



Topic : MicroNano 2009 Report / 1
Activities of the Micromachine Center / 2
Activities of the BEANS Laboratory / 6
Members' Profiles / 8

MICROMACHINE CENTER
<http://www.mmc.or.jp/>

BEANS · TRA
<http://www.beanspj.org/lab/>

Topic

MicroNano 2009 Report

MicroNano 2009 was held at Tokyo Big Sight, East Hall 5 on July 29–31. Despite temperatures reaching the high 80s in Tokyo, the event was a great success, receiving a total of 12,247 over the three days. The sponsors would like to express their appreciation to all who attended.



With a program of concurrent events that included the Exhibition Micromachine/MEMS and the International Micromachine/Nanotech Symposium held at the same time and place, MicroNano 2009 was organized with the aim of bringing together all the latest MEMS-related technologies at one venue and providing business opportunities for visitors and exhibitors alike.

Reflecting the current economic conditions, the number of exhibitors participating in the Exhibition Micromachine/MEMS was down 30 percent from last year (252 exhibitors with 320 booths). On the positive side, there was an increase this year in the number of exhibitors involved in nanoimprinting and MEMS foundries and only about a 10 percent decrease in attendance from last year. Thus, the event has been deemed a resounding success under the circumstances. This year the Micromachine Center (MMC) increased its exhibition area to six booths, our largest number to date, in order to introduce our activities on MemsONE, the Mems Mall, foundry service promotion, and international standardization. The MMC also launched a trial concierge service this year in order to more efficiently direct visitors to booths matching their interests.

A total of eight events were held concurrently in two special conference areas set up in the exhibition hall. These events were the 15th International Micromachine/Nanotech Symposium in which experts presented the latest MEMS-related information for promoting industrialization; the MEMS Forum providing an opportunity for the MEMS Industry Forum (MIF) to distribute information; presentations of results on the

Fine MEMS Project and the BEANS Project; the Japanese-German MicroNano Business Forum providing an opportunity for Japanese and German companies to make business contacts; the MEMS Packaging Forum focusing on MEMS packaging; presentations by exhibitors; and the Workshop on Industry-Academia Collaboration at which universities and research institutes affiliated with the MIF presented their latest research findings. The fact that all events attracted a large audience indicated a strong interest among visitors.

The 15th International Micromachine/Nanotech Symposium held this year as a project of the MIF International Exchange Committee featured ten lecturers both within and without the MIF talking on such topics as the concentration of MEMS R&D centers and MEMS applications. In the keynote session, representatives from LETI/MINATEC, Fraunhofer ENAS, and the MEMS Industry Group discussed trends toward concentrating MEMS R&D into major centers. The speakers in session 1 introduced some of the latest trends in MEMS applications including sensor networks, optical MEMS, and energy-related MEMS. The speakers in session 2 focused on fabrication processes as emerging technologies from the perspectives of wafer vendors, fabrication equipment (bonding equipment) vendors, and material vendors.

Unlike in previous years, there was no charge for attending the symposium, and the event was held during the exhibition in the exhibition hall, rather than at a separate location. While there was some concern whether the Symposium would maintain its high status or see a decline in attendance, all 230 seats in the conference area were filled. Further, more than half of the lecture materials were distributed to non-MIF members (nonmembers were charged 2,000 yen), indicating a strong and widespread interest among visitors. Thus, we can conclude that the value of the Symposium was not affected by the change in format.

MicroNano 2010 will be held next year around the same time (July 28–30). We expect to begin preparations for next year to ensure that this remains the world's largest event for micro- and nanotechnologies in both form and content by further expanding the concurrent program schedule and by adding a concurrent exhibition focusing on service robot fabrication technology (ROBOTECH) in order to create more business opportunities and provide visitors with the latest information of the highest quality.

Research Studies and Standardization Activities

1. MicroNano 2009

In the MEMS Forum held at MicroNano 2009, Dr. Shuichi Shoji, a professor at Waseda University, gave a talk on "Trends in MEMS Technology at International Conferences and the Future Outlook for MEMS." Dr. Shoji is the chairman of the Investigative Committee on Technological Trends at Home and Abroad established by the MEMS Industry Forum to study these trends. On the topic of standardization, Dr. Kuniki Owada of Teikyo University gave a speech entitled "Recent Trends in MEMS International Standardization: Heightened Significance and Business Applications" and Dr. Kazuki Takashima of Kumamoto University spoke on "International Standards for Evaluating MEMS Materials."

