SCIENCE NEWS

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CYCLOTRON TO BE BUILT BY THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

AN atom-smashing cyclotron to be devoted exclusively to medical and biological research, will be constructed at the Massachusetts Institute of Technology during the coming year. The machine will weigh more than a hundred tons and will be of the most approved type and of the same general size as the largest machine yet built, with the exception of the one now under construction by Professor Ernest Lawrence at the University of California.

In announcing plans for the cyclotron, made possible by a grant from the John and Mary R. Markle Foundation of New York, Dr. Karl T. Compton, president of the Massachusetts Institute, said: "The institute is in a fortunate position to undertake this work for two reasons. First, because Professor Robley D. Evans, under whose direction the cyclotron will be built and operated, has developed an unusually successful technique for the detection, measurement and handling of radioactive chemical elements of the type which can be produced in large quantities by a cyclotron. It was for this technique as applied specifically to radium poisoning that he was awarded the Theobald Smith Prize of the American Association for the Advancement of Science a year ago.

"Working up to the present with a relatively very feeble source of radioactive materials, Professor Evans has nevertheless done some very interesting exploratory work regarding the medical possibilities in the use of particular radioactive elements, in collaboration with several members of the Harvard Medical School and local hospitals, and also in collaboration with members of the department of biology and public health at Technology.

"The new cyclotron will permit work of this type to be greatly extended in power and scope and the program may be considered as a joint program between Professor Evans's group of physicists together with biologists at the Massachusetts Institute of Technology and medical research men in neighboring institutions.

"The second fortunate element in the situation at the Massachusetts Institute of Technology is the parallel program of the high voltage electrostatic generator of Professor Van de Graaff, who, with his colleagues, is engaged in a very comprehensive program of atomic physics. This program comprises not only the very important medical x-ray applications, which a cyclotron is inherently unable to handle, but includes also a comprehensive program of investigation in atomic physics which will parallel the investigations which can be made with the cyclotron."

AN APPARATUS FOR COUNTING COSMIC RAYS

A DEVICE enabling the fastest and most accurate counts ever made of cosmic rays and other particle radiation has been developed in the laboratories of physics at Harvard University by Dr. E. C. Stevenson, instructor of physics, and Dr. Ivan A. Getting, junior fellow.

With the new instrument, technically known as a scaling circuit, random electrical impulses coming only a fifty thousandth of a second apart can be distinguished and counted. The circuit is so stable counts can be made at these speeds for months on end without any effective changes in the equipment.

The device was designed to fill the need for such an instrument in a long-range program of counting millions of cosmic rays daily recently undertaken at Harvard. No mechanical counter is fast enough and previous electrical circuits were either too slow or too unstable. The device is also expected to be of considerable value in counting the emanations from artificially radioactive substances built up in the new cyclotron. Many of these substances shoot out tremendous numbers of particles.

The new scaling circuit does not receive cosmic rays or other particle radiations directly, but rather the electrical discharges produced by these particles in a standard Geiger counter. This is a long glass tube filled with gas at a critical electric equilibrium. A particle passing through the tube upsets this equilibrium to produce an electric discharge. These impulses are fed into one end of the scaling circuit, where their number is divided by two, four, eight, sixteen or thirty-two, depending on how the apparatus is adjusted. Thus the impulses are scaled down sufficiently to permit their being counted by a plain mechanical counter attached to the circuit outlet.

A NEW SYSTEM OF TELECOMMUNICATION

A NEW system of telecommunication that uses the tone generator from the Hammond electric organ as an integral part of the wire circuit and makes possible simultaneous transmission of ninety-six messages over existing telegraph facilities has been installed on Western Union lines between New York and in a number of key cities.

Intended for eventual extension throughout the country, the new system uses the electric organ tone generator to generate a number of electric currents, each of a different frequency, which can carry messages at the same time over the same wire without interfering with each other. The system has already been applied to the circuits linking New York and Chicago, New York and Washington, New York and Atlanta and New York and Buffalo.

It makes use of the "carrier current" principle, the most important general development in the field of telegraph and telephone communication in the last three decades. A number of alternating currents, which can be sent over the same wire without interfering with each other if they are sufficiently widely spaced, carry the message, which can either be a voice message as in telephony, or the telegraph message. The latter is transmitted by interrupting the carrier current in accordance with a code.

The tone generator from the Hammond organ, which replaces bulky pipes and reeds with compact electrical

apparatus, is used to produce the different low-frequency carrier currents used in the Western Union system. The electric organ uses a current of a given frequency to generate a musical note whose pitch or frequency is the same. The frequencies are spaced 300 cycles per second apart, making possible 22 simultaneous currents on a single circuit. As a result of methods previously in use, each frequency can be made to carry a number of messages, making possible the total number of ninety-six.

