SCIENCE NEWS

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RADIO RECEPTION WITHOUT STATIC

VISIONS of the day when a severe electric thunderstorm will no longer bring crashing static in home radio receivers became a virtual reality when Major Edwin H. Armstrong, professor of electrical engineering at Columbia University, showed his colleagues his static-free, nonfading system of radio transmission. From a small experimental radio station at the top of the lofty Empire State Building Major Armstrong has been testing the system for over a year with receivers scattered about the metropolitan area.

Signals from the little 2,000-watt station were recorded 85 miles away on a phonograph record while a bad lightning storm was in progress. Uninterrupted reception and no static was the result. For comparison WEAF's big 50,000-watt station, recorded at the same time, gave signals full of crashing jars and often unintelligible.

Major Armstrong also sent a radio facsimile copy of the front page of a newspaper through electric storms. Clear readable copy was received. The absence of blurriness denoted the freedom from static. At the same time a musical program was simultaneously transmitted. This is the first time in his experiments, Major Armstrong said, that music and the printed word have been sent and received together.

The fundamental point about the new static-free system, Major Armstrong explained before the Institute of Radio Engineers, is the introduction into the transmitted waves of a characteristic which does not exist in radio waves that nature created in causing static. The receiving set is so constructed that it picks up those radio waves having the special "man-marked" characteristics and discards the natural ones of static. "The theory on which the problems were solved flies directly in the face of all previous mathematical deductions. The old theory of the way to shut out static assumed that the best that could be done was to narrow the band of the selective systems at the receiver as much as possible without shutting off the signal. By narrowing the band down to a width just sufficient to admit the signal it was believed that the ratio of signal to static strength would be best. Where the signals and disturbances are of the same order of magnitude, I find the exact opposite to be true. With proper methods of transmission and reception, the wider the band, the better will be the signal to noise ratio."

The Armstrong experiments have been carried out on a wave-length of two and a half meters and have applications, it is indicated, in television broadcasting. The range of the extra-short waves is only over visible distances. The waves will not bend around the curvature of the earth. It was because of this that a sky-scraper was used for the transmitting station.

RADIOACTIVE PHOSPHORUS IN THE BODY

THAT bone formation is an ever-changing process in the body and not a happening occurring only during youth is suggested by experiments reported in *Nature* by two Danish scientists.

Using phosphorus made artificially radioactive so that its atoms could be "traced," Professor Georg Von Hevesy, of the Institute of Theoretical Physics, and Dr. O. Chiewitz, of the Finsen Hospital, Copenhagen, have studied the absorption of phosphorus atoms in bone formation.

Using experimental rats, it was found that the phosphorus atoms fed in the food take about two months before they come out of the body. They report: "The experiments suggest strongly that the formation of bones is a dynamic process continually taking up phosphorus atoms which wholly or partly replace others."

It was found that 30 per cent. of the phosphorus atoms deposited in the skeleton of an adult rat were removed in the course of twenty days, and that the front teeth absorbed ten times as much phosphorus as the average for the whole skeleton. The molar teeth, by contrast, absorbed less than the average.

The technique employed in the experiments was to add radioactive phosphorus to one milligram of ordinary inactive phosphorus to such an extent that the Geiger counter, used in detecting the radioactive element, registered 1,000 clicks a minute. Thus if any product obtained later by subsequent biological or chemical reactions gave only one click a minute, only one thousandth of a milligram of the inactive phosphorus was present. The ability of radioactive phosphorus atoms to act as tracers through the animal body is comparable with research on heavy water whose "heavy" isotopic atoms can similarly be used for tracing biological happenings.

Last January Professor Hevesy reported that if a person drinks a glass of water nearly half of it is still in the body after nine days. He used the heavy hydrogen atoms in heavy water to detect the process of elimination. His present report on phosphorus absorption is similar research with a different chemical element.

TUNGSTEN ALLOY AND THE TREATMENT OF CANCER BY RADIUM RAYS

A NEW tungsten alloy which effectively takes the place of more bulky lead as a "screen" when massive doses of radium rays are being administered has been developed for use at the Westminster Hospital in London.

The bomb-shaped containers in which large packs of radium are shielded in hospitals can be made much smaller with the new alloy and yet have the same screening effect. A volume reduction to nearly half the former size is attained. More compactness means the patient can be placed closer to the source of the radium rays, if need be, and receive more intense radiation.

The new tungsten alloy resulted from the researches of Sir John McLennan while he was scientific adviser of the Radium Beam Therapy Research Company, and Dr. C. J. Smithells, of the (British) General Electric Company. Sir John recently died while on vacation on the Continent.

When massive doses of gamma rays from radium are administered to cancer patients a large amount of radium

is necessary. Many authorities believe not less than four grams of radium, valued at close to $200,000, is the minimum. This potent radium pack is shielded so that its piercing gamma rays do not strike doctors and nurses or any parts of the patient's body except the afflicted area. The complete equipment, radium and its shield, is known as a radium bomb.

