

13th International Micromachine / Nanotech Symposium

- Introducing BEANS as the 3rd Generation of MEMS -

The 13th International Micromachine / Nanotech Symposium was held Thursday, July 26, 2007 as one of the events of MicroNano 2007. The symposium was held in the “Iris” banquet room at the Tokyo Bay Ariake Washington Hotel. The subtitle of this year’s symposium was “MEMS Frontier: Innovative Devices by Micro and Nano-Bio Fusion Create New Lifestyles.” Thirteen invited guests – three from the United States, one from Belgium, one from Italy and eight from Japan – gave presentations on the latest research and development trends in the fields of MEMS and nano-bio fusion (environment / energy, comfort / security / safety and health care / welfare). The symposium was attended by 255 people who also participated in the spirited discussion.

One of the two keynote lectures, entitled “BEANS: Hetero-Functional Integrated Device Impacting the Society over the Next 20 Years,” was given by Professor Hiroyuki Fujita of the Institute of Industrial Science at The University of Tokyo. Professor Fujita discussed Bio Electromechanical Autonomous Nano Systems (BEANS), devices that represent a fusion of different fields and are expected to have a revolutionary impact on society twenty years from now. Third generation MEMS are defined as MEMS that fuse microtechnology with bio- and nanotechnologies to create devices and systems that will function in an autonomous and decentralized manner. In Japan, it is said that semiconductors are the “rice” (in other words, the core) of Japanese industry. In contrast, MEMS will be the “beans” of industry, providing it with protein as well as muscle in the form of sensors and actuators to serve as eyes and ears and the like. It is for this reason that the acronym BEANS was adopted.

BEANS will focus market expansion efforts on those fields that are presently the main markets for MEMS: automobile, IT,

health care, biotechnology, environment, energy, security, safety and so on.

In order to make BEANS a reality, three processes will be essential:

- 1) Three-dimensional nanostructure formation
- 2) Biotechnology-fusing processing
- 3) Large-area continuous processing

A FY 2008 budget request for BEANS has been submitted by the Ministry of Economy, Trade and Industry. The budget focuses on the development of manufacturing technologies for next-generation devices that fuse different fields.

The other keynote lecture, entitled “Bio POETS for Innovative Healthcare,” was presented by Professor Luke Lee of the Berkeley Sensor & Actuator Center (BSAC) at the University of California at Berkeley. BSAC is the center for MEMS research and development at UC Berkeley. Professor Lee spoke about the following research and development efforts aimed at achieving bio-related applications for MEMS:

•Cellular Biologic Application Specific Integrated Circuits (BioASICs)

(devices in which microfluidic elements, sensors, control circuits etc. are integrated)

•Biologically-inspired Polymeric Opto-Electro Mechanical Systems (BioPOEMs)

(photoregulation, automation and imaging in bio-reactive element arrays)

•Quantum Nanoplasmonics for In-vivo Molecular Imaging

(molecular imaging by means of Surface Enhanced Raman Scattering [SERS] using nanocrescents)

The 14th Symposium will be held next year, once again as part of MicroNano 2008.

