REMARKS TO THE JUNE 15, 1998 WEPAN CONFERENCE

Dr. Martha Krebs
Director, Office Of Energy Research

U.S. Department of Energy
1000 Independence Ave, Washington D.C. 20585

Thank you for that introduction. And let me say how pleased I am to be here today with Dr. Shirley Malcolm. Shirley and I are among a number of policy makers in Washington who are wrestling with a very difficult problem: how do we increase the numbers of women and minorities in the fields of science and technology?

I believe the answer to that question is critical to the future of our nation and our continued ability to increase our quality of life. I say this for four reasons:

1. First, as a nation, we need more scientific and technical innovation.
2. Second, it is clear that in the future fewer producers will be supporting a greater number of non-producers.
3. Third, the trend toward globalism will have a dramatic affect on our workforce and workplace.
4. And, fourth, we are increasingly recognizing the vital role that diversity plays in the conduct of science.

Need for Innovation

Economists who have studied the impact of innovation on our economy have estimated that 20-25% of our national economic growth has been derived from scientific and technological innovations. The current U.S. economic expansion, which has created more than 15 million new jobs and hundreds of thousands of new businesses, has been fueled by technological advances -- particularly in computers and information technology.

A 1993 survey of U.S. companies, for example, found that 75 percent used at least one advanced technology and 29 percent used at least five technologies. This was up from 68 percent and 23 percent, respectively, in 1988. And larger U.S. companies that produce higher priced products and compete in foreign markets were more likely to use advanced technologies than other U.S. companies. U.S. trade in products that incorporate advanced technologies accounted for 19% of all U.S. trade. And that share is growing each year.

We can see the power of science and technology in a number of different ways, but let me give you two illustrations. First, we can look backwards and see that much of today's high-tech industry is based on the research of yesterday.

Telecommunications has been revolutionized by lasers and fiber optics coming from research that began at the turn of the century with work done by Albert Einstein, who recognized in 1917 the theory of "stimulated emissions," and continuing through the important research at Bell Labs in the 1950s and 1960s that resulted in the first laser. The Global Positioning System that now allows us to precisely locate anything and anyone -- whether its UPS delivering your packages or a robot working in a Bosnian minefield -- is based on ultra precise atomic clocks developed for research starting in the 1950s. And the biotechnology industry is based in large measure on recombinant DNA techniques developed in the 1970s.

And we can also look to the future and see that many of tomorrow's high tech industries will be based on the research of today.

Today's research in quantum mechanics and advanced materials will help us get around Moore's Law, which predicts that the need for increasingly small etchings on complex computer chips will soon exceed our technological capabilities. The pharmaceutical industry is increasingly moving toward the design of drugs that interfere with the ability of pathogens to act. The designs of these drugs are based on the detailed molecular structure of the pathogens determined by structural biologists using the physicist's x-ray diffraction techniques. And at the Department of Energy, our human genome project and a new initiative, which we are calling the Strategic Simulation Initiative, hold enormous promise for the future of medicine, computation and other disciplines.

Fewer Producers

As critical as S&T has been for U.S. economic growth in the past, it will be more critical in the next century. As the boomers retire, the remaining smaller work force must be more productive in order to support us. To me, this argues for more innovation and more trained scientists, engineers, and technicians at all levels.

But what we see on the horizon are a number of troubling signals that indicate that if we do not begin planning today, we might not have the workforce we need to maintain our preeminence in science and technology. I would like to focus on two of those trends:

* First, the composition of our national workforce is changing.
* And, second, we might not be doing enough to train the next generation of scientists, engineers and technicians.

Increasingly, our workforce will become more diverse. California and Texas are well on the path to becoming majority-minority states soon after the turn of the next Century. The Bureau of Labor Statistics estimates that the total non-Hispanic white population will decline from 76% in 1990 to 53% in 2050. In 2030, the BLS estimates that more than half of the 18 and under U.S. population will be minority.

When you examine the current composition of our science and technology workforce, some disturbing facts emerge. Of all science and engineering degrees awarded in 1993 at the Ph.D. level, only 2.9 percent were earned by African Americans, 3.3. percent were earned by Hispanics, and less than one percent were earned by native Americans.

But this isn't just about minorities, it's also about women in the workforce. Women are only 14 percent of physical science and 6 percent of engineering faculty.

And the numbers won't growing significantly, according to the latest statistics from the National Science Foundation. For example, the number of minority and women engineers graduating from our universities has steadily increased since 1980. But the enrollment of minority freshman is down 10.4 percent since 1992, which means a decline in graduations is imminent.

As one expert in the field recently wrote (George Campbell, NACME's President):

"The decline in enrollment reflects a basic shift in student interests, attitudes and choices, a situation that has serious implications for our future economic competitiveness."

