18TH IEEE INTERNATIONAL CONFERENCE ON MICRO ELECTRO MECHANICAL SYSTEMS

JANUARY 30 - FEBRUARY 3, 2005

MEMS2005 MIAMI

FINAL ANNOUNCEMENT & ADVANCE PROGRAM

SPONSORED BY

IEEE AND THE **RA** **ROBOTICS AND AUTOMATION SOCIETY**

MEMS2005 MIAMI

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FROM THE CO-CHAIRS

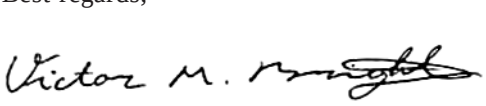
We would like to invite you to Miami Beach, Florida, USA, for the 18th IEEE International Micro Electro Mechanical Systems (MEMS) Conference!

Since the beginning of this conference series in 1987, the MEMS community has experienced significant growth in various areas such as environmental sensors, inertial sensors, optical MEMS, RF devices, microfluidics, and bioanalytical microsystems. Great strides have been made in approaches to making MEMS, including self assembly, integration of nano-scale features and use of materials new to MEMS. The enthusiasm of this community is evident from the creativity and speed shown in both research and product development.

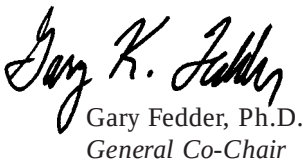
It is our great pleasure to announce that this year we received a record high of 750 abstracts. A total of 216 papers were judiciously selected by the 21 member Technical Program Committee. The presentations are arranged in a single-session format, which consists of 3 invited talks, 41 oral presentations, and 175 posters. We are continuing the successful poster presentation format pioneered last year. Poster presentations will be divided into four sessions to facilitate interaction with authors, who will have their posters on display throughout the conference. During their designated poster session, authors will be asked to give a short presentation once every 30 minutes to those present next to their poster. All conference papers, oral and poster, are included in a Technical Digest. All presentations at the conference will be included in a Technical Digest. This Technical Digest will be available both in paper form and on a CD ROM and will be distributed at the conference to all attendees.

We'd like to specially thank all the authors of the submitted abstracts. It is their highest quality work that serves as the foundation for the success of this conference. The Technical Program Committee is made up with equal representation from the regional sub-divisions, which include the American sub-continents, Europe and Africa, and Asia and Australia. To facilitate review of the large number of abstracts, three sub-committees were formed to examine abstracts in different categories. The committee recommendations on the acceptance and declination of papers were taken as binding. We are greatly indebted to the TPC members, who volunteered their valuable time, including participation in a two-day on-site meeting, for paper selection. We are also indebted to the International Steering Committee and the Advisory Co-Chairs, Paddy French and Oliver Paul, for their guidance in managing all aspects of the conference. We gratefully acknowledge the industrial support groups and exhibitors for their involvement in this conference. We are also very thankful to the IEEE Robotics and Automation Society for their continued support of this meeting. In closing, we look forward to seeing you at the conference in January at Miami Beach!

Best regards,



Victor M. Bright, Ph.D.
General Co-Chair



Gary Fedder, Ph.D.
General Co-Chair

SCOPE of the CONFERENCE

The conference series began in 1987 as the Micro Robots and Teleoperators Workshop in the USA. It was subsequently renamed the IEEE Micro Electro Mechanical Systems Workshop, and since 1999 it has been known as the IEEE International Micro Electro Mechanical Systems Conference. It has seen significant growth in this period, reflecting the commitment and success of the research community that has supported it. In recent years, the conference has attracted more than 600 participants and has presented 140-170 select papers in non-overlapping oral and poster sessions. The conference has historically followed a single session format, with ample opportunity for interaction between attendants.

The 18th IEEE International Micro Electro Mechanical Systems Conference MEMS 2005 will be held in Miami, Florida, USA, at the Fontainebleau Hilton Resort. The world's premier playground, Greater Miami offers visitors the best of all worlds -- a rare destination where the cutting edge of urban chic co-exists with the beauty and splendor of a tropical paradise. Great year round weather, top-ranked beaches and the sparkling waters of Biscayne Bay are the backdrops for a cosmopolitan metropolis, pulsing with the rhythms of its diverse population. Boasting a vibrant arts and cultural landscape, renowned nightlife scene and world class dining and entertainment, Miami Beach draws an eclectic mix of visitors from sizzling celebrities to frolicking families seeking fun in the sun.

The major areas of activity in the development of MEMS solicited and expected at this conference include but are not limited to

Design, Simulation and Analysis Tools with Experimental Verification
Fabrication Technologies and Processes
Materials
Electro-Mechanical Integration Techniques
Assembly and Packaging Approaches
Metrology and Operational Evaluation Techniques
System Architecture

The major areas of activity in the application of MEMS solicited and expected at this conference include but are not limited to

Mechanical, Thermal, and Magnetic Sensors and Actuators, and Systems
Opto-Mechanical Microdevices and Microsystems
Fluidic Microcomponents and Microsystems
Microdevices for Data Storage
Scientific Microinstruments
Microdevices for Biomedical Engineering
Micro Chemical Analysis Systems
Microdevices and Systems for Wireless Communication
Nano-Electro-Mechanical Devices and Systems

In conjunction with the technical program will be an exhibition with vendors of products and services relevant to researchers in the MEMS field.

MEMS 2005 provides an excellent opportunity to present, discuss, and assimilate the latest developments in MEMS.

PROGRAM at a GLANCE

	Sunday, January 30	**Monday**, January 31	**Tuesday**, February 1	**Wednesday**, February 2	**Thursday**, February 3
7 am		7:00 a.m. **Registration**	7:30 a.m. **Registration**	7:30 a.m. **Registration**	7:30 a.m. **Registration**
8 am		8:30 a.m.-8:50 a.m. **Welcome Address**	8:10 a.m.-8:50 a.m. **Invited Speaker** *B. Berge*	8:10 a.m.-8:50 a.m. **Invited Speaker** *E. Sakaue*	8:10 a.m.-10:10 a.m. **SESSION 8** Bioanalytical Systems
9 am		8:50 a.m.-9:30 a.m. **Invited Speaker** - *J. Kitching* 9:30 a.m.-10:30 a.m. **SESSION 1** Self Assembly & Packaging	8:50 a.m.-10:10 a.m. **SESSION 4** Optical Microsystems	8:50 a.m.-10:10 a.m. **SESSION 5** Power MEMS	
10 am		10:30 a.m.-11:00 a.m. **Break**	10:10 a.m.-10:40 a.m. **Break**	10:10 a.m.-10:40 a.m. **Break**	10:10 a.m.-10:40 a.m. **Break**
11 am		11:00 a.m.-12:40 p.m. **SESSION 2** RF MEMS	10:40 a.m.-12:40 p.m. **POSTER/ORAL** **Session II** Physical Microsystems Actuators	10:40 a.m.-12:40 p.m. **POSTER/ORAL** **Session IV** Bio MEMS	10:40 a.m.-12:20 p.m. **SESSION 9** Nano Systems
12 pm					
1 pm		12:40 p.m.-1:40 p.m. **Lunch**	12:40 p.m.-1:40 p.m. **Lunch**	12:40 p.m.-1:40 p.m. **Lunch**	12:20 p.m. **Conference Adjourns**
2 pm		1:40 p.m.-3:00 p.m. **SESSION 3** Pneumatic/Jet Systems	1:40 p.m.-4:00 p.m. **POSTER/ORAL** **Session III** Materials & Device Fabrication & Packaging	1:40 p.m.-3:20 p.m. **SESSION 6** Physical Microsystems	
3 pm		3:00 p.m.-3:30 p.m. **Break**		3:20 p.m.-3:40 p.m. **Break**	
4 pm		3:30 p.m.-5:30 p.m. **POSTER/ORAL** **Session I** Optical MEMS RF MEMS		3:40 p.m.-5:20 p.m. **SESSION 7** Polymer MEMS	
5 pm	4:00 p.m. - 7:00 p.m. **Registration**				
6 pm					
7 pm	6:30 p.m. - 8:30 p.m. **Welcome Reception**			7:00 p.m. **Conference Banquet**	
8 pm					
9 pm					

*The Executive Conference Committee reserves the right to change the program as necessary.

PROGRAM SCHEDULE

Sunday, January 30, 2005

4:00 p.m. to 7:00 p.m. **REGISTRATION**

6:30 p.m. to 8:30 p.m. **WELCOME RECEPTION**

Monday, January 31, 2005

8:30 a.m. **WELCOME ADDRESS**

8:50 a.m. **INVITED SPEAKER**
MICROFABRICATED ATOMIC CLOCKS
J. Kitching[1], S. Knappe[1], L. Liew[1], P. Schwindt[1], V. Shah[2], J. Moreland[1] and L. Hollberg[1]
[1]*The National Institute of Standards and Technology, USA* and [2]*University of Colorado, USA*

SESSION 1 **Self Assembly and Packaging**
Session Chairs:
O. Tabata, *Kyoto University, JAPAN*
P. French, *Delft University of Technology, THE NETHERLANDS*

9:30 a.m **NON-ROBOTIC FABRICATION OF PACKAGED MICROSYSTEMS BY SHAPE-AND-SOLDER-DIRECTED SELF-ASSEMBLY**
W. Zheng, J.-H. Chung and H.O. Jacobs
University of Minnesota, USA

9:50 a.m. **HIGH YIELD BATCH PACKAGING OF MICRO DEVICES WITH UNIQUELY ORIENTING SELF-ASSEMBLY**
J. Fang and K.F. Böhringer
University of Washington, USA

