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SOME PAPERS READ AT THE DENVER MEETING OF THE AMERICAN ASSOCIATION AND ASSOCIATED SOCIETIES

PROFESSOR NEVIL VINCENT SIDGWICK, of the University of Oxford, in the Maiben Lecture before the association showed that out of the possible billion-degree range of temperature which can exist from the coldest depths of interstellar space to the centers of flaming stars, chemical molecules—and therefore life—can exist only between 6,000 degrees absolute, temperatures like those of the surface of the sun, and the temperature of liquid air at 100 degrees above absolute zero. Actually 6,000 degree temperatures are twice as hot as electric arcs, made by man, and far above those temperatures that can support life. Greatest temperature restriction of life is the necessity that organisms have to have some liquid to act as a lubricant. Water is that lubricant, so life can not exist where the temperature is consistently below its freezing point or hotter than its boiling point, a range of 100 degrees Centigrade. Other restrictions on life are that it must occur on the surfaces of planets if radiant energy is to be utilized. Also it will have to occur on a planet of just the right size. If the planet is too small, like the moon, all its atmosphere will fly away into space; if the planet is too heavy it keeps too much of its atmosphere. The thick clouds prevent the planet from getting the radiant energy from its parent star and it is too cold to permit life. Of the planets of the solar system Professor Sidgwick pointed out that "The moon is much too small for life to be possible; Mercury is probably too small and too hot; Jupiter and the outer planets too cold. The only places in the solar system where life is possible seem to be the earth and our two neighbors, Mars and Venus."

THAT the universe may not be uniform with regard to the fundamental building blocks of matter is hinted in the report on a recently detected particle in cosmic rays, presented by Dr. J. C. Street, of Harvard University. From beyond the Milky Way are imported as part of the cosmic rays penetrating particles not found on earth. They are responsible for the showers in the cosmic rays. The new particle is five to fifty times heavier than the familiar unit of electricity, called the electron, but it carries the same electrical charge.

MARS continues to be a desert, defying the largest telescopes and the most delicate instruments to find any trace of water vapor on the rust-red surface of its middle part, according to a report given by Drs. Walter S. Adams and Theodore Dunham, Jr., of the Mount Wilson Observatory. Last April Mars was in an especially favorable position for observation. The hundred-inch telescope was turned on the planet and it was armed with a nine-foot spectral grating to split the light reflected from its surface into the rainbow band of the spectrum. Dark absorption lines appeared in the spectrum, part of them due to the "soaking up" of the planet's light by water vapor in the atmosphere of the earth. Particularly critical study was made to see if any of this light absorption took place in water vapor in the atmosphere of Mars itself, before the light left on its long trip earthward. But of this the astronomers reported they could find "no evidence whatever." There remain still the polar caps of Mars—white patches on either end of the planet that grow and wane with changing seasons. But the position of Mars last April was such that while good observations could be made on the middle of its disk they could not be satisfactorily made on the polar regions. Dr. Paul W. Merrill, also of the Mount Wilson Observatory, reported on the use of sodium vapor, drifting as separated molecules in interstellar space, as a kind of natural ray filter for the light of distant stars and galaxies. Advantage is taken of this sodium vapor absorption of light in forming estimates of the nature, distance and motions of heavenly objects.

THERE is little use in looking for masses of iron buried beneath the floors of great meteor craters like the one in Arizona, in the opinion of John D. Boon and Claude C. Albritton, Jr., who presented a joint paper. These great gaping holes were probably made by projectiles from the sky, but the projectiles exploded shortly after they hit, scattering their fragments far and wide. Wartime experience shows what to expect from high-velocity projectiles, even if they contain no explosive charge. Bullets at a velocity of half a mile a second explode when they hit anything solid enough, even at a glancing angle. And large meteorites fall at speeds approaching a hundred times that of a bullet. Mr. Boon stated that: "When a giant meteorite hits it penetrates the earth for a short distance, like an airgun bullet penetrating a piece of cheese; then it explodes." Pieces of meteoric iron have been found as far as six miles from the craters where the parent body struck and burst.

CRATERS on the moon, an astronomical and geological puzzle for many years, are due to violent explosions of meteorites that plunged into the airless surface of the earth's satellite with great energy. This theory of the lunar pockmarks was presented to the Society for Research on Meteorites by Dr. L. J. Spencer of London. Only the hundred-mile blanket of air around the earth protects it from undue damage by meteorites that still bombard it. But Dr. Spencer believes that there must have been an earlier period during which these stray masses of the solar system were much more numerous.

MANY of the chunks of iron that fall flaming and roaring from the sky as meteorites are pieces of planets that met destruction only 100 million years ago, or even less, according to an announcement made at the meeting by Dr. William D. Urry, of the Massachusetts Institute of Technology. Dr. Urry has for some years been conducting research on the ages of terrestrial minerals,

using a method worked out by Professor F. A. Paneth, of Imperial College, London, and himself. Now for the first time he has applied this method to substances of non-earthly origin—pieces of iron chemically very similar to stainless steel, that are found in all collections of meteorites. The newest of the 25 iron meteorites thus far examined are these bits of "recently" smashed planets 100 million years old; the oldest is 2,900 million years old. The greatest number of the specimens are more than 1,000 million years old, but none exceeds the estimated age of the earth itself, between 2,000 and 3,000 million years.

