SCIENCE NEWS

Science Service, Washington, D. C.

OPEN AIR ACOUSTICS

A SPEAKER may be heard more clearly and accurately in the open air than in any auditorium. This conclusion, following elaborate experimentation by Dr. Vern O. Knudsen, physicist in the University of California, Southern Branch, is a contradiction of the widespread idea that a properly constructed auditorium reinforces and improves audibility. The walls of such a room may increase the general loudness of speech-sounds, but the interference of reverberation more than counteracts the presumed advantage. In one test of an auditor's accuracy in understanding speech it was found that a listener 100 feet from a speaker in the open-air Hollywood Bowl made a better record than he could even in the best Los Angeles auditorium available.

More precise tests were carried on with the aid of an oscillating amplifier—the equivalent of a "howling" radio set. This device yielded a sound electrically controlled and maintained at a set value just 1,000 times the amplitude of a barely audible sound. The "howl," suddenly interrupted, reverberated for five seconds in a test room with a cement floor and no furniture. When a set of meaningless speech-sounds was spoken in this room, the auditor got only 50 per cent. of them correctly.

The room was now gradually padded more and more completely, as time went on, with a one-inch layer of hair-felt. Reverberation was steadily shortened. Finally with maximum padding, 92 per cent. accuracy in speech understanding was attained, while the reverberation time had shrunk to six tenths of a second. This is considered the limit in acoustic clearness indoors; but when the experimenters moved outdoors the accuracy rose to 95.7 per cent. exceeding the best record of a padded room and much ahead of any regular auditorium. Higher accuracy than 95.7 is improbable, as the auditors make a few mistakes in any case. These occur with end consonants, especially "th" and "ng," and not with vowel sounds.

Concave sounding boards located back of a rostrum are considered by Dr. Knudsen of appreciable acoustic value, but are generally architectural misfits. Auditorium walls in any common position are simply a necessary nuisance. Music halls, where clearness of speech articulation is of minor concern, are not directly considered in the work described; nor is any account taken of peculiar halls where a rear-seat auditor can hear a pin drop on the stage. Such a stunt may have no relation to the value of the auditorium for continuous speech.

The moral of all this to the architect seems to be—break the rules of scientific acoustics if you have to in order to avoid spoiling an artistic design; then spend some money on padding. In view of the expense and other disadvantages of hair-felt, the field is now open for a porous, spongy wallplaster which may absorb more of the stray sound than common hard plaster, and thus prevent reverberation.

THE CONSTITUTION OF THE ATOM

THAT particles even smaller than the electrons, hitherto supposed to be the smallest things in the world, surround the parts of which atoms are built up, and that this hypothesis may reconcile the old wave theory of light and the newer "quantum" theory, is the suggestion made by Sir Joseph Thomson in his recent Kelvin lecture before the Institution of Electrical Engineers. According to modern notions, an atom consists of a central, rather massive, nucleus charged with positive electricity called a proton, surrounded at relatively great distances by ultra-minute particles of negative electricity called electrons, which rotate in different orbits around the nucleus.

In order to reconcile the modern view that energy is emitted in small separate bundles or "quanta," with the older ideas, Sir Joseph said, it is necessary to assume that both the proton and its satellite electrons are surrounded by an atmosphere of much smaller particles, the impact of which on the protons and electrons causes them to vibrate and send out energy. "Both proton and electron must be regarded as nebular systems," he stated.

Theory indicates that the vibrations or oscillatory movements of protons and electrons should give rise to electrical waves, and Sir Joseph believes that such waves are actually produced, although ordinarily they are unable to escape from the outer confines of the atom, being reflected back into the interior. The so-called "quanta" of light he believes to consist of bundles of electrical waves shot out from the atom at the same time as ordinary electromagnetic waves.

INFANTILE PARALYSIS

A TEST that will indicate whether or not children are susceptible to infantile paralysis has probably been found by Dr. Edward C. Rosenow, of the division of experimental bacteriology of the Mayo Foundation.

Redness of the skin at the end of eighteen to twenty-four hours at the point where suspensions of the streptococcus from infantile paralysis are injected is thought to indicate susceptibility. Complete lack of redness is considered to show that the person is immune. A serum prepared from the blood of horses immunized with the streptococcus prevents this toxic reaction.

Dr. Rosenow cites as supporting evidence for his contention: "the absence of marked reactions in persons fully recovered from poliomyelitis, the strongly positive reactions during the acute stage of the disease, and the negative reaction during convalescence."

Skin tests that indicate susceptibility to scarlet fever and diphtheria are already in widespread use in medical practice. Children whose skins show positive reactions are then immunized to prevent their succumbing to the disease in question. At the present time no antitoxin for infantile paralysis has been developed and there are numerous points regarding the skin reaction described that have not yet been worked out, according to Dr. Rosenow.