Our newspapers have been filled with stories recently about the low achievement levels for all of our nation's students in math and science, which means the pipeline isn't being filled. One study had U.S. 12th graders ranked nearly dead last in international science and math tests. Less than one-third of our fourth, eighth and 12th graders scored a "proficient" on national science tests.

As bad as this news was, it was worse when you consider the fact that test scores for minority students was even lower than the national average. As the National Science Foundation noted recently:

"Mathematics scores for black and Hispanic students remain substantially lower than those of white students....The median scores for black and Hispanic students at [9, 13, & 17 years of age] are lower than the 25th percentile scores for white students."

Increasing Globalism

As the manager of one of our nation's premier science organizations, trends like these cause me to sit up and take notice. This is particularly true because I see an increasing trend toward globalism, especially in science and technology.

Nations of the world realize that the path to sustained economic development is paved by technological advances. Countries are putting tremendous resources into the training of their future workforce. Taiwanese and Korean school children annually score the highest on international mathematics and science assessments. In 1992, more than half of all university degrees in China were in the science and engineering fields. And foreign companies are filing for an increasing number of U.S. patents in key technology fields, such as communications and electronics.

Fueling this trend of increasing competition is the fact that science and technology is becoming a global enterprise. International industrial research/technology partnerships are continuing to grow, notably in the information technologies. The partnership between Mercedes and Chrysler isn't just about marketing, it's also about shared research and ideas.

International coauthorship of science and technology publications -- a key indicator of scientific vitality -- has increased markedly. From 1981 to 1993, the number of international coauthored articles increased by 150% -- which is even more startling when you consider that the total number of all articles only increased by 20%.

At the Department of Energy, we understand that international cooperation is the wave of the future. This past December, DOE joined with an international consortium to build and

operate the $6 billion Large Hadron Collider in Switzerland. The Collider will be one of the premier scientific facilities of the 21st Century. We would have missed a tremendous opportunity to increase our knowledge of basic science if we had not participated.

Value of Diversity

So I see a future where we need more scientific innovation if our children and grandchildren are to enjoy a high standard of living. And I see a future where our workforce is becoming more diverse and, potentially, isn't being trained to meet our needs in science and technology. And I see a future where the need to interact globally becomes very important.

All of this, in my view, points to the need for greater diversity in our science and technology workforce. Let me offer several reasons why.

First, C.K. Prahalad, a noted corporate strategist and the originator of the concept of "core competencies," writes that increasing globalism will require greater diversity. "While the focus thus far has been on intellectual diversity, in a global firm, there is yet another dimension to cultural diversity. This is a result of multiple country cultures." As Prahalad argues:

"Cross-cultural collaborative activity is emerging as a critical skill in the New Economy."

A second reason why diversity should be valued is that evidence is emerging that diversity improves the conduct and quality of science. A recent report by the National Research Council said it very well:

"The intrinsic value of diversity to the vitality of a modern enterprise goes well beyond strictly demographic considerations. The confluence of disparate points of view, the clash of ideas, and the multiplicity of perspectives born of distinct cultural backgrounds, managed well, can yield higher creativity and lead to greater innovation, both of which are critical to the conduct of science."

The NRC report then cites a number of academic studies that offer practical benefits of diversity, including the probability of "superior problem solving," and "a higher proportion of high quality solutions."

And let me add a final reason: we should value diversity because it is the right thing to do. We should be providing opportunities to all of our citizens. And, in the future, the best paying jobs with the brightest futures will be in the sciences and technology.

Interagency Working Group

These are the reasons why Dr. Artie Bienenstock, the Associate Director for Science at the White House Office of Science and Technology Policy, recently asked me to help him lead an interagency working group that is focused on the science and technology workforce of the future.

When you have court decisions like *Adarand* and *Hopwood* that have a potentially chilling effect on our ability to design programs that encourage women and minorities to enter the science and technology workforce, we believe it is time for the federal government to take decisive and positive steps.

We are currently studying the most current research in the field of human resource development and will host a high level workshop in July. Based on that research and the findings of our workshop, we will prepare a report to the President and the nation that makes forward looking recommendations that we believe will enable federal agencies, like DOE, to invest in people and programs that are critical for our nation's future.

Conclusion

Let me conclude by noting that it is very appropriate that WEPAN is meeting today, June 15th. Because it was on this date in 1913 that Carrie Chapman-Catt opened the first Women's Suffrage Congress in Budapest, Hungary.

Women have come a long way since that day 85 years ago and have made tremendous progress. But as should be obvious, we have much farther to go. There simply shouldn't be a gender gap -- or any kind of gap, whatsoever -- when it comes to having an opportunity to succeed in the sciences.

That is why WEPAN is to be congratulated for its leadership and vision. By bringing more women into our science and technology workforce, WEPAN is making an investment not just in people, but in superior science and technology that will keep our nation at the forefront of new ideas and innovations as we enter the next millennium.