SCIENCE NEWS

Science Service, Washington, D. C.

THE BENDING OF RADIO WAVES

BENDING of the radio waves in the upper atmosphere, in somewhat the same way as a beam of light is bent when crossing a hot stove or highly heated ground, is responsible for many of the curious and apparently contradictory effects observed in radio transmission with short waves, according to William G. Baker and Chester W. Rice, of the research laboratory of the General Electric Company at Schenectady, N. Y. Just as the bending of light waves over a desert sometimes brings into view objects far beyond the horizon, and produces a mirage, when the radio waves are bent it may be possible to hear signals from a distant station though nearer receiving sets can not detect them.

"Experiments in short-wave (*i.e.*, 60 to 15 meters) transmission made during the past two years have definitely brought to light many peculiarities which were entirely unexpected as extensions from our many years of long-wave experience," said Mr. Baker. "Until recently any announcement of long-distance short-wave transmission was put down as an unexplained freak by the average radio man, and dismissed from his mind. As the number of such reports increased, we could no longer be content to dismiss them as freaks. We were forced to abandon our preconceived notions as to what normal short-wave transmission should be.

"As a typical example of the peculiarities of short-wave transmission, let us describe the experience obtained with a 5 kw., 30 meter transmitter. Here the signal strength rapidly decreases as we leave the transmitter and reaches the lower useful limit at about 70 miles. This short range is what might be called the unexpected value as viewed from our long-wave experience. If now we continue to greater distances the signal remains out until we reach approximately 450 miles where the day signal unexpectedly becomes strong again.

"Continuing to greater distances we find the signal gradually falling off in intensity and reaching the limit in the vicinity of 4,500 miles by day. On a summer night the signal does not reappear after the 70 mile extinction until we are approximately 2,000 miles from the transmitter, after which the signal falls off gradually to a very low value at 7,500 miles."

These effects, which vary in amount according to the wave length and power of the transmitting station, are explained by the investigators as being due to the presence high up in the atmosphere of a layer of free electrons, of which the atoms of matter are supposed to be made. Near-by receiving sets hear the transmitting station by the direct waves as these go out in all directions from the aerial, but these waves that rise in the air enter this electron layer, and are refracted so that they are bent downwards again. However, the waves which ascend almost or entirely vertically are not refracted, and so are not brought back to the earth, and the 450 mile day limit represents the line reached by the waves which have just been far enough from the vertical to be refracted. At night time the layer of free electrons is at a greater altitude and so the nearest return of the "sky wave," as it is termed, is farther than in the day.

Fading, the bane of the broadcast listener's existence, may be caused when the sky wave comes back to earth within the limit of the ground wave, causing interference between the two. However, as the work of Mr. Baker and Mr. Rice has discovered some of the laws which govern the short waves, it may now be possible to design sets which will give the best transmission between two particular points.

LOSS OF LIFE FROM VOLCANOES

PRECAUTIONARY measures to prevent loss of life from volcanic disaster are being urged by European scientists.

In a paper published by the Geographical Society of Geneva, Dr. Albert Brun stresses close scientific observation of all the phenomena attending active volcanoes as the best means of guarding against catastrophe. He mentions the study of earthquakes at the volcanoes, registration of sound waves, chemical analysis of gas, use of aviators for reconnoitering and the steady observation of the performances of craters and hot springs as necessary means of being forewarned for trouble.

Dr. Karl Sapper, of the University of Wurzburg, maintains, on the other hand, that the disturbances characteristic of active volcanoes, such as appearance of new vents, underground noises, earth tremors, exhalation of gas and the like are not sufficient evidence of a coming eruption. He cites Cotopaxi, Kilauea, Keloet and others as eruptions that have broken out without any such advance warnings. 190,000 people have been killed by volcanoes in the last four centuries, he says, 93 per cent. of which were about the Pacific, the maximum loss having occurred at volcanoes erupting only once with much violence and after a period of long inactivity.

Dr. Sapper advocates as the most effective method of attack popular propaganda and education of the public in the schools concerning precautions, building sites, steep roofs to shed ash and readiness to migrate in case of danger. Valley bottoms, the natural paths of the lava flows, should be avoided as places in which to settle. Governmental insurance reserves and rehabilitation are the only means of meeting the emergency of famine and disease, caused by the heavy fall of ash, destructive to plant and animal life alike.

Already some results of the progress in knowledge and education about volcanology have been seen in the handling of the Vesuvius and Etna eruptions. Still better preparation and protection were in evidence at Sakurajima in Japan. Java and Hawaii have cared for disasters with science and forethought and many of the countries which have active volcanoes within their confines are devoting attention to careful building, transportation and organization for crisis, as never before.

THE HIGHER APES

JUST where the higher apes belong on the zoological family tree, and exactly what names we have a right to call these hairy cousins, has been the subject of an ex-

haustive study by Dr. C. W. Stiles, of the U. S. Public Health Service, who has just completed a 150-page treatise on the subject for early publication.

