SCIENCE NEWS

Science Service, Washington, D. C.

THE SOUTHAMPTON MEETING OF THE BRITISH ASSOCIATION

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ATHLETIC RECORDS

What kind of sport a student is most likely to excel in may be determined by a physiological examination, according to Professor A. V. Hill, of London University. In giving the presidential address before the physiological section of the British Association for the Advancement of Science in session at Southampton, he showed curves, based on many years of experimentation, from which it is possible to tell how many yards a man can run without exhaustion, and what is his best speed. He finds that this depends chiefly upon the ability to supply sufficient oxygen from the air and to dispose of the products of combustion accumulating in the muscle from exertion. The oxygen used by the body is the measure of the energy expended. One liter of oxygen, about a quart, would be sufficient, if it could be used with a hundred per cent. efficiency, to raise a weight of one ton to a height of seven feet.

In running, the oxygen needed increases as the square or cube of the speed. That is, running twice as fast requires from four to sixteen times as much oxygen per minute. A man taking 240 steps per minute may consume eight liters of oxygen a minute, while if he speeds up to 280 steps he may require twenty-four liters. But a runner may for a short time consume more oxygen than he can breathe in, just as a man may for a while spend more than his income. An athlete, for instance, may have a maximum intake of four liters a minute and be capable of running into debt for oxygen to the extent of fifteen liters. If then he was running at a speed requiring five liters of oxygen a minute, he would have to draw on his reserves at the rate of a liter a minute and at the end of fifteen minutes would be exhausted.

This possibility of thus overdrawing one's oxygen income depends upon a mechanism of the muscle by which lactic acid, the sour milk acid, may be accumulated to be oxidized off when the exercise is over. The muscles therefore serve as storage batteries for energy to be drawn upon in an emergency and recharged when the man has leisure to catch his breath again. The inability of women to match the highest athletic records of the men is due to their lesser energy reserve. Women may have as much skill as men, but, on the average, they can expend in a given time only 67 per cent. of the energy available to men. Dr. Hill suggests that "an enterprising woman athlete who wants to break a record should avoid the 300 meters; she would be well advised to try the 500 meters."

The scientific study of the feats of trained athletes discloses facts that would have appeared incredible. For instance, Dr. Hill says of the mechanics of high jumping: "Paradoxical as it may seem, it is possible for an object to pass over a bar while its center of gravity passes beneath; every particle in the object may go over the bar and yet the whole time its center of gravity may be below. A rope running over a pulley and falling on the other side is an obvious example. It is conceivable that by suitable contortions the more accomplished high-jumpers may clear the bar without getting their centers of gravity above or appreciably above it. Let us calculate, however, on the assumption that the center of gravity of a jumper just clears the bar. The world's record high-jump is 6.61 feet, the center of gravity of the performer being presumably about 3 feet high at rest. He raises it therefore 3.61 feet into the air, from which we may calculate that the whole time occupied in the jump is about 0.96 second. Seeing the amazing complexity of and the skill involved in the rapid movements and adjustments involved in a record high-jump, it is striking that all those events can occur within a time of less than one second."

THE DRIFTING MOTION OF CONTINENTS

Are America and Europe drifting farther apart? This question, asked in a geological and not in a political sense, was set before the meeting of the British Association by Professor J. W. Gregory, who proposed to answer it by the use of wireless time signals for the determination of variations in longitude. Kept up for a few years, he said, these would afford a conclusive test of the theory recently advanced by Wegener, that the Atlantic Ocean was produced by the drifting apart of the Americas on one side and Europe and Africa on the other.

The reality of a drifting motion of whole continents is now seriously accepted by many geologists. Recent investigations have shown that beneath the uppermost sixty miles or so of rocky crust, there is a semi-molten layer of magma or lava overlying the earth's solid central core, and on this viscid mass the continental blocks find more or less uncertain footing. The idea of a drift also receives support from the rather suggestive reciprocity of the projections and indentations of the Atlantic shores of America and the Eurafrican coastline.

Professor Gregory was not inclined, however, to admit the rapidity of drift postulated by the Wegener theory, and it is to get a critical test of this disputed question that he proposed the use of radio time signals.

THE GALILEE SKULL

Man in Neanderthal times was divided into distinct races just as he is to-day, according to the evidence of the newly discovered Stone Age skull found near Capernaum in Galilee. Discussing the find before the meeting of the British Association Sir Arthur Keith characterized the man to whom the skull had once belonged as a twenty-five-year-old representative of a new race of the Neanderthal type, differing from the European Neander-

thal skull previously known in being relatively high and narrow. This Neanderthaler of ancient Palestine had a brain showing the development of the higher faculties, including probably even speech; it has long been considered doubtful whether men of the Neanderthal ages were really capable of articulate speech, though they were undoubtedly human beings.