HURD C. WILLETT, of the Daniel Guggenheim Aeronautical Laboratory of the Massachusetts Institute of Technology, took the "Almanac" type of forecast out of the realm of longe range weather prediction. Accurate, short-range forecasts predicting local conditions can only be obtained when a full knowledge of widely distributed meteorological conditions is available both from ground stations and from aloft. This full knowledge is necessary, Mr. Willett pointed out, because the specific air masses are continually forming and disintegrating. But, he added, "It seems rather improbable that the detailed development of [air mass] systems yet unborn can ever be forecast." Long range forecasting, on the contrary, is based on the known fact that frequently pronounced weather abnormalities may persist over considerable areas for weeks, months and even years. The approach to the problem has been by two methods: the statistical method, using past records of weather and correlating them with an almost endless variety of variables; and the synoptic method, using synoptic charts or weather maps. The weakness of the statistical methods lies in the fact that they are empirical shortcuts which have no concern at all with physical causes of the weather. Studying weather maps, carefully prepared daily, however, furnishes a current picture of general circulation of weather over large areas. By studying this general circulation pattern it should be possible to see the influence of the pattern on contemporary weather conditions. A second aim would be to detect, if possible, empirical clues as to the future state of the weather circulation from its current state and tendencies.

P. L. HIBBARD, of the University of California, told of his investigations of soil zinc in connection with the plant diseases variously known as rosette, little-leaf and die-back. There is very little zinc in ordinary soils, between one and ten parts per million, as determined by extraction with weak acetic acid. The midpoint of this range seems to be what is needed for plant health. At less than five parts of zinc per million of soil, it may become necessary to add zinc to the fertilizer formula.

PROFESSOR M. A. RAINES, of Howard University, reported that plants have been grown successfully on sheets of glass cloth, woven out of glass fiber, and impregnated with inorganic silica jelly. He has been working for some years on a method for growing plants in what he calls "wick culture." The seeds are planted at the top edges of sloping sheets of glass, backed by an absorbent material which brings them water and fertilizer salts. This arrangement permits close study of root growth. While he was using paper or cloth as the wick material he had trouble at times with bacterial growth. So he sought an inorganic wick which bacteria would not find so tempting. The arrangement he reported seems to constitute a successful answer to his problem.

DR. GEORGE M. PETERSON, of the University of New Mexico, reported that the brain center that determines right- and left-handedness has been located through experiments on rats. It is a quite small area in the cerebral cortex, well up toward the front of the brain and a little to one side, described by Dr. Peterson as "a small region in the contralateral frontal lobe." Dr. Peterson located it by operating surgically on the brains of a number of ambidextrous rats. Finally he found a spot which left the rats right- or left-handed when it was removed, according as it was taken from left or right side of the brain—for control centers in the brain are on the side opposite to the body parts they serve.

DEATH is a crystalline pattern permanently set. Life is associated with the formation and destruction of crystals. The living organism is crystalline in nature, just like the material of the non-living world. Evolution began with the joining of basic elements to form very simple compounds long before life was born on earth. These new ideas of life, death and evolution were presented to the association by Dr. George A. Baitsell, of Yale University, as the result of recent x-ray studies which reveal the crystalline structure of living matter. The very processes of life, according to Dr. Baitsell, are associated with the breaking down and the reforming of cellular structure, crystalline in nature. When the living cell loses this ability to form and reform the crystals, it is dead. Look into the chromosomes, those bearers of heredity that pass life on from one generation to another, and there also crystals will be found at the very citadel of our germ cells. Just as the chemist knows that the invisible molecule made up of atoms is the smallest possible unit of any non-living substance, so Dr. Baitsell views the cell of the biologist as the analogous indivisible unit of life. Like the inorganic molecule it is essentially crystalline in nature. Each cell is a living crystal, a complete functional unit of life with a precise pattern characteristic of its particular tissue and species. To Dr. Baitsell the evidence points conclusively to a principle of uniformity in all nature, which has hitherto been lacking. The biologist has regarded the world of life as being unique in its structural characteristics, but the x-ray shows crystals in everything and basic uniformity everywhere.