10:10 a.m. **BINDING FORCE MEASUREMENT BETWEEN MICRO-SCALE FLAT SURFACES IN AQUEOUS ENVIRONMENT BY FORCE-SENSING PIEZORESISTIVE MICRO-CANTILEVERS**
H. Onoe, M. Gel, K. Hoshino, K. Matsumoto and I. Shimoyama
University of Tokyo, JAPAN

10: 30 a.m. **BREAK**

SESSION 2 **RF MEMS**
Session Chairs:
C.T.-C. Nguyen, *DARPA/University of Michigan, USA*
J.-U. Bu, *LG Electronics Institute of Technology, KOREA*

11:00 a.m. **LOW MOTIONAL RESISTANCE RING-SHAPED CONTOUR-MODE ALUMINUM NITRIDE PIEZOELECTRIC MICROMECHANICAL RESONATORS FOR UHF APPLICATIONS**
G. Piazza, P.J. Stephanou, J.M. Porter, M.B.J Wijesundara and A.P. Pisano
University of California, Berkeley, USA

11:20 a.m. **CMOS-MEMS RESONANT RF MIXER-FILTERS**
F. Chen, J. Brotz, U. Arslan, C.-C. Lo, T. Mukherjee and G.K. Fedder
Carnegie Mellon University, USA

11:40 a.m. **FILM BULK ACOUSTIC RESONATOR AT 4.4 GHZ WITH ULTRA LOW TEMPERATURE COEFFICIENT OF RESONANT FREQUENCY**
H. Yu, W. Pang, H. Zhang and E.S. Kim
University of Southern California, USA

12:00 p.m. **A LOW-VOLTAGE PUSH-PULL SPDT RF MEMS SWITCH OPERATED BY COMBINATION OF ELECTROMAGNETIC ACTUATION AND ELECTROSTATIC HOLD**
I.-J. Cho, T. Song, S.-H. Baek and E. Yoon
Korea Advanced Institute of Science and Technology, KOREA

12:20 p.m. **FROM ZERO- TO SECOND-LEVEL PACKAGING OF RF-MEMS DEVICES**
A. Jourdain[1], K. Vaesen[1], J.M. Scheer[2], J.W. Weekamp[2], J.T.M. van Beek[3] and H.A.C. Tilmans[1]
[1]*IMEC, BELGIUM*, [2]*Philips CFT, THE NETHERLANDS* and [3]*Philips Research Laboratories, THE NETHERLANDS*

12:40 p.m. **LUNCH**

SESSION 3 **PNEUMATIC/JET SYSTEMS**
Session Chairs:
Y. Zohar, *University of Arizona, USA*
A. van den Berg, *University of Twente, THE NETHERLANDS*

1:40 p.m. **A MEMS ARRAY FOR PNEUMATIC CONVEYOR AND ITS CONTROL BASED ON DISTRIBUTED SYSTEM**
Y. Fukuta, Y.-A. Chapuis, Y. Mita and H. Fujita
University of Tokyo, JAPAN

2:00 p.m. **ACOUSTIC DIFFERENTIAL AMPLIFIER BASED ON ACOUSTIC FET**
M. Tanaka, T. Sakashita and S. Konishi
Ritsumeikan University, JAPAN

2:20 p.m. **ACTIVE INK-JET NOZZLES EQUIPPED WITH ARRAYED VISUAL SENSORS FOR PARALLEL ALIGNMENT CONTROL**
K. Hoshino, T. Nagai, Y. Mita, M. Sugiyama, K. Matsumoto and I. Shimoyama
University of Tokyo, JAPAN

2:40 p.m. **A DROPLET VOLUME ADJUSTABLE SINGLE-HEATER MICROINJECTOR BASED ON DIGITAL CURRENT PATH CONTROL**
C.H. Je, T.G. Kang, D.W. Lee and Y.-H. Cho
Korea Advanced Institute of Science and Technology, KOREA

3:00 p.m. **BREAK**

3:30 p.m. to 5:30 p.m. **POSTER/ORAL SESSION 1**

5:30 p.m. **ADJOURN FOR THE DAY**

POSTER / ORAL SESSION I

Optical MEMS

CRYOGENIC IMAGING X-RAY SPECTROMETER
R.J. Wiegerink[1], J.J. van Baar[1], J.H. de Boer[1], M.L. Ridder[2], M.P. Bruijn[2], A. Germeau[2] and H.F.C. Hoevers[2]
[1]*University of Twente, THE NETHERLANDS* and
[2]*SRON National Institute for Space Research, THE NETHERLANDS*

FABRICATION AND PRELIMINARY TEST RESULTS OF BICEP[1,2,3] (BACKGROUND IMAGING OF COSMIC EXTRAGALACTIC POLARIZATION) BOLOMETER
S.Y. Bae[1], K.-W. Yoon[2] and T. George[1]
[1]*Jet Propulsion Laboratory, USA* and
[2]*California Institute of Technology, USA*

SINGLE-MASK, HIGH ASPECT RATIO, 3-D MICROMACHINING OF BULK TITANIUM
M.P. Rao, M.F. Aimi, E.R. Parker and N.C. MacDonald
University of California, Santa Barbara, USA

MEMS-TUNABLE AND WAVELENGTH SELECTIVE RECEIVER FRONT END
H. Halbritter[1], F. Riemenschneider[1], B. Kögel[1], A. Tarraf[2], M. Strassner[3], S. Irmer[2], H. Hillmer[2], I. Sagnes[3] and P. Meissner[1]
[1]*Technische Universität Darmstadt, GERMANY,*
[2]*University of Kassel, GERMANY* and [3]*LPN-CNRS, FRANCE*

SELF-ALIGNED VERTICAL ELECTROSTATIC COMBDRIVES FOR SCANNING MICROMIRRORS
C. Tsou[1], W.T. Lin[2], C.C. Fan[2] and B.C.S. Chou[2]
[1]*Feng Chia University, ROC* and [2]*LighTuning Technology Inc., ROC*

TUBE SHAPE PIEZOELECTRIC 2D MICROSCANNER FOR MINIMALLY INVASIVE LASER TREATMENT
H. Akahori, H. Wada, M. Esashi and Y. Haga
Tohoku University, JAPAN

STUDY OF INJECTION-LOCKING PHENOMENON USING MEMS TUNABLE LASER
X.M. Zhang[1], J.B. Zang[2], A.Q. Liu[1], F. Chollet[1] and J.Z. Hao[3]
[1]*Nanyang Technological University, SINGAPORE,*
[2]*Data Storage Institute, SINGAPORE* and
[3]*Institute for Infocomm Research, SINGAPORE*

WIDE-RANGE LINEAR ATTENUATION VIA ELLIPTICAL MIRROR FOR VARIABLE ATTENUATOR APPLICATION
H. Cai, X.M. Zhang, C. Lu, A.Q. Liu and E.H. Khoo
Nanyang Technological University, SINGAPORE

WAVELENGTH-SELECTIVE INTEGRATED OPTICAL MEMS FILTER IN INP
M. Datta[1], M.W. Pruessner[1], K. Amarnath[1], J. McGee[1], S. Kanakaraju[2] and R. Ghodssi[1]
[1]*University of Maryland, USA* and
[2]*Laboratory for Physical Sciences, USA*

A TUNABLE MICROLENS SCANNER WITH LARGE-VERTICAL-DISPLACEMENT ACTUATION
A. Jain and H. Xie
University of Florida, USA

COMPOUND EYE SHAPED FLEXIBLE ORGANIC IMAGE SENSOR WITH A TUNABLE VISUAL FIELD
H. Saito, K. Hoshino, K. Matsumoto and I. Shimoyama
University of Tokyo, JAPAN

THERMALLY TUNABLE OPTICAL THIN-FILM FILTERS WITH SUB-NANOMETER RESOLUTION AND 41.7nm CONTINUOUS TUNING RANGE
D. Hohlfeld and H. Zappe
University of Freiburg, GERMANY

DEVELOPMENT OF QUASI-PASSIVE OPTICAL SUBSTRATES FOR PHOTONIC PACKAGING
B. Li, J. Menger, T. Walsh, H. Wirz and A. Sharon
Fraunhofer USA Center for Manufacturing Innovation, USA

OPTICAL BEAM GUIDANCE IN MONOLITHIC POLYMER CHIPS FOR MINIATURIZED COLORIMETRIC ASSAYS
M. Grumann, I. Moser, J. Steigert, L. Riegger, A. Geipel, C. Kohn, G. Urban, R. Zengerle and J. Ducrée
University of Freiburg, GERMANY

PHOTONIC CRYSTAL TUNED BY CANTILEVER
T. Takahata, K. Hoshino, K. Matsumoto and I. Shimoyama
University of Tokyo, JAPAN

RF MEMS

LOW-MOTIONAL-IMPEDANCE HIGHLY-TUNABLE I2 RESONATORS FOR TEMPERATURE-COMPENSATED REFERENCE OSCILLATORS
G.K. Ho, K. Sundaresan, S. Pourkamali and F. Ayazi
Georgia Institute of Technology, USA

1.1 GHz SILICON BLADE NANO-ELECTROMECHANICAL RESONATOR FEATURING 20 nm GAP LATERAL TRANSDUCERS
V. Agache[1,2], B. Legrand[2], D. Collard[1,2], H. Fujita[1] and L. Buchaillot[2]
[1]*University of Tokyo, JAPAN* and [2]*IEMN, FRANCE*

THIN-FILM PADDLE MICRORESONATORS WITH HIGH QUALITY FACTORS FABRICATED AT TEMPERATURES BELOW 110 ˚C
J. Gaspar[1], T. Adrega[1], V. Chu[1] and J.P. Conde[2]
[1]*INESC-Microsistemas e Nanotecnologias, PORTUGAL* and
[2]*Instituto Superior Técnico, PORTUGUAL*

NONLINEAR ELASTIC COUPLING IN TETHER-SUSPENDED MEMS
W.O. Davis[1], A.P. Pisano[2] and O.M. O'Reilly[2]
[1]*Microvision, Inc., USA* and [2]*University of California, Berkeley, USA*

