SCIENCE NEWS

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THE SPEED OF ROTATION OF STARS

BECAUSE a spinning star is both moving towards you and away from you at the same time, astronomers can now measure their speed of rotation, and have found many that turn at 40 miles a second, 150 times the speed of the earth at the equator.

This seemingly paradoxical effect occurs merely because one side of a turning sphere approaches while the opposite side recedes. Stand in front of a phonograph and watch the turntable as it revolves. If you drop a bit of paper or some small object on the right side, it will be carried towards you, but if you drop something else on the left side, it will be carried away from you at the same time. Then, of course, the first thing will go from you and the second towards you. Only if you were directly above the turntable, or if the phonograph were tilted so that you were on line with the axis of rotation, would all parts of the table remain constantly at the same distance.

This is an example of the principle used by C. T. Elvey, astronomer at the Yerkes Observatory of the University of Chicago, to measure how fast a number of stars are turning. The method was developed by a Russian and a German astronomer, also at the Yerkes Observatory, Dr. G. Shajn and Dr. Otto Struve.

Mr. Elvey has measured what is called the "contour" of a line with the instrument known as the recording microphotometer. In this instrument the spectrum plate is moved in front of a narrow slit through which a light shines. An electrical arrangement measures the amount of light which gets through and makes an automatic record by a moving spot of light on a strip of photographic paper. A single sharp narrow line makes a deep notch in the line on the paper after development. But if the spectrum line is broad and faint, it makes a flat "bay," broad and shallow. The "contour" of the line refers to its shape when recorded by the microphotometer. As the spectrum line of wave-length 4481 due to magnesium is ordinarily sharp and narrow, it is well adapted to such studies and was the one used by Mr. Elvey.

Of 59 stars that he has studied, the average surface speed is 60 kilometers (37 miles) a second. The sun, at its equator, turns only about 2 kilometers a second. Therefore, if these stars are the same diameter as the sun, which is of about average size, they turn about thirty times as fast, or about once in 24 hours. The sun is about 865,000 miles in diameter and turns once in about 28 days. At the equator of the earth the speed is only about 400 meters, or about a quarter of a mile, a second, because of its much smaller size.

These speeds for the stars are conservative, because Mr. Elvey has made no consideration of the effect of darkening at the limb of the star. Most of the star's light comes from the center as it faces us, the region which is not approaching or receding. This makes the broadening of the spectrum line less than if the light came with equal intensity from all parts of the star.

One star studied by Drs. Shajn and Struve is turning even faster. It is known as W Ursae Majoris, and is in the Great Bear. Though about three quarters as large as the sun, or 650,000 miles in diameter, it turns once in a third of a day.

THE CLAUDE OCEAN POWER PLANT

IT is not a house of mystery, this power plant that the famous French inventor and engineer, Georges Claude, has built on the ocean shore in Cuba. Now he is just about ready to test to find out if it will successfully and economically make the warm water of the surface and the cold water of the deep sea produce electrical energy.

Although some engineers have criticized the Frenchman's novel apparatus as being impractical and point to serious difficulties to be overcome, they admit that M. Claude's theory is sound.

The apparatus resembles closely the usual steam power plant that uses a fire to make its steam. But in the plant at Matanzas, there is no place for a fire. The highest temperature of any of the apparatus will be that of the incoming water from the surface of the ocean at about 80 degrees Fahrenheit. This enters the boiler or steam generator after passing through a de-gassing tank which removes the dissolved atmosphere and gases.

Water which comes from deep in the ocean and is 30 degrees cooler than that which enters the generator is brought to the condenser at the other end of the system. As in the ordinary steam power plant, it is used to condense the steam after it has passed from the generator through the turbine. This continuous process of condensation lowers the pressure in the boiler and causes more water to evaporate into steam and flow through the turbine into the condenser, where it is changed into water again.

Pressure in the usual steam boiler is measured in hundreds of pounds, while that in the Claude boiler will be less than the pressure of the atmosphere outside. Even this low pressure of the boiler will be higher than that of the condenser, because the steam must flow from the boiler through the turbine to the condenser in order to turn the blades of the turbine and produce power.

And this is where engineers accustomed to conventional power plants direct most of their criticism. Because the process involves relatively small changes of temperature and pressure, unusually large quantities of cool condensing water and warmer boiler water will be required. Will not a prohibitive amount of auxiliary power be required to pump this water? it is asked.

Also, because of the slight pressure differences on which the turbine operates, large quantities of steam must pass through it to produce a reasonable amount of power and the turbine will have to be unusually large to take care of this steam. These are serious problems

which some believe may make the Claude project impractical on a commercial scale.

