SCIENCE NEWS

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CHANGES IN THE EARTH'S ROTATION

EVERY day the earth changes a little in its rate of rotation.

This is the opinion of Dr. Benjamin Boss, director of the Dudley Observatory at Albany, and director of the department of meridian astrometry of the Carnegie Institution of Washington. Furthermore, this variation appears to be related to the frequency of earthquakes, and so further investigation of it might aid in the study of quakes.

Dr. Boss has found evidence for this apparent variation in a long study of star positions. At the Dudley Observatory an exhaustive catalog of star places is in preparation, and in the work on this it has been found that a considerable correction, which varies annually, is needed for the right ascension of the stars. The right ascension is the celestial equivalent of longitude. As a telescope permanently placed on the earth would point to different right ascensions in the sky as the earth turns, any change in the rate of the earth's rotation would affect the right ascensions of the stars.

For sometime, says Dr. Boss, it has been known that the sun, the moon and the planets Venus and Mercury undergo changes indicating the variable rotation of the earth over long periods of years.

The annual change in the star positions can be explained by daily variation in the rate of rotation of the earth. Possible evidence in favor of such a variation is suggested when checking clock time with the stars, for it has been found that there is a daily variation in the clock rate, which indicates that the earth may change daily in the rate of its rotation.

That the changes in the moon and stars are both due to the same cause is indicated by the fact that when the minor fluctuations in the moon's path, and the variation in star positions, are plotted over a long period of years, the curves are closely similar. About 1860 both curves reached a minimum, while about 1900 they were both at a high mark. Since that they have been going down, until 1920, when the moon fluctuation reached a minimum. For the last ten years the figures for the star variations have not been completed, but they also seem to have reached a minimum about the same time. Dr. Boss believes that this indicates very strongly that the two variations are due to the same cause.

What this cause may be is not certain, but Dr. Boss thinks that it is very likely to be the result of tides in the earth. This view is supported by the fact that Dr. A. A. Michelson, of the University of Chicago, has actually obtained experimental evidence of earth tides. Ocean tides are not sufficient to account for the observed phenomena, but if the outer crust of the earth is in a condition such as recent investigation supposes it to be, tidal friction might appreciably affect the rate at which the earth turns.

According to Dr. Boss, the tide might produce the long period changes by the fact that the crust of the earth, lifted at high tide, fails to settle back to its original position. Thus the earth's diameter is gradually increased, slowing its rotation. When a critical point is reached, it gradually starts to settle, speeding up rotation.

AUTOMATIC CONTROLS

A FEW turns of copper wire around an iron core is able, in many places, to do the work of a man! With the recent demonstration of a "mechanical man" to unveil a portrait of George Washington by a telephoned signal attention has been called to other ways of performing routine tasks either by remote control of an operator, or even without any operator at all.

The televox, by which the portrait was unveiled, depends upon a device that responds to a sound of certain frequency, but not to another. Stand in front of a piano, put your foot on the loud pedal, and whistle a note. Then stop whistling, and you will hear the piano continue to emit the same note. This is because the sound waves of your whistle set in vibration the piano string tuned to that particular note. Other strings, tuned to other notes, or to air waves vibrating at a different rate, fail to respond, just as a radio set will not bring in a broadcasting station unless it is tuned to waves of the proper frequency. With the televox, the receiving apparatus is tuned to a particular frequency of sound. A musical note, either from a tuning fork or a whistle, is telephoned to it. A relay, which is simply an electromagnet with a movable armature arranged to come against it when the current flows through the coils of the magnet, operates when the proper note is sounded. This in turn may start a motor, turn on or off a light, or do any one of a number of mechanical operations. By having several units of the apparatus, each with its relay, a complicated performance may be gone through by sending a series of different notes. These may, if wished, be so adjusted that the notes form a tune.

So far this particular device has only been used with land telephone lines, but it could be easily adapted to radio. Experiments have been made for many years with radio-controlled automobiles and other machinery, but in many cases these devices used several radio wavelengths, instead of different sounds, each performing a certain task.

Entirely automatic operation has in many instances made it possible to dispense with the human element completely. For instance, lights on buoys and light-houses have been operated with a selenium cell, with which light regulates the flow of an electric current. As soon as darkness comes, the light is turned on, when daylight breaks, the light goes off.

Another form of automatic control has been used in electrical substations, where formerly it was necessary

to keep an operator in constant attendance. Electric current comes over the lines from the power plant to the substation, from which it is redistributed, perhaps at a lower voltage, to the users. When the load is heavy, certain transformers may have to be turned on, while different ones would be required when so much current is not needed. In such cases relays can be used so adjusted that when the load reaches a certain point, the necessary switches are closed, while they are turned off when the load is lightened.