Implements and animal remains found with the skull show that it corresponds to the Mousterian era of the Old Stone Age in Europe, estimated at from 25,000 to 50,000 years ago. Three healed wounds indicate trephining, or possibly some mysterious disease.

The British scientists also had their attention called to the problem of the emotionally abnormal child. Professor Cyril Burt stated that about one tenth of all school children are emotionally unstable, and that one per cent. are actually menaces to themselves and the public. We all have within us the potentialities of criminals, which are kept in check by habits inculcated through education. A systematic program for the stabilization of the emotionally unsteady child is one of the prime present needs of our educational systems.

THE ULTRA-MICROSCOPE AND THE CANCER GERM

THE filter-passing organism held responsible for cancer of the breast was held up for all the world of science to see, at the meeting of the British Association for the Advancement of Science. J. E. Barnard, co-discoverer with Dr. Gye of the cancer germ, demonstrated the means by which these almost infinitely small objects can be photographed.

The ultra-microscope, the chief weapon in this research, makes use of the invisible, short-length ultra-violet rays instead of the longer-length rays of ordinary visible light. These shorter-length waves can pick up objects shorter than the shortest wave-length of visible light, and can be focused on a photographic plate by means of quartz lenses, thus making pictures of things too small to see.

But Mr. Barnard is not content with his present conquests with the ultra-microscope; he is constructing a super-ultra-microscope that will photograph even smaller organisms and probably the non-living molecules themselves, some of the larger of which are still only one one hundredth of the size of the invisible cancer germs. This instrument will be equipped with fluorite lenses, and will use Schuman rays, the shortest-length radiations known. It will be operated in a vacuum, to avoid even the slight disturbances due to the presence of air.

Possibilities of getting germs into the "movies" were suggested by Mr. Barnard, who has found that by means of the intense cadmium light he can get enlargements up to 3,000 diameters in one tenth of a second. Under these magnifications, the jelly-like agar medium on which bacteria are cultivated shows up as a spongy structure, cut through with liquid-filled canals, like irrigation ditches in a field. In this ultra-microscopic world the germs play the rôle of cows feeding on the banks.

INDIANS OF THE SAN FRANCISCO BAY REGION

LIVING in exactly the same place, with exactly the same customs, for three and a half thousand years, the Indians of the San Francisco Bay region, in California, take the palm for conservatism. This long and unchanging record has been exposed by excavations of partly submerged prehistoric shell mounds around the bay, which show that the region was inhabited 3,500 years ago by Indians who then lived as their descendants live to-day, it is announced by Dr. A. L. Kroeber, of the University of California, through the Smithsonian Institution, Washington.

"When Troy was besieged and Solomon was building his temple, at a period when even Greek civilization had not yet taken on the traits that we regard as characteristic, when only a few scattering foundations of specific modern culture were being laid and our own northern ancestors dwelled in unmitigated barbarism," according to Dr. Kroeber, "the native Californian already lived in all essentials like his descendant of to-day."

There are few parts of the world, even those inhabited by dark-skinned savages, where such a condition can be regarded as established. The permanence of California culture, therefore, is of far more than local interest. It is a fact of significance in the history of civilization.

If it be objected that the period dealt with is after all conjectural rather than established, the import of our inference may be diminished; but it is not destroyed. Cut the estimate of 3,500 years in half, or even to one third, we are still back to the time of Charlemagne. The elapsed millennium has witnessed momentous alterations in Europe, in India, in Japan; even the Mohammedan countries, China, Central Asia and Malaysia, have changed deeply in civilization, while this part of America has stood still.

Dr. Kroeber bases his inferences upon the fact that all classes of objects found in these shell-mounds were unearthed with practically the same frequency from the top, middle and bottom of the heap and show that the prehistoric people ate the same food, in nearly the same proportions, prepared in the same manner, and sewed skins, rush mats and coiled baskets similarly to their recent descendants.

Even their religion was conservative, since the identical charms seem to have been regarded as potent. In a word, the basis of culture remained identical during the whole of the shell-mound period, he declares.

The age of the mounds is estimated by the time necessary for the shells to have accumulated, supposing that they represent the débris of a large hamlet of 100 people and allowing 50 mussels a day for every man, woman and child. Experiments show that five thousand mussel shells crush down to a quarter as many cubic inches.

The population may have averaged more than one hundred, Dr. Kroeber admits, but this would be a rather high figure for a native California village. It may also have been augmented seasonally by visitors from the interior, but to compensate, its own inhabitants are likely to have spent five or six months of each year away from their mussels. "However the question is approached," he maintains, "3,500 years seems to be a conservative estimate."

SUNLIGHT AND INFANTILE PARALYSIS

ANOTHER of the dreaded diseases of childhood, infantile paralysis, which, like rickets, graduates large quotas

of cripples, has responded to the good influence of the sun's rays. Dr. G. Murray Levick, medical director of the Heritage Craft Schools at Chailey, Sussex, who originated the treatment, said that no other method has ever had as good results as this in the treatment of infantile paralysis.

