SCIENCE NEWS

Science Service, Washington, D. C.

PAPERS READ BEFORE THE EIGHTH AMERICAN SCIENTIFIC CONGRESS

ASTRONOMY is improving its yardstick of the universe in order to make it a more accurate measure of vast astronomical distances. The improvement may alter some accepted astronomical measurements by as much as 30 per cent. This was the news reported to the Eighth American Scientific Congress, meeting in Washington on May 15, by Dr. Harlow Shapley, director of Harvard College Observatory, the man who first succeeded in providing astronomy with this valuable measuring technique. Essentially the method depends on the so-called "period-luminosity relationship" of Cepheid variable stars, a certain type of star which fluctuates in brightness and derives its name from the constellation in which this type was first found. The relationship first found during a study of the Small Magellanic Cloud, by Miss Henrietta Leavitt, of the Harvard Observatory, in 1912, is simple—the period in which a Cepheid variable dims and brightens is related directly to its intrinsic brightness. Dr. Shapley later found this was true of all Cepheid variables. Thus by studying the period of such a star, astronomers can learn its absolute brightness and by comparing this with its apparent brightness, they can measure its distance. The yardstick has been of tremendous value, for once an astronomer has found a Cepheid variable in a far-off galaxy, he can learn its distance and thus that of the entire galaxy. There are various factors which affect the apparent brightness of a star as observed from this earth, however, which, if not allowed for, render measurements inaccurate. Dr. Shapley has just finished a survey of some 300 Cepheid variables in the Small Magellanic Cloud to learn what these factors are and how to allow for them. One of the important factors, he found, is that the light of a star is absorbed as it travels through this cloud to earth and thus may appear as much as half a magnitude less bright than it actually is. This was the first study of absorption ever made in an outside universe, although astronomers have made many studies of absorption in our own Milky Way. On an average, Dr. Shapley found, a star's light loses about a quarter of a magnitude in the cloud, but, of course, each star must be measured individually. The thickness of a galaxy also affects a star's light (depending on whether it is on the near or far side) and a phenomenon known as "doubling" resulting from two stars in the same line of sight, also affects these observations. Dr. Shapley estimated that because of this absorption and remaining uncertainties in the period-luminosity relation for the longest period Cepheids, the distances of some galaxies may be incorrect by as much as 30 per cent. Relative distances will not be altered appreciably, however; nor do these studies require any major change in the accepted distances of the Magellanic Clouds. He also called attention to the need for more study of the relations between period and luminosity for Cepheids of very short or very long periods, as well as the need for more dependable magnitude standards in the southern sky where many important studies of external galaxies are being made. To-day's accepted magnitude standards have been established in the northern sky and comparisons of these southern stars involve the risk of a certain amount of error. Dr. Shapley's discussion of this topic was most appropriate for the American Scientific Congress, for the plates from which they were made were taken by Harvard in Peru. He also showed exceptionally fine photographs of a solar eclipse taken in Peru in 1936.

THE electric shock treatment is recommended in certain cases when death comes suddenly following an anesthetic, after an electric shock, or in the heart disease known as coronary occlusion. Dr. Carl J. Wiggers, of the Medical School of Western Reserve University, reported the advantages of his method of restoring the heart beat over drugs such as quinidine and procaine and over the combination of a single electric shock with massage of the heart to start it beating. In the type of cases he investigated death comes suddenly because of a condition known medically as ventricular fibrillation. The French name for it, insanity of the heart, describes it very aptly. Ordinarily the many muscle fibers of the heart all contract together in regular rhythm to pump the blood out into the arteries. In fibrillation, the muscle fibers act as individual units. The result is a useless twittering and quivering instead of a strong contraction. When the heart gets the jitters this way, it fails to pump blood out to the rest of the body and death follows swiftly. Strong counter-shock of electricity has been given dogs to stop the useless twittering and get the heart back to its normal rhythmic beating. To achieve the same results in a man, however, the doctor would have to use a current of from 27 to 30 amperes at 2,000 to 3,000 volts. This would be dangerous both to the doctor and to the patient. Weaker currents can be used, and the heart's fatal twittering can be more certainly abolished, if a series of three or four shocks is given at intervals of about one or two seconds, instead of one strong shock.

MAKING food substances (starch and fat) without chlorophyll and in the dark, rated as a biological impossibility by all accepted standards, is a regular performance of a one-celled water organism known scientifically as *Chilomonas paramecium*. Not only that, but Chilomonas can make food, grow and reproduce in a solution containing only inorganic materials, according to Professor S. O. Mast, of the Johns Hopkins University. In Professor Mast's experiments, single individuals of this microscopic aquatic species were isolated and kept in bacteria-free drops of water in hollowed microscope slides. Rate of growth was determined by the rapidity of reproduction by division. Starch grains and oil droplets could be seen through the transparent body substance of the tiny creatures. Chilomonas can form food in light as well as in darkness, but it was found that starch accumulated in its body more rapidly when it did its work in the dark. It can use organic substances if they are present, but it can

get along perfectly well with only inorganic salts and carbon dioxide. Increasing the amount of carbon dioxide in the atmosphere in contact with their tiny watery world enables the organisms to produce more food, and up to a certain point also to divide more rapidly. At the highest carbon dioxide concentrations reproduction stopped. Non-reproducing Chilomonas individuals, however, were found to be more heavily stocked with starch than the others. Chilomonas belongs to the primitive group of organisms known as flagellates, which occupy a position near the bottom of the evolutionary ladder. Botanists and zoologists have sometimes disputed whether they are really plants or animals. They have been known to science for a long time, for they are extremely common. But until now the ability of this animal-like species to do a plant's work and make food out of inorganic substances—and without the supposedly necessary tool, chlorophyll, at that—has not been suspected.