At the Exhibition Micromachine/MEMS, the Micromachine Center presented an exhibit detailing terms and definitions for MEMS that have been proposed or established thus far, tensile testing methods for thin film materials, standard test pieces for tensile testing, and fatigue testing methods for thin film materials, as well as drafts of international standards that are either currently under review or under development.



2. Survey of Technological Trends at Home or Abroad (First Semester)

For its activities in the first half of 2009 in the Survey of Technological Trends at Home and Abroad, the Committee conducted a survey on Transducers 2009 (the 15th Annual Conference on Solid-State Sensors, Actuators and Microsystems). The Transducers conference features presentations on the latest R&D casework related to microsensors and microactuators and has occurred biennially since the first conference was held in Boston, Massachusetts in 1981. As the 15th installment of this conference, Transducers 2009 was held in Denver, Colorado in June 21–25.

Transducers 2009 drew 984 participants from 28 countries according to the advance registration. The conference attracted 1,307 paper submissions, with an acceptance rate of 45.9%, as well as 216 oral presentations and 384 poster presentations. Fig. 1 shows the numbers of submissions and corresponding acceptance rates over the past several conferences.

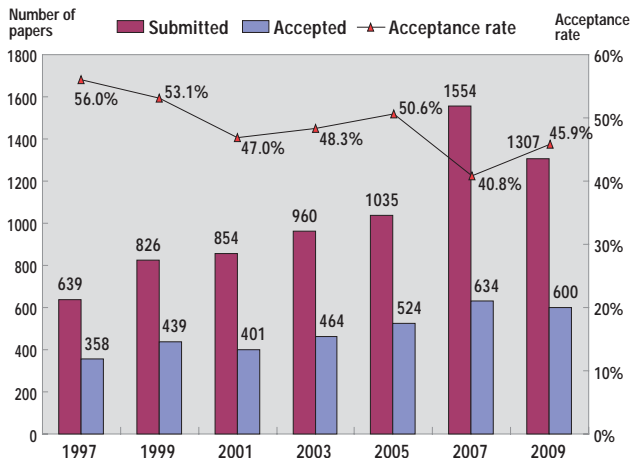


Fig.1 Numbers of submissions and corresponding acceptance rates over the past several conferences

Fig. 2 shows the numbers of oral presentations by country for the past three conferences. The U.S. had the most presentations at Transducers 2009 with 94, an increase of 1.7 times over its previous conference's total of 56. Japan was second with 43 presentations, less than half of that from America, while Taiwan had a remarkable increase in presentations to take the third spot. The top three presenters were followed by Germany, Switzerland, China, the Netherlands, and South Korea.

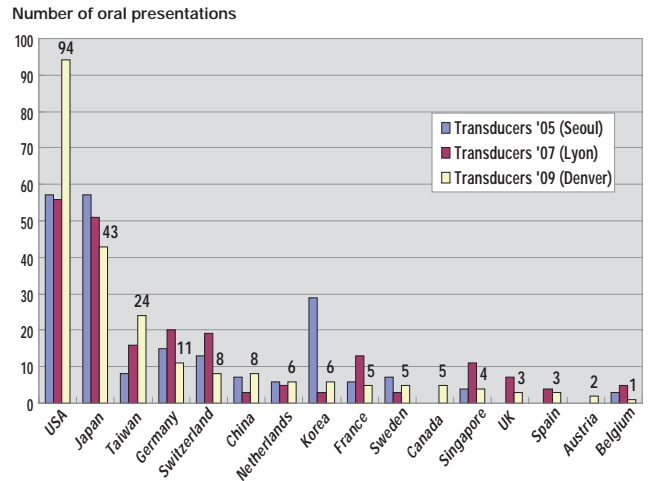


Fig.2 Numbers of oral presentations by country for the past three conferences

Fig. 3 shows the numbers of presentations broken down by specific technological field. Among the basic technologies (1-1 through 1-7 in Fig. 3), actuators were the most popular, followed by packaging technologies, whose number increased dramatically over the previous conference. Under applied technologies (2-1 through 2-9 in Fig. 3), mechanical sensors occupied the top spot with a considerable increase in number over the previous conference. This topic was followed in popularity by fluidic and biomedical systems, while the number of presentations on chemical/biosensors was half that of the previous conference.

