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UNEDITED TRANSCRIPT OF THE EXTEMPORANEOUS REMARKS OF
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Dean Gregory Geoffroy:

Dr. Shakhashiri describes himself as a 'Scientist by training, public servant by trade, advocate by conviction, and optimist by nature'.

By training, he is a chemist. A native of Lebanon, he came to the United States in the late 50's, with his father, mother and two sisters, and with one year of college at the American University in Beirut behind him. He earned his B.S. at Boston University, then the master's and Ph.D. degrees at the University of Maryland, all three in chemistry. He has held academic appointments at Bowdoin College, The University of Illinois, and at the University of Wisconsin, where he continues in a faculty position, concurrent with his assignment at the National Science Foundation.

At Wisconsin he founded the Institute for Chemical Education, which is a thriving body, devoted to improving the quality of chemical education in this country.

In his role as public servant, Dr. Shakhashiri is Assistant Director for Science and Engineering Education at National Science Foundation and is responsible for the

creation and administration of a wide variety of programs designed to improve education at all levels in mathematics, engineering and the sciences. One piece of evidence for the quality of that public servant is the fact that this years congressional appropriation to the Science Education Directorate is over twice what it was just three years ago - and is the largest in the nearly 40-year history of the National Science Foundation.

As advocate, he has designed interactive exhibits for major U.S. museums and produces a "science magic show" that appears annually on television and plays to packed audiences at the National Academy of Sciences, the Smithsonian's National Air and Space Museum in Washington, the Boston Museum of Science, and other locations around the country. He has co-authored textbooks, manuals and booklets about the teaching of science, and played leadership roles in many scientific and educational organizations.

Along the way, he has won numerous Distinguished Teaching Awards; has been cited several times for distinguished public service; and has been awarded honorary doctoral degrees by George Washington University and Illinois State University.

Dr. Shakhashiri will address us today on a subject obviously near to his heart: 'Communicating Science'.

Please join me in welcoming Dr. Shakhashiri. (applause)

Dr. Shakhashiri:

President Jordon, Mr. Huck, Dean Geoffroy, guests, and especially, you, who are about to commence on a very exciting role, I want to add my congratulations, and I want to share with you this morning some important convictions about the expectations, that not only your parents, your spouses, but the rest of us in society, have of you -- as scientists.

My message today deals with communicating science. For it is from the Eberly College of Science that you are receiving your degrees today. And my message deals with reminding all of us of the value system that we have not only in doing science but for the reasons for which we pursue science. In science we seek knowledge, we acquire knowledge and we communicate knowledge. Unfortunately, the communication of knowledge in science is limited only to those who are in the scientific community and what we must do quickly and forcefully is develop ways to communicate science to the rest of the population, for it is the rest of the population that supports those of use who are in science, it is the rest of the population that will benefit from what we do in science, it is the rest of the population that must understand the value of scientific accomplishments.

So when we talk about education in science we're talking about the continuing education, not only of scientists but of the population at large. We need to communicate science to ALL citizens. Citizens not only of this great nation but citizens of the world. What is at stake is not only the quality of life in State College or the quality of life in the Commonwealth of Pennsylvania, or the quality of life in

the United States of America. What is at stake is the quality of life on the Planet.

It is appropriate for all of us to examine and to affirm the reasons for which we do science. These reasons not only relate to our national security, to our economic security, and the to effective democracy that we belong to, but these reasons are based on our convictions that all citizens of the planet must be enabled to fulfill their human potential. And that, can happen only if the integrity of the planet is preserved and protected. In the words of former Secretary of State, George Schultz, "if the sovereignty of the planet is maintained". That is why we need a good supply of scientists and a supporting citizenry, a supporting public at large, that can appreciate the benefits from the advances in science and in technology as well as deal responsibly with their potential hazards.

What threatens the planet is not only lack of regulations for controlling pollution, for curbing deforestation, and for dealing with ordinary and with hazardous waste. The biggest threat is from irrational behavior on the part of societies, their leaders, and the individuals who belong to them. It is through education in general, and especially through education in science and technology, that we have a fighting chance to maintain the sovereignty of the planet.

Since behavior, for the most part, is a manifestation of attitudes and beliefs, we must devote a good deal of our intellect to develop a healthy societal environment which will influence attitudes and which will help our citizens avoid being bamboozled into making foolish decisions. What we must be after is: rational behavior as individuals

and as a society.

