

# 2nd U.S.-Japan Workshop on S&T for a Safe and Secure Society March 10-11, 2005

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Global Dialogues on  
Emerging Science and Technology

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Japan-US workshop on the future of  
sensors and sensor systems

Tsukuba, Japan • 28 February–2 March 2005

Patricia Wrightson, The National Academies (US)

Hajime Haneda, The National Institute of Material Science (Japan)

# Purposes of GDEST

- To cultivate the role of science and technology in U.S. diplomatic relations with its allies and strategic partners;
- To help contribute to global security, to the meeting of human needs and to advancing knowledge;
- To foster relationships among leading scientists in fields critical to our global future;
- To foster relationships between mature scientists and engineers and the next generation of researchers.

# Goals of Japan-US Workshop on the future of sensors and sensor systems

- To provide both leading and promising U.S. and Japanese scientists and engineers the opportunity to explore with each other research directions and challenges in sensor technologies, systems and applications;
- To explore together the role of sensors and sensor systems in achieving a safe and secure society;
- To identify common research interests between leading and future U.S. and Japanese sensor scientists and engineers.

Dr. Haneda will now talk on the substance of the meeting and I will make some concluding comments.

# Summary of Japan-US Workshop on the Future of Sensors and Sensor Systems

## The 2nd Japan – US Workshop on Science and Technology for A Safe and Secure Society

Honolulu, 10 and 11 March  
2005

U.S.: Patricia Wrightson, National Academy of  
Sciences

Japan: Hajime Haneda, National Institute for  
Material Sciences (NIMS)

# Photos of the workshop



Opening address by Prof. Atkinson



Oral lecture



Discussion



Panel view



Welcome address by Prof. Kurokawa

# Opening address

## Mr. Murata

- Preparation of 3rd Science & Technology Basic Plan;
- Expectation for the new style of SCJ;
- This workshop is held in relation with US-Japan activity on science and technology for a safe and secure society;
- Some typical problems for safety and security are terror, earthquakes, and tsunamis;
- Good collaboration between US and Japan is important for development in this field.

# Opening address

## Dr. George Atkinson

- US and Japan have announced the objective to establish strong collaboration for development of a secure and safe society;
- Global Dialogues on Emerging Science and Technology (GDEST), a program of the national academies of US was conceived and initiated by the Office of Science and Technology Advisor to the Secretary of State;
- GDEST includes promotion of young scientists and engineers for next generation;

# Keynote lecture by Prof. Lewis Branscomb

- “Jeffersonian Science” for sensor technology
- Importance of sensors being effectively sensitive, not too sensitive
- Future sensor keywords:
  - Sensor array – combination of sensors with common protocol
  - Sensor platform – fixed and mobile
  - New science – biotechnology, nanotechnology, visualization
  - Network data management – cross checking, combination of many sorts of data
  - Wireless – efficient collection of data

# Keynote lecture by Prof. Lewis Branscomb, cont'd

- Useful sensors: Resilient and trustworthy
- Important applications : earthquake, hydrogen, environment, health, robot, danger

# Keynote lecture II by Prof. Yanagida

- Categorization of sensors: hetero-structure, monolithic structure, etc.;
- Classification of interfaces;
- Fabrication of sensor with hetero-structure is a key to obtain high selectivity and sensitivity;
- Safe to use or useful for safe, ecological, easy for use, intelligent: these are important aspects which should be considered for direction of science and technology. He explained this idea with combination of several Chinese letters, all of which are pronounced "Ken" in Japanese;
- To avoid spaghetti syndrome.

# Summary of discussions, February 28<sup>th</sup>

The individual presentations covered a comprehensive array of sensors from chemical sensors, optical sensors to biosensors for example. Sensor materials or components utilized ranged from conventional semiconductors, oxide ceramics, diamonds, to photonic atoms. Importance of interfaces, catalysts, and processes was also discussed, while properties such as thermoelectricity, piezoelectricity, and MEMS technology, nano- and micro-fabrication were utilized in the sensors.

# Summary of February 28<sup>th</sup> discussions, cont'd

This first day emphasized the wide array of diverse approaches there are to the mutual goal of developing sensors and sensor systems for a safe and secure society, and also the possibilities of fruitful collaboration at such a multidisciplinary Workshop.