ANCHOR LOSS SIMULATION IN RESONATORS
D.S. Bindel, E. Quévy, T. Koyama, S. Govindjee, J.W. Demmel and R.T. Howe
University of California, Berkeley, USA

SUPPORT LOSS IN MICROMECHANICAL DISK RESONATORS
Z. Hao and F. Ayazi
Georgia Institute of Technology, USA

RESONANT DRIVE: SENSE AND HIGH VOLTAGE ELECTROSTATIC DRIVE USING SINGLE MEMS CAPACITOR AND LOW VOLTAGE ELECTRONICS
B. Cagdaser and B.E. Boser
University of California, Berkeley, USA

MEMS CAPACITIVE SERIES SWITCHES: OPTIMAL TEST VEHICLES FOR THE RF SELF-BIASING PHENOMENON
X. Rottenberg[1], K. Vaesen[1], S. Brebels[1], B. Nauwelaers[2], R.P. Mertens[1,2], W. De Raedt[1] and H.A.C. Tilmans[1]
[1]*IMEC v.z.w., BELGIUM* and [2]*K.U. Leuven, BELGIUM*

SINGLE-MASK REDUCED-GAP CAPACITIVE MICROMACHINED DEVICES
R. Abdolvand and F. Ayazi
Georgia Institute of Technology, USA

HIGH POWER HANDLING RF MEMS DESIGN AND TECHNOLOGY
K. Grenier[1], D. Dubuc[1], B. Ducarouge[1], V. Conedera[1], D. Bourrier[1], E. Ongareau[2], P. Derderian[2] and R. Plana[1]
[1]*LAAS-CNRS, FRANCE* and [2]*MBDA, FRANCE*

INTEGRATION OF A NOVEL ELECTROCHEMICAL TUNING SCHEME WITH MEMS SURFACE MICROMACHINED RESONATORS
S. Enderling[1], C.L. Brown, III[2], M. Balakrishnan[2], J. Hedley[3], J.T.M. Stevenson[1], S. Bond[1], C.C. Dunare[1], A.J. Harris[3], J.S. Burdess[3], M. Mitkova, [2]M.N. Kozicki[2] and A.J. Walton[1]
[1]*University of Edinburgh, U.K.*, [2]*Arizona State University, USA* and [3]*University of Newcastle, UK*

A GROUND SHIELDED LOW LOSS TRANSMISSION LINE USING AU-TO-AU THERMO COMPRESSIVE PACKAGING FOR RF APPLICATIONS
J.J. Tsaur[1,2], T. Kobayashi[1], Y. Murakoshi[1], R. Maeda[1] and T. Suga[2]
[1]*National Institute of Advanced Industrial Science and Technology, JAPAN* and [2]*University of Tokyo, JAPAN*

MICROFABRICATED PLASTIC 95 GHZ RECTANGULAR WAVEGUIDE
F. Sammoura[1], Y.-C. Su[1], Y. Cai[2], C.-Y. Chi[3], B. Elamaran[3], L. Lin[1] and J.-C. Chiao[2]
[1]*University of California, Berkeley, USA*,
[2]*University of Texas, Arlington, USA* and [3]*Agilent Technologies, USA*

BULK MICROSWITCH FOR POWER RF APPLICATIONS
P.N. Muller[1,2], N. Rolland[1], A. Ziaei[2], J.-P. Polizzi[2], D. Collard[1,3] and L. Buchaillot[1]
[1]*IEMN, FRANCE*, [2]*THALES Research and Technology, FRANCE* and [3]*University of Tokyo, JAPAN*

CHARACTERIZATION OF ACOUSTIC VIBRATION MODES AT GHz FREQUENCIES IN BULK ACOUSTIC WAVE RESONATORS BY COMBINATION OF SCANNING LASER INTERFEROMETRY AND SCANNING ACOUSTIC FORCE MICROSCOPY
X. Liu[1,2], A. San Paulo[1], M. Park[1,3] and J. Bokor[1]
[1]*University of California, Berkeley, USA*,
[2]*Cornell University, USA* and
[3]*Samsung Electronics Co. LTD, KOREA*

FLEXIBLE POLYIMIDE FILM BASED HIGH ISOLATION RF MEMS SWITCHES FABRICATED USING PRINTED CIRCUIT PROCESSING TECHNIQUES
R. Ramadoss[1], S. Lee[2], Y.C. Lee[2], V.M. Bright[2] and K.C. Gupta[2]
[1]*Auburn University, USA* and [2]*University of Colorado, USA*

MICROASSEMBLED TUNABLE MEMS INDUCTOR
N. Sarkar[1,2], D. Yan[1], M. Ellis[2], E. Horne[1,2], J.B. Lee[3], H. Lu[3], R. Mansour[1], A. Nallani[3] and G. Skidmore[2]
[1]*University of Waterloo, CANADA*, [2]*Zyvex Corporation, USA* and [3]*University of Texas, Dallas, USA*

SINGLE CRYSTAL SILICON CANTILEVER-BASED RF-MEMS SWITCHES USING SURFACE PROCESSING ON SOI
T. Nakatani, A.T. Nguyen, T. Shimanouchi, M. Imai, S. Ueda, I. Sawaki and Y. Satoh
Fujitsu Laboratories, Ltd., JAPAN

RADIO FREQUENCY POWER SENSOR BASED ON MEMS TECHNOLOGY WITH ULTRA LOW LOSSES
L. Fernández, J. Sesé, R. Wiegerink, J. Flokstra, H. Jansen and M. Elwenspoek
University of Twente, THE NETHERLANDS

A LATERAL, SELF-CLEANING, DIRECT CONTACT MEMS SWITCH
Y. Shi[1] and S.-G. Kim[2]
[1]*Stevens Institute of Technology, USA* and
[2]*Massachusetts Institute of Technology, USA*

HIGH-Q INTEGRATED INDUCTORS ON TRENCHED SILICON ISLANDS
M. Raieszadeh, P. Monajemi, S.-W. Yoon, J. Laskar and F. Ayazi
Georgia Institute of Technology, USA

A 1.14 GHZ PIEZOELECTRICALLY TRANSDUCED DISK RESONATOR
L. Yan, J. Wu and W.C. Tang
University of California, Irvine, USA

SINGLE-RESONATOR FOURTH-ORDER MICROMECHANICAL DISK FILTERS
M.U. Demirci and C.T.-C. Nguyen
University of Michigan, USA

VERTICAL CAPACITIVE SiBARS
S. Pourkamali, G.K. Ho and F. Ayazi
Georgia Institute of Technology, USA

ADHESION AND CONTACT RESISTANCE IN AN ELECTROSTATIC MEMS MICROSWITCH
S. Majumder[1], N.E. McGruer[2] and G.G. Adams[2]
[1]*Radant MEMS, USA* and [2]*Northeastern University, USA*

SPURIOUS MODE SUPPRESSION IN UHF MICROMECHANICAL EXTENSIONAL WINE-GLASS RING RESONATORS
Y. Xie, S.-S. Li, Y.-W. Lin, Z. Ren and C.T.-C. Nguyen
University of Michigan, USA

FULLY-DIFFERENTIAL POLY-SiC LAMÉ-MODE RESONATOR AND CHECKERBOARD FILTER
S.A. Bhave, D. Gao, R. Maboudian and R.T. Howe
University of California, Berkeley, USA

Tuesday, February 1, 2005

8:10 a.m. **INVITED SPEAKER**
LIQUID LENS TECHNOLOGY: PRINCIPLE OF ELECTROWETTING BASED LENSES AND APPLICATIONS TO IMAGING
B. Berge
Varioptic, FRANCE

SESSION 4 **OPTICAL MICROSYSTEMS**
Session Chairs:
M. Wong, *Hong Kong University of Science and Technology, HONG KONG*
D. Collard, *University of Lille, FRANCE*

8:50 a.m. **"POP-UP" DISPLAY WITH 3-DIMENSIONAL MICROLENS STRUCTURES**
M. Tohara, E. Iwase, K. Hoshino, K. Matsumoto and I. Shimoyama
University of Tokyo, JAPAN

9:10 a.m. **THIN COMPOUND EYE CAMERA WITH A ZOOMING FUNCTION BY REFLECTIVE OPTICS**
H. Kinoshita, K. Hoshino, K. Matsumoto and I. Shimoyama
University of Tokyo, JAPAN

9:30 a.m. **A MICROMACHINED PLATFORM FOR LOCALIZED INDEX MODULATION IN CHIRPED FIBER BRAGG GRATINGS AND ITS APPLICATION TO ULTRAFAST OPTICAL PULSE SHAPING**
K. Udeshi, K.-H. Liao, L. Que, A. Galvanauskas and Y.B. Gianchandani
University of Michigan, USA

9:50 a.m. **A NANOIMPRINTED STRAIN-INDUCED RECONFIGURABLE POLYMER MICRO-OPTICAL GRATING**
Y.-C. Tung and K. Kurbayashi
University of Michigan, USA

10:10 a.m. **BREAK**

10:40 a.m. to 12:40 p.m. **POSTER/ORAL SESSION II**

12:40 p.m. **LUNCH**

1:40 p.m. to 4:00 p.m. **POSTER/ORAL SESSION III**

4:00 p.m. **ADJOURN FOR THE DAY**

POSTER / ORAL SESSION II

Physical Microsystems

INTEGRATED NITRIDE CANTILEVER ARRAY WITH Si HEATERS AND PIEZOELECTRIC DETECTORS FOR NANO-DATA-STORAGE APPLICATION
H.-J. Nam, Y.-S. Kim, C.S. Lee, W.-H. Jin, S.S. Jang, I.-J. Cho and J.-U. Bu
LG Electronics Institutue of Technology, KOREA

