Do protons help produce the stuff of life?

Classic experiments have shown that organic compounds that are chemical precursors to life can be formed from the substances believed to have been abundant in the atmospheres of the planets early in their history. In the laboratory, samples of the appropriate mixture of gases have been subjected to electrical discharges, which, like modern lightning, ought to have been of frequent occurrence in primitive atmospheres, or to ultraviolet light, which is present in sunlight.

These endeavors usually sought to reproduce the supposed conditions near the surface of the early planet. Now there is interest in conditions in the upper atmospheres of planets. Several planets and satellites have layers and patches of color in their upper atmospheres. Some suggest that the coloration is due to the presence of certain organic compounds called chromophores. Thomas Scattergood, Peter Lesser and Tobias Owen of the State University of New York at Stony Brook have done a series of experiments to determine whether such compounds can form from the gases present in upper atmospheres.

To provide energy for the chemical reactions they used not the lightning or ultraviolet appropriate for lower-atmosphere simulation, but energetic protons. They figure that the upper atmospheres of the bodies in question would be subject to bombardment by protons from the solar wind and the planetary radiation belts, and they wanted to see whether this form of energy deposition could produce organic compounds.

They report in the Jan. 11 NATURE that it does. The experiments used four different gas combinations in five runs. The first two used methane and ammonia; the third added hydrogen sulfide; the fourth used methane and nitrogen; the fifth, as a check, only methane. The samples were placed in gas cells and irradiated with protons from a Van de Graaff accelerator. The fluxes of protons were equal to what the upper atmosphere of Jupiter's satellite Io would receive in approximately 100,000 (earth) years.

In the methane-ammonia case an orange-brown liquid was formed which contained, among other things, cyclic amines alkyl amines, diacetyline and hexamethylene tetramine. When hydrogen sulfide was added, the cyclic amines did not appear, but a number of compounds with sulfur in them, such as alkyl di- and tri-sulfides did. The color of the liquid formed in this case was yellowish, and investigation showed that it contained free polymeric sulfur, predominantly S_8. This is interesting because free sulfur and resulting sulfur compounds have been invoked to explain the yellow and yellow-brown layers on Jupiter.

The methane-nitrogen mixture produced compounds similar to those in the methane-ammonia mix, but this time there was a larger proportion of alkyl amines to cyclic amines. Even the methane alone produced hydrocarbons. As a result the three Stony Brook investigators conclude: "It is obvious . . . that energetic protons can be an effective energy source for the formation of complex molecules from simple ones." □

Britain's blackout babies

The new year is traditionally a time for circumspection and reassessment, and Britain's staid scientific journal NATURE has used the occasion to speculate about the possibility of late-evening TV blackouts creating a merrier Old England. Nine months after America's great Northeast power blackout in 1965, the journal notes, there was "an unprecedented increase in the birth rate." The current British TV blackout is less spectacular, but then it may go on for months. "Fertility is most quixotic," comment the editors, "so, look out all maternity units from next September on." □

Mariner 10 ready for Feb. 5 pass by Venus

Venus may not be exactly a traffic jam, but it has been visited by more of the earthlings' spacecraft than any other planet in the solar system. The U.S. Mariner 2 and 5 probes have each flown by it, while Soviet vehicles have flown by four times and reached the surface (in conditions ranging from crushed to workable) half a dozen more.

On Feb. 5, one more spacecraft will complete the journey, but for Mariner 10, the veiled planet is primarily a way station on the road to never-visited Mercury.

For the time being, however, Venus is the focus of attention. On encounter day, at about 1:01 p.m. EDT, Mariner will reach its closest point to Venus. Data from a small course adjustment on Jan. 21 indicate that the craft should swing by between 3,550 and 3,600 miles away, meanwhile borrowing a gravity assist to slow down so that the sun can pull it in towards Mercury.

About 15 minutes before that, the spacecraft's two television cameras should send back their first pictures of the mysterious world, and they'll keep on sending more for 17 days, building up a library of almost 4,000 photos. (There will be only about half as many shots of Mercury, beginning six and a half days before the March 29 encounter, but they should be razor-sharp, due to the lack of atmosphere. The latest estimate—two course corrections will be made between planets—is that Mariner will see the Mercurian surface from about 625 miles away.)

One of the most unusual Venus experiments will be the occultation of a radio signal sent earthwards from the spacecraft through the planet's atmosphere. Past experiments with Venus, Mars and Jupiter have involved simply measuring the rate at which the signal frequency changes as the atmosphere blocks it out. This time, however, the spacecraft's antenna will be swiveled around as it disappears behind the planet to see how much the extremely thick atmosphere will bend the signal's path.

A pleasant, if belated, surprise for flight controllers is that the heaters for the cameras have turned themselves on. Stuck "off" since launching, they woke up on Dec. 18 when some other, no-longer-needed heaters were turned off. Earlier, Mariner mysteriously switched to its back-up power regulating system, but all seems to be well except for one of the experiments—a plasma analyzer—which is stuck so that it will only record high-energy particles. □

Carolina glacial grooves: 'Well, we goofed'

J. O. Berkland

'Glacial' grooves were due to cables.

Last March it was "100 percent incontrovertible"—a series of linear grooves in the rock of North Carolina's Grandfather Mountain that seemed, to geologists James Berkland and Loren Raymond, to be proof positive that glaciers had grated their way across the peaks of the southern Appalachians (SN: 3/31/73, p. 205). "Well," says Raymond, "we goofed."

During the latter years of World

War I, a railroad ran past the base of the mountain, beneath the rocky outcropping in which the grooves were later found, picking up timber lodged on the slopes and hauling it to a sawmill 10 miles away. To reach the train, the logs had first to be carried down several hundred feet of steep, smooth facing to where the flatcars waited below. The solution was a winch-like device, similar to those that hoist hay bales in and out of lofts. Long, thick cables, running through pulleys, were used to lower the logs down the slope.

"We knew about the cables," Raymond admits, "but we discounted them." In the first place, the grooves in the outcropping did not seem to line up directly with the railroad, traces of whose bedding still remain. In addition, the geologists were told while discussing the site that the heavy cables were so expensive that no logger would ever have allowed them to pass unprotected over the rock.

Except that they did. Months after the original discovery, the two Appalachian State University scientists found a rock on another slope of the mountain with grooves "that we were sure were caused by cables." These grooves also clarified the route that the cables took across the other outcropping. From the first glance, the "conclusive" evidence of the wandering glaciers was out in the cold.

It doesn't disprove the idea, however, and Raymond sticks to his guns. "Though it takes away what we thought was the best evidence of glaciation," he says, "it doesn't alter our view."

Skeletal traces of caribou, ptarmigan and other animals now confined to the colder, northern regions have been found as far south as Florida, he says, "so the cold was certainly there." The other necessity is adequate precipitation, which Raymond says is proven by researchers who have tracked the courses of Pleistocene storms. The southern glaciers were not part of the north polar ice cap, he points out; the storm tracks would have avoided the cap ice, and in fact are charted in part by measurements of the cap's southern limits. Instead, they were independents, leaving their traces in isolated U-shaped valleys with piled-up rock walls like roadside snowbanks left by a passing plow.

Raymond further maintains that his and Berkland's investigation, goof and all, has actually had a positive effect on a much-ignored area of research. "At least 10 geologists have come down here to look," he says, and others are publishing papers using data that they had previously passed off as unnecessary support for an accepted fact. "We're sorry that we goofed," he says, "but we're glad we opened the door."