

Earthquake Recorders, Rays and Radio

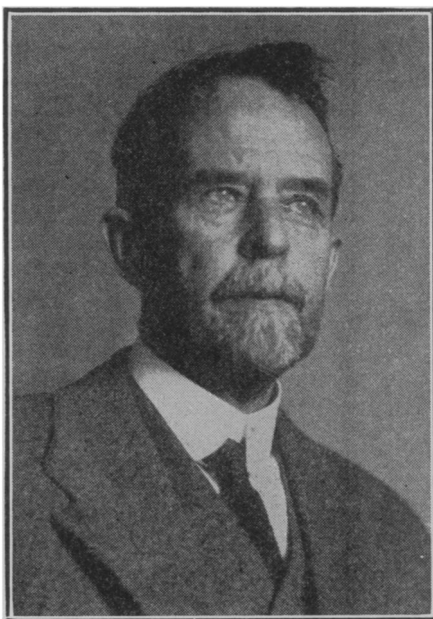
General Science

The National Academy of Sciences, founded during the administration of President Lincoln, met in Washington on April 23, 24 and 25. A part of the proceedings of this body, which is in a way the Senate of American science, are reported here. Further reports will be given in the SCIENCE NEWS-LETTER for May 5.

A new type of seismometer, or earthquake measurer, that has already proven its utility by records of the earthquake in Bulgaria on April 14 and other recent quakes, was shown by its inventor, Dr. Frank Wenner, physicist at the U. S. Bureau of Standards. Earthquake experts hail the new instrument as a great improvement over earlier types, and the U. S. Coast and Geodetic Survey is planning to install the Wenner seismometer at one or more of its earthquake observatories.

The new seismometer depends upon the fact that when a coil of wire moves in relation to the field of a magnet, an electric current passes through the wire. This principle is used in electric dynamos. It was also applied to the recording of earthquakes by a Russian nobleman, Baron Galitzin, in a form of instrument used in some modern observatories. A pendulum-like device supports the coil, the magnets are on the ground. As the ground shakes, even though very slightly because of the earthquake waves, the pendulum remains stationary. The relative motion of the magnets and the coil produces a minute electric current, which passes through a delicate galvanometer. Here the current causes a tiny mirror to turn, and a reflected spot of light moves across a moving strip of photographic paper. When the paper is developed there appears on it a wavy black line, the autograph of the earthquake, which to the seismologist reveals the quake's complete history.

Dr. Wenner has employed a similar principle, but has made important improvements in the instrument's design. It is estimated that it can be installed for about a seventh the cost of the Galitzin apparatus, and it does not require unusual skill to keep in operation. The record obtained with the Galitzin device is quite different from that of earlier types of instrument, where the hanging mass makes a direct record on smoked paper. Dr. Wenner says that his instrument gives a record that is essentially the same as if the tiny mirror were directly attached to the mass. Another advantage is that the seismometer proper can be in a vault at some dis-



PROF. THOMAS HUNT MORGAN, internationally known biologist and President of the National Academy of Sciences

tance from the recording apparatus, from which the adjustments and tests can be made.

Ultra-Violet Light and Radio

The sun's ultra-violet light, consisting of waves too short to be seen with the eye, and which prevents the occurrence of rickets in children, may also have to be thanked for making radio telegraphy and telephony possible. Dr. E. O. Hulburt, of the U. S. Naval Research Laboratory, announced his theory that the ultra-violet light in the sun alone causes the ionization of the upper layers of the earth's atmosphere. This ionization is associated with the so-called Kennelly-Heaviside layer, which is believed to hold radio waves down close to the earth and preventing them from spreading out into interplanetary space. By successive reflections from this layer radio waves are brought back to the earth, so that the antipodes are able to communicate with each other.

Waves as short as 16 millionths of an inch can be perceived by the eye, but the waves to which Dr. Hulburt ascribes the cause of the ionization are about 5 millionths of an inch in length, or even shorter. He pointed out that this theory was based entirely on known laws of pressure and the constitution of the high atmosphere, and

of the way that atoms lose part of their quota of electrons when they become ionized. Because of the seasonal changes of the upper atmosphere, and the lower altitude of the sun during the winter, ionization in winter time is reduced, and this accounts for the better radio transmission during the cold months. To the daily changes in ionization, with the coming of darkness, is due another change in ionization, and which is responsible for the better night transmission.

Since, he says, a satisfactory theory of this kind must account for what happens to all of the light from the sun, Dr. Hulburt has worked out the fate of all the sun's ultra-violet light. The shortest waves, of lengths less than about 3 millionths of an inch, he says, cause the ions to form in the highest layers of the atmosphere. Part of this causes the aurora borealis. Waves between 3 and 5 millionths of an inch cause the ions at a layer between 90 and 120 miles high in summer, and between 50 and 62 miles in winter. Waves of lengths between 5 and 7 millionths of an inch are absorbed by the oxygen and turn it to ozone, but these and the longer waves do not produce any ions. Waves longer than about 11 millionths of an inch reach the earth's surface, where they cause sunburn and cure rickets.

World Will Feed Eight Billions

A world population of eight billions can be realized if all the land areas capable of yielding food are put into agriculture, grazing or whatever uses they are best suited for. So Prof. H. L. Shantz of the University of Illinois told members of the National Academy.

"The natural vegetation of the world may be divided into 7 forest types covering a world area of about 22 million square miles, 7 grassland types covering 13 million square miles, and 5 desert types covering 17 million square miles," said Prof. Shantz. "Most of the forests are valuable as timber land but may be converted into agricultural land. Of the 22 million square miles of forest about 14 million square miles are capable of yielding crop producing land. Of this area about 6 millions are suitable for warm weather crops and 8 millions are suitable for cool weather crops.