On the other hand, M. Claude's record of achieving what others have called impossible should not be overlooked. He invented the first successful process for making liquid air and for liquefying other gases; he pioneered in the field of making liquid ammonia out of the atmosphere, and he is the inventor of glowing red neon lights that shine on our streets at night. Certainly, it is entirely probable that the experiments on the coast of Cuba may be the beginning of a series of great power plants that will revolutionize life in tropical countries.

ANIMAL DISEASES IN THE UNITED STATES

"THE United States is entirely free from such serious diseases of animals as rinderpest, contagious pleuropneumonia, surra and foot-and-mouth disease," according to a statement made by Dr. John R. Mohler, chief of the U. S. Bureau of Animal Industry, to the Inter-American Conference on Agriculture, Forestry and Animal Industry that met recently in Washington. Foot-and-mouth disease has been introduced occasionally but prompt slaughter of affected animals and disinfection of premises has quickly eradicated it.

Dr. Mohler told delegates to the conference how a national quarantine law should be drawn up to prevent introduction into a country of serious animal diseases. For instance, federal officials should be able to control not only the animals offered for entry into the country but also the materials generally closely associated with livestock, such as hay, straw, forage, meats, hides and other animal products. Some of the most dangerous animal diseases may be introduced into the country through the medium of such materials and products.

Plans for an inter-American cooperative clearing-house for the exchange of information on animal diseases and control measures were discussed. Such a clearinghouse would depend on the existence in each country of an efficient national livestock sanitary organization which could enforce suitable regulations for the control of animal diseases. Regular reports of the livestock disease situation should be sent by each country to the inter-American clearinghouse for the benefit of all member countries. Unusual disease outbreaks, such as those of a nature not previously known, should be reported by telegraph.

THE USE OF PULQUE BY MEXICAN INDIANS

PULQUE, a Mexican drink inherited from prehistoric times and for which prohibition has been urged because it is blamed for the degeneracy of the Indian, may have been keeping him alive this long, a nutritional investigation seems to indicate.

Under the direction of Dr. José Zozaya, director of the Hygienic Institute of Mexico City, studies are being made for the first time on foodstuffs used by the native population. The first material thus investigated was pulque, and the results show that this slightly intoxicating liquor is extremely rich in yeasts. The native diet on the central plateau where pulque is the great drink, consists mainly of chili, beans and corn, an unbalanced and incomplete ration in the light of what is now known of man's requirements.

Because of such a diet, rickets should be the prevalent disease of that region, but curiously enough crooked bones are rare and, in spite of extremely unhygienic living conditions, those that survive the infectious diseases of childhood grow surprisingly strong. The strong back of the pulque-drinker supplies most of the transportation in rural Mexico. Little Indian girls, hardly more than babies themselves, play games with the next youngest sister or brother slung on their backs in a rebozo. Small squatty brown boys can lift weights off the ground that are hard for grown white men to lift. Indian babies are often weaned on pulque, and as soon as they can walk they consume chili that would make a strong man cry.

What part "Alpine" sunlight on the high Mexican plateau plays in the prevention of Indian rickets is not known, but Dr. Zozaya is convinced that pulque, with its plentiful yeasts rich in the vitamins and amino acids than corn and beans lack, has probably served to keep the race alive, rather than killing it off. He finds that in spite of the very bad water supply of many pulque haciendas, intestinal infections there are rare.

Pulque is the fermented juice of the maguey, or century plant, which with the cactus is the most characteristic object on the Mexican landscape of the central plateau. Its leaves, like curved swords, sometimes grow ten feet long and several inches thick. Its importance was so fully appreciated by the ancient Mexicans before the Conquest that they had a patron-deity-in-chief of pulque, with many minor gods to assist.

Because of its undoubted nutritional value, as well as the enormous capital invested in the industry, Dr. Zozaya believes a hygienic control of the industry is what is indicated at this time, rather than prohibition.

THE ORIGIN OF CULTURE

A FIRST-HAND study of the artifacts left by early man leads to the conclusion that all the cultures of the world, even including that of the American Indian, are the result of a process of evolution and have some single origin. At least such is the judgment of Dr. H. S. Harrison, curator of the Horniman Museum, as expressed in a report just submitted to the British Association for the Advancement of Science.

Man is not capable, said Dr. Harrison, of inventing some previously unconceived instrument or method to fit an ideal purpose. "The plough," he said, "was not invented as a means of more efficient tillage, but was the result of the discovery that a pick or a hoe could be dragged through light soil so as to prepare a seed bed more rapidly than could be done by packing up the soil; the implement got a new start in life by a change in the method of use. . . . At no stage was there a premonitory

vision of a method of agriculture, or a type of plough, having an origin in a mental conception cut off from its roots in the state of knowledge of the place and time. That kind of unconditioned foresight does not happen even now-a-days, and we may assume it never will.'' Even man's purpose and desires are a result of the process of evolution, Dr. Harrison believes, and even the research worker in our modern laboratories is merely building upon the foundation of the past.