# Summary of discussions, March 1<sup>st</sup>

The main focus of Day 2 was on sensor networks, systems, their frameworks and processing of information. Scales ranged from global proportions like the network of seismic sensors to microbial sensor systems. Broad spanning concepts like the ubiquitous networks, for example, were also presented. Another aspect of the day was that many applications of the systems pertaining to pressing societal needs were discussed in more detail.

# Summary of March 1<sup>st</sup> discussions, cont'd

For example to list just several; crime prevention, non-intrusive robots, home automation, care for elders, environmental and disease monitoring, and health care in general. Together with the previous day, this day underlined again the importance and necessity of the participants to utilize science and technology to develop these sensors, sensor materials, and systems for the sake of human society.

# Summary of discussions on March 2<sup>nd</sup>

The underlying major themes regarding sensors (which have been noted above) were also developed on the final day. In regard to specific topics; self diagnostic sensor systems for structural health monitoring, security, and aerospace were presented, while a wide range of approaches to developing sensors which detect gas, vapor, or smell were also discussed in detail.

# Summary of March 2<sup>nd</sup> discussions, cont'd

Future challenges were also discussed and evaluated such as the possibility of using mobile nodes, the need for heterogeneous sensor systems, system integration, addressing power needs, security of networks, and sensor situational awareness.

# Minutes of the “Japan-US Workshop on the Future of Sensors and Sensor Systems”

- Sensors and sensor systems play important roles to construct a secure and safe society. In order to identify and cope with various and emerging risks to societies, the existing sensors and sensor systems are not sufficient, and **new technologies with emerging concepts have to be developed.**
- Research on these advanced sensors and sensor systems calls for a dynamic approach linking multidisciplinary fields.