"This may look like a question of interest only to professors of zoology," said Dr. Stiles, "but the exact opposite is the case. The study was undertaken in the first place because of its very great practical importance. Apes and monkeys are indispensable now-a-days in the experimental study of human diseases, and a great deal of confusion and some possibly dangerous mistakes can be caused in medical and bacteriological circles when the same name is given by different men to entirely distinct species of apes, one of which might be very susceptible to a given disease and the other quite immune. So a straightening up of the whole situation was necessary, if we are really to know what we are talking about.

"My survey of the literature on apes and monkeys took me back to the year 1551," Dr. Stiles continued. "The confusion of names began then, and it has not been straightened out yet. Not merely apes but the human species also were involved by the earlier writers, who lived long before Darwin and so far as I know never gave a thought to evolution. Some of them listed apes as a kind of man, others considered certain types of men as apes. Even as late as 1829, a freak human being who was discovered was classified as an ape.

"One interesting side-light on this situation is afforded by the name of the big East Indian ape, the orang-utan. 'Orang' is a Malay word meaning 'intelligent being'; it is applied not only to man and the orang-utan, but also to the elephant. Roughly, it may be said to mean 'man.' 'Utan' means 'of the woods.' 'Orang-utan' therefore means 'man of the woods.' One early scientific name of the orang-utan was a literal translation of the Malay into Latin: 'Homo sylvestris.' A later but only slightly freer translation was made by P. T. Barnum, *i.e.*, as 'the wild man of Borneo.' "

In order to end the confusion of names among these animals, Dr. Stiles has decided to cut the Gordian knot, and instead of trying to determine exactly which ones among the many names that have been given to them should be applied to the various species, he will appeal to the International Committee on Zoological Nomenclature to authorize the use of names on which no conflict in use exists.

ULTRA-VIOLET LIGHT AND RICKETS

BATTERIES of quartz-tube ultra-violet lamps may become a necessity in stables where dairy cattle are fed in winter, if the experiments performed at the Maine Agricultural Experiment Station by Dr. John W. Gowen and his associates may be taken as an indication. The experiments show that milk from cows receiving a "dose" of ultra-violet light from mercury vapor lamps contains the substance that prevents rickets in children and young animals, while the milk from cows kept away from sunlight and not treated with ultra-violet light was powerless to prevent the ailment.

In the experiments, Holstein-Friesian cows of nearly the same age and calving date and receiving like treatment as to feed, temperature, etc., were placed side by side in the same barn.

"Throughout the experiment these cows did not leave the barn. For one month none of the cows received ultra-violet light. For the second month two cows received ultra-violet light fifteen minutes a day generated from a Cooper-Hewitt alternating current light at three feet above their backs. For the third month these cows received ultra-violet light for thirty minutes a day under the same conditions. In the meantime Rhode Island Red chickens were allowed to develop rickets, shown both clinically and by X-ray photographs. They were divided into two lots, one lot of these chickens receiving milk from the ultra-violet cows, the other of two chickens, milk from the control cows. Both lots received all the milk they wished.

"The chickens have now been under treatment fifty days," Dr. Gowen states. "The lot receiving milk from cows exposed to ultra-violet light are in good condition with no appearance of rickets in X-ray plates. The lot receiving normal milk has moved progressively toward more extreme clinical and X-ray rickets. The experiment has been repeated, using the milk from these same cows on White Leghorn chickens showing clinical and X-ray rickets. Five chickens were in each lot. After thirty-eight days' treatment four of the lot receiving milk from the ultra-violet cows are almost cured of rickets, showing only a very slight stiffness. The fifth chicken shows same stiffness. Four of the lot receiving the normal milk show constantly increasing symptoms of the more advanced stages of clinical rickets.

"These results point to the conclusion that more of the substance necessary to cure rickets is absorbed by the cow exposed to ultra-violet light and secreted by her in her milk. The cows prevented from receiving ultra-violet light are not able to secrete this anti-rachitic substance in sufficient quantities to cure or allay the progress of clinical rickets. The results thus point to an environmental factor transmitted by the cow to her offspring through the medium of her milk. It further suggests that the high incidence of rickets in children during the late winter months is due to their mothers' not receiving ultra-violet light either during pregnancy or while in lactation. Furthermore, it would appear that cows' milk produced especially for baby-feeding should be from cows which have access to ultra-violet light either from the sun or some other source."

THE FUNCTION OF THE SPLEEN

MODERN medical science is at last unraveling that physiological mystery of the ages, the purpose of the spleen in the human system.

It has been known since classical times that the spleen could be removed without any apparent ill effects on the patient. Various conjectures, all more or less erroneous as to what its purpose could be in the human anatomy, have come down to us. By the last half of the nineteenth century it was definitely established that it had something to do with the purification of the blood as well as the formation of some of the blood cells, and though it was not necessary for life these functions after removal were taken over by the bone marrow and other organs.

