SCIENCE NEWS

Science Service, Washington, D. C.

ESTIMATES OF THE SIZE OF THE UNIVERSE

WRITE the number 176 and after it put a row of 18 ciphers. Then you will have the number of miles that you will have to travel if you want to completely encircle the universe and get back where you started.

Vast as this figure appears, it is about a twentieth as large as scientists supposed a few years ago. It is based on a new value of the "radius of curvature of space-time," as the physicist calls it, that was announced to the meeting of the American Physical Society in Washington by Dr. Ludwik Silberstein. Dr. Silberstein is a mathematical physicist connected with the research laboratory of the Eastman Kodak Company.

According to Einstein and his school, space is not infinite. The old idea that one could travel in a straight line forever is wrong. As a matter of fact, there is no such thing as a straight line, and if a person should travel far enough and long enough in what seems to be a straight line, he would eventually find himself back at his starting-point.

Yet, it is also said, space is unlimited, and this is an illustration of how that may be. If a small insect lived on the surface of the globe, and was unable to leave it, or to perceive anything else off its surface, he could travel indefinitely around it in any direction. He would never come to an end, yet his universe would be limited. Even if endowed with human intelligence, and he or his ancestors had never been able to perceive anything off the globe's surface, he would not be aware of the rest of the world about him.

Our universe, say the relativists, is similarly curved, in some fourth dimension, which the human race has so far been unable to perceive or comprehend. Apparently, we are free to move in any direction we choose, but actually there is at least one direction in which we can not move, since we can not comprehend it. If we could, then we could move in that direction. But even though it can not be comprehended, the scientists can get some faint glimmering of its existence, and estimate the size of this four-dimensional sphere in which we live. This is what Dr. Silberstein has done.

Using data pertaining to two separate groups of stars, furnished him by the Harvard College Observatory, Dr. Silberstein has made a new estimate of the radius of curvature of the universe, or "spacetime" as it is generally called. This radius is practically the same when calculated from either of the two kinds of stars. It is about a twentieth as large as a previous estimate that he made in 1924, which was based on 18 globular star clusters and the Magellanic Clouds. The latter are clouds of stars seen in the southern hemisphere of the sky. Dr. Harlow Shapley, director of the Harvard College Observatory, is now working out some new material on these objects. Though not finished, it appears that his previous estimate of their distances, which Dr. Silberstein used, was too large. Therefore, and for other weighty reasons, Dr. Silberstein believes that his new determination of the radius is the more accurate.

THEORIES OF LIGHT

THE idea that light consists of minute particles, or corpuscles, popular centuries ago, but which was abandoned during the seventeenth century, is again seeking scientific recognition. At the meeting of the American Physical Society this idea of the great Sir Isaac Newton was suggested as being true after all.

The corpuscles which compose light, as conceived by Dr. Herbert J. Brennen, of Northwestern University, are nothing but the electrons of matter itself. These electrons, say modern theories, form part of the atoms of which matter is made. They are also given off from a hot filament in an electric lamp. They make possible the radio vacuum tube. As cathode rays they are given off in an evacuated tube when high-voltage electricity is passed through it. Recently Dr. W. D. Coolidge, of the General Electric Company, obtained them in large quantities in the open air, outside the generating tube.

But none of these electrons travel as rapidly as light. About 150,000 miles a second is the fastest the cathode rays can be made to travel, but light will traverse 186,000 miles in a second of time. If the electrons from a cathode ray tube could be accelerated to that speed, then a beam of light, and not cathode rays, might emerge.

The wave theory of light, which has held the field without dispute until recent years, states that light consists of waves, in a hypothetical and mysterious medium called the ether. The quantum theory, which physicists have recently tended to accept, states that light consists of bursts of energy, or "quanta," but these are not the same as the corpuscles of Newton, even though they are discrete units, and not a steady series of waves. Another phase of modern physics, the so-called "wave mechanics," suggested by the German physicists Schroedinger and Heisenberg, the latter now in this country and in attendance at this meeting, and the French physicist the Duc de Broglie, holds that the electron itself is a wave phenomenon. If this is the case, perhaps the theory proposed by Dr. Brenner may reconcile all the suggested theories of light.

THE EVOLUTION OF MAN

MAN, until now almost as passive a plaything of the evolutionary forces as the animals beneath him, may in the future be expected to take a hand in the directing of his own development.

This was the central theme of an evening address by Dr. Aleš Hrdlička, anthropologist of the U. S. National Museum, before the meeting of the American Philosophical Society in Philadelphia.

"Man has given and still is giving a vast amount of thought to his life after death, but only relatively little

to his future on this earth," said Dr. Hrdlička. "The latter attitude, however, is undergoing a substantial change, due to the teachings of evolution.

