III. Exchange and Cooperation with Worldwide Organizations Involved with Micromachines

1. Participated in the 8th Micromachine Summit (Maastricht, the Netherlands: April 30-May 2, 2002)

2. Held the 8th International Micromachine/Nanotech Symposium (Science Museum in Kitanomaru Park, Tokyo: November 14, 2002)

3. International Exchange and Dispatch of Researchers

Norichika Fukushima, manager of the Research Department, visited the Netherlands (Twente University) and Germany between January 30 and February 6, 2003, to examin R&D trends in micro fluids-related fields.

4. Constructing a foundry network system

In order to further the industrialization of micromachines, particularly MEMS, upgrading of foundry facilities is vital. To this end, MMC established the Foundry Service Industry Committee to organize businesses providing foundry services, to set up a network system to improve services and to consider ways such a system could be developed. As means of disseminating information, the MMC also set up its own Internet homepage and participated in various lectures and seminars.

5. Establishing a forum for the exchange of micromachine technology

A workshop on micro fluids was held; lecturers were invited from universities to speak on technology trends at international conferences on micro-fluids-related topics and information and opinions exchanged.

IV. Standardization of Micromachines

In micromachine technology and other newly established fields of systemized techniques as well, there is an urgent need for the standardization of terminology, measurement, and evaluation methods. The MMC worked towords it, taking international initiatives into perspective.

1. Creation of an international standard as a method for evaluating the properties and measuring methods of thin film materials

The results of R&D on measuring and evaluating the properties of thin materials, conducted as part of the NEDO Research and Development for Standards project that ended in 2001, were considered for inclusion in proposals for international standards.

2. Investigation and research on micromachine standardization

The results of this research have been transmitted worldwide, encouraging international standardization while exercising initiative in establishing international standards. With regard to terminology, MMC submitted a specifications proposal to IEC/TC47 and supported deliberations through such actions as compiling comments. With regard to measurement and evaluation, MMC continued selecting and prioritizing items standardization items. An international standardization workshop was also held at the 2nd International Standardization Forum in Tokyo in July.

V. Dissemination and Education about Micromachines

1. Publication of a Public Relations Quarterly Magazine "MICROMACHINE"

Vol. 39 to 42 were published in Japanese only.

English versions are available on the MMC website:http://www.mmc.or.jp/

2. Micromachine Drawing Rally (Implemented in 2002 as a small-scale means of gathering and utilizing micromachine drawings)

3. The 13th Micromachine Exhibition (Science Museum in Kitanomaru Park, Tokyo: November 13-15, 2002

4. Administration of the Federation of Micromachine Technology

Served as secretariat for the Federation of Micromachine Technology to link and strengthen micromachine-related organizations.

5. Workshop presenting the results of grant recipient projects for the 8th Micromachine Technology Research Grants (FY 2000) on September 17, 2002

An Introduction of MMC's Activities: Future Vision for Micromachines

It is certain that micromachine technology will play an important role in a variety of social and economic fields in the 21st century and will contribute to improving the quality of our lives. However, today's severe socioeconomic environment does not allow us to foresee the prospects for micromachines accurately.

With the successful completion of Japan's first national micromachine project, conducted over a ten-year period, we are now working on new endeavors aimed at further development of micromachine technology. One of these endeavors is to create viable industrial applications based on results obtained through R&D on advanced technologies. Among other things, Microelectromechanical Systems (MEMS) technology is increasingly used for various applications and furthering its industrialization has become a major objective of ours. The second endeavor is a top-down approach to the nanotechnology research that originated from the U.S. National Nanotechnology Initiative (NNI). Nanotechnology is not truly useful unless it is complemented by a seamless interface with human-sized technology, which is the role micromachine technology should assume.

There is no precedent for any nation having attempted to accomplish these objectives. Given the fact that Japan remains in structural change ten years after the economic boom ended, pursuing these objectives entails great financial risk and considerable effort, as well as requiring diverse expertise and knowledge of researchers in industry, government, and academia. Therefore, a compass is needed by which we can proceed to unexplored disciplines based on the current developments in micromachine technology.

Last year, the Micromachine Center formed a committee for deliberating the long-term prospects of micromachine technology (Chairman: Prof. Isao Shimoyama, Department of Mechano-Informatics, Graduate School of Information Science and Technology, The University of Tokyo). The committee has compiled their deliberations and investigations in an interim report entitled "A Future Vision for Micromachines."

Contents of the report:

1. Introduction: Why is a vision required now?

2. Prospects for micromachine technology (short-, mid-, and long-term)
3. Approaches to the development of industrial applications
4. Collaboration among industry, government, and academia (the roles of business, government, universities, and MMC)
5. Technical roadmaps in ten major fields, including a support system to improve the quality of life for the elderly (safety, security), a bio-nanosystem, a medical care roadmap (applications of microtechnology and nanotechnology in the medical field), a health care roadmap, environment-related sensors, intelligent tagging (logistics system), information and telecommunications (sensor-based network), next-generation robotics, a space-based MEMS system, and a roadmap for innovative micromachine manufacturing technology

An outline of the interim report is given below.

2. Prospects for micromachine technology (short-, mid-, and long-term)

Micromachines have been developed for use in a wide range of industrial products, including sensors, moving microparts, chemical analyzer parts, optical parts, and the like. In addition, micromachine technology is expected to support technological bases in the information and telecommunications industry, the biomedical industry, and the automobile industry. Optical MEMS, RF-MEMS and sensors show promise for micromachine industrialization in the short term, while there is considerable potential for industrialization in fields based on biotechnology or microfluid systems from a long-term perspective.