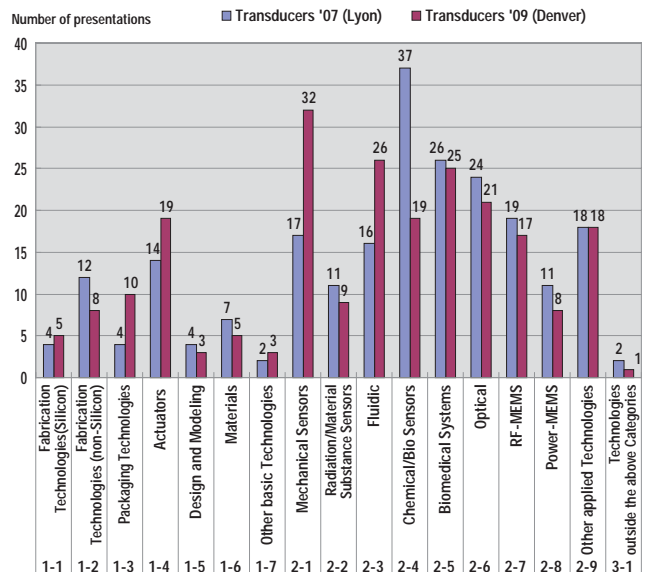


Fig.3 Numbers of presentations broken down by specific technological field

Activities of the MEMS Industry Forum

1. The 15th International Micromachine/Nanotech Symposium – MEMS World

The 15th International Micromachine/Nanotech Symposium was held at MicroNano 2009 on July 29, 2009 (Wednesday) in a special conference area prepared at the event as one of the concurrent events with the 20th Exhibition Micromachine/MEMS.



This year's Symposium was held on such topics as the concentration of MEMS R&D centers and MEMS applications and featured keynote speeches from LETI/MINATEC, Fraunhofer ENAS, and the MEMS Industry Group on trends toward concentrating MEMS R&D into major centers. The lecturers in Session 1 introduced some of the latest trends in MEMS applications, including sensor networks, optical MEMS, and energy-related MEMS, while the lectures in Session 2 focused on fabrication processes as emerging technologies from the perspectives of wafer vendors, fabrication equipment (bonding equipment) vendors, and material vendors.

Unlike in previous years, there was no charge for attending lectures, and the Symposium was held during the exhibition in the exhibition hall, rather than at a separate location. The Symposium filled all 230 seats in the conference area and stimulated a lively question and answer session. Looking toward next year, we would like to clarify the positioning of this symposium within the overall MicroNano 2010 event and the target audience (management or on-site technicians, for example) and to prepare a program of even greater quality that meets the needs of this audience.

2. The MEMS Forum

The MEMS Forum was held on July 31 (Friday) in a special conference area at the 20th Exhibition Micromachine/MEMS for the purpose of distributing information on the activities of the MEMS Industry Forum (MIF), a special project committee of the Micromachine Center, and encouraging the exchange of ideas.



In Session 1 of this year's Forum, which was held under the overall theme "Toward development and expansion of the MEMS Industry: an update from the MEMS Industry Forum," the MIF reported on technology trends in MEMS seen at international conferences, trends in the MEMS industry, including trends in MEMS applications and company's breaking into MEMS fields, and the MIF's international standardization activities in MEMS fields.

Session 2 had the sub-theme of "Enhancing the infrastructure for MEMS R&D and production to prevail in global competition." Presentations included the proposed

concept of centers for the integration of MEMS knowledge and experience to serve as arenas for developing nanotechnology, an introduction to the foundry network, MemsONE, and MEMSPedia designed to improve the infrastructure for MEMS development, and a description of efforts to implement micro/nano personnel training in order to promote expansion of the MEMS industry. In Session 3 subtitled "Anticipation toward the formation of MEMS industries and R&D centers," speakers described the state of activities being conducted in the Tohoku, Kansai, and Kyushu regions for strengthening the foundation of the MEMS industry.

The fact that every seat in the Forum's conference hall was filled indicates a strong interest in the MEMS industry.

3. The 18th MEMS Advanced Technology Forum

The 18th MEMS Advanced Technology Forum was held on June 24 (Wednesday) at the MMC Techno Salon, where the MIF had the privilege of hearing lectures by Dr. Minoru Kurosawa, associate professor at the Tokyo Institute of Technology in the Interdisciplinary Graduate School of Science and Engineering, and Dr. Tadatomo Suga, professor at the University of Tokyo in the Graduate School of Engineering.