In a résumé of the more recent work done on this

mysterious organ, by Dr. E. B. Krumbhaar, of Philadelphia, we find that the spleen is an important source of antibodies, those little-understood elements in the blood that help kill off bacteria. Laboratory experiments seem to show that the spleen plays a considerable part in resistance to such infections as tuberculosis and also to the growth of tumors. It has been found that tumor grafts make much less growth in the spleen than in any other organ, and that its removal definitely cuts down the resistance to tumor inoculation. Some experimenters believe that it contains a substance actually destructive to tumor cells, but this has not yet been conclusively proved.

Two doctors of New York City, Dr. S. Shapiro and Dr. F. H. Frankel, have tried to ascertain the effect of feeding extracts of spleen and bone marrow upon the formation of red corpuscles. Their patients showed an increase in the number of red cells while being fed the extract, but the count went down as soon as the dose was stopped. The definite establishment of the fact that such extracts contain a substance which will increase the production of red corpuscles would be of inestimable value in the treatment of many diseases, particularly anemia.

INFLUENZA AND PNEUMONIA

THE world has been afflicted with an unusual amount of influenza and pneumonia during the last six months. While medical authorities will not predict an epidemic like the one of 1918, they admit its possibility.

Three factors make an influenza epidemic a grave contingency: first, its apparently cyclic character; second, the coal strike; third, lack of knowledge with respect to its control.

Cyclic character means that it is likely to come back again and this is demonstrated by study of its previous occurrence. The big influenza epidemics of the past, notably in 1889 and 1918, have been characterized by recurring waves in the succeeding years. After about 1894, unfortunately, influenza faded out of public attention, until by 1918 much valuable knowledge acquired in the earlier epidemic has been forgotten. Dr. Victor C. Vaughan, of the National Research Council, has expressed himself, in a recent talk, as of the opinion that the present outbreak is a secondary wave of this sort.

Many have attributed the increase of influenza to the scarcity and inferiority of the fuel supply though this hardly accounts for its presence in the countries that have not been in the throes of a coal strike. Insufficient heat, while it may not be a cause, has undoubtedly been an aid and abetment in the current prevalence of both influenza and pneumonia.

It is discouraging to learn that years of research will probably be necessary to give the world information as to the best means of combatting this potential plague. Another epidemic would find the medical profession quite as impotent to deal with it as in 1918, according to Dr. Vaughan. Its causative agent is unknown. A vast amount of bacteriological work has been done on the subject but medical science can not come to any definite conclusions concerning the agent that really produces plain unadulterated influenza. The complications such as bronchitis and pneumonia that frequently follow have rendered isolation of the organism causing primary influenza particularly difficult. Various vaccines in use as a safeguard have met with nearly as much failure as success.

The best preventive measure, impractical as it sounds, when influenza assumes any very serious proportions, is to keep in the best physical condition possible, and to stay away from crowds. In other words, the best way not to get it is to avoid it.

ITEMS

A MACHINE which pours ultra-violet light through a funnel down the throat of a patient has been on display in London, at a nursing exhibition, and has attracted considerable interest. Both sunlight and ultra-violet light, or artificial sunlight, are in general use for external treatment of rickets, tuberculosis and some other diseases. Light rays are also being applied to hasten healing wounds. The new apparatus is being used for treatment of various mouth and throat diseases, thus making it possible for patients to take internal baths of artificial sunlight.

BED rest instead of physical exercise, and deep exhaling from the lungs, in addition to the usual non-fattening diet, are prescribed as a cure for obesity by Dr. G. Leven, general secretary of the Paris Therapeutic Society. Dr. Leven teaches his patients to breathe out so hard that they bend the flame of a candle, and to inhale only very slightly. The breathing can be done lying in bed, sitting up or standing erect. Series of five exhalations are repeated every half hour fifteen to twenty times a day. One patient lost fifteen pounds in twenty days and another sixty pounds in the course of eight months. When a person overeats, Dr. Leven believes, the solar plexus is irritated and this disturbs the functioning of those cerebral centers that regulate the destruction of fat. Other conditions may also cause this disturbance. The course of treatment prescribed is claimed to counteract the effect.

THE French have a new fireproof building material. It is cheap, light, durable, sound proof and made of straw. The straw is pressed into rectangular panels nine feet long by six feet wide and two inches thick, bound together by lengthwise wires about six inches apart. The heavy pressure under which the panels are constructed as well as the mineral content of the straw account for its being fireproof. Solomite, as it is called, was used extensively last summer on account of its easy handling properties in the construction of many of the buildings of the Exposition of Decorative Arts at Paris. It has been found to work out very well as side walls, ceilings and partitions, offering a convenient surface for plaster and stucco. This type of construction has proved to be very popular for summer cottages, while the sound-proof qualities of the material have rendered it useful in the audition rooms of music stores.