GUEST EDITORIAL

The Critical Materials Act of 1984

*Dr. Paul C. Maxwell**

When future historians look back on the latter part of the twentieth century, they will most likely view high technology for communication, information handling, transportation and even warfare as the dominant force. Because materials underlie all this technology, this era could be called the "Age of Advanced Materials." Advanced ceramics opens new vistas in microelectronics, automotive power sources and aeronautics. Advanced polymeric composites and exotic metallic glasses make possible entirely new products, the latest being the proposed aerospacecraft or "Orient Express." Advanced processing, coupled with robotics and artificial intelligence, points to new innovations even in our basic materials industries.

Federal policy, at the urging of Congress, has focused on two divergent aspects of materials—the critical importance of materials in international economic competition, and the strategic nature of materials for our national defense. Japan, Western Europe, and others have taken decisive steps in this decade to develop key materials technologies to leapfrog our country's earlier leads. In some cases, such as microelectronics and fine ceramics, we may already have lost the "war." South Africa, with its inherent political instability, underscores this nation's import vulnerability to certain key minerals and strategic materials. Many materials decisions that directly affect our defense posture include operations of the federal stockpile, the health of our mining industry, and the survival of our steel industry, to name a few examples.

Until recently, no one in the federal government was responsible for critical materials concerns. The National Critical Materials Council was created by congressional mandate in 1984 to fill this need. While offering a unique means for addressing materials issues, the Council has met with less than an enthusiastic response from the White House. The three-member Council, operating from the President's Executive Office, is charged with coordinating and overseeing implementation of national materials policy. This includes oversight of the more than $1.5 billion federal materials R&D programs and development of a federal program plan for advanced materials R&D. Other tasks include promoting technological innovation in our advanced and basic materials industries, establishing suitable materials property data information systems, setting responsibility for implementing materials policy, and making recommendations to the President and Congress regarding critical materials issues.

Obviously, carrying out these tasks will require a close interaction between the Council, other federal officials and agencies, and, not least of all, the materials community at large. The Council represents a major opportunity for the materials community to collaborate with the federal government and to help set important national goals and priorities. It would be unfortunate if this opportunity were lost due to inattention by either party.

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VIEWPOINT

Team Research: Education Consequences

[Excerpts from a presentation by William D. Nix of Stanford University at a symposium on Advances in Materials Research. The symposium was sponsored by the National Academy of Sciences and the National Academy of Engineering in October 1985 in honor of the 25th anniversary of National Science Foundation Materials Research Laboratories on university campuses.]

The need for instrumentation and the need for sharing expensive facilities tend to force us away from the small science research style toward team research. Also, political forces at all levels, not only in Washington, DC, but also in university administrations, push us in this direction. Although this is necessary and in some cases desirable, it has some negative effects.

One of the primary products of small-scale research is the intellectual development of the graduate students involved. With small-scale projects the students can direct their own work and, more importantly, take responsibility for the development of new ideas. If the project is small and the graduate student has complete responsibility for its outcome, then there are no large costs associated with changes in direction during the work. This provides a great amount of flexibility and freedom for the student and permits self-development in the course of the research. This atmosphere allows for creativity and often encourages new discovery.

The team concept in basic research has some merit in that it prepares people for industrial research, and it allows students to be associated with high-visibility projects. However, it is inferior when it comes to individual intellectual development. And intellectual development of our students (not progress) is our most important product.

Prospective employers always ask about the originality shown by the students in their work. They rarely ask about a student's ability to fit into a team, except regarding personality and a basic ability to get along with people. Rather, employers are interested in intellectual development and the potential for leadership. This suggests that our customers are interested in people who have been allowed or encouraged to think independently and creatively, and who are prepared for independent work.

Do You Have An Opinion?

*The **MRS BULLETIN** wants your comments and views on issues affecting materials research.*

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