''Our artifacts, material and immaterial alike, have emerged from the interaction between mind and matter, and between mind and mind; they were not devised beforehand for material or social ends, but arose out of the rough-and-tumble of an environment that grew as knowledge grew and artifacts accumulated. Aims and ends evolved with the discovery and invention of ways and means. The artificial environment has expanded with the progress of civilization, but the human brain has not undergone a like inflation; nor, as far as can be seen, has the human mind undergone a change in its essential characters. It is still unable to form preconceptions of artifacts and processes that can not be built up in the mind's eye, on paper or in practice, by combining fact, methods and principles that are known, with the aid also of discoveries arrived at by experience and experiment. Only as man became capable of transmitting his knowledge to his offspring, by precept as well as by practice, could he create a cultural continuity extending over many generations.

Dr. Harrison urged his colleagues to follow the example of continental and American anthropologists in studying the material remains of early man at first hand in the field. He said: ''The hands of the anthropologist must come to the aid of the eyes and ears. Until he has done practical work of this kind, he is not even able to make the best use of the specimens he views through the windows of museum cases. It is now well known that ordinary glass denies a passage to some of the more active of the sun's rays, but it is not so fully understood that the light of knowledge is also much enfeebled by its filtering action.''

ITEMS

In an effort to replace the lost musk-ox herds of northern Alaska, the U. S. Department of Agriculture has arranged to import thirty of these valuable animals from Greenland. They will make a long detour on their way, for they are to be brought first to New York, thence by rail to Seattle, and finally by steamer and rail again to Fairbanks, Alaska. Representatives of the Bureau of Biological Survey, skilled in the handling of wild animals in transit, will accompany them all the way. The little herd will be an expensive one, for an appropriation of $40,000 has been set aside to cover the cost of its acquisition, transportation and establishment in the protected enclosure that will be its new home. But it is expected that the animals may eventually pay for themselves many times over, as the imported reindeer have done, by becoming the basis of a new meat-producing industry utilizing food plants that now go to waste. Alaska once had a fair number of musk-oxen in the northern part of the territory, but indiscriminate hunting by explorers, traders and natives with newly acquired firearms exterminated the herds.

Experiments conducted recently by the National Physical Laboratory indicate that imitation sunlight, shining through fake windows, aids and encourages belated clerks to turn out better work than they are able to do under the artificial stare of ordinary vacuum or gas-filled lamps. A comparison of the hourly work output of clerks working in simulated daylight with their efficiency under ordinary artificial lighting conditions showed a balance in favor of imitation daylight. Coloring of the light to approximate the sun's rays was found to be the most essential condition for efficiency, though the distribution of the light through a window-like aperture was also discovered preferable to illumination from semi-indirect bowls suspended from the ceiling.

Warning of the presence in the air of carbon monoxide and other deadly gases such as hydrogen sulfide may now be given by a chemical in a container similar in appearance to the first-aid ampuls of aromatic ammonia. This carbon dioxide detector has been tested and found satisfactory by the Pittsburgh Experiment Station of the U. S. Bureau of Mines. The little ampul may be carried by the workman going into garages, sewers, mines or other places where the air might be contaminated. When the outer covering is crushed, a white filter paper or wad of white cotton soaked in palladium chloride is exposed to the air. Palladium chloride is a light straw color and does not discolor the white cotton, but as soon as it meets carbon monoxide or several other poisonous gases, the palladium is freed and the cotton turns gray or black, the intensity of the black depending upon the amount of the poisonous gas present.

Limestone, or what will eventually be limestone, is manufactured in thousand-ton lots in shallow lakes in the Middle West. So much is indicated by researches conducted by Professor H. A. Schuette and Hugo Alder, of the University of Wisconsin and the Wisconsin Geological and Natural History Survey. The two chemists analyzed quantities of Chara, a water-weed that grows freely in the ponds and lakes of limestone regions. Its stems and leaves are harsh and rough to the touch, indicating the presence of considerable quantities of mineral. The analyses showed the sand-free, air-dry plants to contain over 41 per cent. of ash, of which much the larger proportion was calcium carbonate, captured out of solution in the lake water. In the lake where the analyzed samples were collected, about half the mass of the yearly crop of aquatic plants is accounted for by Chara. With this as a basis, Professor Schuette and Mr. Alder calculated that this one plant yearly returns to the bottom of this lake something like a thousand tons of calcium carbonate.