A Look at 25 Years of STS

Significant events in the world of science are recounted in addresses given at the 25th Science Talent Search Awards Banquet.

By DR. GLENN T. SEABORG

Chairman
U.S. Atomic Energy Commission

➤ IT IS A PRIVILEGE to be here with you tonight to celebrate the twenty-fifth anniversary of the Science Talent Search.

As a scientist who has also had some association with education, government and industry, I have followed closely the relationship between what one might call "the supply and demand" of scientific talent in this country. And I believe that in helping to meet our ever-growing need for outstanding scientific talent in this country the Science Talent Search has served us well. The record of its past 960 winners is indeed impressive, and demonstrates what an impact this method of encouragement of young scientists has had in this scientific age.

This year also marks the twenty-fifth anniversary of another event which has had a profound effect on our country—the discovery of plutonium.

The key experiment in the discovery of plutonium was conducted in a little chemistry laboratory on the campus of the University of California, Berkeley, on February 23, 1941. The demonstration of the value of plutonium 239 as an energy source took place through the use of a cyclotron on the same campus on March 28, 1941, when it was demonstrated that this isotope has the property of undergoing fission with slow neutrons. Thus we are, tonight, on March 7, 1966, about midway between the twenty-fifth anniversaries of these two important dates in the history of plutonium.

The plutonium isotope of primary importance is, of course, the fissionable isotope plutonium 239. This material can be used as the explosive ingredient for a nuclear weapon, but I think of more interest to us tonight is its potential use as a nuclear fuel to generate electricity in almost unlimited quantities.

This will become possible through the use of "breeder" reactors which generate electricity while at the same time converting the abundant nonfissionable isotope uranium 238 to the fissionable isotope plutonium 239. Our future as a nation depends on the availability of energy, and the plutonium which breeder reactors will provide assures us of all the energy that we will need for centuries to come.

In the years since its discovery we have seen plutonium grow from infinitesimal amounts—like picograms—to a point where today it is measured in thousands and tens of thousands of kilograms. This represents a growth in quantity during the last twenty-five years of a factor of more than 10^{18}—that is, more than a billion billion fold.

It is interesting to note that plutonium 239 is not the only one of the known fifteen isotopes of plutonium which has practical applications. The isotope plutonium 241, produced in nuclear reactors by the capture of neutrons through the intermediate isotope plutonium 240, is also fissionable and can contribute to the nuclear fuel of a reactor. And plutonium 238, which was the first isotope of plutonium to be discovered, may prove to be one of our most valuable isotopes. For many years after its discovery, we regarded this isotope primarily as a stepping stone to the discovery of fissionable plutonium 239, and as an isotope suitable for tracer work.

Now new and important roles are appearing for plutonium 238. This isotope can be used as a compact source of electricity through the conversion of its heat of radioactive decay by thermoelectric or thermionic devices. These plutonium 238 fueled power units are lightweight and compact and can provide reliable long-lived power for use in space and terrestrial applications.

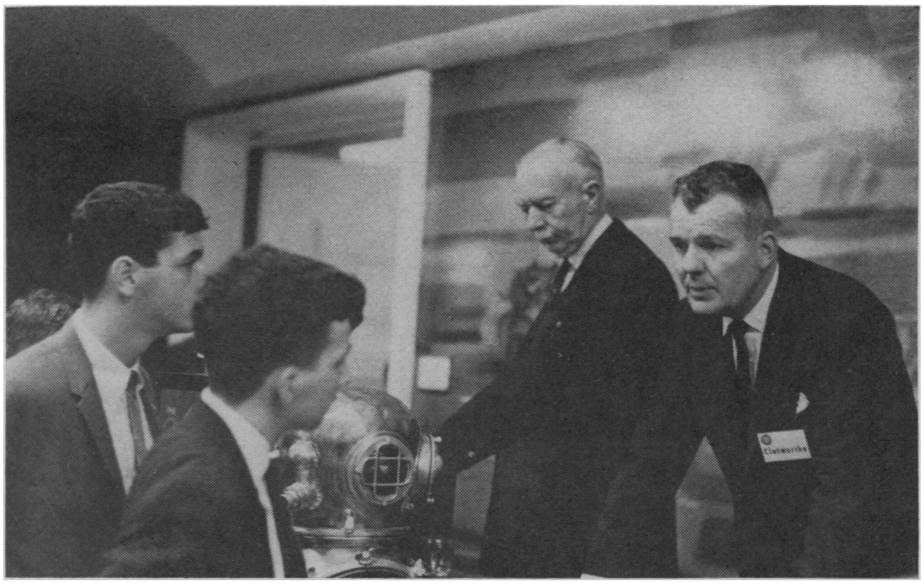
Other potential uses of plutonium 238 include its possible use as a power source for a pacemaker for heart patients. Even more exciting is the concept now being considered by several groups to develop an entirely artificial heart, powered by plutonium 238, which can be surgically implanted in the patient.

