PHYSICS-BIOLOGY

Neutrons, Tool of Physics, Deadly Biological Menace

Warning That New Potential Danger to Experimenters Exists in Rays Ten Times More Potent Than X-Rays

DEADLY danger for young research workers in physics lies in wait in their own laboratories, if they work with powerful new atom-smashing machines using streams or rays of neutrons.

Neutrons are the uncharged particles of matter which can be knocked out of the cores of atoms. They are widely used as atomic "bullets" to pierce the inner nuclei of other atoms and are capable of effecting transmutation of the elements and synthetic radioactivity.

Warning of the potential danger in using such neutron rays is drawn from the results of two investigations on their biological effects, which have just been published (*Proc. Nat. Acad. Sci.*, February). The neutron rays appear, in summary, to be ten times more potent than X-rays in what they can do to the body.

In the first research carrying its warning to scientists neutron rays were used on white rats. It was presented by two brothers, Dr. John H. Lawrence of Yale University School of Medicine, and Prof. Ernest O. Lawrence of the University of California, who built the large cyclotron apparatus with which the neutron rays can be produced. The second, in which neutrons were shot at just-sprouting grains of wheat, was the work of Dr. Raymond E. Zirkle of the University of Pennsylvania and Dr. Paul C. Aebersold of the University of California Medical School.

Exposure to neutron rays was deadly to white rats. They grew sick, miserable-looking, humped-up, and died. The rays were apparently bad for them "all over," but as a quantitative measure of their effect, the decrease in the number of the necessary white blood corpuscles in their blood was counted. It was found that destruction of white blood cells was as great from a given dose of neutron rays as it was from a ten times more intense dose of X-rays, heretofore counted among the really dangerous scientific tools. The effects of neutron rays on growing plant tissue were found by Drs. Zirkle and Aebersold to follow about the same ratio: neutron rays are ten times as dangerous as X-rays.

Commenting on their results, the Doctors Lawrence stated:

"This should constitute a warning inasmuch as many laboratories will soon be using neutron generators of such power that individuals in the vicinity of the apparatus will be exposed to many times the allowable dosage in the course of a few minutes unless adequate protective screening is provided." They set the "allowable dosage" at just one-tenth the intensity of X-ray exposure that workers can stand without permanent damage to their health.

If the present warning is heeded by the enthusiastic scientists in the universities now setting up apparatus for producing neutrons, the world may be spared the tragedies that followed the discovery of X-rays in the late 1890s, and of radium early in the present century.

Not knowing the deadliness of the then new rays to living cells, many of the early workers were severely burned, and even maimed for life, through reckless exposure. Even yet, there are veteran X-ray technicians in scientific laboratories and medical clinics whose hands are seriously damaged—unwitting victims of the two-edged tool they used in their younger days.

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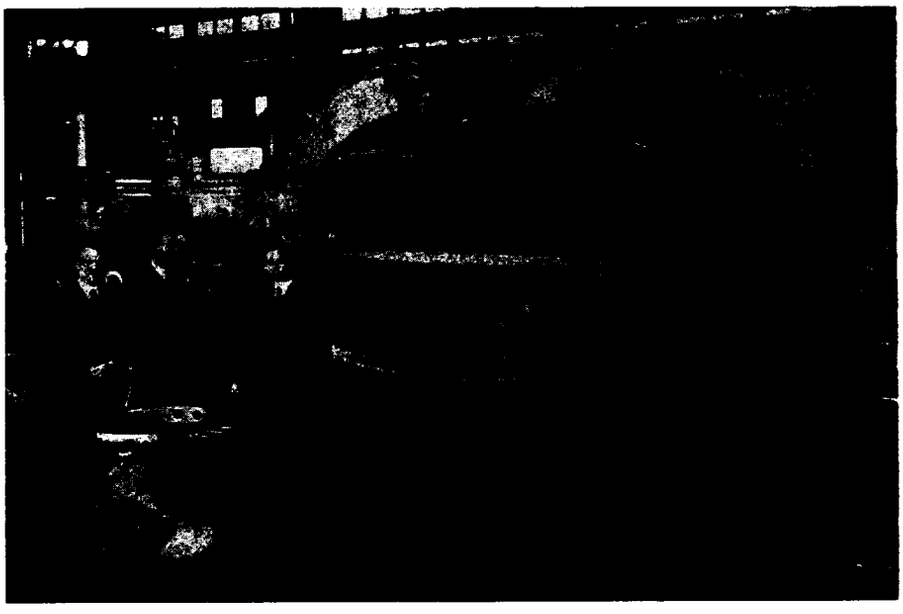

DANGER TO SCIENTISTS

The giant 85-ton cyclotron atom smashing apparatus of Prof. E. O. Lawrence at the University of California, Berkeley, Calif. Across its 45-inch diameter pole pieces scientists create magnetic fields tens of thousands of times as powerful as those of the earth, for use in experiments with neutrons and problems of transmutation of the elements and artificial radioactivity. The men, left to right are: C. U. Foulds, Prof. E. O. Lawrence and Dr. M. S. Livingston. The piercing radiation from this apparatus and other similar ones now under construction throughout the nation is exceedingly dangerous to unprotected scientists near it. Mounds of earth and tanks of water are two protective methods suggested to shield workers from the menace of such potent rays.

