

ASTRONOMY

Universe Began Expanding Few Billion Years Ago

Professor de Sitter, Choosing Between Universes, Sees
Room For Million Galaxies in Space Now Occupied by One

A FEW BILLION years ago all the galaxies were together in a space no larger than is now occupied by one of them, but they at once began to separate, so starting the expansion of the universe.

This theory has been presented to the Royal Astronomical Society in London by Prof. Willem de Sitter, the famous Dutch astronomer, whose previous theories of an expanding universe were accepted by a large number of physicists and mathematicians. He has lately changed his views, he said, as to the origin of the expansion.

"We have to choose between three types of expanding universe," Prof. de Sitter declared.

"The first type begins with zero radius at a finite time in the past, and expands to infinity. The second contracts from an infinite radius to a minimum and expands again to an infinite radius, while the third oscillates in a finite time between zero and a maximum radius.

"The third type involves a periodically recurring catastrophe, a theory of which I have a very strong dislike. Until recently I was inclined to believe in the second type.

"Lately I have come to think of the first case, where, according to the mathematical idealization, the universe contracted to a point at some definite epoch of time, the galaxies passing simultaneously through this point with the velocity of light. When the galaxies approach very near each other the mathematical approximation breaks down, so that the point becomes finite, and a physical interpretation is possible.

"The galaxies can easily penetrate each other. If you put a million galaxies in the space now occupied by one, the stars still have plenty of elbow room. Their mutual distances will still be of the order of 100,000 times their diameters.

"The truth of this theory depends on whether the time of passing through the minimum was a very critical epoch or

not. It is supported by several indications of a serious crisis three or five billion years ago. The planetary system, according to modern ideas of its origin, is about that age. And a few billion years ago there must have been some very critical event in the history of the galaxies, when they were subjected to very strong perturbations, which were responsible for their rotation, their spiral structure, and the inhomogeneous distribution of matter in them."

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AGRICULTURE

\$5,000,000 Fund To Fight Soil Erosion

SOIL EROSION that removes 126,000,000 pounds of plant food annually from fields and pastures of the United States, at a financial loss estimated at \$200,000,000, will be fought with a public works fund grant of \$5,000,000.

MEDICINE

28 Eggs Provide Smallpox Vaccine For 7,000 People

SSMALLPOX vaccine virus from chicken eggs instead of from calf lymph is the achievement of Col. W. D. H. Stevenson and Dr. G. G. Butler of the British Government Lymph Establishment. Their method is reported in *The Lancet*. The new method opens the possibility of large scale production of a bacteria-free virus for vaccination, it is claimed. From twenty-eight eggs the investigators obtained enough material to vaccinate seven thousand persons.

Commenting editorially on this new method, *The Lancet* points out that the new vaccine is sterile; that the method is not as arduous or expensive as the production of calf lymph, and that the

The soil conservation plan will be under the supervision of the Bureau of Agricultural Engineering of the Department of Agriculture and the Special Board of Public Works in making the grant directed that the program be completed before November 1, 1934.

Terracing is the means to be used in controlling the erosion. The government will supply the technical direction and terracing equipment and the landowners will provide the power and labor.

A maximum amount of unemployment relief is promised for every dollar invested by the government. It is estimated that more than twice the \$5,000,000 grant will be spent by landowners in carrying out the work.

Agricultural engineers believe that the one-year program will provide for the terracing of approximately 4,752,000 acres of land and will supply 4,197,600 days of labor.

The Department of Agriculture estimates that 75 per cent. of the cultivated land in the United States is seriously affected by soil erosion. More than 17,000,000 acres of formerly cultivated land have been destroyed by erosion.

Conservation of the fertile top soil, one of the most important of agricultural assets, will tend to maintain the value of the land held as security for long-term loans, made directly or indirectly with government funds. It will decrease the deposits of silt and sand in bottom lands and stream channels.

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yield is excellent. The method seems to represent a definite advance and to be free from the objections to which calf lymph is open.

Other investigators have tried to produce a similar vaccine virus. The method reported by Col. Stevenson and Dr. Butler is a modification of the technic developed by A. M. Woodruff and Prof. E. W. Goodpasture of Vanderbilt University, Nashville, Tennessee.

The English investigators started the cultivation of their virus with purely dermal strains from rabbits injected intradermally with glycerinated vaccine lymph derived from the calf.

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