SCIENCE NEWS

Science Service, Washington, D. C.

THE KANSAS CITY MEETING

Press telegraphic reports sent by Watson Davis, Managing Editor, Science Service

THE NEW GEOMETRY

ALL straight lines are curved. Their two ends join in space to form enormous circles. Space is not "infinite" in the sense in which we are used to thinking of it. The universe is therefore a closed, not an open system, and its limits can be measured.

The new geometry, on which Einstein built and which in turn has been building anew on Einstein, is doing strange things to the ideas of the shapes of things which we learned as youngsters in high school, according to Professor James Pierpont, of Yale University, who addressed members of the American Association for the Advancement of Science meeting at Kansas City.

But though the old-fashioned straight line, which Euclid invented twenty-two hundred years ago to explain his geometrical ideas, must now go out of style, the new Einsteinian straight line, Professor Pierpont insisted, is straight in a real sense, straight as regards the actual world of things and not an imaginary space in which no matter or energy exists, for the new straight line actually measures the shortest distance between two points that can be obtained and measured in a universe full of suns and planets and masses of electricity, all pulling and pushing and hauling to warp space "out of shape."

And though its two ends do meet, thus making the Einsteininan straight line into what Euclid would have called a circle, the circle is so vast that any part of it measured on earth will still appear straight, even in the old-fashioned sense. Professor Pierpont gave its circumference as eighteen quintillions of miles, in round numbers.

A geometry that deals in such vast magnitudes as this, it was suggested, might appropriately demand a new name, for the older geometry meant literally "earth measurement" and was invented in the first place to help land surveyors. This world-measuring system might well be called "cosmometry."

The new geometry, although it first began to be talked about extensively in 1914, when Einstein propounded his theory, has roots that run back about a century. It began about 1823, when a Russian named Lobachevski and a Hungarian named Bolyai questioned the orthodox Euclidian assumption that a given line could have only one line drawn parallel to it through a given point. They were able to build consistent geometrical systems with this axiom left out, and later workers in Germany, notably Riemann, also tried their hands at making geometries that left out certain of the "self-evident" propositions of Euclid.

But these geometries were all like Euclid's in that they worked in a vacuum. Einstein worked out his system for the actual physical universe, for x "a space whose structure is in constant flux, changing with every displacement of gravitational or electric masses." Moreover, the old geometries had to depend entirely on arrays of formal logic for their demonstration, whereas the new gives the means of experimentally determining its own structure.

THE STELLAR GALAXY

THE earth and its sister planets are at least two thousand million years old, yet their destruction through the close approach of the sun to another star will not occur for about a quadrillion years.

Such was the prediction of Professor Frank R. Moulton, of the University of Chicago, who discussed our stellar galaxy, the largest organism whose evolution has ever been considered.

"Our galaxy consists of at least a thousand million suns," he said, "each one, like our own, averaging a million times the volume of the earth. These suns occupy a disc-like or watch-shaped region in space, whose thickness is the distance light travels in about 30,000 years, and light travels 186,000 miles per second. The longer diameter of the galaxy is about 200,000 light years.

"The stars of this galaxy move around among one another something like bees in a swarm. This does not mean that they dart quickly from one side to the other, for although our sun is moving at the rate of 400,000,000 miles per year, the distance between the stars are so vast that its relations to other suns have not changed appreciably in historical times.

"When one sun passes near another sun, any planets that they may have had are destroyed, and new ones begin to be developed from their disintegrated remains and materials which may be ejected from the suns themselves. Our earth and the seven other planets of the solar system had their birth when our sun last passed near another star, which we know from the distribution of radioactive materials in our rocks, was at least two thousand million years ago. Our present planets will be destroyed in some remote future when our sun again passes near another star. This catastrophe will probably not happen for hundreds or perhaps thousands of millions of years to come. We only know that on the average our sun, or any other star, will pass near another member of the galaxy once in about 1,000,000,000,000,000 (one quadrillion) years. This is in round numbers the average lifetime of a family of planets.

"Until recently many astronomers thought there was only vacant space beyond our galaxy. But now it is known that there are exterior galaxies, similar to our own in size and shape and number of suns. Only about a year ago Dr. Edwin P. Hubble at the Mt. Wilson Observatory determined the distance to an exterior galaxy which had heretofore been called the Andromeda nebula, and found it to be a million light years."