A PMMA-BASED MICRO PRESSURE SENSOR CHIP USING CARBON NANOTUBES AS SENSING ELEMENTS
C.K.M. Fung, M.Q.H. Zhang, R.H.M. Chan and W.J. Li
Chinese University of Hong Kong, HONG KONG SAR

REMOTE-POWERED HIGH-PERFORMANCE STRAIN SENSING MICROSYSTEM
M. Suster, N. Chaimanonart, J. Guo, W.H. Ko and D.J. Young
Case Western Reserve University, USA

A NOVEL MEMS DEVICE FOR HIGH RESOLUTION FORCE AND DISPLACEMENT MEASUREMENT
B.A. Samuel, A.V. Desai and M.A. Haque
Pennsylvania State University, USA

EXTRACTION OF COMPENSATED σ_{xx} -σ_{yy} AND σ_{xy} STRESSES FROM A SINGLE FOUR-CONTACT SENSOR USING THE SPINNING TRANSVERSE VOLTAGE METHOD
J. Bartholomeyczik, S. Kibbel, P. Ruther and O. Paul
University of Freiburg, GERMANY

GEOMETRY DEPENDENT SENSITIVITY OF PLANAR PIEZORESISTIVE STRESS SENSORS BASED ON THE PSEUDO-HALL EFFECT
M. Doelle, D. Mager, P. Ruther and O. Paul
University of Freiburg, GERMANY

A VERTICALLY GUIDED MEMS PROBE CARD WITH DEEPLY RECESSED TRENCH-TYPE CANTILEVER
B.-H. Kim[1,2], D.-Y. Chung[2], C.-H. Chung[2], T.-U. Chun[3], S.-H. Seok[1], H.C. Kim[1] and K. Chun[1]
[1]*Seoul National University, KOREA*, [2]*ICMEMS Inc., KOREA* and [3]*Yulimhitech Co. LTD, KOREA*

MULTIFUNCTIONAL ACTIVE TACTILE SENSOR USING MAGNETIC MICRO ACTUATOR
Y. Hasegawa[1], H. Sasaki[1], T. Ando[1], M. Shikida[1], K. Sato[1] and K. Itoigawa[2]
[1]*Nagoya University, JAPAN* and [2]*Tokai Rika Co., Ltd., JAPAN*

POLYURETHANE RUBBER AS A MEMS MATERIAL: CHARACTERIZATION AND DEMONSTRATION OF AN ALL-POLYMER TWO-AXIS ARTIFICIAL HAIR CELL FLOW SENSOR
J.M. Engel, J. Chen, D. Bullen and C. Liu
University of Illinois, Urbana-Champaign, USA

300nm-THICK CANTILEVER IN PDMS FOR TACTILE SENSING
K. Noda, K. Hoshino, K. Matsumoto and I. Shimoyama
University of Tokyo, JAPAN

MULTI-WATT ELECTRIC POWER FROM A MICROFABRICATED PERMANENT-MAGNET GENERATOR
S. Das[1], D.P. Arnold[2], I. Zana[2], J.-W. Park[2], J.H. Lang[1] and M.G. Allen[2]
[1]*Massachusetts Institute of Technology, USA* and [2]*Georgia Institute of Technology, USA*

AN IMPROVED PERFORMANCE POLY SI PIRANI VACUUM GAUGE USING HEAT DISTRIBUTING STRUCTURAL SUPPORTS
J. Mitchell, G.R. Lahiji and K. Najafi
University of Michigan, USA

A HIGH-PERFORMANCE SURFACE-MICROMACHINED PIRANI GAUGE IN *SUMMIT V*™
B.H. Stark[1], J. Chae[1], A. Kuo[1], A. Oliver[2] and K. Najafi[1]
[1]*University of Michigan, USA* and [2]*Sandia National Laboratory, USA*

A MONOLITHIC INTEGRATED ARRAY OF OUT-OF-PLANE HOT-WIRE FLOW SENSORS AND DEMONSTRATION OF BOUNDARY-LAYER FLOW IMAGING
J. Chen, J. Engel, N. Chen and C. Liu
University of Illinois, Urbana-Champaign, USA

FISH & CHIPS: SINGLE CHIP SILICON MEMS CTDL SALINITY, TEMPERATURE, PRESSURE AND LIGHT SENSOR FOR USE IN FISHERIES RESEARCH
A. Hyldgård, O. Hansen and E.V. Thomsen
Technical University of Denmark, DENMARK

FABRICATION OF CIRCULAR DIAPHRAGM FOR PIEZOELECTRIC ACOUSTIC DEVICES
W.S. Lee, Y.C. Kim, J.S. Lee, S.W. Lee and S.S. Lee
Korea Advanced Institute of Science and Technology, KOREA

SPIRAL-TUBE PARYLENE INTRAOCULAR PRESSURE SENSOR
P.-J. Chen[1], D. Rodger[1,2], M. Humayun[2] and Y.-C. Tai[1]
[1]California Institute of Technology, USA and
[2]University of Southern California, USA

MICROMACHINED CAPACITIVE TRANSDUCER ARRAYS FOR INTRAVASCULAR ULTRASOUND IMAGING
R.O. Guldiken and F.L. Degertekin
Georgia Institute of Technology, USA

SURFACE AND BULK MICROMACHINED DUAL BACK-PLATE CONDENSER MICROPHONE
D.T. Martin, K. Kadirvel, J. Liu, R.M. Fox, M. Sheplak and T. Nishida
University of Florida, USA

PROPOSAL OF NEW TYPE OF MICRO-MACHINED QUARTZ TUNING FORK AFM PROBE
H. Hida[1], M. Shikida[1], K. Fukuzawa[1], A. Ono[2], K. Sato[2], K. Asaumi[3], Y. Iriye[3], D. Cheng[1] and K. Sato[1]
[1]*Nagoya University, JAPAN*,
[2]*Toyo Communication Equipment Co., Ltd, JAPAN* and
[3]*Mizuho Information and Research Institute Inc., JAPAN*

MICROFABRICATED SPHERICAL BI-CONVEX QUARTZ CRYSTAL MICROBALANCE ARRAY
L. Li[1], T. Abe[1,2] and M. Esashi[1]
[1]*Tohoku University, JAPAN* and [2]*PRESTO, JST, JAPAN*

MICROFABRICATED FINGER-QCM ARRAY FOR ULTRAHIGH SENSITIVE GRAVIMETRY
L. Li[1], T. Abe[1,2] and M. Esashi[1]
[1]*Tohoku University, JAPAN* and [2]*PRESTO, JST, JAPAN*

MICRO DICE - AN ELECTROSTATIC MICRO RANDOM NUMBER GENERATOR
M. Mita[1], H. Toshiyoshi[2], M. Ataka[2] and H. Fujita[2]
[1]*Japan Aerospace Exploration Agency, JAPAN* and
[2]*University of Tokyo, JAPAN*

RESONANT MAGNETIC FIELD SENSOR WITH FREQUENCY OUTPUT
R. Sunier[1], Y. Li[1], K.-U. Kirstein[1], T. Vancura[1], H. Baltes[1] and O. Brand[2]
[1]*ETH Zürich, SWITZERLAND* and
[2]*Georgia Institute of Technology, USA*

PARAMETRICALLY AMPLIFIED RESONANT SENSOR WITH PSEUDO-COOLING EFFECT
H. Wakamatsu, T. Ono and M. Esashi
Tohoku University, JAPAN

FULLY ENCAPSULATED SUB-MILLIMETER ACCELEROMETERS
W.-T. Park[1], R.N. Candler[1], V. Ayanoor-Vitikkate[1], M. Lutz[2], A. Partridge[2], G. Yama[2] and T.W. Kenny[1]
[1]*Stanford University, USA* and [2]*Robert Bosch Corporation, USA*

DESIGN & FABRICATION OF MINIATURIZED SIX-DEGREE OF FREEDOM PIEZORESISTIVE ACCELEROMETER
R. Amarasinghe, D.V. Dao, T. Toriyama and S. Sugiyama
Ritsumeikan University, JAPAN

THE RESONATING STAR GYROSCOPE
M.F. Zaman, A. Sharma, B.V. Amini and F. Ayazi
Georgia Institute of Technology, USA

VACUUM PACKAGED LOW NOISE GYROSCOPE WITH SUB mdeg/s/√ RESOLUTION
J.-Y. Lee[1], S.-H. Jeon[1], H.-K. Jung[1], H.-K. Chang[2] and Y.-K. Kim[1]
[1]*Seoul National University, KOREA* and
[2]*Intellimicrons Co., LTD., KOREA*

DESIGN AND FABRICATION OF A MICROFLUID ANGULAR RATE SENSOR
J. Zhou, G. Yan, Y. Zhu, Z. Xiao and J. Fan
Peking University, CHINA

DESIGN, FABRICATION, AND TESTING OF MECHANICAL TIME DELAY MICROMECHANISM
J. Liu[1], L. Fan[2] and D.L. DeVoe[1]
[1]*University of Maryland, USA* and [2]*Naval Surface Warfare Center, USA*

Actuators

BI-DIRECTIONAL MICRO RELAYS WITH LIQUID-METAL WETTED CONTACTS
A. Cao, P. Yuen and L. Lin
University of California, Berkeley, USA

MEMS FLEXTENSIONAL ACTUATOR USING LEAD ZIRCONATE TITANATE THIN FILM
H.G. Yu, S. Tadigadapa and S. Trolier-McKinstry
Pennsylvania State University, USA

PIEZOELECTRIC BIMORPH TRANSDUCERS BASED ON SINGLE CRYSTAL $AL_{0.3}GA_{0.7}$ AS FILMS
L. Li[1], P. Kumar[1], L. Calhoun[2] and D.L. DeVoe[1]
[1]*University of Maryland, USA* and [2]*Laboratory for Physical Sciences, USA*

