SCIENCE NEWS

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THE NEED FOR SCIENTIFIC RESEARCH IN AGRICULTURE

SCIENTIFIC research needs greater freedom, less regimentation into separate water-tight compartments, if it is to produce the maximum practical benefits. This idea is laid down as basic doctrine for his department by Secretary of Agriculture H. A. Wallace, in his annual report.

Secretary Wallace writes: "The principal function of this department is scientific research. All its other activities, such as weather and crop reporting, the eradication or control of plant and animal diseases and pests, the administration of regulatory laws, highway construction and economic guidance, are the practical expression of research results. Research is the primary thing, the keystone of the entire structure of the department's functions and services.

"Naturally the department does not rely exclusively on the findings of its own investigators: on the contrary, it draws upon the general fund of scientific knowledge as it increases throughout the world. But this is one of the tests of its scientific efficiency and value. Were the department not engaged itself in creative scientific work, it could not use creatively the findings of other institutions. Only science can assimilate science."

As illustrations of the way science overflows artificial departmentalizing, Secretary Wallace cites the dependence of aviation, farming and the shipping industries on the Weather Bureau, which itself must invoke the aid of physics, geology, geography and other sciences. He also calls attention to the far-reaching effects of the food-preserving industries on changing types of farming; these industries being the product of joint effort on the part of chemists, physicists and biologists. Examples might be multiplied without end.

Yet in the past, appropriations for the support of research in the Department of Agriculture have allocated funds, "item by item, on a bureau basis, for objects sharply particularized."

To get away from this difficulty, and to push ahead faster toward practically usable results, the department is making use of a special fund for basic research, appropriated by the Congress at its last session. This fund, which will grow to an annual total of $5,000,000, is partly under the immediate direction of the secretary, to be disposed for the general good of agriculture and of science.

SEARCHLIGHTS TO EXPLORE THE UPPER AIR

A NEW method of discovering what exists in the unexplored upper air beyond the reach of balloons, some 20 to 50 miles above the earth, has been developed by three Washington physicists connected with the Carnegie Institution's Department of Terrestrial Magnetism and the Bureau of Chemistry and Soils of the U. S. Department of Agriculture.

Searchlights will be used to shoot light into the night sky, light that is "fingerprinted" by being interrupted at a given frequency using a "light-chopper," so that when it is scattered by the upper air and picked up by large mirrors it can be recognized by tuning the observing instruments.

From what happens to the light in the greatest unknown region of the upper air will come the answer to some questions that science is eagerly asking.

How the thinning air's density varies with height some thirty miles above the stratosphere, in the regions known as the "ozonosphere" and the "altotroposphere," will become known. This is important basic information now lacking.

The research team that has taken the first steps toward conquest of the region between where the stratosphere leaves off and the aurora begins to be born, consists of Dr. M. A. Tuve and Dr. E. A. Johnson, of the Carnegie Institution of Washington, and Dr. Oliver R. Wulf, of the U. S. Department of Agriculture. They gave the first hint of their researches in a short letter published in the current issue of *The Physical Review*.

So far tests have been confined to an artificial light in the laboratory, but field tests are being organized, probably with the aid of large Army-type searchlights of great brilliance. Just one large searchlight is expected to furnish enough light for the experiment, thanks to the device of using "chopped" light.

Once the delicate instruments are put into use analyzing the scattered "fingerprinted" light gathered by the mirror, it is expected to solve other numerous problems, connected with water vapor, turbulence, winds and dust, as well as the chemical state of the rarefied atmosphere that allows it to shine with fluorescent light at times.

In no other way can science adequately probe the region 20 to 50 miles above the earth. Man-carrying balloons' "highest up" is the 14 miles of the recent stratosphere flight. Unmanned balloons can reach only about 20 miles altitude, the top of the stratosphere. At about 60 miles above the earth there is found the base of the auroral displays and the first of the ionized or electrified layers that reflect radio waves. The region between stratosphere and the altostratosphere, which begins at about 60 miles, can be probed with no means so far suggested except the modulated Tuve-Johnson-Wulf light.

Using light as a probe was originally suggested about five years ago by Dr. E. H. Synge, of England, who wanted the Army and Navy to assemble several hundred searchlights and focus them on one place in the upper air. The tests described above, however, indicate that by using "fingerprinted" light even better information should be obtained with a single searchlight aimed at the sky.

STUDY OF THE ATOM

AN important inhabitant of the universe has sat for his portrait. Two very different and conflicting can-

vasses, painted in scientific terminology, have resulted. Neither the sitter (the atom to scientists) nor the artists, who are the physicists studying the composition of matter, are worried much about the conflict.

"Modern physics, instead of deciding between them, links them with the help of the statistical method," explained Dr. Edward Teller, the Hungarian theoretical physicist, who is visiting professor of physics of the George Washington University.