In his lecture entitled "Surface acoustic wave linear motors," Dr. Kurosawa talked about linear motors using SAW elements, long-established MEMS devices, and introduced his research spanning from ultrasonic motors to the present. Dr. Kurosawa also discussed potential future development of high-speed, high-precision micro-linear motors.

In his presentation entitled "Low-temperature wafer bonding," Dr. Suga discussed potential applications for the low-temperature bonding of wafers using plasma and ion irradiation for 3D mounting and MEMS packages. He also described various types of bonding and bonding techniques, particularly chip bonding in ambient air and in a vacuum and bonding using nano-adhesion layers, as well as the mechanisms of bonding.



Dr. Kurosawa, Tokyo Institute of Technology



Dr. Suga, the University of Tokyo

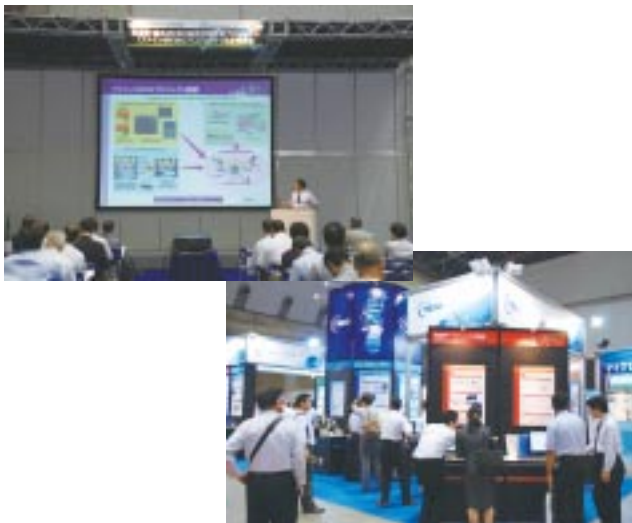
The Advanced Technology Forum attracted 19 participants composed of MIF members, personnel involved in the BEANS Project, and general visitors. Following the lectures on these cutting edge technologies and a round of lively Q&A, some of the participants adjourned to the Micromachine Center's conference room to further discuss these technologies and exchange opinions with Drs. Suga and Kurosawa, bringing the meeting to a harmonious close.

Activities of the MEMS System Development Center

1. Presentation of Results from the Fine MEMS Project and Activities for Disseminating MEMSPedia

A meeting for presenting the results from the Highly Integrated, Complex MEMS Production Technology Development Project (the Fine MEMS Project) commissioned and subsidized by the New Energy and Industrial Technology Development Organization (NEDO) was held on July 31 (Friday) in a special conference room set up within East Hall 5 of Tokyo Big Sight as part of the MicroNano 2009 event (sponsored by NEDO and cosponsored by METI). The meeting began with opening remarks from the sponsor given by Katsuya Okano, head of the Machinery System Technology Development Department at NEDO, and was followed by a guest speech by Motoki Korenaga, Deputy Director of the Industrial Machinery Division under METI's Manufacturing Industries Bureau. Next, Dr. Isao Shimoyama, project leader of the Fine MEMS Project and professor of the Graduate School of Information, Science, and Technology, the University of Tokyo, gave an overview of achievements made through the Fine MEMS Project. Thereafter, the individual leaders for each of the nine commissioned projects and the eight subsidized projects gave a detailed report on their own project achievements, which led to much lively discussion. As was the case with last year's meeting for presenting the interim achievements, this year's meeting proved to be quite popular, with a large enough audience to fill most of the approximately 200-person-capacity hall and to exhaust all 400 copies of the prepared material handouts.

Similarly, NEDO's booth on the Fine MEMS Project at the exhibition center attracted a large number of visitors and also served as a place for more in-depth and animated discussion on the presentation of results. Panel exhibits and computer demonstrations were provided at both the NEDO booth and the Micromachine Center booth on the knowledge database and MEMS equivalent circuit generator, which the Micromachine Center made available to the public in June 2009 under the name MEMSPedia. There was a lot of positive feedback on MEMSPedia, with many visitors looking forward to further developments and expanded functions in the tool.



Presentation of the Fine MEMS Project (upper left) and MEMSPedia demonstrations

The enthusiastic atmosphere at the conference hall throughout the presentation of results and the exhibition showed a strong interest in the achievements of this project. We hope that more companies will utilize this data for commercial products and that the project will lead to new collaborations.