POISONING FROM MERCURY VAPOR

THE insidious poisonous effects upon himself of mercury vapor, utilized in a period of research experiments extending over twenty years, have been described in a scientific paper by the famous chemist, Professor Alfred Stock, of the Kaiser Wilhelm Institute. Chronic troubles of the nose, throat and intestines were rendered more aggravating by increasing nervousness and as time went on his naturally excellent memory and powers of concentration grew weaker and weaker. No course of treatment prescribed by his physicians proved permanently helpful.

Eventually it became evident that collaborators in his own laboratory as well as colleagues in other places were being affected in the same way. In consequence it was decided to readjust laboratory conditions so that as little free mercury would be exposed to the air as possible. And at the same time a thoroughly efficient ventilating system was installed. In the course of a few months the various ailments fell off gradually and after a period of years health in some cases was restored completely when the experimenter refrained from further contacts with the element.

Medical science, according to Professor Stock, is not aware of the danger arising from the inhalation of mercury fumes, the chronic poisoning from which, in his opinion, is quite as fatal as the better known poisoning from lead.

SCIENTIFIC FARMING ALONG THE VOLGA

SOME 77,000,000 roubles (about $35,000,000) have been appropriated by the Soviet government to fend off famines in the Volga district. On experimental farms attempts are being made to find the best system of crop raising to offset the disadvantages of the irregular rainfall in the famous famine region of southeast Russia known as the Lower and Middle Volga.

The average precipitation in this huge section is only 16 inches per year, conditions which are about the same as those in the state of Utah, according to a report by N. M. Toulaikoff, director of the agricultural experiment station at Saratoff, made to a committee of the Geographical Society of Geneva studying world calamities. The same conditions prevail in the south of the Ukraine and a considerable part of northern Caucasus.

If advantage were taken of all the natural factors which go to make up the local climate and if modern methods of agriculture were used, there would be enough moisture to insure a regular succession of crops. Taken as a whole this part of Russia has never been intensively cultivated and in consequence is very fertile. Rye and summer wheat cultivated under modern conditions have been made to produce heavier yields than were ever before obtained in this section. Introduction of Indian corn, millet, beets and other vegetables which do well in hot weather might very profitably lead to cattle breeding and an increased milk supply.

Since drought in April, May and June always spelled disaster to 90 per cent. of the usual crops sown, in the old days the peasants always kept on hand reserve supplies to carry them over the bad years. Agricultural conditions, however, like everything else, have been completely unbalanced with consequent distress to the rural population.

The only solution, according to M. Toulaikoff, lies in building up a carefully organized system of farming that takes full advantage of natural local conditions, since irrigation on such a large scale and under present conditions is out of the question.

WATER POLLUTION FROM WASTE OIL

REPRESENTATIVES from twelve nations attended the International Conference on Oil Pollution in Washington which considered means to make the oil discharge from vessels vanish from the high seas.

The rapid increase in the number of oil-burning ships has rendered the matter of water pollution from the waste oil a matter of world importance for the discharge, being insoluble in water, is driven ashore by the wind with serious detrimental effects on bathers and fish alike.

All attempts to pass regulations effecting total prohibition of discharge of oil at sea have been abandoned in favor of a system of permanent zoning. Vessels will only be allowed to make such a discharge not less than fifty miles off shore and not farther than 150. Zones can be established by a nation only with the consent of its neighbor nations, which in actual practice means that each country will have to work out its own particular zoning problem.

There was considerable discussion during some of the sessions of the installation of separating machinery that would reclaim fully 40 per cent. of the waste oil which could be used over again. Since apparatus of this sort would pay for itself in a few years several delegates strongly advocated this solution of the difficulty. The high initial costs as well as increased tonnage, however, were felt by the majority to be arguments against the oil separators.

The rest of the time allotted to the conference will be taken up with the problem of enforcement of the regulations just passed, a question of major importance since legal jurisdiction over a vessel out at sea beyond the reach of observation is difficult to maintain.

A NEANDERTHAL SKULL

PORTIONS of a human skull, including the frontal bone, belonging to the Neanderthal race that vanished from the earth about 25,000 years ago have been discovered at Devil's Tower, Gibraltar, by Daisy E. Garrod, of Oxford University. The bones were buried at a depth of ten feet and with them were the rude stone implements used by these cave men of prehistoric Europe. The discovery is regarded by anthropologists as being of considerable importance because it corroborates the data of a similar discovery made at Gibraltar in 1848.