THE SHORT-WAVE, HIGH-POWER VACUUM TUBE

A VACUUM tube with a power of 15,000 watts, sending out radio waves of only six meters length, that can light electric lamps without wires or socket, produce a warmth in nearby spectators reminiscent of prohibited stimulants, and cook sausage in a glass tube without fire, is one of the latest radio wonders. It has just been demonstrated at the General Electric Company's research laboratory.

The new tube, known as the ZT–6, looks harmless enough. It is about five inches in diameter, and two feet long, set in a wooden cage and surrounded by a network of wires, condensers and meters. With its great power of 15 kilowatts, it is at least fifty times as powerful as any short-wave tube previously constructed. Through a coupling system it is connected to a copper bar about three meters, or ten feet, long, which acts as the tuned aerial circuit, radiating the full 15 kilowatts into space.

When an ordinary electric lamp is touched to the copper bar, it lights up brilliantly. A loose copper rod, lying on the floor, is picked up, and, though cold, it blisters the hand. When a person approaches the apparatus, he first feels a warm glow, then pain in the limbs and joints. Artificial fever, as much as 100 degrees Fahrenheit, is induced after standing close to it for 15 minutes.

This may indicate one of the future applications of the tube, says Dr. W. R. Whitney, director of the laboratory. "If we had a perfectly harmless method for warming the blood it might have value," he stated, "because fevers are sometimes artificially produced in order to start convalescence, and it may well be, as asserted, that raised blood temperature, or fever, is one of nature's factors in the recovery from infectious diseases."

Another feat of the apparatus, which also involved the heating of animal tissue without fire, was the cooking of a sausage in a glass tube, suspended from a wire some distance from the transmitting aerial. An apple was placed on the end of this receiving aerial and in a few minutes it was thoroughly baked to the core.

One of the most spectacular "stunts" performed was the imitation of the famous but seldom observed "ball of fire" reputed to accompany tropical thunderstorms. When the end of the radiating aerial was touched with a metal-tipped pole, a greenish-white arc arose to a height of a foot or more. This arc remained, even after the pole was removed, like a plume of fire, sputtering and sending out molten copper in all directions until it was blown out. As many as three of these standing arcs, each without any visible return circuit, were established along the bar at once.

ADVANCES IN TELEVISION

A SMALL crystal of quartz, less than an inch thick, has now simplified television by taking the place of a complete telephone line or radio transmitting and receiving equipment. This is the latest achievement of the Bell Laboratories, which perfected a process of television first demonstrated nearly a year ago.

With practically all methods of television so far invented it is necessary to have a disc at the receiving end rotate in exact synchronism with a similar disc in the transmitter. When first demonstrated, the Bell system did this with a separate synchronizinz circuit. Over land telephone lines, this consisted of a special pair of wires connecting Washington and New York, separate from the two lines used for carrying the actual image and the spoken words. With the radio television, a special signal was sent out over its own wave-length for the purpose.

Only two telephone lines, instead of three, or only two wave-lengths, are now required, as the result of the work of W. A. Marrison and J. W. Horton, in making quartz crystal oscillators capable of holding the rate of vibration constant to within one part in ten million.

The control of the picture on the television screen is now as simple as that of a motion-picture image on the movie screen. Sometimes the motion-picture image becomes "out of frame" when the pictures on the film are out of step with the mechanism. The effect is that the top of the picture is seen at the bottom of the screen, and the bottom at the top. At the touch of a lever by the operator this can instantly be corrected.

With the television apparatus, the failure of the two discs to keep in step produces a similar effect, except that the picture is displaced laterally, instead of vertically. The remedy is also very simple. Connected with the receiver are two buttons. When one is pushed, the whole picture slowly moves to the right, while the other moves it to the left. The operator merely touches one of the buttons until the picture is in the proper position, then the quartz oscillator holds it in place for a long time. In an hour, it is stated, the image will not wander more than one third of its width.

Despite this great simplification, which represents a step well in advance of anything yet accomplished in television, the engineers point out that it is still full of such complexities that its field of application is still quite restricted.

THE CONTROL OF ERYSIPELAS

ERYSIPELAS may now be added to the list of diseases controlled by man, Dr. Konrad E. Birkhaug, of the University of Rochester School of Medicine, told the American College of Physicians meeting at New Orleans.

As a result of four years of work, Dr. Birkhaug has developed an antitoxin treatment for use in the early stages of erysipelas that gives results commensurate with those obtained through the use of diphtheria antitoxin in the early hours of that disease.

The erysipelas treatment reduces to half the time that the patient must spend in the hospital. The mortality in adults has been reduced from twelve to only four per cent., while recurrent attacks of erysipelas have been

prevented through a course of immunization through the use of toxin.