PIEZOELECTRIC ACTUATOR BASED ON STIFFNESS CONTROL AND STROKE AMPLIFICATION FOR LARGE LATERAL ACTUATION
Y.H. Seo, D.-S. Choi, J.-H. Lee, T.-M. Lee, T.-J. Je and K.-H. Whang
Korea Institute of Machinery and Materials, S. KOREA

A DIE-SCALE MICROMACHINING PROCESS FOR BULK PZT AND ITS APPLICATION TO IN-PLANE ACTUATORS
T. Li and Y.B. Gianchandani
University of Michigan, USA

BIDIRECTIONAL ELECTROSTATIC LINEAR SHUFFLE MOTOR WITH TWO DEGREES OF FREEDOM
E. Sarajlic[1], E. Berenschot[1], H. Fujita[2], G. Krijnen[1] and M. Elwenspoek[1]
[1]*University of Twente, THE NETHERLANDS* and
[2]*University of Tokyo, JAPAN*

AN ELECTROSTATIC INERTIA-DRIVEN MICRO ROVER
M. Mita[1], H. Toshiyoshi[2] and H. Fujita[2]
[1]*Japan Aerospace Exploration Agency, JAPAN* and
[2]*University of Tokyo, JAPAN*

LINEAR MICROMOTORS AND SPATIAL MICROMECHANISMS BASED ON UV-LIGA
W.-J. Cheng and D.L. DeVoe
University of Maryland, USA

SELECTIVE STICTION BASED VERTICAL COMB ACTUATORS
J. Kim, D. Christensen and L. Lin
University of California, Berkeley, USA

ALL PDMS PNEUMATIC BALLOON ACTUATORS FOR BIDIRECTIONAL MOTION OF MICRO FINGER
O.C. Jeong, S. Kusuda and S. Konishi
Ritsumeikan University, JAPAN

KINEMATICALLY-STABILIZED MICROBUBBLE ACTUATOR ARRAYS
G. Yuan, X. Wu, Y.-K. Yoon and M.G. Allen
Georgia Institute of Technology, USA

AN ELECTROSTATICALLY LATCHING THERMOPNEUMATIC MICROVALVE WITH CLOSED-LOOP POSITION SENSING
J.A. Potkay and K.D. Wise
University of Michigan, USA

A PASSIVE MICRO GAS REGULATOR FOR HYDROGEN FLOW CONTROL
A. Debray[1], T. Nakakubo[1], K. Ueda[1], S. Mogi[1], M. Shibata[1] and H. Fujita[2]
[1]*Canon, Inc., JAPAN* and [2]*University of Tokyo, JAPAN*

MICROPUMPING BY DIRECTIONAL GROWTH AND HYDROPHOBIC VENTING OF BUBBLES
D.-S. Meng and C.-J. Kim
University of California, Los Angeles, USA

POSTER / ORAL SESSION III

Materials and Device Characterization

ZnO NANOWIRES BASED UV PHOTODIODES
L. Luo, Y. Zhang, S.S. Mao and L. Lin
University of California, Berkeley, USA

NANO CONTACT FORMATION IN A SIMPLE MEMS DEVICE FOR THE CONDUCTANCE MEASUREMENTS OF NANO OBJECTS
M. Gel, S. Ishida, S. Iwamoto, Y. Arakawa and H. Fujita
University of Tokyo, JAPAN

DETERMINING THE STRENGTH OF MICRO-BEAMS WITHOUT MEASURING FORCES OR DISPLACEMENTS
D. Elata[1], A. Hirshberg[1] and M. Naftali[2]
[1]*Technion - Israel Institute of Technology, ISRAEL* and
[2]*SCD Semi Conductor Devices, ISRAEL*

DEVELOPEMENT OF ADHESIVE CONTACT OF MEMS-SWITCHES UPON ACTUATION CYCLING
G. Gregori[1], R.E. Mihailovich[2], J.F. DeNatale[2] and D.R. Clarke[1]
[1]*University of California, Santa Barbara, USA* and
[2]*Rockwell Scientific Company, USA*

NEW FATIGUE DAMAGE EVALUATION OF MEMS MATERIALS UNDER TENSION-COMPRESSION CYCLIC LOADING
Y. Isono[1], H. Kito[1], T. Kikuchi[1], T. Shimazu[2] and M. Katayama[2]
[1]*Ritsumeikan University, JAPAN* and
[2]*Sumitomo Electric Industries, Ltd., JAPAN*

VISCO-ELASTIC PROPERTIES OF MICRON-THICK SU-8 POLYMERS MEASURED BY TWO DIFFERENT TYPES OF UNIAXIAL TENSILE TESTS
T. Namazu, S. Inoue, K. Takio, T. Fujita,
K. Maenaka and K. Koterazawa
University of Hyogo, JAPAN

LOW-STRESS, HEAVILY-DOPED POLYCRYSTALLINE SILICON CARBIDE FOR MEMS APPLICATIONS
J. Trevino, X.-A. Fu, M. Mehregany and C. Zorman
Case Western Reserve University, USA

STICTION-FREE CANTILEVERS WITH ROUNDED CROSS-SECTION
D.-H. Kim, J.-W. Jeon, S.-I. Chang, K.S. Lim and J.-B. Yoon
Korea Advanced Institute of Science and Technology, KOREA

FABRICATION AND MODELING OF 3-D SELF-ASSEMBLED SOI MEMS CONTROLLED BY THERMAL AND PLASTIC STRAINS
F. Iker[1,2], N. André[1], J. Proost[1], T. Pardoen[1] and J.-P. Raskin[1]
[1]*Université Catholique de Louvain, BELGIUM* and
[2]*IMEC, BELGIUM*

HIGH-TEMPERATURE COMPATIBLE NICKEL SILICIDE THERMOMETER AND HEATER FOR CATALYTIC CHEMICAL MICROREACTORS
S. Jensen, U.J. Quaade and O. Hansen
Technical University of Denmark, DENMARK

NANOCOMPOSITE EFFECTS ON THE COEFFICIENT OF THERMAL EXPANSION MODIFICATION FOR HIGH PERFORMANCE ELECTRO-THERMAL MICROACTUATOR
L.-N. Tsai, Y.-T. Cheng and W. Hsu
National Chiao Tung University, CHINA

MECHANISM OF TEMPERATURE-INDUCED PLASTIC DEFORMATION OF AMORPHOUS DIELECTRIC FILMS FOR MEMS APPLICATIONS
Z. Cao and X. Zhang
Boston University, USA

MICRO/NANO GLASS PRESS MOLDING USING SILICON CARBIDE MOLDS FABRICATED BY SILICON LOST MOLDING
K.-O. Min, S. Tanaka and M. Esashi
Tohoku University, JAPAN

THIN FILM METALLIC GLASSES AS NEW MEMS MATERIALS
S. Hata, J. Sakurai and A. Shimokohbe
Tokyo Institute of Technology, JAPAN

MEMS RELIABILITY: METROLOGY SET-UP FOR INVESTIGATION OF FATIGUE CAUSES
O. Millet[1], O. Blanrue[1], B. Legrand[1], D. Collard[1,2] and L. Buchaillot[1]
[1]*IEMN, FRANCE* and [2]*University of Tokyo, JAPAN*

MICROMACHINING OF PULSED LASER ANNEALED PECVD Si_xGe_{1-x} DEPOSITED AT TEMPERATURES ≤ 370˚C
S. Sedky[1,2] and A. Witvrouw[2]
[1]*American University in Cairo, EGYPT* and [2]*IMEC, BELGIUM*

Fabrication and Packaging

A TWO-LEVEL PREDICTION MODEL FOR DEEP REACTIVE ION ETCH (DRIE)
H. Sun, T. Hill, H. Taylor, M. Schmidt and D. Boning
Massachusetts Institute of Technology, USA

CREATING POLYMER-BASED MICROSTRUCTURES WITH VARIOUS ASPECT RATIOS FROM A SINGLE TEMPLATE FOR CELLULAR FORCE MEASUREMENTS
Y. Zhao, H. Yu and X. Zhang
Boston University, USA

A LIQUID-BASED GRAVITY-DRIVEN ETCHING-STOP TECHNIQUE AND ITS APPLICATION TO WAFER LEVEL CANTILEVER THICKNESS CONTROL OF AFM PROBES
W.-C. Lin[1], C.-C. Liang[1], C.-H. Tsai[1], G.-W. Hsieh[1] and L.-J. Yang[2]
[1]*Industrial Technology Research Institute, TAIWAN ROC* and
[2]*Tamkang University, TAIWAN ROC*

TOWARDS A VERSATILE DRIE: SILICON PIT STRUCTURES COMBINED WITH ELECTROCHEMICAL ETCH STOP
P. Kurzawski, T. Salo and A. Hierlemann
ETH Zürich, SWITZERLAND

FLEXIBLE STAMP FOR NANOIMPRINT LITHOGRAPHY
T. Nielsen[1], R.H. Pedersen[1], O. Hansen[1], T. Haatainen[2], A. Tolkki[2], J. Ahopelto[2] and A. Kristensen[1]
[1]*Technical University of Denmark, DENMARK* and
[2]*VTT Technical Research Centre of Finland, FINLAND*

HIGHLY CONTROLLABLE ELECTROCHEMICAL DEEP ETCHING PROCESS ON SILICON
Y. Chen[1,2], L. Wang[1,2] and P.M. Sarro[3]
[1]*East China Normal University, CHINA,*
[2]*State Key Laboratory of Transducer Technology, CHINA* and
[3]*Delft University of Technology, THE NETHERLANDS*

