

MEDICINE-BIOLOGY

Filterable Viruses Not Alive; New Disease Attacks Foreseen

Dr. Stanley, Rockefeller Institute, Finds Tobacco Mosaic Virus Consists of Autocatalytic Protein

AT LAST the question as to whether viruses are living or non-living appears to be settled, at least as regards a virus which has always been regarded as a representative and typical virus.

Dr. W. M. Stanley of the Rockefeller Institute for Medical Research's department of animal and plant pathology at Princeton, N. J., has reported (*Science*, June 28) the isolation of a crystalline protein from diseased tobacco leaves which can produce the disease, tobacco mosaic, in healthy plants.

Because many of the common and important diseases, among them measles, smallpox and poliomyelitis, are caused by filterable agents, this research is expected to begin a widespread intensive search into the causes of some human diseases, with good prospects for results that may result in conquest of the diseases and the consequent saving of human life.

The self-propagating crystals of mosaic virus prepared by Dr. Stanley are not alive. In his own words, "Tobacco-mosaic virus is regarded as an autocatalytic protein which, for the present, may be assumed to require the presence of living cells for multiplication." That is, it is a self-active chemical compound which can increase its own kind of substance by taking the necessary ingredients from the even more complex contents of living cell-contents. It is not a "living" crystal; still less a microorganism.

The long road which biologists and chemists will have to travel before they can fully understand the nature and activities of such proteins as this is indicated by the estimate of the size of its individual molecules. Dr. Stanley reports that he was unable to pass it through a filter which permitted egg white, perhaps the most familiar of all proteins, to pass through readily enough. He estimates the molecular weight of the tobacco mosaic virus molecule to be of the order of "a few millions." The bigger the molecule, of course, the more complicated it is, and the greater the complication the greater the difficulty of understanding.

There has been a long debate as to whether the filter-passing viruses are liv-

ing "germs" or simply non-living chemical substances. And back of that, there is an even older discussion as to just what is alive and what is not.

The more naive advocates of a materialistic or mechanistic explanation of life phenomena frequently claim that even simple crystals are "alive" because they grow. More complex crystalloid mixtures are sometimes devised which not only "grow" but ingest "food," move, and reproduce by division.

More careful and better informed biologists and chemists, of whatever philosophical conviction, point out that simple crystalline "growth" is simply a process of external accretion, and that the life-like behavior of the more complex mixtures is to be regarded as a biological analogy or an imitation of life rather than as the thing itself.

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BIOLOGY

Nature Is Prodigal Even In Agents Producing Disease

Infective Particles Numbering 1,000,000,000,000,000
In 20 Drops of Juice from Plant With Tobacco Mosaic

THE prodigality of nature in providing for the survival of a species of living creatures seems to extend even to disease-causing viruses. Scientific estimates on the number of virus molecules required to cause an infection, which from the virus point of view represents a chance of livelihood and survival, run up into stupendous figures.

For the tobacco mosaic virus, ten with fourteen ciphers written after it—a regular New Deal economic program figure—represents the number of infective particles in about 20 drops of juice squeezed from a plant infected with tobacco mosaic, Dr. William J. Robbins of the University of Missouri recently estimated.

Now a figure is given for the number

PALEONTOLOGY

Rich Fossil Insect "Mine" Found in Northern Russia

FOSSIL insects by the thousand have been found in a sandstone stratum near the mouth of the Mezer River, on the Arctic Coast of the U.S.S.R. The remains of wings constitute the majority of the fossils, but casts of bodies are abundant also, and there are a few plant fossils as well.

Prof. A. G. Marynov, a leading Russian entomologist, has made a partial study of the specimens, and states that all paleozoic families of insects are represented. The sandstone layer has been identified as of Permian date, that is, of the age immediately following the great Coal Age. Insect-bearing deposits of similar age have been found in Kansas, in the United States.

Most abundant among the fossils are primitive cockroaches. Early forms of grasshoppers, dragonflies, scorpion flies and other primitive insect orders are also well represented. Entomologists regard the few small beetles present as of especial interest. Several entirely new fossil species have already been identified.

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of molecules of an infective dose of this virus. In a note to a recent issue of *Science* (July 5), Dr. Kenneth Starr Chester of the Rockefeller Institute for Medical Research at Princeton, N. J., follows up Dr. Robbins' hypothesis and announces that there are from 60 million to 600 million virus molecules in a single infection, if the premises for his calculations are correct.

This huge ratio may be due either to a great loss of opportunity to infect in the case of myriads of virus particles, or to a possible aggregation of the particles so that many molecules of infectious material may coalesce, thus greatly reducing the actual number of separate infective units.

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