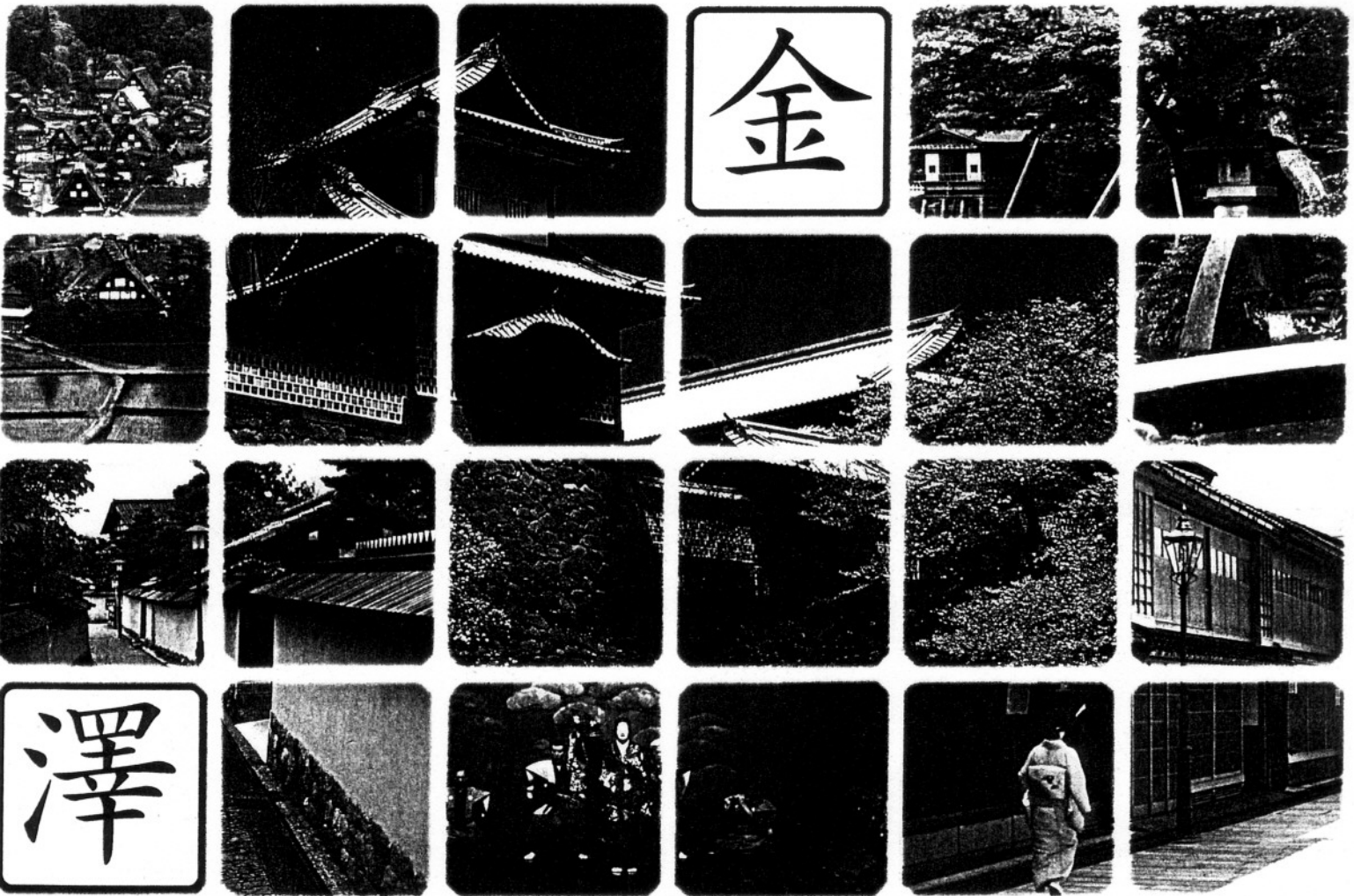


# The 43<sup>rd</sup> Annual Conference of JAPANESE SOCIETY FOR MEDICAL AND BIOLOGICAL ENGINEERING

AKB2

*Partnership in Medicine and Engineering  
-Towards Healthier and Happier Society-*