Professor Moulton showed a photograph which was taken with light that had been on its way a million years. "There are hundreds of thousands of similar

objects, which are probably more remote exterior galaxies,'' he stated. ''Just as sun passes sun within our own galaxy, so galaxies may at much longer intervals of time pass near one another. The spectroscope shows that their relative velocities are generally at the rate of thousands of millions of miles per year, and the high velocity determined by Dr. Dayton C. Miller in his ether drift experiments may indeed be in large part the motion of our entire galaxy through the ether. ''If a galaxy were left alone,'' Professor Moulton said, ''it would undergo a long dynamical evolution and would tend toward a state in which the stars would be symmetrically arranged in concentric layers. Our galaxy has not arrived at that state, for it now consists of great streams and clouds of stars, somewhat irregularly distributed. This does not mean that it was created recently, in the astronomical sense of the term, but that it has encountered in recent astronomical time another galaxy which has spun it out into a vast disc-like mass, which yet contains numerous irregularities.

''About half of the thousand million stars in our own galaxy are in size and constitution and temperature essentially similar to our own sun. It is not improbable—it is, in fact, probable—that a majority of them have planets circulating about them as our earth revolves about the sun. It may be that a fraction of them—perhaps in all hundreds of millions—are in a condition comparable to that of the earth, and that they support life. Some of them are probably in the state that our earth was in five hundred millions of years ago, and some of them are in the state that our earth will be in five hundred millions of years hence. When we reflect on the changes that have taken place on the earth in a much shorter period of time, and particularly on the changes in human beings, our imagination is staggered by the possibilities.

''The impressive thing to the astronomer is not the magnitude of the galaxy nor the long periods of time during which stars exist, nor the tremendous forces of nature, but the most impressive thing to him is that all this vast universe which we have been able to explore is found to be orderly. The orderliness of the universe is the foundation on which science is built. It is the thing that enables us to understand the present, to look back over the past, and to penetrate the remote future. This discovery more than compensates us for the relatively unimportant position that man occupies physically.''

FITTER FAMILIES AND PSYCHOLOGICAL TESTS

Is your family ''certified?'' This is the question that fond and careful parents may soon ask of suitors for the hands of their daughters.

For there is a movement underway under the auspices of the Eugenics Society of the United States of America which will soon allow families of satisfactory health, history and heredity to obtain credentials which distinguish them from those who can not come up to a high eugenic level.

Dr. Florence Brown Sherbon, professor of child care and director of bureau of child research, University of Kansas, explained this project to the American Association for the Advancement of Science.

''Fitter Family'' competitions are now being put on at state fairs and exhibitions and staffs of professional physicians, geneticists, psychologists and others examine these families and score them in a manner somewhat comparable to the way in which stock and other fair exhibits are judged.

The movement to certify families and individuals from a eugenic and health standpoint originated with the first competition held by the Kansas Free Fair at Topeka six years ago and this year fitter family competitions have been held at seven large expositions and state fairs. In Kansas the governor gives a silver trophy cup to the blue ribbon family and individuals who measure up to the high standards get a medal. A plan is also being evolved which allows non-competitive examinations as well. Contestants are scored upon the following data: Family history and heredity, psychological measurements, psychiatric tests, physical and medical condition, condition of eyes, ears, nose and throat, condition of teeth, laboratory tests, health habits.

''The object of the fitter family movement is the stimulation of a feeling of family and racial consciousness and responsibility,'' Dr. Sherbon explained. ''We believe that eventually there will be created a sentiment for certified families as distinguished from those who can not or do not obtain evidence of being able to pass the rather rigid tests of the examinations.''

Not only have parents and children been subject to test, but engaged couples and single individuals of marriageable age have used fitter family competitions to assure themselves that they are worthy of becoming parents of the next generation.

There are geniuses and morons among chimpanzees just as there are among human beings, Dr. Edgar James Swift, head of the department of psychology, Washington University, St. Louis, told the psychologists in contending that the idea that apes can not show volition or will must be revised.

Recent experiments, made by the famous German psychologist, Dr. Wolfgang Kohler, show that a few apes behave as man behaves when, as we say, he wills to do something. Kohler's chimpanzees piled boxes upon one another three or four stories high to reach food, got a hidden ladder seen a short time before and performed other acts that were certainly not instinctive. Dr. Swift, defining will as the control of the activities for the attainment of desired ends or avoidance of undesirable results, explained that its essential factors seem to be memory, the ability to hold two or more ideas in mind simultaneously, to connect them in thought and to make some sort of comparison of their utilities. The exceptional apes, like most men, exhibited these qualities.

Mental tests applied to high-school freshmen serve to indicate what sort of grades the student will make in abstract subjects, but in subjects dealing principally with mechanical actions and material things they do not predict so well, Professor J. C. Peterson, of the Kansas State Agricultural College, reported.

A test for personality was described at the psychological sessions by Professor John J. B. Morgan, of Northwestern University. It consists in showing the person being tested series of ten symmetrical ink blots, some with black alone and others with red, green and yellow intermingled with the black and asking the simple question: "What might that be?" His reaction to these figures classes the subject as conventional or of a certain personality type.