There are, of course, other plutonium isotopes of special interest today. Plutonium 242 can serve as a starting material to produce curium 244, another potential compact source of power from its radioactive decay energy. And plutonium 244, because of its long life, might permit scientists and engineers to study the chemical and physical properties of plutonium and its compounds, using small amounts, in a relatively conventional manner.

The intervening twenty-five years since the discovery of plutonium have, of course, seen a tremendous increase in knowledge concerning other transuranium elements. The heaviest natural element has the atomic number 92, and the heaviest natural isotope has the mass number 238. A total of eleven or possibly twelve transuranium elements are known today, bringing us up to element 103 or 104.

In terms of mass number, we have been able to synthesize isotopes up to mass number 257 in easily detectable quantity, and perhaps as high as mass number 260 in quantities of a few atoms. We have identified a total of about 100 isotopes of the transuranium elements.

I believe that this is nowhere near the end of the road. I think that it will be possible to produce a number of even heavier transuranium elements. We have a national program to pro-



Fremont Davis

WITHIN THE SEA—John H. Clotworthy, vice president, underseas division, Westinghouse Defense and Space Center, Baltimore, Md., explains how the undersea headgear which is about 113 years old was probably used by a deep-sea diver to Science Talent Search winners and Dr. Leonard Carmichael. Dr. Clotworthy gave a lecture on "A Walk in Inner Space" during the Science Talent Institute.

duce curium in kilogram quantities, and elements as heavy as californium in gram quantities.

The production goals for these elements will increase beyond these quantities as time goes on. These and other heavy transuranium elements can be used as target materials for the possible production of new heavy transuranium elements by bombardment with heavy ions and by neutrons produced in nuclear explosions.

Both of these methods hold out hope for the production of new heavy transuranium elements, and some predictions indicate that the half-lives will be sufficiently long to make identification and even chemical investigation of their properties possible. There are even plans to build accelerators that will make bombardments with ions as heavy as krypton or xenon possible, and it may eventually be possible to

(Continued on p. 191)

Anniversary Remarks

By H. S. KALTENBORN

Vice President
Westinghouse Electric Corporation

➤ TO YOU 40 winners who make up this Silver Anniversary "class" of the Science Talent Search, my congratulations upon having that unique combination of native ability, aptitude in science, and high standards of personal achievement which brought you here. In a quarter of a century there have been but 1000 of you Science Talent Search winners . . . just 1,000 from the 35 million high school seniors graduated in these 25 years.

Important anniversaries tempt us to pause and evaluate our accomplishments. We at SCIENCE SERVICE and Westinghouse have yielded to this temptation. We made a survey of the 960 Science Talent Search winners who have preceded the 40 we honor here tonight. . . . (See SNL, 89:149 March 5, 1966.)

Your predecessors have had a part in largely remaking the world of science and technology that existed at the time they sat where you sit tonight.

They have played a part in discovering the structure of the atom and bringing useful power from its nucleus . . . in extending the known limits of the universe to almost inconceivable distances . . . in learning the form and function of living molecules, with its hope of understanding the secret of life itself . . . in beginning that inevitable chain of events which will place man as much at home in space and beneath the sea as he now feels on our planet's surface.

We hope you do as well. For this we know: you will have no dearth of problems to work upon, because the acquisition of scientific knowledge always creates more questions than it solves. And we know, too, that the problems of science and technology which you face grow ever more complex, and their social and political implications more complicated still.

But such problems, we know, will not deter you any more than they did Dr. Meyers, Dr. Teschan and their fellow winners who have gone before.

The English scientist, James Smithson, whose name is perpetuated in the Smithsonian Institution which Dr. Carmichael served so well, once said: "It is in his knowledge that man has found his greatness and his happiness."