Dr. Levick first deduced that neurasthenia in grown-ups and rickets in the young are due to the same cause. Both these diseases, he claims, are nutritional disturbances of the nerve centers affecting the bones in the young, and the nervous systems in the old. The action of sunlight on the skin forms a substance which is carried into the blood and feeds the nerve centers as well as the bones. His success in treating neurasthenia with sun's rays led him to apply it to cases of infantile paralysis, a disease which is a severe shock to the nervous system and which results in muscular atrophy. Under the action of sunlight a renutrition of nerve centers takes place.

Synthetic sunlight produced by him with an electric arc light of his own invention proved as good as natural sunlight, and could be better regulated to the patient's endurance. He used two distinct kinds of light rays, the short ultra-violet rays for nerve nutrition and the long red and infra-red rays for muscle treatment. Red rays, as can be seen when the hand is held up against the sunlight, penetrates the flesh to a considerable extent, and can therefore stimulate the sleeping muscle.

Dr. Levick warns that immediate success must not be expected. He has found constant improvement where daily short treatments were continued over a period of several years. While the method may not be effective in extreme cases, it is nevertheless a test which will soon show after a few treatments whether any rejuvenation of the nerve fibers is taking place.

THE DISASTER TO THE SHENANDOAH

THAT *The Shenandoah* disaster will have no more effect on the progress of development of aircraft than previous similar wrecks have had is the opinion of Dr. Richard B. Moore, of New York city, who was the first to propose the use of helium in an American airship, and who, when chief chemist of the U. S. Bureau of Mines, worked out the process for producing the rare gas in quantity.

"*The Shenandoah* was simply caught in a storm that was too severe for her or for any other type of aircraft," said Dr. Moore in a statement to *Science Service*. "Before I learned the details I thought that possibly something had gone wrong with the steering apparatus, or that a flaw had developed in the metal framework; but apparently even this was not the case. That storm would have wrecked anything that tried to fly through it.

"Such danger can never be eliminated, any more than wrecks of automobiles, airplanes or railway trains can be entirely done away with. But it has already been greatly reduced and further improvements are sure to be made.

"Lighter-than-air craft are safer to-day than airplanes. Twice recently, great dirigibles have weathered severe storms, and though severely damaged have returned under their own power to their hangars, under conditions utterly unsafe for airplanes.

"Improved construction of metal parts of airships will help reduce the chances of accident; but the greatest need of constructional improvement at present is probably the development of the steering gear to a point where it will handle the ship under extreme weather conditions. Engines burning heavy oil will also be a boon.

"The disaster has shown again the great value and absolute necessity of helium and proved also that gasoline is not the fire hazard it has been believed by some. Hydrogen is a much greater fire hazard than gasoline, and this hazard helium eliminates entirely. Without helium *The Shenandoah* would undoubtedly have burned, causing much greater loss of life. The disaster was bad enough, but not nearly as bad as some that have taken place in the past, where hydrogen was used instead of helium, so that fire played a major part.

"Our commercial supplies of helium should be considered by the nation as a great asset, and supported adequately by the congress, as an important means of national defense as well as for progress in commercial aviation. Helium should always be used until the danger of structural defects in the ships is less, and flying efficiency is definitely established.

"I believe personally that the accident to *The Shenandoah* will only shake the confidence of the public for a short time, and that commercial airships will be crossing the Atlantic within a few years. I am emphatically of the opinion that the congress should appropriate money to replace the lost *Shenandoah* at once."

ITEMS

THAT the continued use of insulin may really cure and not just allay diabetes by giving the overstrained glands a long rest, is the opinion of Dr. F. G. Banting, who first extracted insulin from the pancreatic glands of animals and made it available for use by diabetic patients. "Regardless of the severity of the disease," said Dr. Banting, "all patients may now be maintained sugar free. Since this is possible it is to be strongly advocated, for we have abundant evidence that there is a regeneration of the islet cells of the pancreatic glands when the strain thrown upon them by high blood sugar is relieved. In some moderately severe cases the carbohydrate tolerance has increased sufficiently so that insulin is no longer necessary."

FOR the first time in history, the development of the embryo of a warm-blooded animal has been carried on under such conditions that it can be watched continuously. This feat has been accomplished by two scientists at the University of Leyden, Drs. J. P. M. Vogelaar and J. B. van den Boogert, who have placed common hens' eggs, with the shells removed, in small glass dishes in an incubator, and have succeeded in keeping the embryo alive and growing for five days. Hitherto the only way in which such embryos could be studied has been by placing large numbers of eggs in the incubator, and removing and opening them one by one at intervals. By this older method it has been possible to study closely spaced stages of development, but not to observe the growth as a continuous process, now made possible by the new way.