SCIENCE AND AGRICULTURE

WHAT science has done and can do through agriculture to solve the great problem of bread for the coming crowded generations occupied a considerable share of the association's attention. President F. D. Farrell, of Kansas State Agricultural College, told of the romance of the conquest of the plains of the West.

"During the past eighty years this country has witnessed a transformation which, in kind and magnitude, probably has no equal in history," President Farrell told his hearers. "It is the transformation of an area of hundreds of thousands of square miles of land from what once was universally regarded as a desert to what is now one of the most important areas of food production and of population in the Western Hemisphere."

This transformation of the plains, which even the early explorers who actually saw them regarded as an impassable barrier to migration, was largely the result of scientifically designed agricultural machinery, permitting farming on a vast scale, and partly of the introduction of new crops suited to the region, found in foreign lands by agricultural explorers.

Dr. W. A. Orton, of the Tropical Plant Research Foundation, discussed the botanical problems of American tropical agriculture. The greatest contributions of the tropics in the future, he said, will be of sugar, oils and fruits. The principal industry of the tropics will probably continue to be agriculture, but for its fullest development much scientific work will have to be done which is now in its very earliest beginnings. As an example, Dr. Orton pointed out that such important crops as rubber, coffee and cacao, and most of the tropical fruits, are still propagated from seeds, whereas virtually all the important tree crops of the temperate countries have been for years, sometimes for centuries, carried on as choice grafted stocks and not left to the uncertain chances of seedling growth. Another problem pointed out by Dr. Orton is the apparently paradoxical lack of fresh vegetables on the tropical menu. Whatever may be the cause of this deficiency, he said, medical workers find that part of the lassitude and inefficiency of native laborers is apparently due to a lack of necessary vegetable vitamines.

That the rôle of the tropics in supplying the staple foods of the future will be at most a secondary one, is the opinion of Dr. E. D. Ball, former assistant secretary of agriculture and now Florida state entomologist. He agrees with Dr. Orton that the amounts of accessory agricultural products from the tropics will increase greatly, but believes that the production of breadstuffs and meat will continue to be mainly the affair of the lands that now produce them. He holds therefore to a program of intensification of the methods whereby the "Great American Desert" was conquered, as described by President Farrell.

AWARD OF THE ASSOCIATION PRIZE TO PROFESSOR MILLER

THE award of the $1,000 prize of the American Association for the Advancement of Science to Dr. Dayton C. Miller, Case School of Applied Science, Cleveland, is a recognition of patience, perseverance and service to science as well as an acknowledgment that the results of Dr. Miller's work may require serious changes in the prevalent idea of the way the universe is put together.

The observations made in the course of the ether drift experiments during 1925 consisted of over 100,000 separate readings, a procedure that required Dr. Miller to walk, in the dark, in a small circle, for a total distance of 100 miles, while making at very frequent intervals the most delicate measurements possible.

Dr. Miller said in his prize paper: "I think I am not egotistical, but am merely stating a fact when it is remarked that the ether drift observations are the most trying and fatiguing, as regards physical, mental and nervous strain, of any scientific work with which I am acquainted."

That the results reported in the paper that the judges selected as a notable contribution among the thousand papers of the Kansas City meeting will have a far-reaching effect on the foundations of physics and astronomy can not be doubted. Dr. Miller repeated the experiment that is fundamental to the Einstein theory and found that the accepted interpretation of the famous Michelson-Morley experiment of 1887 must be reversed. There is an ether drift, the earth does carry along with it through space some of the ether, whereas the Einstein theory was built upon the assumption and the results of the 1887 experiment that showed no such drift.

Either the Einstein theory must be modified to meet the new facts, or, if such modification is impossible, it must be scrapped. When Dr. Miller announced preliminary results at the April meeting of the National Academy of Sciences, Einstein acknowledged that the data if confirmed would be a serious blow to his theory in its present mathematical formulation. Physicists believe, however, that results of Dr. Miller are possible of reconciliation with a theory of relativity worked out upon the new assumptions and facts.

That the earth with the solar system is speeding through space at the rate of 125 miles a second or more, ten times the speed previously suspected, was also shown in Dr. Miller's experiments. Professor F. R. Moulton, of the University of Chicago, during the meeting explained that this high velocity may mean in part that our own stellar galaxy or universe is rushing through the ether. If so, the astronomers may be revising some of their ideas of the composition of the universe.

Dr. Miller first began his experiments on ether drift thirty years ago. Soon he will again journey to Mount Wilson to repeat the experiments. Such is the method of science; the rewards are an inspiration to mankind.