Although lead is easily shaped and machined and is relatively cheap, it takes a somewhat unwieldy size of lead bomb to provide adequate screening for four or more grams of radium. The screening effect of lead is due to its high density (11.35), the degree of absorption of gamma rays by metals being nearly proportional to the density of the metal. Plainly a smaller quantity of a denser metal than lead would have an equivalent screening effect, but the only suitable metals in this category are gold, platinum and tungsten. Of these the first two are prohibitively expensive.

There remained tungsten, best known in the form of electric lamp filaments. Its high theoretical density (19.3) is only found when the metal has been treated by expensive metallurgical processes.

The difficulty of cost was overcome by the tungsten alloy. By adding from 5 to 10 per cent. of either copper or nickel an alloy of a density in the neighborhood of 17 could be successfully evolved on the desired scale, and for about $5.00 per pound. The tungsten alloy radium bomb is only 64 per cent. as large as the lead bombs previously used. The size is in the ratio of the densities of the two materials, 11 to 17.

The alloy has been adopted for use by the Westminster Hospital for its 4-gram radium bomb now being constructed under the direction of Dr. H. T. Flint and C. W. Wilson. It is also to be used for the radium bomb at Birmingham, England.

EXCESS VITAMIN D REPORTED HARMLESS

TAKING large amounts of rickets-preventing vitamin D into the body causes no harm whatever, it is indicated in recent research by Dr. Harry Steenbock, of the University of Wisconsin, whose research has led to irradiation of food products to increase their vitamin D content.

With irradiation of food products becoming increasingly popular, there is a possibility that many persons consume vitamin D in excess of their needs. Since this vitamin increases the power of the body to fix calcium, it has been a matter of considerable speculation whether this element may be fixed in injurious amounts, or whether the vitamin D may have other undesirable effects.

Dr. Steenbock conducted feeding trials with experimental animals over a ten-month period, allowing them to consume vitamin D in far greater amounts than human beings are ever likely to do. While commercial irradiated milk usually contains about 50 Steenbock units of the vitamin per quart, he used milks varying in potency from this figure up to 5,000 units per quart. All the common methods of fortifying milk with additional vitamin D were employed. Some of the milks were laboratory irradiated, others were produced by cows fed irradiated yeast, and still others were supplemented with irradiated ergosterol and cod-liver oil concentrate.

The experimental animals were given no other food than vitamin D milk to which small amounts of iron, copper and manganese were added. They were given all they could drink during the ten-month period. All the animals grew well, were uniform in appearance and showed no evidence of abnormality whatever.

RACIAL SUPERIORITY AND STERILIZATION

TWO widely held biological opinions which are claimed to be the basis of the present policy of one European nation are attacked by Professor J. B. S. Haldane, of the University of London. Sterilization of the unfit is not necessary for national hygiene, and the evidence that some races are superior to others is rather weak, Professor Haldane points out in his Halley Stewart lecture.

As far as improving national hygiene by decreasing the number of the unfit, other measures than sterilization are available in all cases, Professor Haldane observed, mentioning as alternatives chastity or birth control for mentally normal persons and segregation for defectives. "It is doubtful whether sterilization of all mental defectives would reduce the number in the next generation by 15 per cent.," Dr. Haldane said, referring to one of the arguments of those who favor sterilization of the unfit.

Professor Haldane has analyzed five classes of human abnormalities that are determined genetically, or in the popular phrase, are inherited. His analysis shows that sterilization would be very effective in the case of such abnormalities as lobster claw, Huntington's chorea and similar conditions which may all be determined by dominant genes. Sterilization would be moderately or slightly effective in other conditions associated with dominant or sex-linked genes or the cooperation of several genes. It would, however, be totally ineffective in conditions associated with inbreeding, as in the marriage of cousins.

Discussing the theory of racial superiority, he called attention to the fact that innate psychological characteristics of races overlap. Among the so-called races of Europe outside the Arctic there is also overlapping of physical characteristics. Some facts, he said, support the theory that racial crossings for humans as well as other animals are advantageous in the first generation but harmful in later ones.

SELF-PORTRAITS OF WOLVES

BLACK wolves take their own photographs at midnight, in the dark of the moon, in thick woods in the South. They live in the Singer Wildlife Refuge, on the banks of the Mississippi in northern Louisiana. Their photographs were taken by flashlight, with cameras set off by cleverly concealed electrical apparatus. The photographs, published in a new bulletin of the Chicago Academy of Sciences, constitute the first known self-portraits of timber wolves made in their natural habitat.

The pictures were secured by Tappan Gregory, of Chicago, with the collaboration of Robert S. Sturgis, of Chicago, Stanley Young, of the U. S. Biological Survey, and the assistance of a number of other Biological Survey workers.