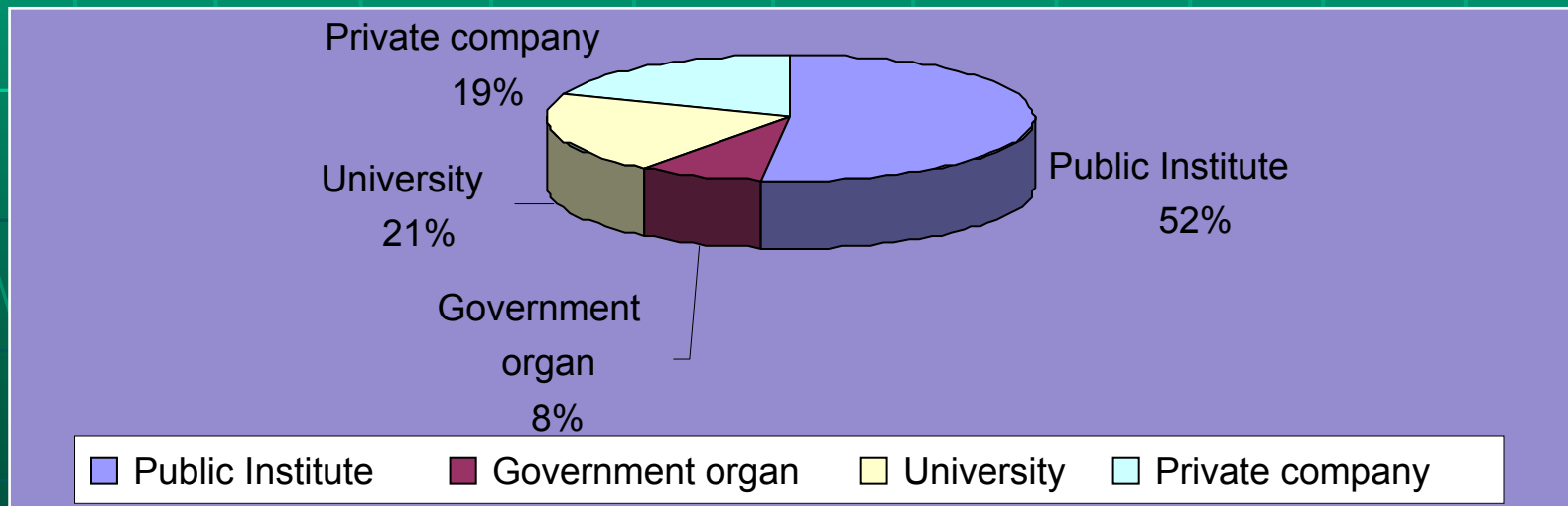
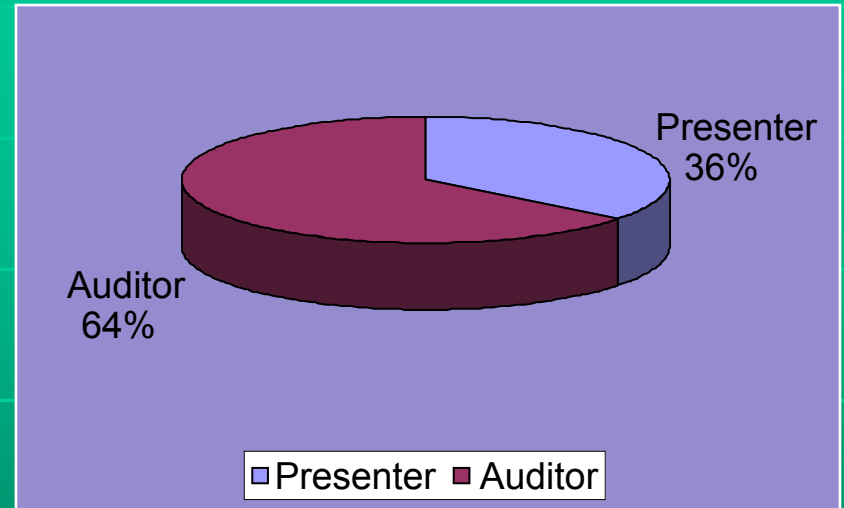
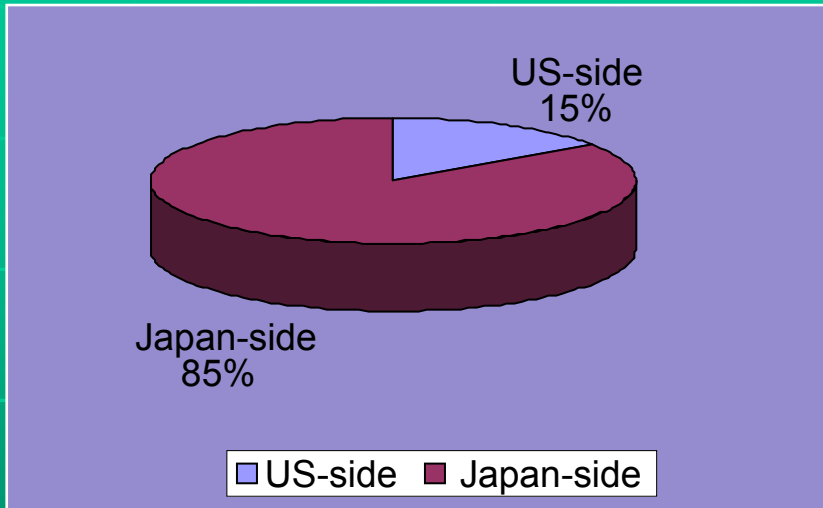
# Minutes of the Workshop, cont'd

- The **basic science** is extremely important for the above mentioned purpose, and development would be unfocused and inefficient without basic research. Academies should actively support basic science activities on sensors and sensor systems.
- This workshop spanned a comprehensive array of topics ranging from sensors and sensor materials themselves, **nano- and micro-fabrication, interfaces and processes, to sensor networks, systems, their frameworks, processing of information and the challenges ahead.**

# Minutes of the Workshop, cont'd

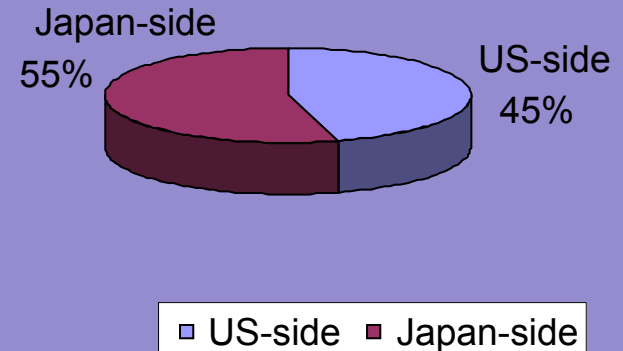
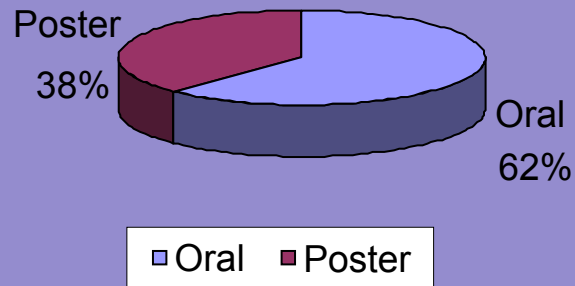
- Applications presented and proposed addressed pressing societal needs which underlined the importance and necessity of advancing work on sensor science and technology.
- This workshop is considered the first step to establish collaborations among scientists and engineers in the US and Japan on new sensor technologies, and judging from the lively panel discussion and valuable input from both sides, **active cooperation will continue.**

