4 March 1983, Volume 219, Number 4588 **SCIENCE**

International Competition in High Technology

The Japanese are moving vigorously toward a national goal of world domination in semiconductors. They recognize that excellence in this area will carry with it leadership in computers, telecommunications, robotics, aerospace, and other high-technology industries. Our government seems paralyzed. Its behavior is in contrast to the financial help and other encouragement that the Japanese government bestows on its electronics industry. In addition to effectively restricting importation of competing items, the Japanese government fosters industrial cooperation in research and development both by authorizing and by subsidizing it.

The United States has tough antitrust laws that in the past have served to stifle cooperation between companies in research. In consequence, there is a tremendous waste of scarce resources of people and excessive duplication of effort in our industrial research. Companies often must rediscover the same phenomena. There are at least two types of applied research. One is highly specific and product-oriented. Companies prefer to keep that work secret from each other. A second type is closely akin to good basic research. Its goal is to work out procedures and production techniques of general applicability. That kind of research and development should be shared and its costs borne by cooperating companies.

A new consortium of companies proposes to do just that. They have agreed to participate in the Microelectronics and Computer Technology Corporation (MCC). Admiral Bobby R. Inman (retired) has been elected president and chief executive officer of the corporation. The founding shareholders are Advanced Micro Devices, Control Data Corporation, Digital Equipment Corporation, Harris Corporation, Honeywell, Motorola, NCR Corporation, National Semiconductor Corporation, RCA, and Sperry Corporation. A substantial number of other companies have expressed interest but are holding back largely because of fear of antitrust proceedings. The Justice Department has been reassuring, but lawsuits are cheap to file and costly to defend.

Initially, MCC will concentrate on four advanced, long-range programs. Their stated objectives include:

- Electronic computer-aided design and computer-aided manufacture (CAD-CAM): Major advances in electronic CAD-CAM design tools will be integrated into a system that encompasses the spectrum of design needs from concept and simulation to the design and layout of microelectronic chips containing up to 10 million elements.
- Software productivity: This MCC program will develop techniques, procedures, and tools based on expert and knowledge-based systems in order to gain an order-of-magnitude improvement in the effectiveness of both systems and application software development processes.
- Advanced computer architecture: This 8- to 10-year program will focus on knowledge-based architectures and artificial intelligence and their applications. Its range of applications includes image analysis and design automation of very large scale parallel computing structures as well as data-flow techniques, pattern recognition and manipulation, and development of expert knowledge and inferencing systems.
- Microelectronics packaging: The objective will be more cost-effective techniques for interconnecting components, using future complex chips that contain 1 million or more circuit elements.

The Bell System and IBM are sufficiently big and entrenched that they are secure for at least a while. But smaller companies such as those in MCC are unlikely to prosper in the longer term if they must go it alone. The Japanese will target their products one by one. These companies have been innovative and have created jobs. A strong MCC would solve part of their future problems by facilitating innovation and cutting costs. Congress should quickly modify antiquated antitrust laws to permit industrial cooperation in applied research.—PHILIP H. ABELSON