TO BATTLE CANCER

The outlet tubes of this giant X-ray machine, directed at the patients, permit only a narrow beam of X-rays to strike them at the proper places for the therapy.

PHYSICS

New 1,200,000-Volt X-Ray Machine Aids Cancer Fight

NEWEST aid of science in the fight on cancer was revealed as the giant 1,200,000-volt X-ray machine of Columbia University's Institute for Cancer Research. Dr. Francis Carter Wood, widely known cancer specialist and director of the Institute, exhibited the apparatus which took two years to construct.

Uniqueness of the new development, which makes it an improvement over previous apparatus having a comparable voltage, is that it is completely housed in a large steel tank which is continuously evacuated. Both the voltage generating circuits and the X-ray tube are thus shielded from any possible accidental contact. Patients are protected, in addition, by four inches of lead which permits only a narrow beam of X-rays to strike them at the proper places for X-ray therapy.

Five outlet openings for the rays are provided: four for patients and one reserved for research purposes. Cost of the apparatus was $25,000.

The pressing search of science for improved ways of splitting the atom and studying its intricate nucleus is directly responsible for the new Columbia X-ray machine. Back in 1934 Dr. D. H. Sloan at the University of California developed a similar apparatus for accelerating charged particles in atomic bombardment experiments.

It was found, shortly, that by a simple change of only one essential part of the apparatus it was possible to make a highly compact and efficient X-ray machine of high voltage. Such an apparatus was built for the University of California Medical School and the present Columbia equipment is copied and improved in design over this prior equipment.

In operation the new type X-ray machine utilizes 15,000 volts of alternating current electricity and applies this to twin radio oscillator tubes generating radio waves 50 meters in length, in the shielding tank. The electrical circuit of these tubes is so designed that when resonance is obtained more than 200,000 watts of electrical power flows in the hollow copper tubes of the equipment. Swift-flowing streams of water help dissipate the great heat generated.

Eight hundred thousand volts potential have been obtained in Dr. Sloan's original apparatus and the Columbia equipment has already been operated at 1,200,000 volts. Upper potential limit of the design is limited only by the effectiveness of cooling the enclosed apparatus. Potential 5,000,000 volts could be obtained with existing oscillator radio tubes if there were any way of cooling the apparatus and making it work without burning up.

Science News Letter, January 23, 1937

PHYSICS

Relativity and Quantum Theories Are Harmonized

ALTHOUGH they may not understand the exact research being done, most laymen have a rough idea of what an experimental physicist does in his experiments; how he sets up controlled conditions and then takes measurements with great patience and much ingenuity.

Less clear, perhaps, are the doings of the theoretical physicists who use only paper and pencil and the rules of mathematics as found in scientific literature or stored in their head. The layman may well ask: "What do famous men like Einstein, Eddington, Dirac or De Broglie think about? What problems are they studying? And why are they interested in them?"

The new book "Relativity Theory of Protons and Electrons" (Macmillan) by Sir Arthur Eddington gives a partial answer to these questions. Sir Arthur may be best known throughout the world for his popular books on science but the reading public who devoured Eddington's "Nature of the Physical World" will be disappointed if they expect something similar in his new volume.

Here Sir Arthur writes strictly for his fellow scientists and rounds up his thinking on some means of harmonizing two great physical theories—Relativity theory with its wide usefulness in the scale of larger things, and Quantum theory which works with equal success in the tiny world within the atom. Relativity treats matter as continuous while quantum theory breaks things up into discontinuous units and handles them accordingly.

The hitch has been that quantum theory, as a younger upstart, has been surprisingly successful in getting along without relativity. Cause and effect and rigid determinism was the basis of older thinking. An indeterminate "looseness" in the relationships of physical science is the fundamental concept of the new

lines of attack, so that there is room left within the scheme of physical law for undetermined behavior.

Part of the mystery of atomic physics, points out Sir Arthur, is that man himself unwittingly hides facts. Of this he says:

"The physicist might be likened to a scientific Procrustes, whose anthropological studies of the stature of travelers reveal the dimensions of the bed in which he has compelled them to sleep. Yet I do not think that we take unwarrantable liberties with the universe in our Procrustean treatment of it. If experience is a subject-object relation, the subject is entitled to—nay, he cannot divest himself of—his half-share. It can scarcely be a coincidence that Heisenberg's uncertainty principle has defined the half-way line with mathematical exactitude, distributing a coordinate to one side and a momentum to the other side with perfect impartiality. And so we may look forward with undiminished enthusiasm to learning in the coming years what lies hidden in the atomic nucleus—even though we suspect that it is hidden there by ourselves."

