GENERAL SCIENCE

Main Competition Lies Ahead

Science makes it possible not only to invent ideas which bring beauty, elegance and order into the world of nature but also to build them on one another.

By DR. DONALD F. HORNIG

Special Assistant to the President
For Science and Technology

Address at Awards Banquet of the 24th Science Talent Search for Westinghouse Scholarships and Awards, March 1

➤ I COUNT IT as an honor and an opportunity to talk with you tonight. It is clearly an honor to talk with 40 young men and women who have been selected from the 22,000 who originally entered, most of whom were considered students of outstanding promise. You come from all parts of the country; you come from all kinds of families. You have excelled not only in scholarship examinations and bookish learning, but you have distinguished yourselves by undertaking projects of your own in areas ranging from nuclear physics on the one hand to biochemical genetics on the other; you have shown independence, initiative and the ability to finish a job. For these things your country is proud of you, and I am honored to be with you.

I consider this an opportunity, too, for you have given me a chance to talk about matters which are very dear to my heart. You have been selected as students of outstanding promise. As such you have a duty to yourselves and to your country to turn that promise into achievement. But I would not be honest if I did not tell you now, when all is so rosy, that there are thousands more who have also promise and talent, and many of them may eventually pass you by if you do not continue as you have started. The main competition still lies ahead of you. Nevertheless, tonight I am proud of you; I know that these brilliant beginnings will make you examples for many others.

The Origin of Interest

I wonder why each of you became interested in some aspects of science? And I wonder, also, why so many other high school students find it uninteresting or even repellent. This is an important question, for science has become so important to everything that goes on in the world; it has become so important for any educated person who wants to understand man and his place in the scheme of things; it has become so important for any philosophical person who wants to think about whence we came and where we are going that it worries me that science is not considered part of the general intellectual apparatus of an educated person like literature or history.

I once asked a large number of college seniors how they came to be interested in science and found without exception that they had been interested in the first place by their high school teachers. By the same token I suppose those who aren't interested just didn't find the right teacher to bring them into contact with science. I am sure that most of you owe your interest to a high school teacher. If this is true, it places a tremendous responsibility on the high schools. Fortunately, many high schools realize that science is not a collection of facts to be taught from unimaginative text books by teachers who have not themselves comprehended it deeply. But far too many science teachers still have little background in their subject. Far too many have been trained in the methodology of teaching but lack deep insight into the subject they teach. You are, I am sure, the lucky ones who have had the good fortune to study with some of the many high school teachers who do feel and transmit the excitement of creative science. I hope that after you have finished your training, many of you will take up teaching as a career and help bring inspiration and sound teaching to more of our schools.

Scientist Like a Detective

I like to think of the scientist as a kind of Sherlock Holmes. To be sure, there is no crime, but there is certainly a case to be solved. The case starts with curiosity, and with the courage to be skeptical, to ask what really goes on and why? The game is to find the answer to the question with a minimum number of clues, and the trick is to find the "right" clues, to do just the "right" experiments. And, of course, like Sherlock Holmes, the right deductions from those clues may allow one to skip many steps in finding the solution to the puzzle.

That is what I am sure in one way or another makes science exciting: the discovery that there is a problem, doing just the right experiments, getting the necessary ideas and coming to a conclusion. Of course, solving each puzzle exposes several more, so you can look forward to a lifetime career of such fun and excitement with the added pleasure of knowing that what you do will probably turn out to be useful in the bargain.

In short, the work of the scientist has much in common with that of the poet, the musician and the artist. This is why scientists speak of researches as "elegant" or "beautiful." Such researches are imaginative, economical of time and effort and find just the right path to a meaningful conclusion.

I may have painted too simple a picture, but I am sure that each of you, in the course of working up your project, has come to feel what I mean. You have undertaken projects addressed to answering questions at the very border of what we know and understand, and that is what makes them such good projects.

I hope that more of our high schools and more of our colleges and universities can get across the sense of exploration which marks your projects and can allow students to experiment on their own to find out for themselves what fun it can be.

Takes Mastery

After all, one cannot become a musician without mastering an instrument nor aspire to be an artist without drawing, painting or sculpting, and surely the art of self-expression can only be developed by writing. Our schools do all of those things, not only for the potential musicians, artists and writers, but also for the pleasure and meaning they add to the life of most of us who at best can become earnest craftsmen or seek to appreciate the work of the masters.

Independent, creative inquiry has always been the core of postgraduate study and the major requirement of all of the best universities is that to obtain a Ph.D. degree the student submit a thesis based on research he has carried out himself. Experimentation must be an integral part of science at all levels of schooling, and fortunately, it has been for those we are honoring tonight.

I have taken pains to emphasize that science is not a collection of facts, just as history is not a collection of events, dates and places. But, just as in history, the facts can't be ignored, they are the bed rock on which the advance of science is built. It is up to the schools at all levels to integrate, organize and present the factual picture of the world in which we live in a way which will keep open the spirit of inquiry. As the body of factual knowledge grows, we will need new approaches such as the new high school curricula in physics, in biology, in chemistry and in mathematics.