## Program & Abstract Digest Version for English Sessions



# 19-21 MAY

# 2004

Welcity **KANAZAWA**

# JAPAN

Session No.	Categories	Lecture Title or Session Theme (Sessions in <u>underlined Italic</u> letters; all the papers in the Session will be presented in English) (Sessions in <u>underlined</u> letters; one or two papers in the Session will be in English)	Date	Time	Place
<u>OS16</u>	<u>Organized Session 16</u>	<u>Physiome in Cardiovascular System</u>	<u>Fri., May 21</u>	<u>9:00 - 11:30</u>	<u>Room E</u>
OS17	Organized Session 17	(Mother-Child Communication and related topics)	Fri., May 21	9:00 - 11:30	Room F
<u>OS18</u>	<u>Organized Session 18</u>	<u>Advanced Computational Biomechanics and Related Technology</u>	<u>Fri., May 21</u>	<u>9:00 - 11:30</u>	<u>Room G</u>
<u>OS19</u>	<u>Organized Session 19</u>	<u>Progress in Artificial Organs</u> $150\frac{1}{2} / 6 = 25\frac{1}{2} / \text{table}$	<u>Fri., May 21</u>	<u>14:00 - 16:30</u>	<u>Room B</u>
OS20	Organized Session 20	Noninvasive and Long-term Measurements of Bioinformation	Fri., May 21	14:00 - 16:30	Room C
LS1	Luncheon Seminar 1	Statin ; World No.1 Drug Developed in Japan	Wed., May 19	12:00 - 13:00	Room B
LS2	Luncheon Seminar 2	Safety Standard Formulation for Infusion Pump and Industry Response	Wed., May 19	12:00 - 13:00	Room C
<u>LS3</u>	<u>Luncheon Seminar 3</u>	<u>Current Status of ICD Therapy : What Have We Learned From Clinical Trials (in English)</u> ①	<u>Thur., May 20</u>	<u>12:00 - 13:00</u>	<u>Room B</u>
LS4	Luncheon Seminar 4	The Principle and Application of Augmentation Index of Arterial Pulse Wave.	Thur., May 20	12:00 - 13:00	Room C
LS5	Luncheon Seminar 5	Contrast Echocardiography; The State of the Art and the Future	Fri., May 21	12:30 - 13:30	Room B
LS6	Luncheon Seminar 6	Diagnosis of Ischemic Heart Diseases and Arrhythmias by Magnetocardiogram	Fri., May 21	12:30 - 13:30	Room C
OR01	Oral Session 01	Artificial Organs (Blood Vessels, Trachea and Others)	Wed., May 19	10:00 - 11:00	Room B
OR02	Oral Session 02	Assisted Devices for Surgical Operation (I)	Wed., May 19	9:00 - 10:00	Room C
OR03	Oral Session 03	Assisted Devices for Surgical Operation (II)	Wed., May 19	10:00 - 11:00	Room C
OR04	Oral Session 04	Devices for Medical Diagnosis and Treatment (Brain and Neuropathy)	Wed., May 19	9:00 - 10:12	Room D
OR05	Oral Session 05	Intravascular Diagnosis and Treatment	Wed., May 19	10:12 - 11:00	Room D
OR06	Oral Session 06	Biorheology and Microcirculation (Heart and Kidney)	Wed., May 19	9:00 - 10:00	Room E
OR07	Oral Session 07	Biorheology and Microcirculation (Measurement and Pathology))	Wed., May 19	10:00 - 11:00	Room E
OR08	Oral Session 08	Devices for Medical Diagnosis and Treatment (Rehabilitation)	Wed., May 19	9:00 - 10:00	Room F
OR09	Oral Session 09	Devices for Medical Diagnosis and Treatment (Respiration)	Wed., May 19	10:00 - 11:00	Room F
OR10	Oral Session 10	Biomaterials for Cellular Engineering	Wed., May 19	9:00 - 10:00	Room G
OR11	Oral Session 11	Devices for Medical Diagnosis and Treatment (Sensory Organs)	Wed., May 19	10:00 - 11:00	Room G
OR12	Oral Session 12	Ultrasonic Measurement for Heart and Vessels	Wed., May 19	9:00 - 10:00	Room H
OR13	Oral Session 13	Advanced Ultrasound Technology	Wed., May 19	10:00 - 10:48	Room H
OR14	Oral Session 14	Assist Devices for Surgical Operation (III)	Wed., May 19	16:30 - 17:30	Room C
OR15	Oral Session 15	Robotic Surgery	Wed., May 19	17:30 - 18:30	Room C
OR16	Oral Session 16	Human Activity Measurement	Wed., May 19	16:30 - 17:30	Room D
OR17	Oral Session 17	Non-invasive Ambulatory Physiological Measurement	Wed., May 19	17:30 - 18:30	Room D
<u>OR18</u>	<u>Oral Session 18</u>	<u>Steady Flow Blood Pumps</u>	<u>Wed., May 19</u>	<u>16:30 - 17:42</u>	<u>Room F</u>
<u>OR19</u>	<u>Oral Session 19</u>	<u>Devices for Medical Diagnosis and Treatment (Dental Care)</u>	<u>Wed., May 19</u>	<u>17:42 - 18:30</u>	<u>Room F</u>
OR20	Oral Session 20	Pulseoximetry and Tissue Metabolic Measurement (I)	Wed., May 19	16:30 - 17:30	Room G
OR21	Oral Session 21	Pulseoximetry and Tissue Metabolic Measurement (II)	Wed., May 19	17:30 - 18:42	Room G
OR22	Oral Session 22	Micro and Nanotechnology	Thur., May 20	9:00 - 10:12	Room D
OR23	Oral Session 23	Measurement and Analysis for Experimental Animals	Thur., May 20	10:12 - 11:00	Room D