The Gibraltar skull brought to light seventy-eight years ago was a historic event since it gave the first clue to a branch of the human race very different from people of today. But this significance of the skull was not realized until 1856, when a skeleton of the same peculiar type was unearthed at the Neanderthal region in Prussia. This

Neanderthal skeleton was so strange that it was at first regarded as the body of a man misshapen by some terrible disease or deformity, but later finds proved the existence of an entire race with large flat skulls; great ridges over the brows; snout-like noses, probably unlike any noses that we have any conception of; thick, clumsy joints; heads carried heavily bent forward. The remains of this type of human being have been found in widely scattered places in Europe, and evidence indicates that the race existed for some 50,000 years in the era before the last great ice age.

The first Gibraltar skull could be dated no more exactly than to say that it belonged to the Neanderthal race of the Mousterian age. It is possible that this skull will enable anthropologists to find out more definitely when, why and how these extinct people made their cave homes in southern Spain.

THE CASEY COLLECTION OF BEETLES

THE insect collection of the National Museum, already one of the most valuable in the world, has been enriched by the well-known beetle collection of the late Colonel T. L. Casey, whose study of these insects had earned for him an international reputation.

For several decades Colonel Casey collected beetles, large and small, for he had a preference for those of microscopic size, at the numerous army posts at which he was stationed in the United States and in different countries in which he saw foreign service. The resulting collection comprises an accumulation of North American beetles which is one of the most complete in existence and contains as well many rare specimens from South America and other parts of the world. Colonel Casey published in all twenty volumes and many shorter scientific papers on the beetles to which he devoted so much of his life.

Being a private collector of independent means, Colonel Casey was able to indulge his fancy and at the same time add to the sum total of scientific knowledge, by studying many rare, little known species for which most specialists can spare little time from their investigation of insects of greater economic importance.

The Casey collection does include, however, many economic species that attack standing timber as well as numerous genera of weevils that are injurious to the roots and seeds of crops. These groups are being rearranged and made available for study in the museum; those of greater economic importance receiving earlier attention so that specialists may have access to them for study at as early a date as possible.

This collection brings around 6,000 type specimens to the national collection, including nearly 4,000 not in its possession before, and opens up to scientists a wealth of valuable material for study.

ITEMS

THE addition of one per cent. of metallic cadmium to copper trolley wire produces an alloy which lasts about three times as long as the ordinary copper wire, it has been revealed in tests conducted on British and Canadian trolley lines. One stretch of double track, over which some fifty cars passed in an hour, was equipped with two different wires, the copper wire wearing down several times faster than the alloy. The tensile strength of the alloy, for the same size of wire, is nearly double that of the copper. In one series of tests, reported Dr. N. F. Budgen, British scientist, copper wire after 130 days of service had worn down 6 per cent., a cadmium-copper wire of the same gauge having lost only 12 per cent. after 730 days of service. In another set of experiments the copper wire after 602 days had diminished 31.5 per cent. and in the same interval the cadmium-copper wire had lost only 8.2 per cent. The power loss due to a slightly poorer electrical conductivity of the alloy is low.

TWO thousand minnows from the U. S. Bureau of Fisheries are *en route* for Buenos Aires to help stamp out malaria in the South American republic. Top minnows are voracious feeders on the larvae of the mosquito carriers of the germ causing malarial fever. These larvae breed only in stagnant water and being air breathers stay almost entirely on the surface. Pools too large to have the air supply cut off by a film of oil have in many parts of this country been stocked with top minnows which have proved efficacious aids in keeping down the numbers of the anopheles mosquito. The minnows have been sent from the Bureau of Fisheries at the request of the International Health Board to be used for breeding purposes and distributed throughout the malarial regions of Argentina to help in the campaign of that organization to rid the Americas of malaria and yellow fever.

IN the Dead Sea a search for the two elements still missing from the chemist's periodic table has been made. The high concentration of salts in this famous body of water caused J. Newton Friend, of the Municipal Technical School of Birmingham, to consider the possibility of their containing either eka-caesium or eka-iodine. Diffractionations of samples of the water were accordingly carried out and the final diffractionation products submitted to X-ray analysis, but unfortunately the spectrum lines that would reveal the presence of either the one or the other failed to show up. Traces of the element strontium, however, were found, the presence of which had never before been recorded in any previous analyses of Dead Sea water.

ALL native attempts in China to imitate western furniture have been conspicuously unsuccessful, but the great demand for Chinese carvings and objects of art as decorations in occidental homes has led to their adaption in articles of furniture of European style and utility but Chinese in design. At first old carved wood-work decorations from shop fronts and ruined temples were incorporated into such pieces as screens, tables, chairs and even mirrors, but as the supply threatened to run out the native artisans were called in to meet the demand by using the older motifs as models for reproductions. The results have been so successful that a whole new industry has sprung up with products of real artistic merit, it is stated. Teak is the wood chiefly used which lends itself to a variety of finishes of great beauty.