The situation that we face now in this country is by far much more critical and much more consequential than what we faced in the immediate post-Sputnik era. It is so for a variety of reasons that can be summarized as follows. First, the population of the United States, in the past 30 years or so, has increased by about 50 million people. To put that number in perspective, that happens to be the approximate population of all of Great Britain and twice the population of Canada. What does that mean? It means we have more students to teach and we need more qualified teachers to teach them at all educational levels. So the first reason, can be summarized by saying there has been a tremendous change in scale in the population. And all societal institutions, especially educational institutions are very sluggish in responding to changes of that magnitude.

The second reason as to why the situation is more critical and more consequential than 30 years ago is that for our nation to maintain its international pre-eminence in science and technology in the global economy, in the humanities, in the arts, in all walks of life, we must have a good flow of talent going into careers in science, mathematics and technology.

I was told very recently that this year's graduating class is smaller than in previous years. That is of concern to us. It is not only smaller here at the Pennsylvania State University but across the country.

The third reason as to why the situation is more critical and more consequential than thirty years ago, and in my judgement the most important of all three reasons, is that we now live in a much more advanced scientific and technological society than we did back then and it's the education in science and technology of the non-specialists that we have to pay attention to. We need an educated citizenry that can distinguish between astronomy and astrology. We need a our fellow citizens to understand the complex issues related to animal rights. We need the population at large to successfully deal with issues related to pollution and pollution control. It is up to us to communicate all of these concerns to the rest of our society. So the twin mission that all of us must embark on, is to see to it that we have a good flow of talent into careers in science, and to see to it that the public at large is literate in science, literate in mathematics.

Speaking of mathematical literacy, I am reminded of the story that I think everyone knows. I share this story with you with some hesitation this morning. It's about the student athlete who was having trouble maintaining his eligibility and his coach went to the teacher and said, "Please give my student a chance to maintain his eligibility, otherwise he is going to go off the team and we will end up with a losing season." The teacher agreed to give the student a special test and the coach said, "Well, can I come along?" The teacher said, "Yes". At the appointed hour the two of them came to the teacher's office and the teacher proceeded to administer to the student athlete the special exam and the first question was, "What is the square root of 16?" The student said "4". The coach was heard to be saying, "Oh, please give him another

chance, please give him another chance." (laughter) Not too long ago I shared this same story with a group of lawyers and unlike your reaction, there was dead silence. (laughter and applause) About 23 seconds later, someone in the back of the room was heard chuckling; he had taken out his pocket calculator. (laughter)

When I speak about literacy in science and in mathematics I mean literacy for all citizens. Not only for those who are college bound, not only for those who are going on to graduate school, but for lawyers, business people, workers, voters. That is our value system in science. That is what must be communicated to all segments of our society. For if you believe, as I do, in the democratic institutions upon which this country was founded and continues to exist, then you will join in the effort of seeing to it that all citizens are literate in science and literate in mathematics.

It is extremely important for all of us, especially todays graduating class, to become part of a national effort to develop the capacity that we have in this country, to develop the talent that we have in this country, to achieve goals that lead to enabling all of us to fulfill our human potential. What we need is to quickly develop a national will, a national determination, a national resolve, to address the problems that face us, not only in science but in everything that relates to our society.

And so I ask you to join in the talent development activity. I ask your professors, who today, are stating publicly that you are ready to commence, I ask your professors also to join in the talent developments approach so that my colleagues across the country, not only at Penn State, will stop taking pride in how many students they

weed out of the freshman and the sophomore years of chemistry, mathematics, physics, biology, and instead join in developing talent. (applause)

I believe that we have not only the capacity but the ability to act in rational way. And I ask the graduating class in joining that effort to also consider not only careers in science but also to consider possible careers in public service. The country needs talented individuals to take part in the governance of this nation. I ask you to seriously consider becoming a public servant not only at the local level or the state level, but at national level.

In closing I share with you a story that appeared in the Wall Street Journal about 18 months ago. It was about a conversation between a Polish economist and an American economist. The American economist asked his colleague, "How do changes take place in the Polish economy?" This conversation was taking place before the great movements toward freedom took place in Eastern Europe. And the Polish economist responded by saying, "Why there are two ways in which changes take place. One is the natural way and the other one is the miraculous way." The American economist said, "Oh, what is the natural way?" He said, "The natural way for change is when the Angels descend from heaven and bring about change in our economy." The American looked at him puzzled and said, "That's the natural way, then what is the miraculous way?" He said, "the miraculous way is when the people themselves decide to do it!" (applause)

My friends, we need to join forces so that in the United States of America the miraculous way becomes the natural way.

Thank you very much. (applause)