GENERAL SCIENCE

NAS Celebrates 100th Year

The vital importance of international scientific cooperation and the wise use of the world's resources was stressed by President Kennedy before the National Academy of Sciences.

See Front Cover

➤ PRESIDENT KENNEDY said there are four areas—natural resources, the world's seas and atmosphere, and the results of scientific experiments—about which the National Academy of Sciences should be especially concerned.

Speaking at the centennial celebration of the Academy in Washington, D. C., he called for a continuation of international cooperation in these fields. President Kennedy noted, for instance, that the yield of food from the seas "could be increased five or ten times through better knowledge of marine biology."

He recommended that the job be done by all nations of the world working together in international institutions. Even more than the oceans, President Kennedy said, the study of the atmosphere requires worldwide observation and international cooperation, since weather cannot be easily reproduced and observed in the laboratory.

However, the President charged that the "greatest challenge to science in our time" is to use the world's resources to expand life and hope for the world's inhabitants.

He noted that the responsibility to control the effects of scientific experiments was one that had greatly concerned many Academy members. The problem is that scientists now have the power, for the first time in history, to undertake experiments that can change the world's biological and physical environment.

President Kennedy said he was "heartened" by the fact that more than 100 nations have joined to outlaw nuclear testing in the atmosphere. This shows, he said, the world is satisfied that radioactive contamination involves unnecessary risks.

The international character of science, he said, is shown by the fact that 163 of the Academy's 670 members were born in other countries.

He noted that the great scientific challenges such as the four outlined "transcend national frontiers and national prejudices."

In closing, President Kennedy said:

"If science is to press ahead in the four fields I have mentioned, if it is to continue to grow in effectiveness and productivity, our society must provide scientific inquiry" the money with which to function.

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Fremont Davis

FROM RUSSIA—Among the foreign guests attending the centennial celebration of the National Academy of Sciences were Drs. A. P. Vinogradov (left) and Vladimir I. Veksler both of the Academy of Sciences of the USSR. Dr. Veksler is co-winner of this year's Atoms for Peace Award with Nobelist Edwin M. McMillan.

GENERAL SCIENCE

Science Interest at Peak

➤ GENERAL INTEREST in science is greater than ever before, and it is not solely in the form of uncritical praise, President Kennedy's top science advisor reported.

Speaking before the centennial celebration of the National Academy of Sciences, Dr. Jerome B. Wiesner said the increased interest includes a mood of "deep-seated concern about the character and purposes of the nation's scientific and technological undertakings."

His remarks followed a blast at the nation's project to put a man on the moon made by Dr. Linus Pauling, another centennial speaker. Dr. Pauling, the outspoken chemist who recently won his second Nobel Prize, had said the enormous expenditure for the moon shot could be spent better on down-to-earth projects.

Dr. Pauling and other Academy members agreed not to talk any more on that topic until after the three-day celebration for fear it would detract from it.

Dr. Wiesner said one of the biggest influences to the interest in science has been the widened field of research supported by the Federal Government.

"While the level of spending for military research and development has remained almost constant during the past three years," he said, "total Federal expenditures for all research and development have continued to rise at an exponential rate."

Dr. I. I. Rabi, famed physicist of Columbia University, New York, told the session that the rise of interest is also due to a realization that science "satisfies a basic desire or aspiration just to know, to find, or perhaps make order out of the otherwise chaotic jumble of immediate experience."

In this sense, he said, scientists are just children who never grew up, who never lost the nagging urge to ask how, why and what.

"Science possesses an infinite variety of limited goals but in the end marches toward a limitless horizon; it consolidates its gains but does not rest on its laurels," Dr. Rabi said.

"Members of this community possess an inner solidity which comes from a sense of achievement and an inner conviction that the advance of science is important and worthy of their greatest effort."

Dr. J. Robert Oppenheimer, director of the Institute for Advanced Study, Princeton, N. J., called for a greater understanding by non-scientists of the method and goals of science.

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Stress Affects Behavior

➤ INFANTS WHOSE SKIN is cut to form scars and whose ears and nose are pierced in the manner required by their society may grow up differently as the result of this stress.

A child who is separated from its mother through unusual circumstances may have an adult personality of mistrust, hostility and delinquency.

Monkeys reared with artificial mothers or sheep fed with bottles do not show normal maternal behavior when they grow older.

These are only a few examples of current research in the behavioral sciences.

In order to understand man, it is necessary to study culture and conditions governing his behavior, Dr. Neal E. Miller, professor of psychology at Yale University, told the centennial celebration of the National Academy of Sciences. The basic principles of human learning and behavior are inherited in man's physiological makeup, he said.

What a child or animal learns during a critical period can affect him the rest of his life. The effects of certain experiences during this critical period have been demonstrated with laboratory animals. But scientists cannot experiment on children, unless unusual circumstances allow or unless they are studied in societies where children are normally subjected to stress.

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PHYSICS

All Atomic Particles Equal

With the increasing number of new particles being discovered, the theory that no particle is more elementary than another is gaining strength according to Dr. Geoffrey Chew.

➤ THE PROTON, the neutron and other "aristocrats" of matter are losing their status among the growing population of atomic particles.

The "notion of democracy"—that no particle is more elementary than another—is gaining strength among modern physicists, Dr. Geoffrey Chew said at the centennial celebration of the National Academy of Science in Washington, D. C.

Dr. Chew, a theoretical physicist of the University of California, Berkeley, has been a leader in efforts to give meaning to the great number of new particles being discovered with high-energy research equipment.

Not long ago physicists believed all matter could be built up out of certain elementary particles, such as the electron, proton, neutron and mesons. The list of such particles kept growing until there are now from 30 to 100 entries, depending on which physicist you talk to.