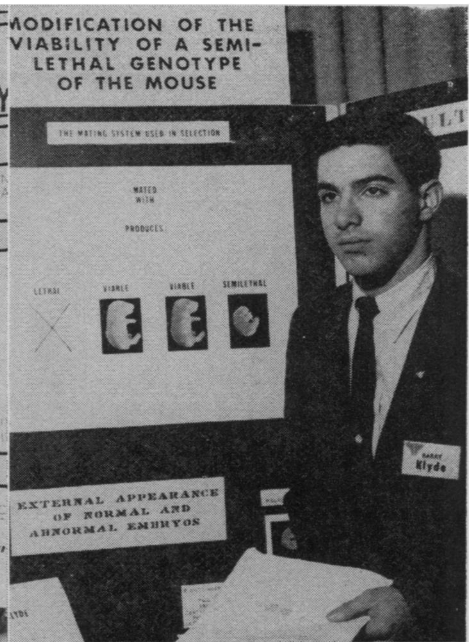
• *Science News, 89:182 March 19, 1966*

TALENTED SCIENTISTS—In the center are the forty Science Talent Search winners during their visit to the U.S. Capitol. In the other photographs, the scholarship winners and their alternates are shown with their exhibits at the Science Talent Institute. Top row, left to right, Larry E. Morse, first alternate; David R. Jefferson, third winner; Barry J. Klyde, second winner. Center row, left, Henry Wagner Jr., first winner; right, Mary Lou Silkworth, second alternate. Bottom row, left to right, Linda Sue Powers, fifth winner and Kevin R. Binns, fourth winner. →

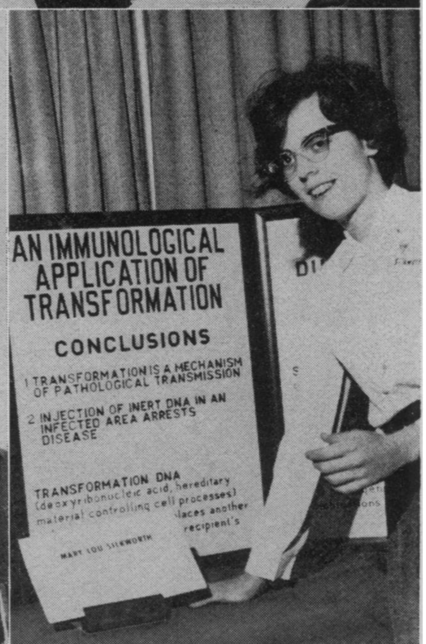
Photographs by Fremont Davis

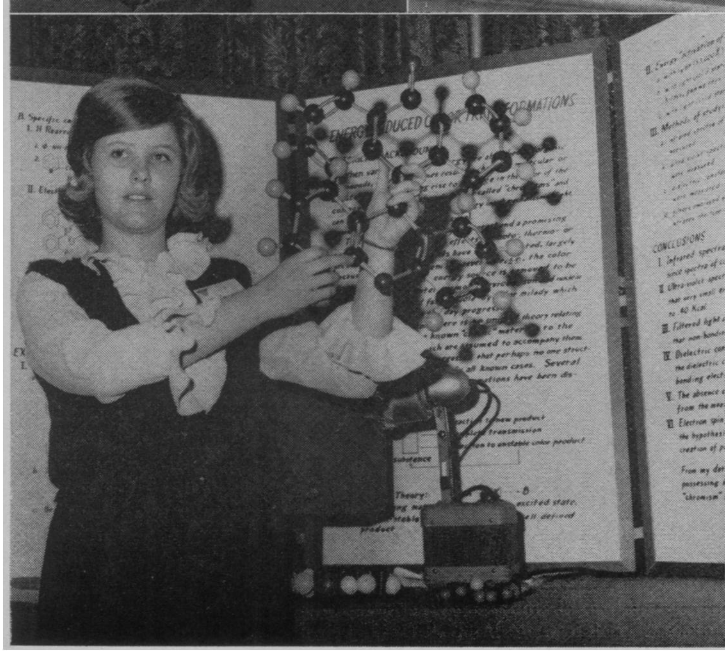

WILD RASPBERRY
COLOR VARIATION
PURPOSE
MATERIALS
PROCEDURES
BLACK RASPBERRY
DATA
YELLOW RASPBERRY
PIGMENTS
OTHER TESTS
CONCLUSIONS


FUNCTION RELATIONS
ISOSCELES
TRIGONOMETRY
PURPOSE
THIS PROJECT IS A DEVELOPMENT OF A N TRIGONOMETRY BASED ON FUNCTIONS RELA TO THE SIDES OF ISOSCELES TRIANGLES
DEFINITIONS
DAVID JEFFER


