

Japanese National Initiatives, Future Outlook

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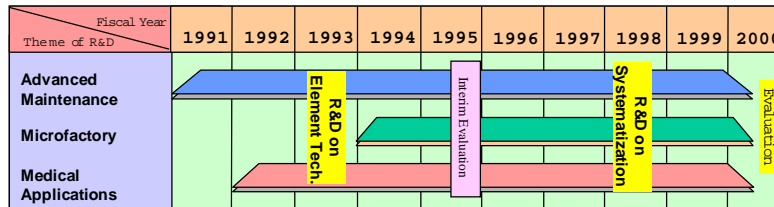
Outline

- ◆ Micromachine Technology Project
 - Goals
 - Outcomes
 - Future
- ◆ Current Climate
- ◆ Funding Initiatives
- ◆ Future Outlook

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Micromachine Technology Project (MTP)

- ◆ Initiated in 1991 by MITI, ¥18.5B (Planned ¥25B)
- ◆ Two Five-Year Phases:
 - R&D on Elemental Technologies
 - R&D on System Technologies

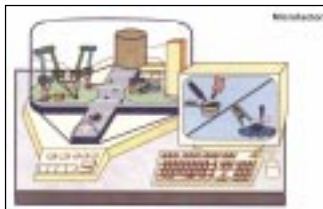


- ◆ Commercialization not an explicit goal

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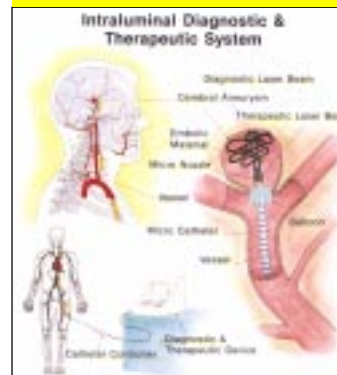
MTP Application Areas

Advance Maintenance Systems for Power Plant



Microfactory

Medical Devices



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Micro Machine Center (MMC)

- ◆ Established Jan. 1992 to run MTP
- ◆ Goals and Activities:
 - Research: National R&D Project
 - Exchange & Cooperation: Annual Micromachine Summit (1st in 1995), Annual International Micromachine Symposium
 - Providing University Grants: ¥3M/2 years
 - Promoting Standardization
 - Promotion: Micromachine Exhibition (11th annual in Nov. 2000 in Tokyo), 7th annual Micromachine Picture Contest.

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MTP: Outcomes & Achievements

- ◆ Brought micromachine technology to the forefront
- ◆ Educated both public and private industry about potential of micromachines
- ◆ Developed basic technologies
- ◆ Helped companies establish facilities for MEMS and microfabrication technologies
- ◆ ~580 patents

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MTP: Lessons Learned

- ◆ Selection of applications not optimal
- ◆ Original project definition and selection did not involve the scientific community and was coordinated mostly by government personnel
- ◆ Not enough real products, should have done more technology transfer
- ◆ No well-defined business model
- ◆ Therefore, many companies do not see real commercial products and benefits from MEMS
- ◆ Funds were primarily provided to large companies
- ◆ Too little work on microfabrication technologies
- ◆ MTP should have paid more attention to foundry and infrastructure development

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Future of MTP and MMC

- ◆ Funding has officially ended, no future funding
- ◆ Some activity will continue with funds generated from an endowment
- ◆ Will not be able to fund major R&D projects without additional government support
- ◆ Continue educational and community activities

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Current Climate

- ◆ The US National Nanotechnology Initiative (NNI) has raised awareness and mobilized government to act. MITI's MTP triggered DARPA's MEMS program, and US-NNI has shocked Japan into action.
- ◆ Clear sense of urgency and need to re-establish Japan's world position in basic science and technology.
- ◆ How we felt in the US in 1980's is exactly how Japanese felt in the 1990's and 2000's.
- ◆ Traditional semiconductor businesses (e.g., DRAM) are not dominated by Japan any longer.
- ◆ Japanese industry needs to work on new areas, and MEMS may be one of those.

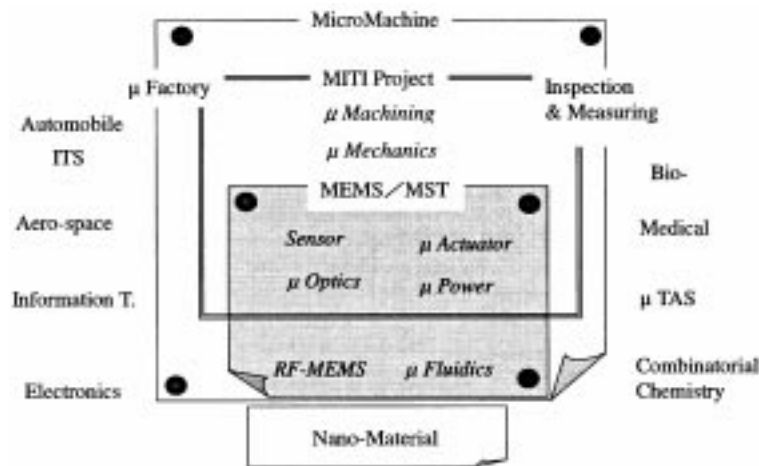
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Current Climate

- ◆ Science and Technology Basic Law (1995) has helped improve university facilities and programs
- ◆ More concentrated and larger funding to productive university programs has helped increase impact
- ◆ Research and scientific community seems to be more involved in determining new R&D areas
- ◆ University faculty interested in establishing foundry services and distributed manufacturing capabilities

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Micromachines, Micro/Nano Technologies



Y. Hata, NEDO

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Government Initiatives

(Approved, Pending, and Developing)

- ◆ Focus on Nanotechnology
- ◆ Major METI program to start in 2002 in Microchemical Analysis and Synthesis Systems, \$50-100M/5 yrs.
- ◆ Initiative in Microfluidics for Cell-Based Biochemistry, Ministry of Agriculture Program to start in 2003
- ◆ Micro Power Generation (within Nanotechnology Initiatives), 2002?
- ◆ Intelligent Transportation Systems (ITS), will fund some MEMS activity
- ◆ Some funds available for foundry and distributed manufacturing services

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Future Outlook

- ◆ Very positive outlook for Nanotechnology, motivated by US-NNI
- ◆ Biotechnology and chemistry are driving government programs
- ◆ MEMS seen as a critical technology for realizing the potential of Nanotechnology
- ◆ Limited activity on RF or Optical MEMS
- ◆ Developing products and commercialization seen as critical for securing funding in the future