Using mere figures of statistical theory as a microscope with which to view the atom is necessary because the idea that it is indivisible is a paradox, contradicting our ideas gained from everyday experience. Moreover, Dr. Teller observes, atoms can be probed only with other atoms used as tools, so that actions of individuals can not be determined.

The compromise picture of the atom painted by mathematics is still opposed by some of the best physicists, Dr. Teller said, but the drastic procedure is accepted by most because it is successful and the philosophy of its method is satisfying. Studying atoms in bulk instead of trying to understand the behavior of individual atoms has also given information about average actions of atoms and thus it is possible to understand properties of matter as a whole.

THE PREVENTION OF GAS EXPLOSIONS

SMOTHERING dangerous vapors to the point of suffocation is the latest method of preventing dangerous gas explosions in mines, homes and factories which has been developed by scientists at the U. S. Bureau of Mines at Pittsburgh, Pa.

Inert, non-combustible carbon dioxide and nitrogen gas are the smothering agents used to prevent disaster in gas lines, gasoline tank cars and storage holders.

In air-tight rooms in the Bureau of Mines laboratory various gas burners were lighted and allowed to run until their flame was extinguished from lack of oxygen. By analyzing the oxygen content of the room at this time the critical percentage of oxygen was determined below which combustion could not occur. From 10 to 12 per cent. of the normal oxygen content was found sufficiently low for safety.

With this knowledge the suffocating and diluting carbon dioxide and nitrogen gases were then pumped into the air-tight room, containing an explosive mixture, until the oxygen content was lowered to the critical non-combustion supporting stage. Again the flame would not burn. The discovery should find use as a precautionary measure in closed places, with a great improvement in safety.

STEAM AND OIL-BURNING DIESEL LOCOMOTIVES

WITH the fate of millions of dollars' worth of new railroad equipment at stake, the race between steam and oil-burning Diesel locomotives reached a new peak in 1935, it is indicated in the progress report presented by a committee of the American Society of Mechanical Engineers at its fifty-sixth annual meeting in New York City.

Steam, the old stand-by of railroad propulsion, brought out fifteen new locomotives either stream- or semi-streamlined for sustained high speed. Three new Diesel-driven locomotives were put into service during the year, while twelve light-weight Diesel-electric articulated trains went into operation.

Steam-driven trains ranged from the crack "Hiawatha" of the Chicago, Milwaukee and St. Paul to the "Asia," built in Japanese railroad shops, running between Dairen and Hsinking in Manchukuo. Diesel locomotives included those for the Union Pacific's "Super Chief," and the Baltimore and Ohio's "Royal Blue" and "Diplomat." In the light-weight, high-speed field were the four "Zephyrs" of the Burlington, the New York, New Haven and Hartford's "Comet," and the first of the southern flyers, the "Rebels" of the Gulf, Mobile and Northern.

In Germany, where high-speed light-weight articulated trains started, the original "Flying Hamburger" has two new colleagues, the "Flying Frankfurter" and the "Flying Koelner." More significant in Germany, however, was the arrival of three streamlined steam locomotives capable of pulling full-weight heavy trains at 110 miles an hour.

THE HOSPITALIZATION OF TUBERCULOSIS PATIENTS

THE most complete data ever obtained on the hospitalization of tuberculosis patients in the United States is presented this week in the *Journal* of the American Medical Association.

The survey shows that American sanatoriums, or hospitals for the tuberculous, provide beds for 95,198 patients and are on the whole fine institutions. Sixty per cent. of their patients are definitely improved by the treatment given. These special hospitals represent an investment of $330,000,000, including land, buildings and equipment. Veterans' hospitals for the tuberculous cost on the average $4,000 a bed. In most other institutions, both private and public, the cost per bed is less, but there are extremes in variation.

Elaborate plants and expensive equipment bring the cost of some tuberculosis hospitals as high as $10,000 a bed. One sanatorium built with public money cost $13,043 a bed.

The use of tuberculosis departments in general hospitals has been endorsed by the American Medical Association, the American Hospital Association and the National Tuberculosis Association. The endorsement, however, requires adequate segregation for the protection of other patients and personnel.

In a few of the sanatoriums, the survey revealed, adults and children are allowed to associate in various ways. In a few cases, too, it was found that children with tuberculosis of the lungs were hospitalized with children in the preventorium unit. That such conditions call for prompt correction is made plain in an editorial commenting on the survey.

No attempt was made to give a relative rating to the individual institutions. The comment that would characterize the tuberculosis institutions of the United States

in general would in most cases be commendatory, according to the council on medical education and hospitals of the association, under whose direction the survey was made.