Science News Letter, January 23, 1937

PHYSICS

New Property of Matter Is Believed Discovered

In One of World's Rarest Minerals, Hackmanite, Evanescent Streaks May Be Revived by Radiation

WHAT may be an entirely new property of matter has been discovered in one of the world's rarest minerals known as "Hackmanite." Found originally in the rugged fiords of Greenland in the early years of the last century and later in the old crater of Italy's volcano Vesuvius, Hackmanite has long been a treasured collector's piece for scientific museums, for its rarity alone. Now a clear variation of the deep blue, lapis lazuli-like mineral may take on the added merit of research value.

Samuel G. Gordon, associate curator of minerals in the Academy of Natural Sciences, Philadelphia, explained the rare mineral and its new found property to Science Service.

The American mineralogist O. Ivan Lee of Jersey City, N. J., has made the strange discovery that a quickly passing red-violet colored streaking of the surface of Hackmanite can be revived at will by radiating the mineral with ultraviolet rays, explained Mr. Gordon.

For many years, continued Mr. Gordon, mineralogists have known that when a clear variety of Hackmanite was fractured, characteristic and beautiful bright red-violet splashes of color appeared on the clean surface. Then, on exposure to ordinary light, they passed away.

Radiation with ultraviolet light, Mr. Lee has found, brings back this lost property at will and as many times as one wanted to perform the experiment.

The first thing which one might think of to explain this strange revival of a color-death would be fluorescence, pointed out Mr. Gordon. But the phenomenon is not fluorescence, at least in the ordinary sense of the term, he added.

The fluorescence of Hackmanite, that is, its brief temporary glowing following exposure to light, is a characteristic salmon pink that cannot possibly be confused with the bright red-violet shade of the revived colors.

Neither is the happening one of phosphorescence, since this property of Hackmanite yields a beautiful blue color.

What really is the true explanation of the effect is thus unknown at present, but at this stage of scientific research when supposedly the external properties of matter, at least, are well known, the discovery takes on added interest. Mr. Lee calls the phenomenon reversible photosensitivity.

Over and above the scientific story of the discovery is the almost fantastic adventure yarn concerning the original discovery of Hackmanite.

Hackmanite was discovered in 1806-08 by an Austrian scientist who later was knighted by Great Britain and finally became professor of mineralogy at the University of Dublin.

The mineral specimens, first found in Greenland, themselves had a topsy-turvy trip until they finally reached their destination.

Charles Giesecke, the Austrian scientist, went on one of the early Danish expeditions to Greenland. He collected specimens of many minerals and shipped them back by a Danish boat, and stayed behind for another six months or a year. But it was seven years before a boat returned to Greenland to pick him up!

In the meantime the mineral specimens on the Danish boat, including what later became known as Hackmanite, were captured by a French privateersman, for the Napoleonic wars were in full swing.

Then, in turn, the French vessel was captured by a British frigate and each time the barrels of minerals were transferred. The barrels were imposing looking and one may reasonably suppose that first the French and then the English thought they had a commercially valuable cargo seizure.

At any rate the Giesecke specimens were finally landed in Scotland at the port of Leeds and eventually found their ways into the hands of mineralogists in Dublin who studied and classified them.

Giesecke, Mr. Gordon told Science Service, earned his education by selling mineral specimens in his native Austria. In addition he is said to have composed several operas.

Besides the Greenland and Vesuvius regions where Hackmanite is found, varieties of it have also been located on the Kola Peninsula in Arctic Russia and just recently in the province of Ontario, Canada, near Bancroft.

The Academy of Natural Sciences Museum has now under shipment from Canada a specimen of this strange, rare mineral.

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POPULATION

Thousands Migrate From the Great Plains

MORE than 27,000 people from the drought-stricken Great Plains areas migrated voluntarily to California during 1936, reports John C. Page, Acting Commissioner of the U.S. Bureau of Reclamation. In addition 2,329 families entered the state of Washington, 1,930 families the state of Oregon and 4,500 families the state of Idaho, hoping to settle permanently.

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