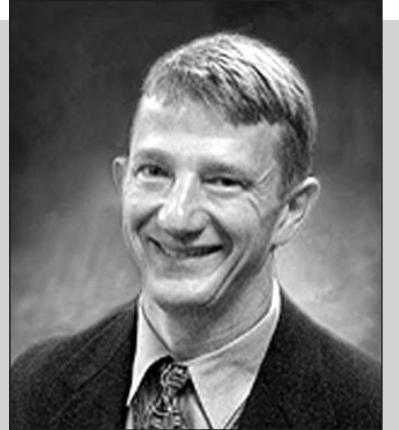


The Globalization of Materials Research

Globalization is a hot-button topic in the United States. There is widespread concern, even alarm, at the rapid trend toward white-collar jobs moving from the United States to lower-cost locations, especially India and, above all, China. This issue has moved onto the radar screen of scientists, as it has come to involve the research activity. Large corporations are now outsourcing and "offshoring" not only manufacturing and tech-support centers, but research and development (R&D) centers as well. This development is the subject of intense debate throughout the science and technology community. The U.S. scientific community in particular is immensely concerned about a movement that seems to threaten the traditional U.S. dominance in certain fields of R&D, particularly in several technology areas linked to the physical sciences. Combating this trend of globalization is now an unstated goal of many recent legislative actions in the United States. As a society with global roots and a strong international membership, I believe the Materials Research Society should embrace the trend. We will then be positioned to move our community into a globalized future.

The crossover of an essentially Luddite attitude into the high-tech community is interesting to watch. Fear of globalization was once the province of the more technophobic low-tech industries. Since the 1930s, trade unions in almost all developed countries have vehemently opposed the "movement of jobs overseas" in the same way that Luddites opposed "machines taking jobs away from people" in the 19th century. The recent migration of garment manufacturing and other labor-intensive industries to the emerging economies has been met with fear, loathing, and protectionist import controls. But the technology community in general has spoken out for free trade and the open transfer of human knowledge. The globalization of the steel and silicon industries was perhaps closer to home for us in MRS, but until recently it affected mainly manufacturing activities, and we looked on with equanimity. Now, however, we are seeing global outsourcing of the most knowledge-based components of our economy, including not only the most high-tech segments of our manufacturing economy, but also basic R&D. This has generated debate at the highest levels of scientific society on how to prevent the movement of "our" "competitive advantage" "overseas." The renewed popularity of rules that control technology exports or, worse, the "Deemed Export" of technology (by communication of know-how to an



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"alien") is a direct consequence. The point of a joke, like the point of a compass, tends to disappear when it is pointing at you.

Looked at with hindsight, the fear that globalization of garment manufacturing would impoverish the Western economies was irrational. And futile: The opposition to globalization was as productive as the (apocryphal) opposition to the incoming tide of the legendary king Canute. In the end, the consequence of moving labor-intensive tasks to low-wage countries was to force the Western countries to compete and to focus on the jobs and roles where more value was added. And the increased efficiency of manufacturing made the goods more affordable. The upshot was that incomes and the standard of living in both countries generally rose, although the gap between rich and poor narrowed somewhat (both good things, surely). The increase in trade and in the flow of information (especially technology) is generally credited with the increased rate of growth of the global gross domestic product since the 1930s. As the economist Adam Smith pointed out 230 years ago, the free movement of people and goods generates value. Historically, both technology transfer and increased trade have been beneficial to all partners. Ideally, this is symmetrical, and competition will be fair as well as open. Where the playing field is not level (as in China's control of the yuan exchange rate), most economists seem to think unilateral relaxation of trade controls benefits that

party. But if we press for a level playing field and fail, we still cannot control the motion of information. The history of protectionist laws shows that the diffusion of information, like physical diffusion, is remorseless, unstoppable, and inevitable. Knowledge increases like entropy, and laws attempting to contain knowledge are ultimately as productive as a law against the Second Law.

The specific mission of MRS is to "share findings in the research and development of new materials of technological importance." While U.S.-based, we are specifically not a U.S. society. Any move to place constraints on the flow of information violates our very *raison d'être*. And again, attempts to control the free flow of information have historically proven utterly futile. (In the area of nuclear weapons information—the most sensitive classified item of all time—the United States kept the former Soviet Union out of the game for about a year.) In the industrial technology arena, the free flow of information is our glorious heritage. While there are areas where some countries are stronger than others, the differences reside in the research capability and general vibrancy of the community, not in specific pieces of know-how.

So how should we respond to the "threat" posed by the "migration" of "our" jobs "overseas"? By embracing the coming change. By working with our colleagues in the emerging economies to build collaborations. By establishing strong transnational links so that we seize the opportunity to build a truly global community. By working to establish joint meetings with technical societies in other nations. By using MRS's strong international membership to become a leader in the global scientific endeavor. It seems unlikely that this will lead to the demise of R&D in the United States: there is every reason to think that the United States can compete in the technology segments in both R&D and manufacturing, even in an environment where the flow of information is completely unrestrained. U.S. funding agencies are now increasingly focused on enhancing U.S. competitiveness in a globalized tech community. If U.S.-based research still fails to compete successfully in this global community, then so be it. But I believe that all countries will successfully carve out their own niche in an open, free, vibrant, and truly global materials research community. And that MRS can be a leading society in this community.

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