Dr. Birkhaug observed in 1924 that nine tenths of the streptococci associated with the disease were of a specific type. This form of organism had been suspected of causing erysipelas when it was discovered in the lesions of the disease in 1881. The production of the disease experimentally in animals and their protection with a specific antiserum confirmed Dr. Birkhaug's idea that the particular kind of streptococci observed was the cause of the disease. The next year he discovered the toxin produced by the streptococci and then in 1926 erysipelas antitoxin was produced. The evidence for erysipelas specificity has been confirmed by other laboratories since Dr. Birkhaug's pioneer work.

PREHISTORIC MAN IN CHINA

THE discovery of further traces of prehistoric men in China and the recent finding of teeth which belonged to ancient human beings like the Neanderthal men of Europe, has attracted geologists to intensive study of the prehistoric Chinese scene.

The evolution of the land surface on which early man dwelt in North China has been studied by Professor George Barbour, of Yenching University, Peking, and reported to the New York Academy of Sciences.

In the era before man appeared, the land had been worn down almost level and the rivers flowed smoothly over flat country, Professor Barbour's survey showed. Then this flat land was suddenly broken up by the same disturbance that pushed up the Alps, the Rockies and the Himalayas. The rivers had barely succeeded in opening out the valleys when a slight buckling of the surface dammed the streams back into lakes. About this time we find the first traces of primitive man, or some close relative of his, living in a limestone cave overlooking the Peking plain.

With a change of climate the rivers flowed more swiftly and cut narrow gorges, making the surface of China more rugged. As the soil was worn away, gentle upheavals in the earth's crust pushed the surface of Mongolia up, and cold dry winds blew over these high altitudes, picking up the dust and sweeping it along in immense quantities. The blanket of dust in some regions became as deep as 800 feet, and forms the famous loess of China.

In the limestone caves have been found stone axes and arrows belonging to the prehistoric men, and with the weapons are the bones of mammoths, deer, rhinoceroses and other animals and the broken eggshells of ostriches. The teeth found near Peking, and considered as possibly belonging to the oldest human inhabitants of China, were from one of these ancient cave shelters.

A communication from China, just received by Professor Barbour, states that new specimens of human fossil teeth have been found and are designated as belonging to the Neanderthal period, which in Europe was about 50,000 years ago.

ITEMS

GREATER deadliness to insects and their kindred pests, but less danger to human beings and warm-blooded animals, are the virtues claimed for two new types of spray chemicals by Dr. Simon Marcovitch, of the Tennessee Agricultural Experiment Station. The new insect poisons on which he conducted his research are sodium fluoride and sodium fluosilicate. He tried them on grasshoppers, mosquito "wigglers" and one or two other small creatures, and also on rabbits as substitutes for human subjects. He found that the insect life in general succumbed to smaller doses of the new compounds, but that to the rabbits they were only about one ninth as poisonous as the standard arsenical spray materials now most widely used.

A NEW type of dark glasses for outdoor wear at tennis, golf and other sports, and said to be especially useful for auto drivers at night when meeting cars with glaring headlights, has been produced in the optical works of the Zeiss firm at Jena. The basis for the new eye protection consists of two wedge-shaped pieces of glass fused together. The upper member of the pair is made of a dark, gray-brown glass, while the lower part is clear and uncolored. Goggles made from this material are thus very dark at the top, shading off gradually into clear glass at the lower edge. This arrangement cuts off the glare of the sky, while permitting an unclouded view of the ground. Motorists, encountering glaring headlights, simply duck their heads a little and look through the tops of their goggles until the offending car has passed, when they again make use of their normal vision through the lower parts of the glasses.

GERMAN lovers of birds are up in arms over an attack being made by fisheries interests on the heron, a beautiful bird given careful legal protection in America and other countries. The herons of the Moehne Valley, in Westphalia, have been accused of destroying undue numbers of fish, and a bounty of nine marks per head has been placed on them. The defenders of the herons declare that it has been possible to protect the Rhine fisheries without exterminating the herons there, and claim that there is no need to kill off the birds. Even the despised crow has its defenders in Germany. A large number of the black marauders have been killed lately by means of poisoned eggs. Friends of the crow decry this practice, claiming that in spite of its undoubted mischievous and thievish habits, it still has its counterbalancing usefulness as a destroyer of field mice and similar vermin.

A HUNDRED skeletons and 2,500 records of the size and other physical characteristics of living modern Maya Indians of Yucatan brought back to Peabody Museum by Dr. and Mrs. G. D. Williams may give an insight into the kind of people who erected great cities and developed a culture in America long before the coming of Columbus. During an anthropometric survey of the Mexican state of Yucatan, Dr. Williams obtained information on 2,000 adults and 500 children of the descendants of the ancient Maya and also secured for scientific study the skeletons of a hundred present-day Mayas. Metabolic tests were included in the studies. The expedition that was in the field for eight months was under the auspices of the Bureau of International Research of Harvard University and Radcliffe College.