Information on all of the activities in the project performed thus far, materials prepared for the presentation of results, and NEDO reports are available via the Fine MEMS Project link provided on the Micromachine Center's home page. Feel free to make use of these materials.



Web page for the Fine MEMS Project

2. Nano-Tech R&D Base, Tsukuba

METI's policy measures for strengthening the role of AIST Tsukuba Central as an R&D base for nanotechnology have entered the implementation stage. The measures call for more emphasis on N/MEMS, as well as nanoelectronics and power electronics. The policy sets a new direction that will not only enhance MEMS R&D at the arena, but also initiate implementation of the arena as a center for trial manufacturing, with the Micromachine Center playing an active role in planning the specifics. In addition to cutting-edge technologies emphasizing multilayer integration, large-diameter wafers, and low environmental impact, the MMC recognizes the importance of a trial production line that facilitates the transition to mass production and is investigating this possibility. We will be providing more information as the investigation progresses.

Dissemination and Publicity Projects

1. Report on the 20th Exhibition Micromachine/MEMS

We are pleased that so many of you visited the Micromachine Center's booths at the 20th Exhibition Micromachine/MEMS throughout the entire MicroNano 2009 event. The following is a description of the exhibits at each booth.

(1) Special 20th Anniversary Booth

To commemorate the 20th anniversary of Exhibition Micromachine/MEMS, we created a chronological table entitled "Twenty years of progress" to take a look back at the growth of the exhibition from its beginnings at the 1st Industrial Micromachine Exhibition to the now world-leading event MicroNano 2009, and guided visitors on a journey through this history using large panel exhibits. This booth also featured the debut of "MMC Concierge," an experimental navigation system designed to help visitors locate products and technologies of interest in the exhibition hall. We are happy to report that many of you made use of this service.



The Special 20th Anniversary Booth

(2) MemsONE Booth

The MemsONE booth doubled in size from the previous year's exhibition, as we greatly expanded promotional activities through videos, panel exhibits, computer demonstrations, pamphlets, a free offer for temporary use of the MemsONE software, and the establishment of a consultation corner. We are happy to report that visitors to this booth showed a keen interest in the MemsONE software distributed at the booth, and we have since issued many licenses for the product. Incidentally, the demonstration software provided at the booth is the full version, with no functional restrictions. If there are any of you who have yet to install and evaluate the program, we hope that you will do so and apply for a license.



MemsONE Booth

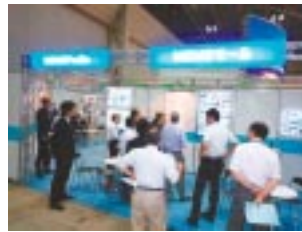
(3) MEMS Mall Booth

At the MEMS Mall booth, panel exhibits were used to explain how the Web-based MEMS Mall introduces MEMS-related products and technologies, and to list participating businesses and describe how other businesses can participate.

We also set up computers at the booth in order that visitors could explore the MEMS Mall. The booth was quite popular, particularly among visitors seeking business opportunities, with many people remarking that the exhibit helped them see the big picture of the MEMS market and some people expressing a desire to include their company in the MEMS Mall.

(4) MEMS Foundry Booth

At this booth, we prepared panel exhibits and a computer corner for introducing the MEMS foundry network composed of members in the Foundry Service Industry Committee under the Micromachine Center, and the on-line help desk MEMStation that accepts inquiries from users seeking information on the foundry service. We received much feedback from visitors looking forward to further developments in and expansion of MEMStation and the foundry network.



MEMS Mall Booth



MEMS Foundry Booth

2. Adjusted Participation Fee for the MEMS Mall

The Micromachine Center launched the MEMS Mall on its Web site to provide information on products and technologies developed by MEMS-related companies. This Web site serves as an Internet portal for MEMS businesses, allowing access to information on the entire MEMS industry.

In order to make it easier for non-member companies who did host an exhibit at this year's Exhibition Micromachine/MEMS to participate in the MEMS Mall, we decided to discount the membership fee to a flat 50 thousand yen rate for all companies throughout FY 2009.

	Exhibition Micromachine/MEMS (FY 2009)	
	Did exhibit	Did not exhibit
Non-member companies	50,000 yen	50,000 yen (revised*)
MIF Industry members	No charge	No charge
MIF Associate members (corporations)	No charge	No charge
MIF Associate members (small/medium ventures)	No charge	50,000 yen

Participation fee for the MEMS Mall (tax excluded)

For companies that decide to participate in the MEMS Mall during the current fiscal year, the fees will be prorated based on the number of months of participation from the start of the company's publication on the Web site until the end of the fiscal year.