THE CHIEF CAUSES OF ACCIDENTS

THE seven chief causes of automobile accidents in the United States were listed by Sidney J. Williams, public safety director of the National Safety Council, who made a report for the American delegation to the International Road Congress at a meeting held recently at The Hague, the Netherlands. They are:

1. Exceeding the speed limit or driving too fast for road, visibility and other conditions.
2. Driving on the wrong side of the road.
3. Disregard of stop signs and signals.
4. Improperly failing to yield the right of way at intersections.
5. Attempting to force entrance between moving vehicles to avoid collision with an on-coming vehicle.
6. Attempting to pass on a curve or hill a vehicle moving in the same direction.
7. Failing to indicate intention of stopping or turning.

Systematic research by a large number of individuals and organizations over a period of years has brought out these and other facts. Describing safety work in the United States, Mr. Williams cited figures showing that systematic safety drives in a number of cities have succeeded in materially reducing the high accident rate.

More detailed and more uniform accident reports are still needed in the United States, however, in order to provide a basis for sound highway engineering, a field in which vast sums of public money are being spent. Quoting from a report submitted by A. A. Anderson, of the Portland Cement Association, Mr. Williams said: "It is essential that such information include data which will permit listing accidents on a vehicle mile basis for specific highways, day or night; and a rating to be made of the physical safety of each highway in relation to conditions causing accidents. This will mean mandatory provisions by the state or local government for reporting all details incident to highway accidents. When all contributing factors are obtained, it will be possible to develop an accident expectancy formula." This would enable accident frequency prediction and determination of how much rebuilding of a given highway would reduce accidents. This would provide a basis for judging on a dollars-and-cents basis whether a given road expenditure is justified.

MOUNTAIN BUILDING

WILL the next era of mountain building see the raising of peaks from the swamps and bayous of Louisiana, the muddy farmlands of the lower Nile and the lower reaches of the Ganges?

Geologists, studying the rocks of the great mountain ranges, find that they once were sediments, like those now being deposited on the deltas of our great rivers. Once the mountains were shallow seas, the dumping grounds of great rivers that tore away fragments of rock from other highlands, carried them to the sea, and then dropped them as the fresh waters of the rivers mixed with the still salty ocean waters and came to rest.

Dr. Andrew C. Lawson, the California geologist, who has determined much of the past history of many mountain ranges, predicts that the great deltas of to-day's rivers will be the mountain ranges of the geological to-morrow—millions of years in the future.

Long ago, geologists found that deltas sank as more material was piled upon them by the rivers. Dredgings uncovered modern stumps some hundreds of feet below the surface of the Mississippi delta. Theories were evolved to account for this sinking, and out of these studies has come Dr. Lawson's concept of mountain building.

When a great delta is "loaded" with muds and sands and silts, it tends to sink, just as the swampy ground does when heavy structures are built on it. Far below the surface, plastic rocks are forced away from the compressed delta area, forming highlands around the delta.

Eventually, with this loading and sinking, a geosyncline, or great trough, may be produced. The exact time is hard to predict, for the sinking may not go on as fast as the loading.

Later, perhaps millions of years later, when the geosyncline is filled with sediments, internal earth forces uplift it into a mountain range, which then goes through the whole cycle again.

An ideal delta, according to Dr. Lawson, is about 32 miles long, and reaches out into water 2½ miles deep. Sediments are piled on to the delta until they are about 40,000 feet thick, which seems to be the limit for sedimentary deposits. The time necessary for this growth, Dr. Lawson calculates from studies of the Mississippi delta, is about 55,000,000 years, or roughly from the time of building of the Rocky Mountains until to-day.

In North America, the building of great deltas is going on at the mouths of the Mississippi and Colorado Rivers. As the Mississippi delta is the largest and fastest-growing, we can expect the mountains-from-deltas cycle to progress more rapidly there than at the mouth of the Colorado.

As the Appalachian and Rocky Mountains wear away, their "tailings" start the building of new ranges, which in turn will wear away, continuing the ceaseless change through time that characterizes geologic history.

FLOODS IN THE YELLOW AND YANGTZE RIVERS

WITH the warning trickles already the cause of not inconsiderable damage, serious floods in Kiangsu province, the heavily populated district around Shanghai, are anticipated within the next two weeks.

In that time the crest of the spring flood from the mountains of Tibet and western China regions, thousands of miles away where the Yellow and Yangtze Rivers rise, is expected to reach the eastern part of the country, the battlefield in the Sino-Japanese conflict.

Should the flood come to Kiangsu province in as widespread a form as it has already come to the region around the Lunghai railroad, it will be a severe blow to East Asia generally and to the luckless Chinese behind the Japanese lines particularly. For Kiangsu province, in the hands of the Japanese since the earliest days of the attack on Shanghai, is one of China's bread baskets.