PUBLIC HEALTH

Respirators Cannot Take Place of Dust Control

THE RECENT furor concerning alleged deaths from silicosis at Gauley Bridge, West Virginia, has increased the demand for a better dust respirator which workmen may use when exposed to the dangerous quartz and silica dust.

Says Dr. Philip Drinker of Harvard University, who is the inventor of the artificial "lung" known as the Drinker respirator:

"Some firms, driven panicky by the present silicosis-dust racket, have even gone so far as to stock up with 'ap-

proved' respirators so that they might be able to show they have on hand the best respirators made in case they find themselves defending a dust-compensation lawsuit."

In a report to the American Society of Mechanical Engineers (*Mechanical Engineering,* March) Dr. Drinker further points out:

"It can be said of all the mechanical-filter-type or dust respirators that they are a poor substitute for dust control. Ultimately it is not an economy to supply workmen with air-line respirators or with dust respirators instead of installing the proper dust-control equipment. Further, the time is not far off when the courts and compensation boards will make short shrift of the employer who lets his men work in dense clouds of dust, regardless of what the dust is.

"In general the employer would do well to try some of the dusty jobs himself, wear the men's respirators, and thus decide whether or not it would be better to install dust control instead of respirators. However, dust respirators are centuries old; they have a legitimate place in industry, and are an important aid in the prevention of dust inhalation, but they are not a substitute for dust prevention and never should be used as such."

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PHYSIOLOGY

Sense of Smell Measured With Simple New Instrument

Brain Tumors Located Through Differences In Patients' Abilities to Discern Odors

HOW WELL do you smell?

Eye specialists can measure your acuity of vision and ear specialists have ways of estimating how well you hear, but until now there has been no way of telling how good your nose is at detecting odors.

Now, however, a three-man scientific team at the Neurological Institute of Columbia University have worked out a simple apparatus that gives a quantitative expression of how well you smell, and also how soon your nose gets tired of the steady presence of an odor and refuses to register it any longer. The three men are Drs. Charles A. Elsberg, Irwin Levy, and Earl D. Brewer, and they describe their apparatus and its use in some detail (*Science,* Feb. 28).

Device Simple

The "smell-measurer" (olfactometer might do for a nice, learned-sounding name) is simple in the extreme. It consists merely of a bottle containing the odorous substance under test, with an inlet tube through which air can be forced, and an outlet tube leading up to a nosepiece. The latter branches, Y-fashion, so that each nostril has its separate source of odor-bearing air. Either branch of the Y can be shut off, so that the nostrils can be tested individually as well as both together.

The person being tested puts on the nosepiece and holds his breath, and one of the experimenters shoots a measured quantity of air into the odor reservoir with a syringe. What the experimenters have called the "minimum identifiable odor" (short-handed as M.I.O.) is measured in terms of the smallest number of cubic centimeters of air needed before the subject can detect an odor. This procedure is called the "blast test."

Another Test

Besides this test, the three researchers have another, which they call the "stream test." In this, the subject breathes through his mouth, while a steady stream of odor-bearing air is blown into his nose through the apparatus. This can be done until a "fatigue point" is reached—the human smelling mechanism just quits registering, though the odor is still present. Then, after a rest period, the blast test is made again, to determine the degree of recovery.

The three doctors have made a practical clinical use of their apparatus, as an indirect means of exploring for brain tumors. The brain lobes where the sense of smell is centered are at the very front of the brain, and pressure anywhere within the brain affects them. They behave differently, however, according to the direction from which the pressure comes, so that by studying these differences in smell-sense response it is possible to make an approximate location of the tumor that is causing the pressure.

At the recent meeting of the American College of Physicians, Dr. Elsberg reported on this use of differing levels in odor perception as a tool in brain-tumor diagnosis. Results of over 100 such diagnoses have also been reported. (*Bulletin of the Neurological Institute.* December, 1935)

In these tests, Dr. Elsberg and his colleagues used two odorous substances, a chemical known as citral, and common coffee. The patient's sensitivity was first established by the "blast test," separately for each nostril. Then the fatigue points for each nostril was determined by the "stream test." Comparing these values with those for healthy persons with normal noses and olfactory brain centers and nerves, Dr. Elsberg can tell whether the patient has a tumor in any of several parts of his brain.

He does not believe the method has been tried long enough to warrant using it exclusively in diagnosing brain tumors, but he thinks it should be investigated.

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PSYCHOLOGY-PHYSIOLOGY

Most First Grade Children Not Ready to do Reading

THE eye troubles of school children would be relieved if the schools did not try to teach reading until the child is physically and mentally ready to learn, Dr. Paul A. Witty, of Northwestern University, told the meeting of the American Educational Research Association.

Examination will show that most first grade children and many second grade children are not ready to learn to read, Dr. Witty predicted. A test for measuring the child's background of interest and information, and his language and mental development, should be given to each child to determine this "readiness to learn." Each child when he enters school, and at regular intervals afterwards, should have his eyes carefully examined.

More than 40 out of each hundred children in grades 4 to 6 have serious eye defects, and the percentage is greater in the higher grades, Dr. Witty said.

These defects may not interfere with the child's reading ability.

But, on the contrary, learning to read before the body and mind are sufficiently developed may produce eye strain. Very few children have eye defects at the time they enter school.

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