* Beginning from FY 2010, the participation fee in the MEMS Mall for non-member companies not hosting an exhibit at the Exhibition Micromachine/MEMS will return to the previous annual rate of 100 thousand yen.



At its five research centers (Life BEANS Center, Life BEANS Center Kyushu, 3D BEANS Center, 3D BEANS Center Shiga, and Macro BEANS Center) and its head office, the BEANS Laboratory has been conducting R&D on process technologies for integrating biomaterials, integrating organic matter, fabricating 3D nanostructures, fabricating 3D nanostructures for space applications, and large-area continuous manufacturing of micro/nanostructures, and has been developing a knowledge database for next-generation device fabrication technologies integrating heterogeneous fields. We have presented our research achievements at twenty-two academic conferences worldwide, including Transducers 2009, and have applied for five patents. In order to further publicize the achievements of the BEANS Project, we exhibited at the 20th Exhibition Micromachine/MEMS held at MicroNano 2009 on July 29–31, and organized the 3rd BEANS Project Seminar. Moreover, we did press releases and the rosuH was published in the newspapers and journal articles and was telecasted on the television coverage. This article describes the contents of MicroNano 2009 and the press release held on June 19 as a part of the activities of the BEANS Project.

1. MicroNano 2009

(1) 20th Exhibition Micromachine/MEMS

The Exhibition Micromachine/MEMS provided an opportunity for us to show the R&D achievements of each BEANS research center through posters and actual demonstrations. Models were made to simplify explanations on such difficult topics as neutral beam etching and supercritical film deposition by visually illustrating the theory and principles of these technologies. We also demonstrated functional vests equipped with organic devices, and cloth-like touch sensors formed of woven functional fibers to provide simple illustrations of some developments in BEANS technology. Posters on the exterior of the booth facing the walkway provided an overall description of the BEANS head quarters, while posters on interior area illustrated the location of each research center in Kyushu, Shiga, Tsukuba, and Tokyo (Komaba Campus) and profiles of all researchers participating in the project. Set off in a conspicuous green hue adorned with the bean logo that symbolizes the project, the booth attracted large crowds on every day of the conference and elicited enthusiastic discussion.



BEANS Project booth



Demonstration of functional vests

(2) 3rd BEANS Project Seminar

The seminar was held in conference area B on July 30 (Thursday) at 13:10–17:00. Following greetings by Akira Uehara, executive director of NEDO, and Atsushi Yusa, the BEANS project leader, Professor Masayoshi Esashi of Tohoku University gave a guest lecture entitled “Prospects for MEMS and expectations for the BEANS Project” and Deputy Editor Tsuneyuki Miyake of Nikkei Microdevices gave a guest lecture on “The MEMS market and recent technical trends.” Then, Sub Project Leader Hiroyuki Fujita, a professor at the University of Tokyo, introduced “The structure and significance of the BEANS Project.” After that the center director or other principal researcher for each research center (Associate Professor Masaharu Takeuchi, Professor Chihaya Adachi, Associate Professor Masakazu Sugiyama, Professor Seiji Samukawa, Professor Masaaki Kimata, and Group Leader Toshihiro Ito) gave clear and concise presentations on the core research and achievements of their respective projects. While the presentations continued for a long time with no break, the 200-capacity conference area remained overcapacity, with many of the audience standing throughout.



Project Leader Atsushi Yusa giving the opening remarks at the seminar

2. Press Release

Is Your Ear Glowing?! Developing a Blood Sugar Sensor that Glows under the Skin

A press release was held from the Life BEANS Center on June 19, 2009. Twelve mass communication companies participated. The TV coverage was done at the same time in NHK and Fuji Television, and it was delivered on news and the Internet at that night.

The press release announced that the Center had succeeded in manufacturing beads with a uniform diameter of about 100 microns through microfabrication of a hydrogel whose light emission varies in intensity according to the level of blood sugar. By embedding these beads in a mouse's ear, fluorescent light could be observed externally, as shown in the photo. The Center was able to measure the brightness of the beads externally as the brightness fluctuated in response to changes in the surrounding glucose concentration. This technology may lead to the future development of an embedded blood sugar sensor for humans.