MULTI-USER HYBRID PROCESS PLATFORM FOR MEMS DEVICES USING SILICON-ON-INSULATOR WAFERS
P. Lin[1,2], R.M. Boysel[1], M. Boysel[1], M. Winters[1], W. Hawkins[1], J. Kubby[1,2], P. Gulvin[1,2], J. Diehl[2], K. Feinberg[2], K. German[2], L. Herko[2], N. Jia[2], J. Ma[2], J. Meyers[2], P. Nystrom[2] and Y.R. Wang[2]
[1]*Infotonics Technology Center, USA* and [2]*Xerox Corporation, USA*

DEEP REACTIVE ION ETCHING OF PYREX GLASS USING A BONDED SILICON WAFER AS AN ETCHING MASK
T. Akashi[1], Y. Yoshimura[1] and S. Higashiyama[2]
[1]*Hitachi, Ltd., JAPAN* and
[2]*Hitachi Kyowa Engineering Co. Ltd., JAPAN*

ULTRA LOW LEAK DETECTION METHOD FOR MEMS DEVICES
F. Gueissaz
ASULAB SA, SWITZERLAND

NEXT ALCHEMY: NANOPARTICLE EXOTHERMIC ALLOYING CHEMISTRY FOR PRODUCING TALL ON-CHIP CAST METAL MICROSTRUCTURES
R. Jakka and C.G. Wilson
Louisiana Technical University, USA

LOW-POWER THERMAL ISOLATION FOR ENVIRONMENTALLY RESISTANT MICROINSTRUMENTS
S.-H. Lee, J. Chae, S. Yoon, N. Yazdi and K. Najafi
University of Michigan, USA

MODULAR ASSEMBLY/PACKAGING OF MULTI-SUBSTRATE MICROSYSTEMS (WIMS CUBE) USING THERMO-MAGNETICALLY ACTUATED CABLES
A.B. Ucok, J.M. Giachino and K. Najafi
University of Michigan, USA

FABRICATION OF MEMS STRUCTURE WITH NANO-GAP USING PHOTO-ASSISTED ELECTROCHEMICAL ETCHING
D.H. Kim, H.C. Kim and K. Chun
Seoul National University, KOREA

ON-CHIP HERMATIC PACKAGING ENABLED BY POST-DEPOSITION ELECTROCHEMICAL ETCHING OF POLYSILICON
R. He and C.-J. Kim
University of California, Los Angeles, USA

WAFER-LEVEL VACCUM PACKAGE WITH VERTICAL FEEDTHROUGHS
J. Chae, J.M. Giachino and K. Najafi
University of Michigan, USA

A NOVEL FABRICATION METHOD FOR HYBRID, MICROFLUIDIC DEVICES
C.P. Steinert, N. Schmitt, E. Deier, M. Daub, B. deHeij and R. Zengerle
University of Freiburg, GERMANY

CONTACT PRINTED MASKS FOR 3D MICROFABRICATION IN NEGATIVE RESISTS
D. Haefliger and A. Boisen
Technical University of Denmark, DENMARK

BUBBLE JET PRINTHEAD WITH INTEGRATED POLYIMIDE NOZZLE PLATE
T. Lindemann[1], H. Ashauer[2], T. Goettsche[2], H. Sandmaier[2], Y. Yu[3], R.-P. Peters[3], D. Sassano[4], A. Bellone[4], A. Scardovi[4], R. Zengerle[1] and P. Koltay[1]
[1]*University of Freiburg, GERMANY*, [2]*HSG-IMIT, GERMANY*, [3]*STEAG microParts, GERMANY* and [4]*Olivetti I-Jet, ITALY*

MICROMACHINED FOUNTAIN PEN AS A TOOL FOR ATOMIC FORCE MICROSCOPE-BASED NANOELECTROCHEMICAL METAL DEPOSITION
S. Deladi, N.R. Tas, J.W. Berenschot, J.H. de Boer, M.J. de Boer, G.J.M. Krijnen and M.C. Elwenspoek
University of Twente, THE NETHERLANDS

PARYLENE ETCHING TECHNIQUES FOR MICROFLUIDICS AND BIOMEMS
E. Meng[1] and Y.-C. Tai[2]
[1]*University of Southern California, USA* and
[2]*California Institute of Technology, USA*

PROGRAMMABLE RECONFIGURABLE SELF-ASSEMBLY: APPROACHING THE PARALLEL HETEROGENEOUS INTEGRATION ON FLEXIBLE SUBSTRATES
J.-H. Chung, W. Zheng and H.O. Jacobs
University of Minnesota, USA

3D MICROSTRUCTURES FABRICATION OF PARAFFIN OR PLASTICS WITH LASER HEATING
N. Tsukada, T. Nakao and T. Higuchi
University of Tokyo, JAPAN

A 32-CHANNEL ACTIVE HIGH DENSITY CONNECTOR FOR BIOMEDICAL APPLICATIONS
S. Nikles, K. Najafi, S. Bledsoe and R.M. Bradley
University of Michigan, USA

TRANSFER OF METAL MEMS PACKAGES USING A WAFER-LEVEL SOLDER SACRIFICIAL LAYER
W.C. Welch, III and K. Najafi
University of Michigan, USA

MULTI-STEP SEQUENTIAL BATCH SELF-ASSEMBLY OF THREE-DIMENSIONAL MICRO-STRUCTURES USING MAGNETIC FIELD
E. Iwase and I. Shimoyama
University of Tokyo, JAPAN

SELF-ASSEMBLY OF MEMS COMPONENTS IN AIR ASSISTED BY DIAPHRAGM AGITATION
S.-H. Liang, K. Wang and K. Böhringer
University of Washington, USA

SILICON PROFILE TRANSFORMATION AND SIDEWALL ROUGHNESS REDUCTION USING HYDROGEN ANNEALING
M.-C.M. Lee, J. Yao and M.C. Wu
University of California, Los Angeles, USA

Wednesday, February 2, 2005

8:10 a.m. **INVITED SPEAKER**
MICROMACHINING/NANOTECHNOLOGY IN DIRECT METHANOL FUEL CELL
E. Sakaue
Toshiba Corporation, JAPAN

SESSION 5 **POWER - MEMS**
Session Chairs:
Y. Suzuki, *The University of Tokyo, JAPAN*
L. Lin, *University of California at Berkeley, USA*

8:50 a.m. **A NOVEL MICRO COUNTER-STREAM-MODE OSCILLATING-FLOW (COSMOS) HEAT-PIPE**
M. Sugimoto[1], K. Minai[1], M. Uemura[2], S. Nishio[2] and O. Tabata[3]
[1]*Ritsumeikan University, JAPAN*,
[2]*University of Tokyo, JAPAN* and
[3]*Kyoto University, JAPAN*

9:10 a.m. **FABRICATION AND CHARACTERIZATION OF AN INTEGRATED THERMAL MICROSYSTEM**
M. Lee[1], L.S.L. Cheung[2], Y.-K. Lee[1], M. Wong[1] and Y. Zohar[2]
[1]*Hong Kong University of Science and Technology, HONG KONG* and
[2]*University of Arizona, USA*

9:30 a.m. **GENERATING ELECTRIC POWER WITH A MEMS ELECTROQUASISTATIC INDUCTION TURBINE-GENERATOR**
J.L. Steyn, S.H. Kendig, R. Khanna, T.M. Lyszczarz, S.D. Umans, J.U. Yoon, C. Livermore and J.H. Lang
Massachusetts Institute of Technology, USA

9:50 a.m. **ARRAYED LIQUID ROTOR ELECTRET POWER GENERATOR SYSTEMS**
J.S. Boland, J.D.M. Messenger, H.W. Lo and Y.-C. Tai
California Institute of Technology, USA

10:10 a.m. **BREAK**

10:40 a.m. to 12:40 p.m. **POSTER/ORAL SESSION IV**

12:40 p.m. **LUNCH**

SESSION 6 **PHYSICAL MICROSYSTEMS**
Session Chairs:
T. Akin, *Middle East Technical University, TURKEY*
O. Brand, *Georgia Institute of Technology, USA*

1:40 p.m. **D-MICROGEIGER: A MICROFABRICATED BETA-PARTICLE DETECTOR WITH DUAL CAVITIES FOR ENERGY SPECTROSCOPY**
C.G. Wilson, C.K. Eun and Y.B. Gianchandani
University of Michigan, USA

2:00 p.m. **A DUAL AXIS GAS GYROSCOPE UTILIZING LOW-DOPED SILICON THERMISTOR**
V.T. Dau[1], T. Shiozawa[2], D.V. Dao[1], H. Kumagai[2] and S. Sugiyama[1]
[1]*Ritsumeikan University, JAPAN* and
[2]*Tamagawa Seiki Co. LTD, JAPAN*

2:20 p.m. **MECHANICAL NOISE-LIMITED CMOS-MEMS ACCELEROMETERS**
J.M. Tsai[1,2] and G.K. Fedder[1]
[1]*Carnegie Mellon University, USA* and
[2]*VIA Technologies Inc., TAIWAN*

2:40 p.m. **A LOW COST WAFER-LEVEL MEMS PACKAGING TECHNOLOGY**
P. Monajemi, P.J. Joseph, P.A. Kohl and F. Ayazi
Georgia Institute of Technology, USA

3:00 p.m. **SINGLE-CHIP ATOMIC FORCE MICROSCOPE**
S. Hafizovic[1], T. Volden[1], D. Barrettino[2], K.-U. Kirstein[1] and A. Hierlemann[1]
[1]*Swiss Federal Institute of Technology ETH, SWITZERLAND* and
[2]*University of Washington, USA*

3:20 p.m. **BREAK**

SESSION 7 **POLYMER MEMS**
Session Chairs:
S. Konishi, *Ritsumeikan University, JAPAN*
H.C. Tilmans, *IMEC, BELGIUM*