RATS stuff themselves and grow fat when they are given daily doses of the new, slow-action protamine insulin, Drs. Eaton M. MacKay and Richard H. Barnes, of the Scripps Metabolic Clinic, La Jolla, Calif., reported to the meeting of the Society for Experimental Biology and Medicine. The male rats got so fat that they had difficulty in turning over when placed on their backs. The female rats

got fatter than the males under the influence of the same dose of protamine insulin. In this, the rats resembled their human counterparts. Dr. MacKay pointed out that obesity occurs more often and is more severe among women than men. This is the first time, with one exception, that obesity has been produced in animals in order to have a means of throwing light on the condition in human beings. The exception was an experiment of Professor P. E. Smith, of Columbia University, who showed that chemical injury to the stalk of the pituitary gland was followed by remarkable obesity in rats. The obesity described is like that which occurs in men and women who get too fat from overeating. The rats got fat from overeating under the stimulation of the protamine insulin. Ordinary insulin does not make rats put on weight. When the protamine insulin injections were stopped, the rats stopped eating so much. The studies were made in the hope of learning more about why some persons get too fat, a subject on which there is little knowledge. "Most obesity among human beings," Dr. MacKay said, "appears to be of a simple type and associated with a love for food which may be similar to the desire of the chronic drunk for alcoholic beverages. When these patients are fasted they quickly lose weight." Fat people when fasting develop an acidosis called ketosis which is greater than the similar condition that develops in normal-weight persons when fasting. The fat rats were like their overweight human counterparts in this respect also.

THERE is an old proverb credited to the Chinese: "You must not touch your mouth to any part of your body except your elbow." The excellence of this advice was brought out strongly in studies reported by Dr. Severance Burrage, of the University of Colorado School of Medicine. Dr. Burrage has made fingerprints on plates of nutrient jelly and studied the colonies of germs that spring up after them. He finds it a most effective way of sowing bacteria broadcast. There is a decidedly practical aspect to the studies. Public regulations make much of washing and sterilizing dishes and glasses used in public eating and drinking establishments. Then fingers pick up these clean utensils—and plant germs on them. Dr. Burrage pointed out that "The habit of putting the fingers to the nose and mouth is universally common. The diseases transmitted by mouth secretions are numerous, including influenza, pneumonia, common colds, measles, meningitis, trench mouth, scarlet fever, whooping cough, tuberculosis and diphtheria. With the exception of the last two, morbidity and mortality statistics show no decrease in this group of respiratory infections. Microbial finger printing, I believe is largely responsible for this. . . . While it is a difficult problem to teach every one to cure this finger-mouthing and finger-printing habit, it is my belief that a great advance could be made by instructing employees in food handling establishments on this point; teaching them the proper ways of handling foods and utensils, as well as showing them the dangers of the improper ways."

AN important factor contributing to the decline of tuberculosis in the United States during the last quarter century has been the decrease in the disease in cattle, according to Dr. George W. Stiles, Jr., of the U. S. Bureau of Animal Industry. This is particularly true in the case of glandular, bone and abdominal tuberculosis in children. He stated that "In the continental United States the death rate from all forms of tuberculosis decreased from 201.9 per 100,000 population in 1900 to 52.5 in 1935. During the first 16 years of this period the rate of decrease was approximately 50 per 100,000; however, during the latter half of this period the rate of decrease was nearly twice as rapid, or from 147.1 to 52.5 per 100,000 population. It was during this latter period that tuberculosis eradication in cattle began in this country." The reason for this, of course, is that children and adults can acquire tuberculosis from eating the meat or butter or cheese or drinking the milk of tuberculosis infected cattle, even though the germ of tuberculosis in cattle is somewhat different from the human tubercle bacillus. Hogs and birds or fowl also have their particular kinds of tuberculosis germs, and these may cause disease in man, but are not nearly so important a cause of human tuberculosis as the bovine infection.

SNAKES, fish, frogs, turtles, alligators and iguanas get tuberculosis as well as man and other warm-blooded animals, according to a report read by Dr. Joseph D. Aronson, of the University of Pennsylvania and the U. S. Office of Indian Affairs. The bacillus that causes the disease in the cold-blooded animals, however, apparently can not cause disease in warm-blooded animals. Neither can it be made into a vaccine to protect warm-blooded animals from their own type of tuberculosis.

LEPROSY, a plague of the ages, is still one of medicine's greatest mysteries. But Dr. G. W. McCoy, medical director of the U. S. Public Health Service, pronounced it "not one of our major public health questions," as it is in other parts of the world. In most parts of the United States there is no need for the isolation of cases, in Dr. McCoy's opinion, except for charity reasons or because of the esthetic sensibilities of the community. He believes that nearly all cases of leprosy originate only in Florida, Louisiana and Texas. But because the period between infection and development of the disease is ordinarily from five to ten years, and sometimes twenty years, the tracing of the source of infection is difficult. Only about a thousand cases of leprosy exist in the United States, half of which are known. Dr. Ralph Hopkins, of Tulane University, and dermatologist at the Carville National Leprosarium, presented evidence of a hereditary tendency to leprosy, and maintained that this justified segregation. Hope that scientists will soon be able to transmit leprosy to some animal, in order to study the disease experimentally, was expressed by Dr. Malcolm H. Soule, of the University of Michigan, who is convinced that Hansen's bacillus, first charged in 1874 with being the cause, has been grown artificially. Dr. H. E. Hasseltine, of the U. S. Public Health Service, expressed the hope that science will find not only an animal that can be consistently infected experimentally, but the exact way the disease is transmitted from person to person, and a specific curative drug as effective as quinine for malaria and arsphenamine for syphilis.