PHYSICS

Brilliant Italian Scientist Wins Nobel Prize in Physics

Discoverer of Elements Heavier Than Any Known Before He Has Also Found That Over 40 Are Radioactive

ITALY'S outstanding atom-smashing scientist and theoretical physicist, Prof. Enrico Fermi of the Institute of Physics at the Royal University is the 1938 winner of the Nobel Prize in Physics.

Born on Sept. 29, 1901, Prof. Fermi has won fame in both experimental and theoretical fields of research.

He was the first man to predict and determine experimentally that the bombardment of elements by neutrons would cause transmutation of the elements. Working quietly at Rome, Prof. Fermi was able, within six months after the discovery of artificial radioactivity by the Curie-Joliots, to study the bombardment of over 60 elements with neutrons. Out of this number he found more than 40 to exhibit radioactivity.

Prof. Fermi was also the first scientist to show that the capture of neutrons could be facilitated by water and by making them travel at low speeds. These "slow" neutrons are now a valuable research tool in the field of nuclear physics.

In theoretical physics Prof. Fermi is best known for his development of the so-called Fermi-Dirac statistics, a mathematical method of dealing with the problems encountered in predicting atomic structure and behavior.

In mathematical physics, too, he developed a hypothesis known as the Fermi theory of beta-ray decay which attempted to fit the atomic particle, the neutrino, into the still baffling problem of the liberation of the beta rays (electrons) from radioactive materials. While this theory is far from correct it is still the only one, of the many suggested, which appears to have a semblance of plausibility.

During his intensive research on the bombardment of many elements with neutrons Prof. Fermi used uranium as a target. He was able to make the neutrons stick in the nuclei of the uranium atoms and create super-heavy elements.

At first the scientific world was amazed and skeptical that Prof. Fermi had been able to create an element, No. 93, heavier than the heaviest of all known elements, uranium, No. 92.

However, the discovery was amply confirmed and it has since been found that science can create artificially elements still heavier, Nos. 94 and 95.

Through his atomic experiments Prof. Fermi was able to show that the ability of the nuclei of atoms to capture neutrons was far larger than had been supposed. There appear to be conditions of resonance in the nucleus which aid in this unsuspected capture.

Co-workers with Prof. Fermi at Rome have been a group of scientists whose names should not be forgotten. They are Drs. E. Amaldi, F. Rassetti, E. Segré and B. Pontecorvo.

Science News Letter, November 26, 1938

PROFESSOR ENRICO FERMI

GENETICS

Bearers of Heredity Called World's Most Precious Stuff

WHAT is the most precious material in the world? Gold? Platinum? Radium? Rare precious jewels?

Gold is mere cheap stuff, even at its higher price in effect since 1933, compared with radium, which is something like $21,000 a gram nowadays. And it is quite possible that some of the rare jewels might surpass radium's value, weight for weight.

Suppose we be generous and agree that $100,000 a gram, which is about a thirtieth of an ounce, is just about top value for any such stuff. Investigation shows that any such material is almost valueless in comparison with the minute chromosomes, within germ cells, from which each of us began life.

Since the turn of the century when Mendel's laws of heredity were rediscovered, the secrets of the mechanism of passing life from one generation on to another have been discovered in an amazing exploration into the submicroscopic depths within the cells.

Principal actors in the beginning of life are the two sets of chromosomes, one male, the other female, that come together. This hereditary material is almost inconceivably minute.

If all the first cells of the two billion inhabitants of the earth could be assembled and their chromosomes weighed, calculations by Prof. A. V. Hill, British Nobelist, show that the total would be found to weigh less than a single drop of water or less than an ordinary sized pin. Thus, observed Dr. Albert F. Blakeslee, Carnegie Institution of Washington geneticist, all the future developments of the human race are contained in chromosomes that weigh about 80 milligrams, about a twelfth of a gram. How can a money evaluation be placed on this material?

What is all the human life in the world worth? A thousand, a hundred or just a dollar per person? At one dollar, which is low enough, the human chromosomes from which we sprang are valued at the rate of $24,000,000,000 per gram.

Science News Letter, November 26, 1938

SURGERY

Machine Age Is Also The Age of Surgery

THE machine age might also be called the surgical age, judging by the increase in numbers of surgical operations in the present century. In the U. S. Army and Navy, for instance, the number of operations per 1,000 men is about twice what it was in 1910. For the general population, the annual number of operations performed per 1,000 persons is now 65, Selwyn D. Collins of the U. S. Public Health Service found in a survey of nearly 9,000 families in 130 localities in 18 states.

The increase in number of operations, of course, is due to the discoveries, during the middle of the last century, of anesthesia and antisepsis and asepsis. The first discovery made it possible for surgeons to undertake many more as well as more complicated operations because the patient could be spared all pain. Before anesthesia, operations aside from bone-setting and tooth extractions were desperate, last-resort affairs undertaken only by the bravest surgeons and endured only by the bravest patients.