To obtain an animal self-photograph, a charge of flashlight powder, with an electric fuse to fire it, is set

on a post in a paraffined cardboard box. The wires from the fuse run to a device that closes the circuit when the animal brushes against an invisibly fine wire or steps on a buried tread. So well concealed are these mechanisms that they do not show in the resulting photographs, and the animal might easily be a thousand miles from the nearest works of man, so far as visible evidence goes. The air-concussion from the explosion of the flashlight powder is used in another mechanism to snap the shutter of the camera, making the whole process automatic.

Making wolves and other beasts of the forest take their own pictures at night is not as simple as it sounds, however. Mr. Gregory tells of a score of vexations that beset the man who hunts wolves with a camera. Other animals, from wandering pigs to over-inquisitive raccoons and bait-stealing skunks, often fire the flash, wasting all the work of a night's set-up. The apparatus itself may "go hay-wire" due to moisture, corrosion or mechanical accidents.

But patience, and everlasting willingness to try it again every time something goes wrong, in the end bring their reward, in the shape of first-class pictures of the "Big Bad Wolf."

ITEMS

A SMALL pilot balloon bearing automatic recording instruments has ascended to a height of 18.3 miles—a new record for Russian work in this field—at the Institute of Aerology in Slutsk. At an altitude of eight miles the temperature registered by the device was seventy degrees below zero Fahrenheit. At 11.8 miles the temperature rose to minus 58 degrees Fahrenheit; at 16.7 miles it was minus 52. From this last point to the maximum at 18.3 the temperature stayed constant.

THANKS to rigid game laws, Sweden now has the largest stock of wild moose in Europe, according to Wilhelm Kugelberg, a game preserve official. One hundred years ago the animal was found only in certain parts of the central provinces, Vermland and Dalecarlia, whereas today there are large herds of moose in practically every part of the country. There is very little poaching, for the people as a whole take great interest and pride in the preservation of the animals. During the annual open season, which lasts only a few days, more than 6,000 animals are killed; but the game laws and the virtual absence of illegal shooting has helped to increase the stock enormously.

WILD wheat, in many distinct varieties, has been found growing on the foothills of the Ararat region in Armenia. The authorities of the Armenian Autonomous Soviet Socialist Republic have set aside the area as a scientific reserve, not to be cultivated or grazed, because of the value of such wild wheat varieties in the study of the origin of cultivated wheats, and also in genetic experiments looking to the improvement of the cultivated varieties in resistance to frost and drought.

IT was a lighted sea worm, not a flickering torch in the hand of a native, that Columbus saw from his flagship the anxious night before he discovered America. With this biological explanation, one of the mysterious features of the discovery voyage is believed cleared up at last. The light, which Columbus described as "like a small wax candle which rose and fell," was probably the luminous display of sea worms known as syllids, according to a report in *Nature* by L. R. Crawshay, of the Marine Biological Association Laboratory at Plymouth. October is one of the months in which the illumination has been noted and it occurs usually around the last quarter of the moon, both points fitting America's discovery date.

AFTER the first of January, all applicants for a marriage license in the State of Connecticut must pass a Wassermann or Kahn test before a license will be granted. The certificate must be based on a blood examination by an approved laboratory. The blood examination will exclude the possibility of syphilis. Other states requiring medical examination upon the issuance of a marriage license are Wisconsin, Oregon, North Dakota, Alabama, Wyoming and Louisiana. The State of North Carolina repealed its law this year.

THE latest device to attract customers at fairs is an apparatus for measuring blood pressure. For a dime the customer learns what his blood pressure reading is. If he is of the nervous type, he begins to worry. The great danger to the public is in the use of such apparatus without the necessary medical background for interpreting the results, according to an editorial in *The Journal of the American Medical Association*. "Any single reading of blood pressure, pulse rate or even temperature, without relationship to the general physical and mental condition of the person concerned, is bound to lead to false interpretations and the associated hypochondria," the editor states. When approached by physicians, the manufacturers of such apparatus "protest earnestly and long that they are doing their utmost to stop the sale of such devices to persons outside the medical profession."

WITH light reflected from the top of a tower forty feet high, astronomers at the McMath-Hulbert Observatory of the University of Michigan at Lake Angelus will soon be able to make movies of the sun in the light of a single glowing element in its atmosphere. In this way they will record the solar prominences, great flame-like masses of hydrogen that often shoot out from the sun's surface to heights of hundreds of thousands of miles, and solar "bombs" that are occasionally projected high above its surface and then explode. The tower telescope, now being constructed under the supervision of Robert R. McMath, one of the founders of the observatory, will have two flat mirrors at the top to pick up the sun's light. One will turn with the earth, so as to follow the sun across the sky. The other will reflect the light into a lens immediately below, and this in turn will form a four-inch image of the sun in a building on the ground. Underneath, a pit thirty feet deep will hold the spectroscope through which the sun's light can be analyzed. Similar telescopes have been built at the Mount Wilson Observatory in California, and in Potsdam, Germany; Arcetri, Italy, and Kyoto, Japan.