"When the most earnest and competent students of man are asked, 'What about human evolution,' they can only answer that, while many of the details are still unknown or uncertain, and while here and there an impatient scientific worker may express some revolutionary hypothesis, nevertheless, in general, of all the major natural facts, none to-day is better documented and better established."

Dr. Hrdlička believes that "Man will slowly become ever more a helper and in a sense a co-creator in his further evolution, particularly that of his sensory and mental faculties; and the knowledge of this will furnish, begins already to furnish him, with mighty new criteria of conduct, the criteria of what will be advantageous and what adverse to this further evolution.

"The actual future changes of man can be foreseen for only a limited time to come. They will affect his stature, skull, facial parts, teeth, some of the internal organs, his arms, hands and feet; but the principal acquisitions will be, there is a strong probability, those of a higher organization, with higher effectiveness and endurance, of the brain and the sensory as well as the nervous system.

"The more important of the changes, particularly those of the brain, can not be realized easily. There are many obstacles and dangers ahead and the road of advance will be littered, as in the past and now, by the unfit.

"As to the more distant future of man, no legitimate deductions are possible."

THE INFLUENCE OF LEAD COMPOUNDS ON CELL DIVISION

SULFHYDRYL, which is made of one sulphur atom and one atom of hydrogen, is the stuff that makes possible the growth of plants and animals by the division of their cells. Since life can not continue, nor new organisms arise without cell division, this atom-pair may fairly be said to be the key-compound to life itself.

At the meeting of the American Philosophical Society Dr. Frederick S. Hammett explained the steps in his experimentation that have led to this conclusion. The first hint came from the claim that lead compounds retarded the growth of cancer cells. Since a cancer is only a mass of ordinary cells gone mad about dividing, it would appear that anything that stopped their abnormal career must be something that removed from them whatever gave them the impulse to divide.

Dr. Hammett grew plant roots in solutions of lead compounds, and found that though the cells could increase in size their rate of division was markedly reduced. In the region of most rapid growth lead precipitates appeared, which proved to be compounds of lead with the sulfhydryl group. In roots permitted to grow normally abundant sulfhydryl was found associated with the most actively dividing cells.

A further step in the evidence was obtained when sulfhydryl-containing compounds extracted from actively growing roots were applied to the tips of other roots. Under proper chemical conditions, these compounds caused acceleration of growth. Finally, synthetic compounds containing the same pair of atoms were similarly used and produced similar results, both in root tips and in the division rate of single-celled water animalcules.

The evidence thus seems to be fairly conclusive that this pair of atoms that attach themselves to a wide variety of other chemical compounds are really the "life of the party" in the most literal sense of the term.

MEDITERRANEAN FRUIT FLY

THE Mediterranean fruit-fly, whose appearance in Florida citrus orchards has created a major agricultural crisis in this country, is a most cosmopolitan pest, though this is its first invasion of the continental United States. It has, however, been a serious liability to Hawaiian horticulturists ever since 1910.

It has been known to science for about 100 years, according to workers of the U. S. Department of Agriculture. It first attracted attention in London, where oranges arriving from the Azores were found to be badly decayed and wormy. It was recorded as a pest in Spain in 1842, in Algeria in 1858, in Italy in 1863, in Sicily in 1878 and in Tunis in 1885. In 1889 it was first reported from South Africa. Western Australia became acquainted with it in 1897; eastern Australia a year later. At the turn of the century it was found near Paris, in New Zealand and in Brazil. During the next fifteen years it spread into Africa and reached Madagascar. The United States has escaped a visitation thus far partly by virtue of our good fortune of isolation, but mostly because of the unceasing vigilance of the inspectors of the Bureau of Entomology.

The insect is a fly, about the size and shape of an ordinary house-fly but differently marked. It is cleanly in its habits, living solely on plant juices and on the "honey-dew" secreted by certain other insects.

It is the fruit-fly's larva, or grub, that is the mischief-maker. The adult bores a hole in the skin of a fruit or vegetable and in this pocket deposits from one to six eggs. Sometimes several flies will lay their eggs in the same hole, accumulating as many as a hundred of the tiny white objects. Since a single fruit may be punctured in many places, the damage done is considerable.

On hatching, the larvae eat greedily and grow rapidly. At first hardly visible to the naked eye, they increase in size until the fruit is ruined. After resting for a time as pupae, the insects emerge full-grown and ready to repeat the cycle. The generation of a Mediterranean fruit-fly, from egg to adult, is a span of from about half a month to a little over a month, depending on the weather.

The weak point in the fly's life-cycle, at which it can be most successfully attacked, is its adult stage, especially the few days it spends flying about and feeding before it settles down to egg-laying. It is susceptible to poison dusts, such as calcium arsenate. One difficulty arises, however, in using such dusts against the fly on citrus fruits. For some obscure physiological reason citrus

fruits are hampered in their sugar-storing processes by arsenic dusts, and fruit so protected arouses complaint that it is not sweet enough.