A mouse's ear glows from embedded fluorescent gel beads

Research Centers for the BEANS Project (Part I)

1. Life BEANS Center (the University of Tokyo)

The MEMS devices that are expected to become essential in the fields of health, medical care, and the environment will be implantable medical devices for around-the-clock health management, ultra-high-sensitivity on-site prevention and diagnostic devices, on-site environmental control devices for improving and preserving the environment, and energy harvesting devices for the effective utilization of natural energy.

However, in order to manufacture such devices, it is necessary to develop processes for fusing the desirable functions possessed by biomaterials and organic matter (biomolecules, cells, tissues, microbes, and synthetic organic molecules) with conventional materials used in current MEMS.

In addition to the members involved in MEMS fields, our research center has assembled researchers from health care businesses, researchers active in biotechnology fields for studying regenerative medicine and proteins, for example, and doctors from university hospitals, all of who work day and night on research for fusing heterogeneous fields.

These efforts have continuously produced research findings that are fascinating enough to be covered by the news media, such as a cell doll and fluorescent gel beads, even though we have been conducting research under the BEANS Project for less than one year. While we have plans to continue upgrades on the research facilities, the center is steadily conducting studies on seeds needed to produce even more fascinating results in the future.

As we have plans to add more people to the staff in October, you can expect that the Life BEANS Center will continue to grow stronger.



R&D conducted at the Life BEANS Center

(1) Process technologies for nano-interface fusion

The Life BEANS Center is developing interface control processes for controlling the orientation of materials and achieving selective placement, immobilization, and high-density coating of materials in order to utilize functions like biocompatibility, specific molecular recognition, high-efficiency multi-stage reactions, and high-efficiency energy harvesting. We are also conducting R&D on processes for forming biomaterials with long-term stability, such as hydrogels and artificial lipid bilayers with high biocompatibility.

(2) Structuring of bio/organic materials

The center will establish processes for expressing advanced cell functions through the structuring of bio/organic materials and will acquire technical guidelines for reproducibility and uniformity of process technologies such as processes for producing 3D heterostructures of cells using their capacity for self-assembly.

2. 3D BEANS Center (the University of Tokyo)

The 3D BEANS Center comprises seven companies, four universities, and one research institute and may be distinguished from the other research centers by the large number of members—more than half of the staff—who are dispatched from companies. It may be accurate to say that these employees gradually became acclimated to the lifestyle and culture at the university over a period of about one year, since they were forced into a lifestyle quite different from the corporate environment and culture to which they had become accustomed. During last year, the inaugural year of the BEANS Project, most of our duties were far removed from research, such as outfitting the laboratory that included construction of the clean room and setting up equipment. On many occasions it seemed that we would never reach our intended purpose of conducting research. However, things have now settled down, and we have sufficient equipment installed for performing our own work. Although overdue, we are now progressing slowly but surely and will have much more to show for our efforts in the near future.

We have already begun implementing joint research projects with other research centers in the BEANS Project that have greater needs, since the 3D BEANS Center primarily studies etching, film formation, and other technologies rooted in semiconductor processes, and it is likely that our collaborations will continue to increase. For example, we have begun fusing our low-damage dry etching and supercritical fluid deposition (SCFD) technique with the organic film formation technologies practiced at the Life BEANS Kyushu Center. By utilizing our low-damage dry etching in the Kyushu center's organic film deposition, we have been able to form 3D structures never before seen, indicating that this could lead to a new processing method. In order to accelerate our research, we plan to install special equipment for etching organic films at the Life BEANS Kyushu Center in the near future. Some of the researchers at the 3D BEANS Center will be traveling to Kyushu to help set up the equipment. We are also making steady progress on a study for deposition of the unique organic films at Life BEANS Kyushu using our supercritical fluid deposition (SCFD) technique. Further, while in fields other than research we have worked with the Life BEANS Center, with which we share a lounge at the University of Tokyo, this year joint research projects between the two centers have been proposed as we gradually get on track to achieve the primary BEANS objective of fusing dissimilar fields. Hereafter, the 3D BEANS Center will continue in its efforts to serve as a bridge for the fusion of heterogeneous fields.



Members' Profiles

Shineisha Co. Ltd.

1. Business Summary

Shineisha has specialized in the manufacturing of photomasks since 1963. By manufacturing photomasks over these last 46 years under the corporate philosophy "Meet the needs of our customers promptly and with 100% satisfaction," we have done our best to make some contribution to the semiconductor industry. Our clientele includes university research institutes, corporate R&D institutes, and electronics companies.

