that the earth's atmosphere is an anomalous one. Without life it should have evolved to a state somewhere between those of Venus and Mars. "From astronomy, meteorology, physics and equilibrium chemistry, it is doubtful that we could have predicted the present 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



Australian Information Service

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