IMPROVEMENT OF MEMORY BY SLEEP

IF a person memorizes certain kinds of material perfectly, and goes to sleep immediately afterwards, he will recall more of it, and also re-learn the whole task more economically after a lapse of 24 hours, than if he waits even a few hours before he goes to sleep, according to Dr. H. M. Johnson, professor of psychology of American University, Washington, D. C., who spoke at Cornell University recently.

Experiments based on different methods, made by Dr. Rosa Heine Katz, at the University of Göttingen, and by Joseph F. O'Brien, graduate student at American University, showed that all the subjects who were studied were better able to recall and also to re-learn material that they had learned by rote and partially forgotten, if they first slept for eight hours and then worked for 16 hours, than if they distributed their rest and activity in any other way during the 24-hour period.

Dr. Johnson said that the differences in favor of sleeping immediately varied between 20 per cent. and 30 per cent., according to the subject and the task. One would be justified in offering a bet of 100,000 to one that Mr. O'Brien's results were not due to chance.

Two explanations have been offered. One, which Dr. Johnson called the "hardening" hypothesis, pictures the brain as inert during sleep, giving recently received impressions a chance to become "set." The other, called the "reverberation" hypothesis, regards the brain as an active organ even during sleep, and supposes that it goes on repeating or "reverberating" recently received impressions during the unconscious period.

Dr. Johnson does not regard either hypothesis as satisfactory. The "hardening" hypothesis is cast into doubt by the poor recall of memorized material made by persons who had "hardened" their brains with the equivalent of only one highball. Furthermore, very recent studies on brain waves show that these fluctuations in the electric potential of the brain go on continuously during sleep, though not in their ordinary "waking" patterns. Finally, studies on sleep, conducted by Dr. Johnson himself several years ago at the Mellon Institute, show that sleepers assume muscular positions which they can maintain only by dint of strenuous brain exertion.

Dr. Johnson offered a third hypothesis which, however, he did not urge as necessarily correct. He suggested that the memorized material might "reverberate" in the brain, but during the drowsy periods before sleep and during the slow awakening process, and also during the frequent half-wakeful periods during the night which most persons experience without realizing or remembering them.

ITEMS

WORKING models of industrial plants for the extraction of soy-bean oil and the production of power alcohol from Jerusalem artichokes are among the highlights of the exposition of chemical industries held recently in New York. Exhibited by the newly-formed Farm Chemurgic Council, the models demonstrate the way raw materials raised on America's farms can be utilized for purposes other than for food. From the soy-bean oil new types of plastic materials can be fabricated, which have applications in automobiles and in other industries. The new explosive, nitramon, for use in quarrying and mining, is shown publicly for the first time. Seventy-five per cent. as violent as dynamite, the new material comes in sealed cans which may be dropped, heated with a blow torch or pounded with a sledge hammer without exploding. Special fool-proof equipment must be used to make it explode.

KILAUEA, companion volcano to the erupting Mauna Loa, is being closely watched by scientists of the National Park Service in Hawaii National Park. Both volcanoes are within Park boundaries. Kilauea has long been suspected of having some kind of deep under-earth connection with Mauna Loa, though their greatest activities have not always been simultaneous. Like Mauna Loa, Kilauea is a relatively harmless volcano, venting its energies in rather frequent quiet lava flows rather than storing up back pressures and finally exploding in a great destructive burst. Kilauea differs from Mauna Loa, however, in that it is a wide, low, "shield" volcano without a pronounced cone, whereas Mauna Loa has a tremendous towering peak nearly 14,000 feet high. There has been a fresh flow of lava from a new vent within the past few days, but it is thought that it is quite unlikely to reach Hilo, the largest town on the island.

A CAVE where Ice Age cave bears lived, where Ice Age cave men pursued and killed them, and took over the den as their own dwelling while they gnawed their bones, has been discovered and explored in Schleswig, by Dr. Lothar F. Zotz, curator of prehistory of Breslau. Many of the bones and teeth of the monstrous bears found in the cave have been worked over into implements and utensils, and there are abundant charcoal remains of the old hunters' fires. This cave, Dr. Zotz says, is the first of its kind to be found in northeastern Germany.

DEEPER than the Grand Canyon of Arizona, and very risky to navigate, the Canyon of the Salmon River in Idaho has been explored for the first time under the auspices of the National Geographic Society. Parties of hunters, miners, etc., have in the past made the trip, but until now no systematic attempt has ever been made to record the geology and natural history, or to obtain a full series of photographs of the canyon. The exploring party found Indian paintings of men and animals on the rocks, discovered several hot springs, and saw great numbers of deer, wild goats and grouse. The Salmon has been nicknamed the "river of no return" because when a party wishes to undertake the hazardous trip down its canyon the only practicable method is to purchase a heavily built scow at its upper end, drift down the river, and sell the clumsy craft at the lower end. The upstream trip has never been attempted.