Unless surveys now under way show the insect's distribution to be already too wide to make it practicable, the pest will be combated by the method used successfully a few years ago against the citrus canker in the same state—radical and ruthless destruction of every plant the fly can breed on, resulting in sheer race starvation. This method of protection against pests and diseases from abroad is practicable only where the infected area is not too great and where strict precautions can be maintained against new introductions. The defensive war against hoof and mouth disease in cattle has made the principle of the method familiar to the public.

Like almost all insects, the fly has its natural enemies. Four minute wasp-like insects that parasitize it have been introduced in Hawaii, and although they are not expected to wipe it out they are recognized as useful auxiliaries.

THE ORIGIN OF THE RECENT INFLUENZA EPIDEMIC

THE starting-point of the influenza epidemic which during the past winter swept from California across America and to Europe, where it has only just abated, was probably an island in the Pacific Ocean. This is only a guess, but fresh evidence in support of it has just been received by the U. S. Public Health Service in the official report of the Director General of Health of the Commonwealth of Australia.

The significant feature of the report is that influenza was epidemic in Australia and near-by islands at about the same time that we were having it on the Pacific Coast of this country. This points to a source of infection in some Pacific Island about equally accessible to Australia and California. The definite spot has not yet been located.

In the Society Islands an epidemic of influenza began in the middle of October. In the Cook Islands influenza broke out on November 17, just one week after the arrival of a mail boat from New Zealand. The occurrence of several cold, unpleasant days following fine weather was thought to have aggravated the condition there. The disease was of mild type, only about 300 or 400 people were affected and the epidemic was over by the end of November. In Tonga, another island near Australia, a mild influenza epidemic without any deaths commenced early in July and lasted through August and returned in November.

In the Fiji Islands influenza was widespread throughout the year and towards the close of the year was of an unusually severe type. In the British Solomon Islands an epidemic occurred during the last quarter of the year but was over by January. In Australia proper, the influenza appeared to abate in the eastern states by the end of November, with the onset of summer weather. However, the influenza wave in South Australia reached its maximum in the middle of December, just as it did in the United States. Influenza cases appeared in Hawaii in August, according to reports from the U. S. Army.

ITEMS

THE use of plates of gold, silver, copper and zinc to record slowly moving electrons, instead of the usual photographic plates, was described before the recent meeting in Washington of the American Physical Society. Dr. Percy H. Carr, of Cornell University, showed that when these electrons, moving at what are even slow speeds for them, strike the surface of some metals, they leave their mark. This effect is evident when the metal is exposed to certain metals. In studying the way in which electrons are bent in a magnetic field, Dr. Carr aimed them at a sheet of gold, for instance. Afterwards, the gold was held over hot mercury, and the vapor combined with the gold in the places that had not been struck by electrons. The lines then appeared dark against a gray background. Other metals were used. For these slow electrons the method is superior to photographic plates.

EXPERIMENTS carried out by Professor J. W. Crist and Professor Marie Dye at the Michigan State College showed that green asparagus, whether freshly cooked or canned, contained enough vitamin A to promote health and growth when fed daily to white rats. These animals are the ones regularly used to test the vitamin content of foods. When they were fed the blanched or white asparagus without any other source of vitamin A in their diet, they died as rapidly as on the control diet containing no asparagus and also no vitamin A. Professors Crist and Dye believe a relationship exists between vitamin A content and the development of chlorophyll, the green coloring matter of plants. Further experiments will be necessary to prove this theory, however.

THE vitamin A, B and C content of green, vine ripened, ethylene ripened and air ripened tomatoes has been investigated by Dr. P. Mabel Nelson, Margaret C. House and E. S. Haber at the Iowa Agricultural Experiment Station at Ames. They found no apparent difference in the vitamin B content of these various tomatoes. The vitamin A content was greater in the ripened fruit than in the green mature fruit, but was the same in the ripened tomatoes regardless of the method of ripening used. Green tomatoes, however, are relatively poor in vitamin C, the vitamin for which tomatoes are generally prescribed in the diet. Air ripened and ethylene ripened tomatoes were richer than the green tomatoes but did not have as high a vitamin C content as the vine ripened ones.

SERIOUS objections to the introduction of abaca, or Manila hemp, from the Philippine Islands into southern United States may be raised as the result of investigations of G. O. Ocfemia and M. R. Calinisan, of the College of Agriculture at Los Banos. Abaca is commonly, though not usually seriously, infested with the eel-worm, a microscopic worm one sixteenth to one twentieth of an inch long. This eel-worm is very common in the southern United States where abaca is now growing in a few isolated test gardens.