

Micromachine Technology Reaches a New Stage



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March 31, 2001 saw the conclusion of the decade-long Micromachine Project, part of the Industrial Science and Technology Frontier Program sponsored by the Ministry of Economy, Trade, and Industry. I would like to take this opportunity to thank the many people from the government, private industry, and academic sectors who have been involved with the Project over the last ten years in a research and/or surveying activity. I would also like to extend my appreciation to all those at the Ministry of Economy, Trade and Industry (formerly the Ministry of International Trade and Industry) in recognition of their support for the Project.

When this Project was launched in 1991, Japan was embroiled in commercial difficulties in the form of trade friction over semiconductors, as well as criticism that it was "freeloading" by benefiting unfairly from the research investment of other nations. The Micromachine Project was an attempt to give Japan an independent research capacity in this area via a completely new approach to research that had never been tried elsewhere. The first phase involved identifying key technology concepts by developing element technology predicated on the idea of machines at the micro level, once the sole preserve of science fiction (such as the movie *Fantastic Voyage*). The second phase involved the study of systematization technology for integrating the various forms of element technology into machine systems. Overall, the Project was remarkably successful, generating some 530 patent applications and 1,500 research publication papers and presentations (mainly to academic societies).

The Micromachine Project attracted considerable interest from overseas, particularly with respect to its unique approach to industrial research. Many academic groups came to Japan to see the Project. Researchers and experts in Japan and overseas were most impressed. In addition, the Project enjoyed extensive coverage in the worldwide media and became well known in wider society. Last year's Exhibition MICROMACHINE 2000, which featured broadcasts of an experimental prototype system on five programs (including one from the public broadcaster NHK), was the first important step in addressing the national problem of the continuing drift of young people away from science subjects. Despite the ten years lost to the continuing economic downturn, the

Micromachine Project has brought Japan closer to the ideals of micromachine technology, which is expected to play a central role in the basic "manufacturing" technology in 21st century.

The Micromachine Center (MMC) was established at the same time as the Micromachine Project with the aim of promoting the technology and providing information worldwide via a range of initiatives. With the conclusion of the Project, micromachine technology has reached a new stage. The first task for us now is to speed up the process of refining the technology to create viable industrial applications. Many other nations, inspired by the work of the Project, are building the necessary infrastructure for design, prototype trials, and production for the development and manufacturing of MEMS. Meanwhile, the MMC is working on practical development in the technology field created through the fusion of micromachine technology and the advantages of MEMS. The second task is to take up the challenge presented by new research areas within the context of nano-technology development around the world.

The nano-technology represents the great unexplored field and the most important branch of technology in the 21st century. This was acknowledged last year when then-president Bill Clinton announced a budgetary allocation of \$500 million towards nano-technology development. Nano-technology is a genuinely revolutionary area involving the manipulation of materials at the atomic and molecular level to enable, for instance, the manufacture of materials that are lightweight yet ten times stronger than steel and the detection of cancer cells at a very early stage. But even the most spectacularly advanced nano-technology is not truly useful unless it is complemented by a human interface that appeals intuitively to our basic senses—in other words, human-sized technology is required as well. Micromachine technology provides the bridge, the vital link between nano-technology and human-sized technology. The Micromachine Center is committed to pursuing viable industrial applications for micromachine technology (as described above), while also working to further refine and integrate micromachine technology into nano-technology fields.

The Micromachine Center looks forward to your continued patronage and support in the years to come.