RETURN of rubber production to its native home, the tropical lowlands of the Americas, was advocated by Loren G. Polhamus, of the U. S. Department of Agriculture. Not only would the development of rubber-growing in the warm lands of the New World render this hemisphere more nearly independent industrially of the remote and war-threatened East Indies, but it would be good for the land itself and the people who live thereon. Regions suitable for the cultivation of rubber have heavy rainfall, which endangers the land through erosion if the forests are cleared away and large-scale field crops introduced. To protect the soil, and at the same time to get something commercially valuable out of it, the best things to cultivate are tree crops. Rubber cultivation does not necessarily have to be conducted on huge holdings by the factory-like methods of the great East Indian plantations, Mr. Polhamus pointed out: Many factors favor production of rubber by small holders who are able to take advantage of the use of intercrops which do not interfere with the growth of the rubber tree but which may help to produce a subsistence for the grower. Large expenditures for equipment are not necessary and the small holder need not have the labor difficulties faced by large corporations. The labor of his own family can be used before noon for tapping rubber and after noon for production of food crops. The Hevea rubber tree now grown almost exclusively on Dutch and British plantations in the East Indies is a native of tropical America, so that there is no question of its adaptability to New World conditions. It is exposed to plant diseases here, but resistant varieties have been originated and further improvements, both in disease resistance and latex yield, are now being worked on by plant breeders. The Hevea rubber tree need not be the sole dependence of American planters, either. There is another species, the Castilla rubber tree, that thrives better in the drier, cooler uplands, and it might prove to be the foundation of a rubber-growing industry for the Central American plateau country.

THAT rapid development of agriculture and cattle-raising is going on in the great interior state of Minas Gerais in Brazil, was reported to the congress by A. O. Rhoad, of the U. S. Department of Agriculture. Although it lies within the torrid zone, the high plateau country of Minas Gerais has a temperate climate due to its altitude, and since railroad and highway development have made it more accessible, settlers have been moving in rather rapidly. The central plateau has always been predominantly grassland. Originally, about 14 per cent. of the area was covered with open forest, but this is being rapidly cut away. Reforestation is not being consistently practised. Large numbers of eucalyptus trees have been planted, but these are intended primarily for fuel and not for soil conservation.

STEPS taken by the United States to save its western rangelands were described by Richard H. Rutledge, director of grazing service of the Department of the Interior, for the benefit of his South American colleagues. Mr. Rutledge told of over-grazing under pressure of World War and post-war needs, with drought and dust storms that followed. Now, with the danger well realized, federal, state and private agencies are cooperating to conserve the soil, restrain over-grazing, re-grow the lost grass cover, and reforest denuded areas that are capable of growing trees.

A LAND where conservation means just one thing—water conservation—was described in an address by Harold Conkling, deputy state engineer of California. The land is coastal Peru, where there is no rain to erode soil, no forests to preserve, no range problem. The one big job is to find water where there is arable land, and then get the water on the land. Ironically, the four largest rivers that cross Peru's narrow coastal plain must forever waste their water into the ocean, for there is no land worth irrigating near them. Also, it is impracticable to build storage reservoirs in the mountains. Reservoirs are natural ones, consisting of great masses of loose soil and gravel in the valleys, which get filled up with water, sponge-fashion, every year. The water is brought up by pumping from wells between 50 and 200 feet deep. A promising new project, fostered by the Peruvian Government, has in view the diversion of flood waters, now almost entirely wasted.

LOAD the land less heavily. Do not demand such large cash returns from it. Reduce the acreage of plowland, and reduce the intensiveness of cultivation. These are among the steps necessary in treatment of land if civilization is to survive, according to Professor Paul Sears, of Oberlin College. So long as landholders and tax assessors demand the largest possible cash returns from the land, so long will the land thus burdened rebel by losing fertility and yielding to gullying or wind erosion. Modern science has been applied chiefly to elaboration of finished goods to raw materials. It needs also to be applied to the conservation of energy and materials, and to distribution. No sound program of land use and management is possible except on this basis. Wise planning for use-for-survival, rather than misuse-for-profit, can best be accomplished under a decentralized system of control, in Professor Sears's opinion. Regional community control, he feels, will be more flexible and better informed as to the needs and possibilities of the land. The emphasis in such com-

munities must inevitably be less on profit and more on design.