With territory already flooded by the Yellow River included prominently in the list of China's food-growing districts, the starvation problem already faced by millions of Chinese will become more acute almost than it has ever been in the history of Central China. The problem will, of course, become most pressing a few months from now, for there will be no replacement for food reserves exhausted during the summer while the crops were supposed to be growing.

Flooding of Kiangsu province is apparently due to a combination of high water on the Yangtze and on the Yellow River, some of whose water appears to be flowing into China's mightiest stream by way of the Hwei River and Grand Canal. Were floods near the delta occurring, flooding further up the Yangtze River would be taking place. This latter may still occur, but would in most cases be due to damage to the dykes either as a by-product of the fighting or as a deliberate stroke of military strategy.

The flood of Kiangsu province may likewise render even more tenuous the Japanese grip on that territory. Japanese, a number of surveys have shown, actually control, in much of the country they have nominally occupied, only the cities and the railroad rights-of-way. Flooded countryside is an additional obstacle to their mechanized forces. However, it does not represent nearly so severe a handicap to the partisan bands of guerilla fighters who have scored heavily for the Chinese.

LEONARD H. ENGEL

ITEMS

USING "tagged" atoms, investigators in Copenhagen are learning how muscles, broken down during exercise, are rejuvenated during rest. Professor G. Hevesy, of the Institute of Theoretical Physics, and Professor O. Rebbe, of the Zoophysiological Laboratory, have studied how the muscle substance, known as creatine phosphoric acid, breaks down during muscular exercise and how it is rebuilt or "rejuvenated" in the resting muscles. Atoms of sodium phosphate were labeled by making them artificially radioactive, so that no matter where they might be their presence would be detected by the radiations they produce. Some of this labeled sodium phosphate was injected in frogs and then, at various time intervals, creatine phosphoric acid was extracted from the muscle. The replacement of the phosphorus atoms could thus be traced.

SUPERSONIC WAVES—sounds too shrill in pitch to be heard by the human ear—will soon be used to break up solid particles into new degrees of fineness. Sound's new use has been developed from research of Dr. Karl Söllner, of the department of agronomy at Cornell University. Dr. Söllner found that high-frequency sound waves not only make sediments, gels and precipitates disperse—as previously had been known—but also that certain solids having a laminated structure could be broken into fine bits by the intense vibrations created. Dr. Söllner has filed a patent application on his process which has been assigned to the Acheson Colloids Corporation. Materials on which the supersonic waves work well include graphite, mica and steatite. As soon as production changes are completed, colloidal graphite will be made of much finer particle size and longer suspension than has heretofore been available to industry.

JAMES S. VANICK and J. T. Eash, of the International Nickel Company, reported recently to the American Society of Testing Materials that steels of hardness so great that they approach that of the diamond are now being produced. The standard methods of measuring hardness are no longer sufficiently exact for modern industry they added. For special chromium-nickel alloy cast irons some 16 tests of hardness, where a diamond point is pressed into the metal, are now required to get enough data to arrive at a suitable determination. Tests using a tungsten carbide ball pressed against the metal can give closely uniform values with only two or three determinations.

A LABORATORY instrument has been taught to do card tricks by Professor Christian A. Ruckmick, of the University of Iowa, whose "emotion meter" was originally constructed as a research tool and later was used as a "lie-detector." The victim is shown a full pack of cards, and told to select one mentally. As Professor Ruckmick runs through the pack, asking if each is the chosen card, the subject follows instructions by saying "No." When a band of light on a ruled scale at the front of the foot-square box, which is the emotion meter, fluctuates, the scientist knows the chosen card has been reached. The excitement of telling even so small a lie is enough to change the electrical resistance of the skin cells and deflect the indicator.

PÈRE ARTHÉME DUTILLY, Canadian missionary-botanist who has been conducting research at the Catholic University of America, has sailed from Montreal, to skirt the coast of Labrador into Hudson Bay and land at the remote trading town of Fort Churchill. There he will meet an American botanist, Father Maximilian Dumann, of St. Vincent's Archabbey, Latrobe, Pa., who has been botanizing in Saskatchewan Province since the end of June, and who will proceed to Fort Churchill by the far northern railway. From their remote rendezvous they will proceed northward and westward into lands even more remote, studying the vegetation of the tundras of the Canadian Arctic and collecting specimens to bring back when the first snows drive them out in early autumn.

MINIATURE schoolrooms on wheels have been built by the General Electric Company at Nela Park, Cleveland, to demonstrate the inadequacy of most present schoolroom lighting and what proper lighting is like. Each room measures 38 inches in width, 30 inches in height and 40 inches in depth and is equipped with tiny desks, chairs, blackboards and lighting fixtures. Model lighting fixtures and regular light meters indicate proper illumination levels.