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From our reporters at the meeting of the American Association for the Advancement of Science in Philadelphia last week

The primitive cell: DNA or protein first?

When living cells first formed on the primitive earth, what part formed first: nucleic acids, such as DNA and RNA, which store genetic information? Or proteins, which are involved in cell metabolism, permeability and reproduction? On the basis of studies of proteinoids—compounds which contain some of each of the 18 to 20 amino acids commonly found in proteins—Sidney Fox of the University of Miami believes that the first large molecules of the cell were proteins.

At the meeting, Fox gave several reasons why proteinoids, the precursors of proteins, might have preceded nucleic acids and genetic mechanisms. The proteinoids are easily made in the laboratory under conditions that simulate those of the primitive earth. The proteinoids easily form artificial cell-like microstructures and these cell models include various characteristics of present day cells. The proteinoid microsystems "reproduce" in a number of ways which appear to be evolutionary precursors of contemporary reproduction. Although selective interactions of amino acids with nucleotides, which make up nucleic acids, have not been identified to any great degree, some selective interactions between the proteins and nucleic-acid chemicals have been found. There is no reason not to believe, Fox said, that proteinoids reproduced before nucleic acids, then led to the nucleic-protein mechanism.

Plant roots and chemicals

How plant roots absorb elements from the soil is not altogether understood. The general explanation, buffered by studies, is that ions cross the membranes courtesy of carrier molecules. But Emmanuel Epstein, a plant nutritionist at the University of California at Davis says that some more selective transfer mechanism may be at work as well when a plant needs a particular element that is not as abundant as others competing for passage across the plant root membrane.

Fluorine as an essential trace element

A trace element is a chemical element that occurs in living systems in small quantities. Scientists are finding that more and more trace elements are essential to the health of animals and probably to man as well. One of the major contributors in showing that elements are essential is Klaus Schwarz of the Veterans Administration Hospital, Long Beach, Calif.

Last summer Schwarz said he would be reporting another essential element within several months (SN: 8/14/71, p. 112). At the meeting last week he kept his promise by presenting evidence that fluorine is an essential trace element. Attempts to prove that fluorine is essential were made before, but under less carefully controlled conditions.

What Schwarz did was maintain rats in sterile isolators on highly purified amino-acid diets which contain all the known dietary agents in sufficient amounts. Under these conditions supplements of 2.5 parts per million of fluorine stimulated growth by over 20 percent. The finding throws a new and different light on fluorine. The element seems to be essential, not only for the formation of teeth and bones, but for over-all development.

Schwarz asserts: ". . . with the increasing refinement of our staple foods attention should be paid to the fluorine intake of growing animals and children to guarantee that the large amounts of fluorine needed during growth are adequately supplied."

The history of mercury in fish

High concentrations of mercury have been found in many samples of modern-day fish. A few samples from early in this century suggest that mercury accumulations in muscle tissue of organisms living in uncontaminated waters have remained fairly constant during the past 75 years. Tests of fish from much earlier periods and different locations should help evaluate the significance of modern mercury levels.

Edwin Wilmsen of the University of Michigan and his associates have tested 17 samples of fish remains from three archaeological sites—two in the United States and one in Peru. They found mercury in twelve of the samples. Mercury in two of the samples—from Peruvian sites of about 750 years ago—approaches the highest levels ever detected in marine fish. Wilmsen concludes that mercury concentrations in fish have been as high at various times in the past as they are now—at least in pollution-free waters.

Mercuric salts can apparently be stored in bones. And, says Wilmsen, it appears that, for some tens of centuries at least, aquatic organisms such as fish have accumulated mercury in their tissues in concentrations much higher than those found in their habitats. "These findings reinforce warnings that continual discharge by man of even small amounts of additional mercury can have locally serious effects upon animal and human life."

Cloud seeding and lightning

Lightning is a major cause of forest fires, particularly in the western United States, where it ignites about 10,000 fires a year. Cloud seeding, according to Donald M. Fuquay of the U.S. Forest Service, could retard conflagration by increasing the amount of rain accompanying lightning and thus wetting forests, or it could directly reduce lightning.

The Forest Service has been conducting lightning modification experiments in the Northern Rockies. In tests so far, 66 percent fewer cloud-to-ground discharges, 50 percent fewer intracloud discharges and 54 percent less total storm lightning, occurred during seeded storms than during storms that were not seeded.

Perhaps more significant were that the number of cloud-to-ground flashes over a given period, the average duration of discrete discharges and the average duration of continuing current in discharges were also decreased. Discharges with long-continuing current are responsible for most forest fires. "This modification of the nature of the discharge may be much more important than any change in the total amount of lightning that is produced by a storm," says Fuquay.