The particles fall into two groups. One group, called the leptons, contains only the electron, the mu meson and the two neutrinos. They do not interact strongly with other particles.

All other particles are called strongly interacting particles. It is in this second group that the need for democratic thinking is most urgent, Dr. Chew said.

He protested the second-class citizenship assigned to particles like the deuteron, simply because it is thought to be a composite.

By stripping the particles of their ranks, he said, the proton could be considered a combination of a neutron and a positive pi meson.

On the other hand, the neutron could be considered as a composite of a proton and a negative pi meson.

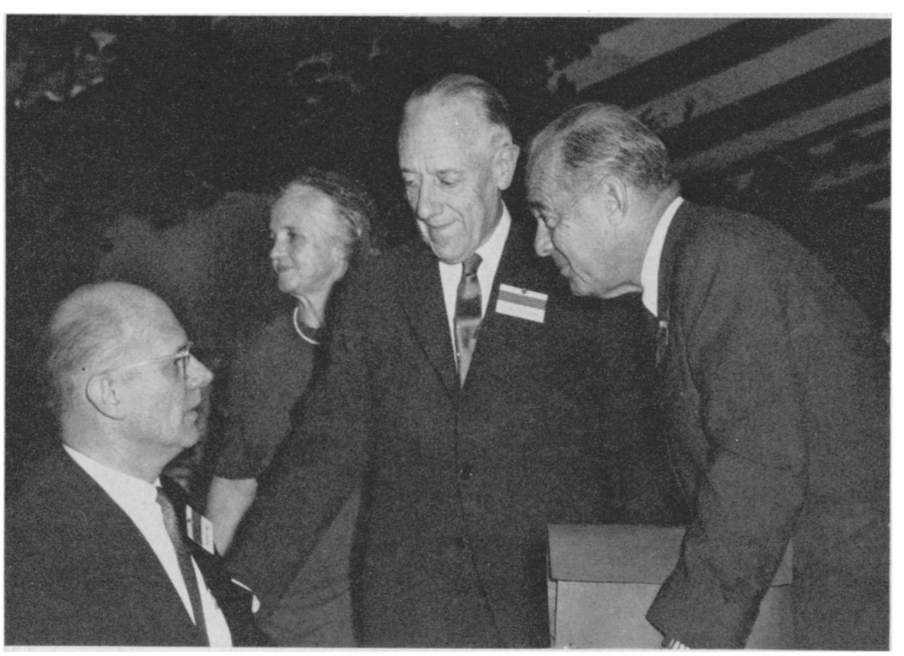
Testing the theory that one elementary particle is just as elementary as the next would require a particle accelerator five times as powerful as the biggest one existing.

He said the secrets of the strongly interacting particles are being unlocked faster than those concerning the leptons.

Dr. Chew has proposed a system called "bootstrap dynamics" to explain the large number of strongly interacting particles. Each particle is thought of as a combination of other particles held together by forces arising from the exchange of still other particles.

Another speaker at the Academy's centennial celebration, Dr. Eugene P. Wigner, mathematical physicist at Princeton University, said that physicists also are giving up, at least temporarily, the hope of finding a single basic interaction.

Early in this century, he said, the electromagnetic interactions were considered to be the source of all others.



Fremont Davis

NAS CENTENNIAL—Shown at the centennial celebration of the National Academy of Sciences are from left to right, Dr. Frederick Seitz, president of NAS, Dr. Detlev W. Bronk, past president of the Academy and chairman of the centennial committee, and Dr. Paul A. Weiss of Rockefeller Institute.

Four or five distinct types of interactions are now recognized, Dr. Wigner said—the gravitational, the electromagnetic, one or two types of strong nuclear interactions and the weak interaction responsible for such phenomena as beta decay.

At present, Dr. Wigner said, there is no way of telling how many interactions there are.

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ASTRONOMY

Comet Belt Predicted Near Farthest Planet

➤ A BELT of yet-to-be-seen comets lies near the pathway of the farthest planet, Pluto, predicted Dr. Fred L. Whipple, director of Smithsonian Astrophysical Observatory, Cambridge, Mass.

Dr. Whipple, who is also an astronomy professor at Harvard University, said the belt extends out to an undefined distance.

The belt is distinct from the great cloud of comets that is more than twice as far off and that accounts for the occasional comets we see.

Speaking at the National Academy of Science's centennial celebration, Dr. Whipple said rocket-borne space probes soon should confirm whether or not such a belt exists and also answer a number of major questions concerning the history of the solar system.

Comets are like flying dust bowls. Surrounding the dust particles are basic gases locked in ice. When they come near the sun, the gases are released, forming long, spectacular tails in contrast to the comet's head.

Dr. Whipple said the gravitational pull of the comet belt probably is responsible for disturbances in the planet Neptune's orbit. This would mean that the belt would be ten times heavier than the earth.

Neptune's eccentric path had been attributed to the gravitational pull of Pluto, but Dr. Whipple said that is unlikely. Pluto appears far too small to be as heavy as a single earth.

Dr. Whipple said pieces of comet clouds probably were the building blocks of Neptune and the planet Uranus, while the giant planets were formed from condensing gases, mostly hydrogen and helium.

The belief that our entire galaxy was formed from helium as well as hydrogen was supported by another speaker at the centennial celebration, Dr. William A. Fowler of California Institute of Technology, Pasadena.

He outlined the current theory that 12 to 15 billion years ago the galaxy was a rotating mass of turbulent hydrogen gas. The gas in regions of relatively low turbulence and high density began condensing into stars.

As the stellar material contracted, he said, the interior became very hot and dense, triggering nuclear reactions. The first such reactions were fusions of hydrogen into helium. More complicated reactions followed, forming the other elements.

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