## Artificial Hearing and Vision Research and Development in Seoul

Sung June Kim<sup>1,2</sup>, Seik Park<sup>2,4</sup>, Soon Kwan An<sup>2,4</sup>, Hum Chung<sup>1,3</sup>, Jongmo Seo<sup>1,3</sup>, Eui Tae Kim<sup>1,2</sup>,  
Seung Jae Oh<sup>1,2</sup>, Jong Keun Song<sup>1,2</sup>, and William Shain<sup>5</sup>

<sup>1</sup>NanoBioelectronics and Systems Research Center, <sup>2</sup>School of Electrical Engineering, <sup>3</sup>School of Medicine, Seoul National University; <sup>4</sup>Nurobiosys Corp., Seoul, Korea. <sup>5</sup>Wadsworth Center, Albany, New York, U.S.A. •

### 1. Introduction

Neural Prosthesis is an area of research to develop a device that connects directly with body (nervous system) to replace or supplement body functions (sensory or motor). There have been rapid progress recently and now there are practical implant devices available. In this paper we introduce our activities on artificial hearing and vision as well as on the use of semiconductor-based microelectrode arrays as future neural interface.

### 2. Artificial hearing development

Cochlear implant system has been developed. This microelectronic implant system includes a 16-channel Pt electrode, a speech processor with CIS strategy and a Ti based hermetic package containing a receiver-stimulator IC chip.

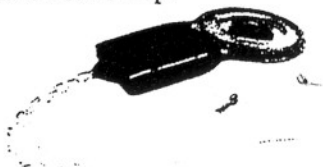


Fig. 1 Photography of cochlear implant.

It also features a bidirectional telemetry link using single coil. The system delivers biphasic current pulses in mono/bipolar format at a rate of 1000 pps/channel.

### 3. Research on artificial vision

Target of this work are the patients with retina related diseases such as retinitis pigmentosa and age-related macular degeneration. This system also consists of image capture and processing, telemetry, stimulation pulse generation and a neural interface. A polymer based microelectrode array (Fig. 2) has been developed suitable for both epiretinal and subretinal interfaces.

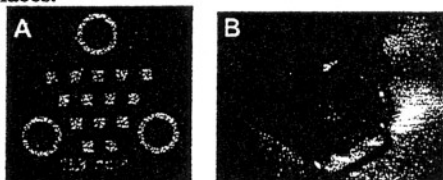


Fig. 2 A. Microphotography of polymer based retina electrode. B. View of surgery for electrode implant.

We have developed surgical skills to insert the flexible electrode and proved the biocompatibility and effective stimulation of ganglion in the retina [1].

### 4. Microelectrode arrays

Neural Prosthesis can benefit greatly from the well developed semiconductor fabrication technology [2]. Use of silicon material is tried for obvious reasons: precise and reproducible definition of electrode sites and low cost. We studied biocompatibility of silicon microelectrode arrays [3]. Brain cell reactions to the insertion of silicon neural probes will be presented.

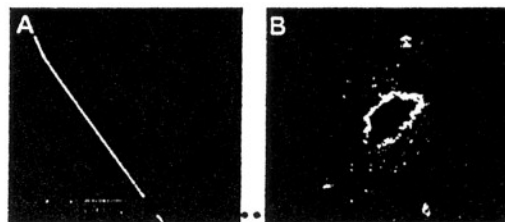


Fig. 3 A. SEM view of silicon probe. B. Cellular reactions of astrocyte (green) and microglia (blue) to the insertion of silicon neural probe in the neocortex.

### Acknowledgement

This work was funded by KOSEF through its center of excellence program (NBS-ERC).

### References

- [1] JM Seo, SJ Kim, HC, ET Kim, HG Yu, YS Yu, Biocompatibility of polyimide micro-electrode array for retinal stimulation, *Material Sci and Eng(C)*, 24(1):185-9, 2004.
- [2] JK Song, SJ Oh, JW Kim, SJ Kim, Development of high-yield fabrication process and low-noise structure for silicon neural probe, *NIH 34th Neural prosthesis workshop*, October 21-23, 2003, Bethesda MD, USA.
- [3] SJ Oh, KL Smith, CS Bjornsson, JN Turner, JK Song, SJ Kim, W Shain, Regional differences of reactive responses against silicon neural probe implanted into deep brain regions, 2003 Society for Neuroscience Meeting, November 8-12, 2003, New Orleans, LA., USA.