"There are about 3 million square miles of forest land suitable for grazing only. The (Turn to next page)

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grasslands are valuable as grazing lands and of the 13 million square miles of grasslands, 3.5 million square miles are suitable for the production of cool weather crops, such as wheat, rye, oats, while 6.8 million are suitable for warm weather crops, such as cotton or corn, and 2.7 million suitable for grazing only."

The desert types constitute 17 million square miles, Prof. Shantz said, and are useful chiefly as grazing land of low carrying capacity.

"On the basis of the combined types," he continued, "the world contains about 26 million square miles of grazing land, about 12.8 million square miles of land climatically capable of producing warm weather crops, and 11.5 million square miles capable of producing cool weather crops.

"If 2 acres are required for every inhabitant or a population density of 320 per square mile, the agricultural land would support a world population of about 8 billion people."

Mayan Turquoise Plaque

The plaque of turquoise mosaic recently dug up at the ruined city of Chichen Itza is so valuable and fragile a piece of ancient American art that a museum expert is now enroute from New York to Yucatan on the special mission of restoring the plaque.

How he discovered the plaque and other buried ceremonial treasure in an old Maya temple at Chichen Itza was described in a communication sent to the meeting by Earl Morris, of the Carnegie Institution of Washington. Mr. Morris and other members of the Carnegie Institution's expedition are still at Chichen Itza, engaged in the task of restoring the temple.

Mr. Morris has spent some time searching for the ceremonial treasure which was usually buried under the altar in a Maya temple. Excavations in the floor finally revealed a limestone jar containing the turquoise mosaic disk, which is about the size of a dinner plate, and also a jadeite ball used by the priests in divining, the parts of a necklace, and the bones of a bird.

About 3,500 pieces of turquoise went into the making of the design in the plaque. Two-thirds of the elaborate mosaic pattern is still intact after hundreds of years, held in place by the thin film of adhesive which once stuck the blue stones to a wooden background. This wood is now only a brown powder. The beautiful object, dedicated to the Maya gods, is

today pronounced the finest specimen of delicate craftsmanship ever found in the land of the Maya Indians.

Referring to the plaque, Mr. Morris stated: "The tiny bits of stone composing it probably were mined in Arizona or New Mexico, fashioned and combined into beautiful form in or not far from the Valley of Mexico, then transported through some hundreds of miles of jungle, finally to be sealed away as a dedicatory offering beneath a temple floor."

Only one other turquoise object found in the Maya country could be recalled, it was said today.

Maya Life-Processes Faster

Maya Indians in Yucatan, descendants of the race that built the great cities that rival the glories of Egypt and Babylon, live faster than white men do. This does not mean that they have Great White Ways, synthetic gin and jazz; on the contrary, they lead about the simplest, healthiest lives that are to be found anywhere on this continent. But certain fundamental physiological processes, involving the chemical taking apart of food, building it into their body tissues, and getting rid of the waste products, they carry on about 7 per cent. faster than do the white men who come to their country to dig up and restore to them the pyramids and palaces of their ancestral glory.

"Basal metabolism" is the collective term for these physiological processes, and it was this that Dr. Francis G. Benedict and Dr. G. D. Williams of the Nutrition Laboratory of the Carnegie Institution of Washington have studied. They reported the results of their researches among the people of Yucatan before the Academy.

The two physiologists measured the basal metabolism of the Maya Indians hired to work in the excavations, and compared it with that of the white men who were hiring them and studying the stones they turned up. They found that the basal metabolism of the whites was about the same in the warm land of Yucatan as it was at home in the United States. A large group of Maya men were found to have a metabolism averaging 7 per cent. above the standards for white men of similar age, weight and height, living in the northern part of the United States. Since the sub-tropical climate might be expected to lower rather than raise the metabolism of these Indians, they state, it is evident

that some other factor, presumably racial, has asserted itself.

Plants in Artificial Climates

Plants growing in climates made to order, with days anywhere from 5 to 24 hours long, and great batteries of powerful electric lights for suns, were described before the meeting of the Academy by Dr. John M. Arthur of the Boyce Thompson Institute, Yonkers, N. Y.

In one set of experiments plants were grown with daylight supplemented at night by a battery of forty-eight 1,000-watt incandescent lamps. In other experiments a similar series was grown entirely with artificial light using twenty-five 1,500-watt lamps as a light source. Both series were grown with and without additional carbon dioxide gas, Dr. Arthur stated.

Several plants, like the red clover, grow well with artificial light even under continuous 24-hour illumination. Most plants studied do not increase in weight of tissue produced on more than a 17 to 19-hour working day. A few plants such as the tomato will not withstand 24-hour continuous illumination.

Daylength effects are produced with artificial light very similar to natural daylight. Lettuce and radish flower on daylengths greater than 12 hours. Salvia flowers mainly on daylengths up to 15 hours. Buckwheat flowers on all daylengths from 5 to 24 hours.

The percentage composition of starches and sugars manufactured by the plants increases with daylengths usually up to a 19-hour working day. In a few plants it may increase up to a 24-hour day.

Brain Workers Restless Sleepers

Middle aged men who are engaged all day in absorbing intellectual work are more restless sleepers than their wives who keep house and play bridge, according to Dr. H. M. Johnson, of the Mellon Institute of Industrial Research at the University of Pittsburgh.

A sleeper sinks to a state of minimum activity about 30 to 45 minutes after retiring, Dr. Johnson has found. For the rest of the night there is a regular wave-like alternation of stirring and quiet. The chart of an individual's activity pattern during sleep is, to a certain extent, characteristic of him. The curve of restlessness undergoes striking changes in anxiety and in different phases of some mental diseases.