It is important for our country that students such as you have the opportunity to become leaders in science. It is important that every student with talent and aptitude for science have that chance. But in a world whose future depends so much on science and on the applications of science, in a world in which the course of our national development depends on the ways in which we encourage science to develop, it is important that we also recognize science as an integral part of our general culture and general education. It must be part of the education of every citizen. As President Johnson recently said so eloquently:

"Close and understanding accord between science and public affairs is imperative for free societies today. As I am so acutely aware, no national policy or purpose of the United States is unaffected by the present state or prospective scope of our scientific knowledge.

(Continued on p. 171)

Dr. Davis is that rare man who is a native of Washington, D.C. He is both a pure scientist and an engineer. At the onset of his career after graduating in engineering he was on the staff of the National Bureau of Standards and also worked for various newspapers and publications.

But since the very beginning of SCIENCE SERVICE 44 years ago, he has devoted himself to developing this influential organization. Some of you will like to look up his biography in "Who's Who" because you will learn there of the honors that have come to him not only in America but from all over the globe.

Tonight, therefore, I do want to say to you that the greatness of SCIENCE SERVICE and its usefulness to America are peculiarly an image of this one modest gentleman. So, I ask all of you here to join with me in thanking him and his associates and especially Westinghouse for the amazing farsightedness in making this now world famous Science Talent Search the original proven constructive program that it has demonstrated itself to be during each of the last 24 years.

A great industry, Westinghouse, and an endowed nonprofit organization, SCIENCE SERVICE, in productive partnership have certainly demonstrated what proven initiative can do in helping to advance the total welfare of science and all that science stands for in modern America.

• Science News Letter, 87:164 March 13, 1965

Dr. Hornig

(Continued from p. 165)

"We look to it—

"For the technology and industry which will supply us with new products and new jobs to meet our needs.

"For the health programs which will eventually conquer disease and disability.

"For the purposeful and useful exploration of the seas around us and the space above us.

"And, most especially for the guidance that will permit us to proceed with greater security and greater confidence toward our goals of peace and justice in a free world.

"As no other force has contributed more materially to our effective pursuit of happiness in America, so it is true that no other force is now requiring of us the more careful examination and reexamination of the workings, values and aspirations of our society.

Science Includes Change

Science is changing many of the very premises on which our greatly successful American society has been built over the past two centuries. If we are to strive toward our society's continuing success and further greatness, we must not merely commit ourselves to its support—we must involve ourselves in seeking to understand the profound changes which it promises.

"For all that has been wrought in this land, we must understand that these are the infant years of a new age—not the aging days of an old era."

This morning the President reminded you all of the decisive part which science plays in our national effort, pointed out the necessity for a development of political science to parallel that of the natural and physical sciences, so that we may all live and work in a world at peace.

I strongly believe that to ensure such a development is it essential for every youngster in our schools, for every young man and woman in our colleges and universities, to receive sound and diversified training in the sciences as well as in the liberal arts. The methods and achievements of the exact sciences have become so much a part of mankind's daily life—in industry, engineering, medicine, transportation, agriculture, in short, in dozens of ways that weave in and out of the fabric of living—that no one can any longer afford ignorance of them.

The sciences have taken their place as an integral part of a liberal, humanistic culture, as a large and important field of human endeavor. We must make certain that they also occupy a corresponding position in our educational scheme.

Science has become so much a part of our lives and our future, it is intertwined in so many of our policies and decisions, it is so big a part of our budget, that it can no longer be regarded as an isolated activity which is the province of scientists alone, no matter how dedicated.

The development of science and the role of science concerns the President, the Congress and all of our people. It is right, indeed it is important, that they all participate in the fundamental decisions regarding science.

But, by the same token, it is up to scientists, and to you students interested in science, to participate in the whole of the democratic process. It is up to you young people, beginning in your schools, to help bring an understanding of science to all of our citizens.

Scientific Responsibility

I am convinced that the approach of scientists, the impartial observation and evaluation of facts and their relationships, coupled to an imaginative, thoughtful synthesis into working concepts, is one which can and must be applied to all human fields of endeavor.

A necessary consequence of this conviction is that we, as scientists, have a duty and an obligation to contribute not only our specific skills but also the whole weight of our scientifically trained minds and abilities to the solution of the varied problems which confront our nation and our world.

What distinguishes science from other creative activity is that it has proved possible not only to invent ideas which bring beauty, elegance and order to the world of nature, but to build them one on another.

It has developed a mode of communication which involves many minds in a common endeavor, united in a common inspiration and seeking a kind of truth which, being testable, can withstand differences in ideology, race and nationality.

It is in this spirit of a common cause and a common goal that I welcome these young people tonight as they prepare to join an ever growing company of scientists and scholars, and we wish them Godspeed on their travels into the bright future that is theirs to build.

• Science News Letter, 87:165 March 13, 1965