# Participant statistics

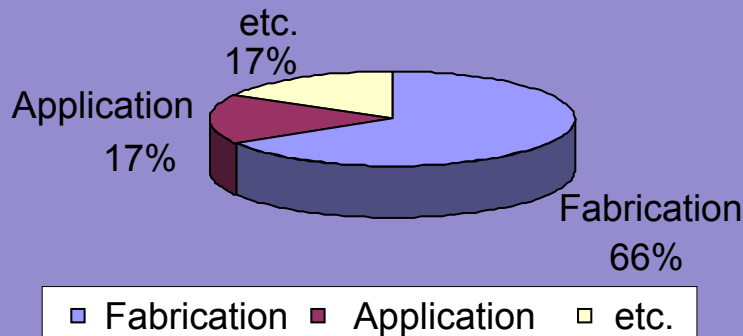


# Presentation statistics

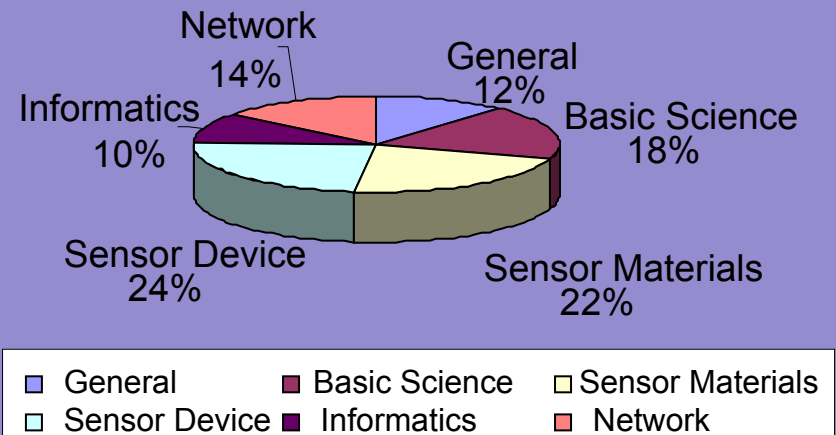
## Presentation type



## Target



## Field



Dr. Wrightson will now make some concluding comments.

# Lessons learned from the Japan-U.S. Workshop

- Everyone must “own” the project: Both sides did their utmost to make it succeed;
  - Presentations were very high quality;
  - Our Japanese colleagues advertised which led to an audience of over 150 people;
- External relations matter: The success of the workshop was due in part to the fact that US-Japanese relations are at a high point—something that was alluded to by both sides several times during the workshop;

# Lessons learned from the Japan-U.S. Workshop, cont'd.

- Constant communication between country-counterparts matters:
  - Several differences of opinion throughout the conference planning were ironed out by means of frequent interactions.
- Globalization matters:
  - In terms of the ability to speak the same language, both literally and figuratively;
  - We experienced a real, if loosely defined, commonality of goals.

# Lessons learned from the Japan-U.S. Workshop, cont'd.

- Details matter:
  - The American participants were very enthusiastic about the workshop—a success attributable in part to the superb coordinating job of my assistant;
  - Our Japanese colleagues thought of everything to make the American delegation as comfortable as possible.

# Potential significance of Japan-US Workshop for the Safe and Secure Society Program

- Our Japanese colleagues conception of “safe and secure society” forms a continuum from personal health, to clean environment, to counter-terrorism;
- We need to find ways to coordinate efforts between the government-to-government and scientist-to scientist efforts.

# Potential significance of Japan-US Workshop for the Safe and Secure Society Program, cont'd.

- The internationalization of the concept of Jeffersonian Science:
  - Linking **basic research** to the needs of society;
  - The late Congressman George E. Brown said that science policy should articulate “the goals and values [that] the public should expect of the scientific enterprise.”
  - As science becomes increasingly global, how do we realize this ideal internationally and even globally?