Antiseptic and aseptic procedures in the operating room added to the safety of surgery and the types of operations surgeons could undertake because it meant the end of often fatal germ-infections following operations.

At the rate of 65 operations per 1,000 persons, Americans undergo more than 8,000,000 operations each year. Most numerous, constituting nearly one-third of the total in Mr. Selwyn's figures, are removal of tonsils. Setting bones and operations in connection with injuries, types of operations that date back to antiquity, are still among those most frequently performed. Bone-setting ranks second and operations in connection with injuries third in order of frequency. Operations on the female reproductive organs take fourth place and appendicitis operations come fifth.

Science News Letter, November 26, 1938

ENGINEERING

Japan Begins Exploitation Of Aluminum In Manchuria

JAPAN is undertaking the exploitation of aluminum ores discovered in Manchuria, according to *Industrial and Engineering Chemistry*. (Nov. 10)

The Manchurian ores are high in phosphorus content and so must first be refined by a process credited to scientists at the University of Tokyo.

The ore is treated with sulfuric acid, yielding phosphoric acid and aluminum sulfate. The latter is treated with gaseous ammonia at 1,200 degrees Centigrade. Out of the reaction comes ammonium sulfate and aluminum oxide. The reduction of the aluminum oxide to metallic aluminum is accomplished by standard electrolytic methods.

Plans for the development call for the treatment of 15,000 tons of ore annually from which will be obtained 5,100 tons of metallic aluminum (about 11,000,000 pounds).

American aluminum production, in contrast, is nearly 300,000,000 pounds a year.

Science News Letter, November 26, 1938

PSYCHOLOGY—MEDICINE

Brain Wave Studies Helping Against Drug Addiction

Researchers Hope That Electric Signals May Distinguish Habit-Forming From Safer Narcotics

BRAIN wave records are now being used to aid in the fight against the poppy's curse, narcotic drug addiction, states an editorial appearing in the *Journal of the American Medical Association* (Nov. 12).

How the wavy lines traced by electrical impulses generated in the brain may help in this fight is described in a technical report of a nine-year search for a morphine substitute that will relieve pain without making addicts of those who use it.

The full report, published by the U. S. Public Health Service, will shortly be available, the editorial states, for especially interested physicians and other medical scientists. The studies have been conducted by a committee of the division of medical sciences of the National Research Council, headed by Dr. William Charles White.

The non-habit-forming morphine substitute has not yet been found. The many scientists working on the problem, however, are not discouraged, even after nine years of search that included examination of 300 new chemical compounds.

They have proved, for one thing, that by chemical methods they can change morphine so as to develop a substance that comes close to morphine in its ability to relieve pain. This can be done by synthetic methods, building up a new compound that is like morphine but that lacks the phenanthrene nucleus of morphine. Although the phenanthrene nucleus of morphine is not essential for relief of pain, the scientists are inclined to think that it is essential for addiction or habit formation.

It is for testing the addiction or habit-forming properties of possible morphine substitutes that the brain wave records, scientifically termed electro-encephalograms, may be useful. No method, short of the impractical one of giving a new chemical to large groups of non-addicts, has been developed for determining whether or not a drug is habit-forming. This has been one of the stumbling blocks in the research. Other properties of new drugs can be safely determined from studying their effects on animals and on addicts and non-addicts, but not the important property of causing addiction.

Brain wave studies, therefore, have been started at the federal government's narcotic farm at Lexington, Ky. In one instance so far, the brain wave studies showed a difference between morphine and another narcotic drug — codeine. Since codeine is known to be less habit-forming than morphine, the scientists hope they are on the right track and that the brain wave studies will give them a safe tool for testing the habit-forming or addiction liability of pain-relieving drugs.

The ideal morphine substitute, the technical report states, will be a compound which gives relief from pain for five hours or more but which has a "dependence satisfying" action of 30 minutes or less, or better still, none at all. By "defendence satisfying" action is meant ability to prevent abstinence or withdrawal symptoms in a morphine addict who is deprived of the drug.

Physical dependence on morphine is one phase of morphine addiction which can be used as a test for addiction or habit-forming properties of morphine substitutes. If a new compound can satisfy this physical dependence already established in a morphine addict, it is assumed that the new compound itself will cause dependence if given over a period of time, and therefore that it has addiction or habit-forming properties.

Science News Letter, November 26, 1938

CHEMISTRY

No Nobel Prize Award In Chemistry for 1938

NO NOBEL Prize in Chemistry for the year 1938 will be awarded, it is announced by the Caroline Institute. The prize money of the award, amounting to something over $35,000, will be placed in the general fund of the Nobel award.

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