Germans Overcome Radio Fading

General Science

Following are reports of the meeting of the Gesellschaft deutscher Naturforscher and Aertzte at Hamburg.

Fading, one of the chief difficulties encountered in transmitting radio messages on short waves, can now be overcome. The method is to utilize two antennas perhaps fifty to a hundred yards apart, at the receiving station, instead of the usual single antenna. This announcement was made at the meeting of the Society of German Naturalists and Physicians by Dr. H. Rukop of Cologne.

According to accepted ideas, these short radio waves, which have permitted conversations between America and Australia, gain their powers of travelling long distances as a result of the Heaviside layer. This is a region of ionized atoms, high above the earth, and which reflects radio waves striking it back to the earth. A receiver located near the transmitting station will get the direct waves, a little farther away these will be too faint to receive, but still farther the station will receive the wave that has travelled to the Heaviside layer and down again. But it is thought that irregularities in this layer may cause temporary changes in the path of the waves. Sometimes two parts of a wave may both reach the same station, but arrive at such a time that they interfere with each other. With the two antennas it would be very seldom that a weak signal reached both at the same time, and so a receiving station connected to both would always receive something.

Though short wave radio is now used throughout the world, its development is due directly to the amateur enthusiasts of the United States, declared Dr. Rukop. Ten years ago it was generally thought that these short waves were of little value, and could only be used for communication over very short distances. Then by international agreement various wavelengths were assigned for various purposes, and the amateur was given the waves shorter than 200 meters, probably because nobody else wanted them. They began to use them, and found that they could cover far greater distances than anyone had supposed, and so spurred on, have made short wave comunication between the antipodes a common occurrence. Television, which requires the use of high modulation frequencies, also needs short waves, and this also has been a recent impetus to research.

Lunar Influences

Perhaps the old ideas of the moon's effect on life are not as "loony" as it has been thought. That it influences such different creatures as human beings and worms in the south sea islands is the startling theory advanced by Prof. F. Dahns, of the University of Hamburg. He has found, he says, that when the attraction of the moon is stronger in the evening, the pulse rate is increased, as well as the body temperature. As for the worms, *Eunice viridis,* as they are known scientifically, he has found that their mating takes place when the moon pulls the earth hardest.

Immunity to tuberculosis can be conferred by the use of a salve made of dead tuberculosis germs, the scientists were told by Dr. E. Lowenstein, of Vienna. It is known as dermotubin, he said, and has been used in the last four years to immunize all Vienna school children. Three applications, a (*Turn to next page*)

No Danger of Science Blowing Up Earth

Physics—Chemistry

A billion years from now water, air, earth and iron, in the form of hydrogen, oxygen, silicon and iron and closely related elements, will continue to be the chief constituents of the earth, just as they are today. The energy used by mankind will continue to come from the sun, or perhaps from another sun that may have been formed when our present one is used up. There is no danger that scientists, in their efforts to "split the atom," may start a world-wide atom-splitting that will result in the complete annihilation of the earth in a burst of energy.

This was the reassuring message brought to the Society of Chemical Industry by Dr. Robert A. Millikan, director of the Norman Bridge Laboratory of Physics of the California Institute of Technology and winner of the Nobel Prize for physics. At the society's recent New York meeting he was awarded the Messel Medal of the society in recognition of his work.

But his address also contained a pessimistic note. Energy can be made from the gathering of atoms of hydrogen to form heavier elements, especially helium, oxygen, silicon and iron. Out in the space between the stars this is probably happening. Cannot man take the enormous quantities of hydrogen that exist as water in the oceans, and turn them into these elements? Dr. Millikan thinks that this is forever beyond the reach of mankind, for, he said, "the indications of the cosmic rays are that these atom building processes can take place only under conditions of temperature and pressure existing in interstellar space."

In suggesting this source of energy, Dr. Millikan departed from previously held ideas. With the discovery of radium by Madame Curie about thirty years ago, it was found that it and allied elements are constantly disintegrating into single elements, with the liberation of energy. Many have thought that a similar process was taking place in all the elements, though too slowly to be observed in the small quantities available for laboratory study. On the whole, however, it was thought, it might be great enough to be an important source.

Einstein's discovery that mass must disappear if energy is to appear, combined with the development by F. W. Aston, an English physicist, of the relation between the weight of the atom and the mass of the electron at its center, show that this is nit true, said Dr. Millikan. An atom with a weight less than a hundred times that of hydrogen cannot disintegrate like radium. As 99 per cent. of the earth consists of elements of lower atomic weight than 100, we do not get much energy from this source. In fact, he said, "the energy available through the disintegration of radioactive or any other atoms may perhaps be sufficient to keep the corner peanut and popcorn man going on a few corners in our larger towns for a long time to come, but that is all."