3:40 p.m. **A MODULAR EXPANDABLE TACTILE SENSOR USING FLEXIBLE POLYMER**
H.-K. Lee[1], S.-I. Chang[1], K.-H. Kim[2], S.-J. Kim[1], K.-S. Yun[1] and E. Yoon[1]
[1]*Korea Advanced Institute of Science and Technology, KOREA* and
[2]*Samsung Electronics Co., KOREA*

4:00 p.m. **ARRAYS OF CRICKET-INSPIRED SENSORY HAIRS WITH CAPACITIVE MOTION DETECTION**
J. van Baar, M. Dijkstra, R. Wiegerink, T. Lammerink, R. de Boer and G. Krijnen
University of Twente, THE NETHERLANDS

4:20 p.m. **A MICROHAND: MODELING, MANUFACTURING, AND DEMONSTRATION**
Y. Lu[1], Z. An[2] and C.-J. Kim[2]
[1]*Rutgers University, USA* and
[2]*University of California, Los Angeles, USA*

4:40 p.m. **RAPID MANUFACTURING OF EMBEDDED MICROCHANNELS FROM A SINGLE LAYERED SU-8, AND DETERMINING THE DEPENDENCE OF SU-8 YOUNG'S MODULUS ON EXPOSURE DOSE WITH A LASER ACOUSTIC TECHNIQUE**
H. Yu, O. Balogun, B. Li, T.W. Murray and X. Zhang
Boston University, USA

5:00 p.m. **DESIGN, FABRICATION, AND CHARACTERIZATION OF ELECTRICAL AND FLUIDIC INTERCONNECTIONS FOR A MULTI-CHIP MICROELECTROFLUIDIC BENCH**
S.D. Suk, S. Chang and Y.-H. Cho
Korea Advanced Institute of Science and Technology, REPUBLIC OF KOREA

5:20 p.m. **ADJOURN FOR THE DAY**

7:00 P.M. **CONFERENCE BANQUET**

POSTER / ORAL SESSION IV

Bio MEMS

STRETCH-AND-POSITIONING OF SINGLE STRANDED DNA AS A TEMPLATE FOR MOLECULAR CONSTRUCTION
T. Kobayashi and M. Washizu
University of Tokyo, JAPAN

HIGH SPEED MICROFLUIDIC DOUBLET FLOW IN POOLS DRIVEN BY NON-CONTACT MICROMACHINED THERMAL SOURCES
A.S. Basu and Y.B. Gianchandani
University of Michigan, USA

SIZE-DEPENDENT BUBBLE DYNAMICS IN A MICROCHANNEL HEAT SINK
L.S.L. Cheung[1], M. Lee[2], Y.-K. Lee[2], M. Wong[2] and Y. Zohar[1]
[1]*University of Arizona, USA* and
[2]*Hong Kong University of Science and Technology, HONG KONG*

INTEGRATED ON-LINE MICRODEVICE FOR PROTEOMICS
M. Tabuchi[1] and Y. Baba[1,2,3]
[1]*University of Tokushima, JAPAN*, [2]*Nagoya University, JAPAN* and
[3]*AIST, JAPAN*

A FLOW-RATE INDEPENDENT CELL COUNTER USING A FIXED CONTROL VOLUME BETWEEN DOUBLE ELECTRICAL SENSING ZONES
D.W. Lee, S. Yi and Y.-H. Cho
Korea Advanced Institute of Science and Technology, REPUBLIC OF KOREA

MICROVISION-ACTIVATED AUTOMATIC OPTICAL MANIPULATOR FOR MICROSCOPIC PARTICLES
P.-Y. Chiou, A.T. Ohta and M.C. Wu
University of California, Los Angeles, USA

MANIPULATION OF WHOLE BLOOD USING TRAVELING WAVE DIELECTROPHORESIS
Y.J. Lo, A.M. Wo and U. Lei
National Taiwan University, TAIWAN

SINGLE-USE MICROFLUIDIC PUMPS AND VALVES BASED ON A THERMALLY RESPONSIVE PDMS COMPOSITE
B. Samel, J. Melin, P. Griss and G. Stemme
Royal Institute of Technology, SWEDEN

ENGINEERING SURFACE ROUGHNESS TO MANIPULATE DROPLETS IN MICROFLUIDIC SYSTEMS
A. Shastry, M.J. Case and K.F. Böhringer
University of Washington, USA

INTEGRATION OF PDMS MICROFLUIDIC CHANNEL WITH SILICON-BASED ELECTROMECHANICAL CANTILEVER SENSOR ON A CD CHIP
H. Cho, J. Kang, S. Kwak, K. Hwang, J. Min,
J. Lee, D. Yoon and T. Kim
Korea Institute of Science and Technology, KOREA

ACTIVE POSITIONING CONTROL OF SINGLE CELL/MICROBEAD IN A MICRO-WELL ARRAY CHIP BY DIELECTROPHORESIS
B.-G. Kim, K.-S. Yun and E. Yoon
Korea Advanced Institute of Science and Technology, KOREA

USING COMPLIANT MEMBRANES FOR DYNAMIC FLOW STABILIZATION IN MICROFLUIDIC SYSTEMS
B. Yang, J.L. Metter and Q. Lin
Carnegie Mellon University, USA

REAL-TIME MONITORING OF A DIELECTROPHORESIS BASED SELECTIVE FILTER USING MICROCHIP FLOW CYTOMETRY WITH INTEGRATED POLYMER WAVEGUIDES
Z. Wang[1], P.K. Petersen[1], A. Rogeberg[1],
J.P. Kutter[1], D.D. Bang[2] and A. Wolff[1]
[1]*Technical University of Denmark, DENMARK* and
[2]*Danish Institute for Food and Veterinary Research, DENMARK*

A WORLD-TO-CHIP MICROFLUIDIC INTERCONNECTION TECHNOLOGY WITH DUAL FUNCTIONS OF SAMPLE INJECTION AND SEALING FOR A MULTICHAMBER MICRO PCR CHIP
K.W. Oh, C. Park and K. Namkoong
Samsung Advanced Institute of Technology, KOREA

A CONFIGURATION FOR HIGH FLOW RATE, HIGH EFFICIENCY AND LOW PRESSURE LOSS MICROMACHINED ACTIVE AIR FILTRATION ELEMENT FOR AIRBORNE MICRO-NANOSCALE PARTICLES SEPARATION AND REMOVAL
B.L. Chua[1], M. Zhang[1], J.M. Huber[1], R.G. Broeke[1], A.S. Wexler[1],
N.C. Tien[1], D.A. Niemeier[1] and B.A. Holmen[2]
[1]*University of California, Davis, USA* and
[2]*University of Connecticut, USA*

A DROPLET-BASED LAB-ON-A-CHIP FOR COLORIMETRIC DETECTION OF NITROAROMATIC EXPLOSIVES
V.K. Pamula, V. Srinivasan, H. Chakrapani, R.B. Fair and E.J. Toone
Duke University, USA

TWO-DIMENSIONAL DIGITAL MICROFLUIDIC SYSTEM BY MULTI-LAYER PRINTED CIRCUIT BOARD
J. Gong and C.-J. Kim
University of California, Los Angeles, USA

MICROFLUIDIC DETECTION AND ANALYSIS BY INTEGRATION OF EVANESCENT WAVE SENSING WITH THERMOCAPILLARY ACTUATION
J.P. Valentino, S.M. Troian and S. Wagner
Princeton University, USA

UNSTEADY IN-PLANE VORTEX MOTION IN A MICROCHANNEL LIQUID FLOW
L.M. Lee[1], W.L.W. Hau[2], Y.-K. Lee[2], M. Wong[2] and Y. Zohar[1]
[1]*University of Arizona, USA* and
[2]*Hong Kong University of Science and Technology, HONG KONG*

INTEGRATED PROCESS CONTROL FOR HIGHLY PARALLEL AND CONTACT-FREE MICROARRAY PRINTING
R. Niekrawietz, W. Honstein, O. Gutmann, B. de Heij, M. Daub and R. Zengerle
University of Freiburg, GERMANY

GENERIC LEAK-FREE DRUG STORAGE AND DELIVERY FOR MICRONEEDLE-BASED SYSTEMS
N. Roxhed, P. Griss and G. Stemme
Royal Institute of Technology, SWEDEN

MECHANICAL EFFECTS OF ATTACHING PROTEIN LAYERS ON NANOSCALE-THICK CANTILEVER BEAMS FOR RESONANT DETECTION OF VIRUS PARTICLES
A. Gupta, D. Akin and R. Bashir
Purdue University, USA

BIOMOLECULAR LINEAR MOTORS CONFINED TO MOVE UPON MICROPATTERNS ON GLASS
Y. Yoshida, R. Yokokawa, H. Suzuki, K. Atsuta, H. Fujita and S. Takeuchi
University of Tokyo, JAPAN

SU-8 LIFT-OFF PATTERNED SILICONE CHEMICAL VAPOR SENSOR ARRAYS
V.T.S. Wong, A. Huang and C.-M. Ho
University of California, Los Angeles, USA

MONOLITHIC INTEGRATED OPTICAL DETECTION FOR MICROFLUIDIC SYSTEMS USING THIN-FILM PHOTODIODES BASED ON AMORPHOUS SILICON
H. Schaefer, K. Seibel, M. Walder, L. Schoeler, T. Pletzer, M. Waidelich, H. Ihmels, D. Ehrhardt and M. Boehm
University of Siegen, GERMANY

POLYMER NANOCHANNEL FABRICATION AND ANALYSIS OF SINGLE PROTEIN MOLECULES
P. Sivanesan[1], Y. Li[1], K. Okamoto[2], C.S. Lee[2], D. English[2] and D.L. DeVoe[2]
[1]*Calibrant Biosystems, USA* and [2]*University of Maryland, USA*