POLITICAL and military disturbances spreading from the Old World are not the only kinds of shocks against which inter-American preparedness is desirable. Captain N. H. Heck, seismologist of the U. S. Coast and Geodetic Survey, urged a wider cooperative study of earthquakes upon the congress, both for the sake of science in itself and for the practical ends of the protection of cities, canals and other works of man against wrecking wrenches when the earth moves. The long line of mountains extending from Bering Strait to Cape Horn, with sharp drops to great depths just off the Pacific coast, constitutes one of the principal earthquake regions of the globe, Captain Heck pointed out. There are also more limited regions of pronounced seismic activity on the Atlantic sides of both continents and in the interior. For the study of these, North America is now fairly well organized, and the development of a similar web of seismological observatories in Central and South America is regarded as highly desirable.

DR. PEDRO I. AGUERREVERE, of the Venezuelan Geological Service, reported that Venezuela may be the next great oil boom land. What it can do to feed the world's ever-increasing demand for petroleum products will depend in large part not on the development of the oil wells themselves but on what can be done to get the oil shipped. Oil can be shipped out of most important oil fields in Venezuela only as fast as tankers can take it away. At present, a sand bar blocks navigation except at high tide, when just enough shallow-draft tank ships to carry away 500,000 barrels a day can make their way into the harbor. The Venezuelan Government has plans for dredging a deeper channel under consideration, and when this channel is once ready ships will be able to come and go freely, without waiting for the tide. But until that time there is no use in sinking new wells, to produce oil faster than it can be taken to sea. Venezuela has another field, to the west of the one now producing most of the oil in the country. Pipe lines, not yet fully developed, can carry the oil to unrestricted deep-water harbors. Again, transportation is the bottle-neck, but this time it lies in the need for more pipe lines. Nobody knows how much oil still lies undiscovered and untested beneath the soil of Venezuela, but undoubtedly the petroleum reserves of South America are vast. And the known oil fields are within low-cost reach of the sea.

USES of both "practical" and "pure" scientific value have been found for plant roots and other tissue cultures, grown detached from the original parent stock and kept going for long periods in nutrient fluids. Dr. Philip R. White, of the Rockefeller Institute for Medical Research at Princeton, N. J., told the Congress about some of these new uses. One, of considerable immediate importance, is the employment of excised roots as living culture media for mosaic diseases of plants. One such study has already shown that the disease virus tends to concentrate in the middle part of the root fragment, away from both tip and basal end. It has also shown that age rather than amount of root tissue apparently determines the degree of activity of the virus. In his own experiments, Dr. White reported that he had learned some valuable facts about the nutritional requirements of roots, especially about their use of mineral salts and vitamins. Thiamin, one member of the vitamin B complex, is necessary for root growth, but in exceedingly minute quantities. A solution containing one part of thiamin in a million millions will suffice, under the conditions of his experiment.

VAMPIRE bats have been convicted as carriers of a dangerous form of rabies causing paralysis in livestock, in researches reported by Drs. Juan Iturbe and P. Gallo, of Venezuela. The affected animals usually lose the use of their hind legs; only in two or three per cent. of the cases are the front legs paralyzed also. The causal virus is able to pass through the pores of porcelain filters, and shows a considerable degree of resistance to heat. Heating at 95 degrees Centigrade (nearly boiling) for two minutes does not kill it. Blood-drinking bats carry the virus from animal to animal, but do not themselves develop symptoms of the malady. Such bats fight a good deal among themselves and the infection can be spread from bat to bat in this way. Whether naturally or experimentally infected, bats can carry the virus for a long time in their bodies. Since they are capable of living actively for several days without food, it is possible for the flying animals to carry the disease for long jumps into previously rabies-free territory. Drs. Iturbe and Gallo have succeeded in preparing a preventive vaccine, which has shown encouraging results in the use which has thus far been made of it. They are now at work on a vaccine prepared by another method, from which they hope for even better results.

SNAILS that live on Cuba's mountaintops tell of several times in past ages when Cuba was not the single island with a mountainous backbone that we know to-day, but a chain of smaller islands with channels between the present peaks. How these beautiful and variegated land shells have served as geologic historians was related by Dr. Carlos de la Torre, of the University of Havana, and Dr. Paul Bartsch, of the U. S. National Museum. Cuba is the home of what is perhaps the largest snail family in the world, comprising 355 species and 702 subspecies, Dr. de la Torre explained. Yet there is no doubt that all these originally evolved from a single ancestral form. As the island alternately rose and subsided, the limestone areas that are the homes of these snails were alternately united and separated. During the periods of separation, since interbreeding was impossible, the many distinct forms of to-day came into existence.

A SOUTH AMERICAN animal that is a "non-missing link" between mammals and their reptilian ancestors was described by Dr. Glover M. Allen, of Harvard University. It is a primitive member of the rodent group, known as the paca. In several orders of mammals, scales are present on tails and backs of feet. This is true of rodents, marsupials and ant-eaters. However, in the paca the scales are found on the body as well, with the hairs coming out between them. Dr. Allen described this arrangement as "probably present in early mammals."