It is this fact also, he stated, that shows how un- (*Turn to next page*)

German Science Meeting—*Continued*

month apart, produced reactions in a third of the six year old youngsters, which indicates active immunity. Despite the virulence of the live germs, the salve is not harmful to those manufacturing it, he said, and it is now being made regularly by the Vienna Serological Institute.

Jekyll-and-Hyde Germs

The possibility of germs, previously harmless, rising in revolt and attacking human beings, while other pathogenic organisms abandon their life of crime and become adapted to peaceful residence in the human system, was presented by Dr. A. Gottstein, chief German health officer. Dr. Gottstein attributed the small number of epidemics during and after the World War to a tolerance to germs, developed during the milleniums of our enforced living with them. This factor, plus personal hereditary immunity, he said, explain the low ebb in the number of cases of scarlet fever and diphtheria despite wartime malnutrition.

A given strain of germs may lead a Jekyll-and-Hyde life, Prof. Emil Gottschlich of Heidelberg believes. Various epidemics may be due to periodic changes in their virility, enabling them at times to do great mischief but at other times leaving them impotent. Prof. Gottschlich also agreed with Dr. Gottstein that there is a possibility of previously harmless germs running amuck and starting an epidemic in that way.

Dr. Peter Debyo of the University of Leipzig drew a vivid picture of the crowded existence that atoms have to put up with. He asked his hearers to imagine a cube of common salt one millimeter on a side, as being enlarged a thousand and million times. This would make an immense block six hundred miles on a side—about the distance from Washington to Detroit. Yet in this vastly enlarged cubic millimeter of salt the atoms of chlorine and sodium would be only a foot apart.

Tetrapyrrol

The oxygen-carrying compound of the blood has at last been driven into its corner and compelled to confess its chemical identity by Prof. Otto Warburg of Berlin. It is an iron compound bearing the chemical label tetrapyrrol and belongs to the class of substances known to the technical world as "ferments." It is ten thousand times more sensitive to light than haemoglobin. But the light affects it beneficially, for when it is poisoned by combination with carbon monoxide, the combination is readily broken up by faint illumination, and the ferment can then resume its function of carrying oxygen.

Living matter has an atomic structure peculiar to itself, declared Dr. H. Mark of Ludwigshafen. The grouping of the atoms in protoplasm into special groups called micellae, found in living things and nowhere else, was postulated by the great botanist Naegeli during the nineteenth century. Now, said Dr. Mark, Nägeli's hypothesis has been definitely proved, thanks to new technique involving the polarization of light and its utilization in the ultramicroscope to demonstrate the structure of such micellae in rubber, cellulose, sugar, etc. Atomic models of these organic structures can now be built with as much confidence as models are constructed for non-living things such as salt or silica.

Science News-Letter, September 29, 1928

A Kansas law prohibits advertising signs within 500 feet of road intersections, turns, or railroad crossings.

Earth Safe from Explosion—*Continued*

justified are the fears of the "advocates of a return to the 'glories' of a pre-scientific age who have pictured the diabolical scientist tinkering heedlessly, like the bad small boy, with those enormous stores of atomic energy and some sad day touching off the fuse and blowing our comfortable little globe to smithereens." If man ever does learn to disintegrate atoms, and he probably will, he will have to do it by putting energy into the process.

It is the cosmic rays that he has studied in collaboration with Dr. George H. Cameron, his colleague, that indicate the formation of energy in the building up of atoms out in the space between the stars. In previous addresses, Dr. Millikan has made this suggestion, and now he believes that he knows just which atoms it is that are being made. Utilizing the discoveries of Aston and Einstein, he says, he has found that only in the formation of helium, oxygen, silicon and iron out of hydrogen could rays of such penetrating power as he has observed in the cosmic rays he produced. He has worked out also the penetrating power that the rays from the formation of each of these elements should have. In very recent experiments he has found that these rays are not all of the same exceedingly short wave-length. Nor are they uniformly spread over a range of wave-lengths, like light from a white-hot poker. Instead, there are four bands in their spectrum, corresponding to four approximate wave-lengths, or four degrees of penetrating power. The most penetrating or shortest wave-lengths are capable of going through 200 feet of water or 18 feet of lead. Other groups of the rays are of less penetrating power, but these different degrees of penetrating power, observed in the experiments, correspond very closely to those calculated for the rays from the principal elements.

"The agreement," he announced, "is better than our observational uncertainty, and leaves no doubt whatever in our minds that the observed cosmic rays are in fact the birth cries of the infant atoms of helium, oxygen and silicon. We have some little indications that we can also hear the shriller birth-squeaks of infant iron, but we are not as yet ready definitely to assert it."

Science News-Letter, September 29, 1928