After becoming a supporting member of the Micromachine Center in March 2009, Shineisha participated in the Exhibition Micromachine/MEMS held in July of the same year with an exhibit on ultraprecision photomasks for MEMS. The company remains committed to developing superior products with no equal.

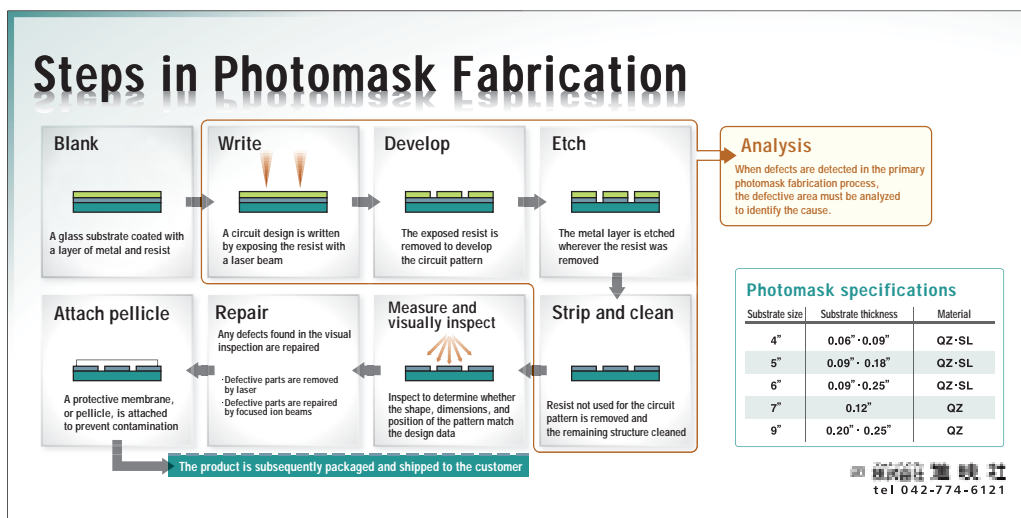
2. Product Lines

- Ultraprecision photomasks from 2", 4", 5", 6", 7", 8", and 9" up to a maximum size of 2 × 2.5 meters
- Ultraprecision photomasks for MEMS, thin-film integrated circuits, master integrated circuits, MPUs, package substrates, and electronic parts
- Photomasks for flat panel displays, such as flat-screen TVs
- Photomasks and lead frames for printed circuit boards

3. Photomask Technology

Shineisha is equipped with more than ten writing tools required to manufacture photomasks of various sizes, as well as inspection and repair systems. In addition to the VIOLD laser plotter, which we have used for some time, we recently added a production line to our Sagami-hara plant in Kanagawa Prefecture for manufacturing high-resolution chrome masks. The production line was installed by the U.S. company Applied Materials, who purchased Etec Systems, and includes the CORE laser lithography tool. CORE employs an argon ion laser with a wavelength of 363.8 nm that is capable of writing lines as fine as 0.6 μ m with a line width precision of $\pm 0.05\mu$ m.

Photomasks for MEMS having a line width greater than 3 μ m are written with the conventional VIOLD system, while high-resolutions masks with a finer line width are written using the CORE system, enabling us to provide more reasonable photomasks to MEMS companies that have typically used semiconductor reticles. We hope that you take advantage of our photomasks when developing and producing your MEMS devices.



Announcement

We would like to announce the recent appointment of Hisao Sakuta (President and CEO of Omron Corporation) to replace Tamotsu Nomakuchi (President and CEO of Mitsubishi Electric Corporation) as chairman of the Micromachine Center and chair of the BEANS Laboratory. We ask for your continued cooperation as we go forward.

The first address from the new director will be combined with his New Year's address and included in the first edition of the quarterly magazine MICRONANO of 2010.

MICRONANO No. 69

MICRONANO is published quarterly by Micromachine Center (MMC), BEANS Technical Research Association (BEANS-TRA) to promote the international exchange of information related to micromachines, R&D and other technical topics, and is circulated free of charge. Please send your comments about MICRONANO to the publisher :

Keiichi Aoyagi, Executive Director, Micromachine Center (MMC)
 MBR99 Bldg., 6F., 67 Kanda Sakumagashi, Chiyoda-ku, Tokyo 101-0026, Japan
 Tel : +81-3-5835-1870, Fax : +81-3-5835-1873
 Internet Home Page <http://www.mmc.or.jp/>
 Date of Issue : November 13, 2009