MODIFICATION OF THE
VIABILITY OF A SEMI-
LETHAL GENOTYPE
OF THE MOUSE
EXTERNAL APPEARANCE
OF NORMAL AND
ABNORMAL EMBRYOS
Klyde


VINE α-CHYMOTRYPSIN


AN IMMUNOLOGICAL
APPLICATION OF
TRANSFORMATION
CONCLUSIONS
1 TRANSFORMATION IS A MECHANISM OF PATHOLOGICAL TRANSMISSION
2 INJECTION OF INERT DNA IN AN INFECTED AREA ARRESTS DISEASE
TRANSFORMATION DNA
(deoxyribonucleic acid, hereditary material controlling cell processes)
MARY LOU SILSWORTH


CONCLUSIONS


THE AIRBRASIVE

Col. Teschan

(Continued from p. 180)

Perhaps we can call this personal dimension and illustrate it like this: As scientists we are expected to think, to reason, to analyze, to synthesize, to create—but there is such a thing as overdoing the intellectual bit, even to become an overblown caricature of a depersonalized, disembodied brain. Since we are stewards of other talents and endowments than merely intellectual ones, we should expect also to live, to love, to savor, to experience the non-quantitative, to be in relationship with other persons—deeply and fully. The zest of the intellectual chase is great, but don't cut the fuel mixture too thin!

If there is a historical and a personal dimension, there is also a social dimension. Last year in Viet Nam our Medical Research Team was studying the impact of our early attempts at medical care among such population groups as the Montagnards of the Central Highlands. On one of these trips I had occasion to visit a number of the sick in Jarai tribal village near Pleiku. One patient in a smoky, reed-matted hut on stilts was gravely ill with pneumonia, grossly dehydrated, with a high fever. She needed the antibiotics we could give her; but she also needed mineral and fluid replacement—how to do that?

Down in the village an ox had just been sacrificed. We had seen parts of it in a grayish soup boiling in large cauldrons set over charcoal fire-pits in the ground. Here was a sterile, mineral-rich source of the fluids the patient needed, and we prescribed accordingly.

We were astonished in the experience; we were not really prepared for it by training: After all how many of the patients in your ordinary acquaintance or mine really live in the Stone Age?

Now while this may be a rather vivid example, it is nevertheless true in medicine and increasingly in other disciplines, that concepts and technologies are increasingly being developed and applied in societies and places different from our own. The successful defense of our own society may just conceivably depend at least partly on just such efforts. This is a social dimension, then, as scientific activity increasingly occurs and scientific careers are increasingly lived, immersed rather than apart from society.

So it may be that you will see your career in science in the historical dimension, a personal dimension, and a social dimension—in a world that is far smaller or larger—depending on your view of it—than perhaps we dreamed, or at least than I dreamed at launching time here 25 years ago.

• *Science News, 89:180 March 19, 1966*

Dr. Seaborg

(Continued from p. 182)

contemplate the bombardment of uranium with uranium ions.

A particularly exciting possibility is that isotopes with about 126 protons and 184 neutrons, corresponding to closed nucleon shells—that is, isotopes like the one with the atomic number 126 and the mass number 310—will be sufficiently stable to make discovery and identification possible. Thus it can be seen that there are prospects for continued exciting advances in the field of the transuranium elements.

In observing the 25th anniversary of both the Science Talent Search and the discovery of plutonium, it is interesting to note that the Westinghouse Corporation has played a leading role in finding and nurturing scientific talent and in furthering the peaceful uses of nuclear power.

The Science Talent Search, developed by SCIENCE SERVICE, is, of course, financed by the Westinghouse Educational Foundation which also makes possible the scholarships and awards granted to the young scientists discovered by the Search.

On the other hand, Westinghouse is also a pioneer in the nuclear power field, being one of the major developers of nuclear power reactors in the world.

Tonight I am sure there are many of us who wonder what the next twenty-five years will bring and whether we will gather to observe such anniversaries on a similar evening in 1991. I believe we will. And I think we will have good reason to celebrate them with success and joy.

I look forward to the challenges ahead, hopeful that the young men and women of science will accept them, triumph over them, and carry on in the tradition of the Science Talent Search winners here tonight and at work throughout the country.

• *Science News, 89:181, March 19, 1966*