3. Approaches to the development of industrial applications

The following issues must be resolved in order to progress smoothly from the current R&D phase to a new phase in which new devices and products are created and put into practical use.

- Meeting needs from potential technical users
- Sharing intellectual properties, such as designs and manufacturing know-how
- Developing such infrastructures as a foundry and a design center enabling start-up companies to design and manufacture new devices and products immediately without the burdens of initial investment and personnel management
- Expanding the opportunities for personnel recruitment training and developing tools to assist in design and simulation

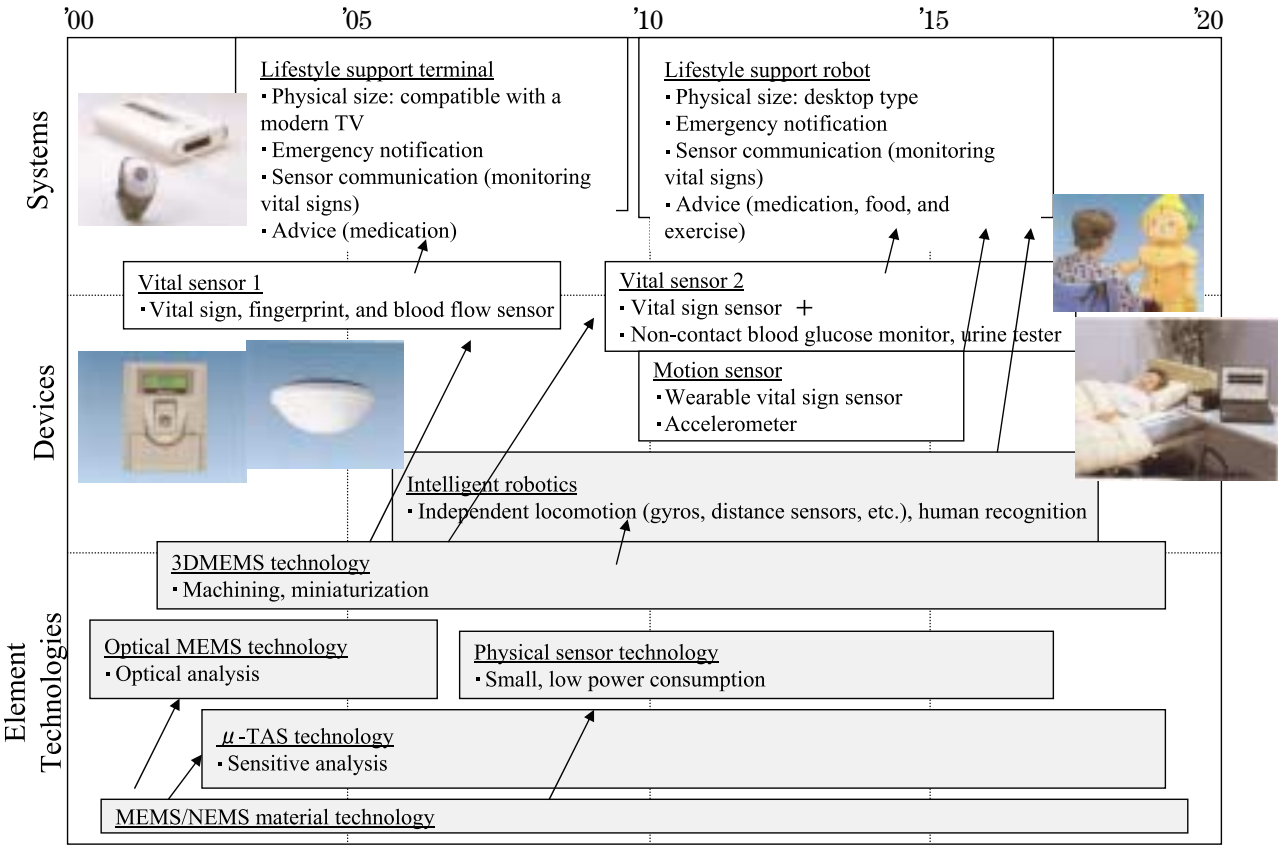
4. Collaboration among industry, government, and academia

While Japan's move toward global development has put its economic and industrial structures in a transitional stage, collaboration among industry, government, and academia is indispensable for accomplishing new objectives. Industry expects the government to support long-term, high-risk research and development and to promote infrastructure. Industry, on the other hand, must commercialize its developed technologies. Academia is expected to create human resources and information on basic and advanced technologies.

5. Technical roadmaps in ten major fields

These roadmaps were developed with a focus on systems adopting micromachine technology. The roadmaps were created for ten fields, while devices and element technologies required in each field were examined based on each of the envisioned systems. As an example, we have included a roadmap for the support system to improve the quality of life for the elderly (5-1). Households with single and married elderly people account for nearly 50% of the aging society in Japan. We have examined systems and MEMS devices needed for these systems that are primarily designed for elderly people who do not need nursing care. An objective of these systems is to improve the quality of life for these people by preventing diseases and eliminating anxiety.

The achievements based on recommendations in this interim report will be published in a book around this fall.



Roadmap for a Support System to Improve the Quality of Life for the Elderly