SILICON BASED NANO LEAD FOR SINGLE CELL RECORDING
M. Shuzo, H. Arai, R. Kanzaki and I. Shimoyama
University of Tokyo, JAPAN

ADJUSTABLE-FORCE SOFT-LANDING CONTACT LITHOGRAPHY FOR PRECISION PATTERNING OF BIOMOLECULES
A. Salim[1,2], S. Humad[3], F. Ayazi[3] and B. Ziaie[1,2]
[1]*University of Minnesota, USA,* [2]*Purdue University, USA* and [3]*Georgia Institute of Technology, USA*

A FULLY-DRY PECVD-OXYNITRIDE PROCESS FOR MICROGC COLUMN FABRICATION
M. Agah and K.D. Wise
University of Michigan, USA

COMPLETE GRADIENT-LC-ESI SYSTEM ON A CHIP FOR PROTEIN ANALYSIS
J. Xie[1], J. Shih[1], Y. Miao[2], T.D. Lee[2] and Y.-C. Tai[1]
[1]California Institute of Technology, USA and
[2]Beckman Research Institute, USA

ON-CHIP TEMPERATURE GRADIENT LIQUID CHROMATOGRAPHY
C.Y. Shih, Y. Chen, J. Xie, Q. He and Y.C. Tai
California Institute of Technology, USA

A COCHLEAR ELECTRODE ARRAY WITH BUILT-IN POSITION SENSING
J. Wang[1], M. Gulari[1], P.T. Bhatti[1], B.Y. Arcand[2], K. Beach[1], C.R. Friedrich[2] and K.D. Wise[1]
[1]*University of Michigan, USA* and
[2]*Michigan Technological University, USA*

POLYMER MICROFLUIDICS COUPLED WITH MALDI MASS SPECTROMETRY
Y.-X. Wang[1], Y. Li[2], Y. Zhou[1], C.S. Lee[1] and D.L. DeVoe[1]
[1]*University of Maryland, USA* and [2]*Calibrant Biosystems, USA*

THE MICROMACHINED FLASHFET: A LOW-POWER, THREE-TERMINAL DEVICE FOR HIGH SPEED DETECTION OF VAPORS AT ATMOSPHERIC PRESSURE
B. Mitra and Y.B. Gianchandani
University of Michigan, USA

A NOVEL REUSABLE NANOMECHANICS-BASED PROTEIN BIOSENSOR WITH ELECTRICAL MANIPULATION
R.-Z. Hwang[1], L.-S. Huang[1], H.-S. Chang[2], C.-W. Wu[2], H.-C. Tien[2], S. Lin[1] and S.-Y. Lee[3]
[1]*National Taiwan University, TAIWAN,*
[2]*National Taiwan Ocean University, CHINA* and
[3]*Tamkang University, TAIWAN*

ON-CHIP MICRODIALYSIS SYSTEM WITH IN-LINE SENSING CAPABILITIES
Y.-C. Hsieh and J.D. Zahn
Pennsylvania State University, USA

A MINIATURIZED FLUORESCENCE DETECTION SYSTEM WITH AN INTEGRATED ORGANIC LIGHT EMITTING DIODE
J.H. Kim[1,2], Y.H. Kim[1], K.S. Shin[1], B.K. Kim[1], Y.M. Kim[1], Y.H. Lee[2], S.I. Moon[1], T.S. Kim[1], J.Y. Kang[1], E.G. Yang[1], S.S. Kim[2], B.K. Ju[1] and J.O. Park[1]
[1]*Korea Institute of Science and Technology, S. KOREA* and
[2]*Korea University, S. KOREA*

DEVELOPMENT OF AN SU-8 FABRY-PEROT BLOOD PRESSURE SENSOR
R. Melamud[1], A.A. Davenport[1], G.C. Hill[1], I.H. Chan[1], F. Declercq[2], P.G. Hartwell[3] and B.L. Pruitt[1]
[1]*Stanford University, USA,* [2]*EPFL, SWITZERLAND* and
[3]*Hewlett-Packard Laboratories, USA*

A MEMS DIFFERENTIAL CALORIMETER FOR BIMOLECULAR CHARACTERIZATION
L. Wang, Y. Zhao, E. Ng and Q. Lin
Carnegie Mellon University, USA

SILICON NANO-NEEDLES WITH SPECIFIC ATTACHMENT POINT FOR VISUALIZATION OF PROTEIN MOVEMENT
A.R. Laine, D. Okuno, K. Tabata, A. Tixier-Mita, H. Noji and H. Fujita
University of Tokyo, JAPAN

IN-SITU MICROFABRICATION OF PERMEATION MEMBRANE WITH PHOTO-CROSSLINKABLE RESIN FOR ISOLATION AND CULTURE OF INDIVIDUAL CELLS
F. Arai, A. Ichikawa, H. Maruyama, T. Uchida, K. Maeda, R. Yamauchi and T. Fukuda
Nagoya University, JAPAN

FABRICATION AND SIGNAL RECORDING FROM LIPID MEMBRANE SENSORS
Y. Kuwana and Y. Tamada
National Institute of Agrobiological Sciences, JAPAN

THE MICRO FABRY-PEROT INTERFEROMETER FOR THE SPECTRAL ENDOSCOPE
T. Dohi, K. Matsumoto and I. Shimoyama
University of Tokyo, JAPAN

CONTRACTION FORCE MEASUREMENTS IN CARDIAC MYOCYTES USING PDMS PILLAR ARRAYS
Y. Zhao and X. Zhang
Boston University, USA

MULTITHERMAL DNA MICRO-ARRAY CHIP FOR RAPID DNA MELTING TEMPERATURE MEASUREMENT AND ADVANCED SNP DISCRIMINATION
S. Petronis, D.T. Ganzhorn, C.B.V. Christensen and M. Dufva
Technical University of Denmark, DENMARK

Thursday, February 3, 2005

SESSION 8 BIOANALYTICAL SYSTEMS

Session Chairs:
R. Zengerle, *IMTEK, University of Freiburg, GERMANY*
L.-S. Fan, *National Tsing Hua University, TAIWAN*

8:10 a.m. **ELECTROLYTIC PATTERNING OF DISSOLVED OXYGEN MICROGRADIENTS DURING CELL CULTURE**
J.H. Park, T. Bansal, B.H. Chueh, S. Takayama and M.M. Maharbiz
University of Michigan, USA

8:30 a.m. **BIOMOLECULAR IMAGE SENSOR OF BACTERIORHODOPSIN PATTERNED BY ELECTRODEPOSITION**
S. Takamatsu[1], K. Hoshino[1], K. Matsumoto[1], T. Miyasaka[2] and I. Shimoyama[1]
[1]*University of Tokyo, JAPAN* and
[2]*Toin University of Yokohama, JAPAN*

8:50 a.m. **DETERMINISTIC LATERAL DISPLACEMENT MEMS DEVICE FOR CONTINUOUS BLOOD CELL SEPARATION**
S. Zheng[1], R. Yung[2], Y.-C. Tai[1] and H. Kasdan[3]
[1]*California Institute of Technology, USA,*
[2]*Stanford University, USA* and
[3]*International Remote Imaging Systems, Inc., USA*

9:10 a.m. **USING FEEDBACK CONTROL AND MICRO-FLUIDICS TO STEER INDIVIDUAL PARTICLES**
M. Armani, S. Chaudhary, R. Probst and B. Shapiro
University of Maryland, USA

9:30 a.m. **ON-CHIP SAMPLE PREPARATION BY ELECTROWETTING-ON-DIELECTRIC DIGITAL MICROFLUIDICS FOR MATRIX ASSISTED LASER DESORPTION/IONIZATION MASS SPECTROMETRY**
H. Moon, A.R. Wheeler, R.L. Garrell, J.A. Loo and C.-J. Kim
University of California, Los Angeles, USA

9:50 a.m. **MICROMACHINED INTRALUMINAL DEVICES FOR ACTIVE AND PASSIVE ELECTROMAGNETIC MEASUREMENTS OF FLOW**
K. Takahata and Y.B. Gianchandani
University of Michigan, USA

10:10 a.m. **BREAK**

SESSION 9 NANO SYSTEMS

Session Chairs:
G.D. Skidmore, *Zyvex Corporation, USA*
C. Hierold, *ETH Zürich, SWITZERLAND*

10:40 a.m. **FULLY INTEGRATED NANORESONATOR SYSTEM WITH ATTOGRAM/HZ MASS RESOLUTION**
E. Forsén[1], G. Abadal[2], S.G. Nilsson[3], J. Verd[2], R. Sandberg[1], W. Svendsen[1], J. Teva[2], F. Peréz-Muran[4], J. Esteve[4], E. Figueras[4], F. Campabadal[4], L. Montelius[3], N. Barniol[2], and A. Boisen[1]
[1]*Technical University of Denmark, DENMARK,*
[2]*Universitat Autònoma Barcelona, SPAIN,*
[3]*University of Lund, SWEDEN* and
[4]*Institut de Microelectrònica Barcelona, SPAIN*

11:00 a.m. **A NANO-CHEMO-MECHANICAL ACTUATOR BASED ON ARTIFICIAL MOLECULAR MACHINES**
T.J. Huang[1], Y. Liu[1], B. Brough[1], A.H. Flood[1], P. Bonvallet[1], H.-R. Tseng[1], M. Baller[2], S. Magonov[2], J.F. Stoddart[1] and C.-M. Ho[1]
[1]*University of California, Los Angeles, USA* and
[2]*Veeco Instruments, USA*

11:20 a.m. **MICRO PROXIMITY ELECTRON SOURCE FOR NANOPROCESSING IN ATMOSPHERE**
W. Cho[1], T. Ono[1], P.N. Minh[2] and M. Esashi[1]
[1]*Tohoku University, JAPAN* and
[2]*Vietnamese Academy of Science and Technology, VIETNAM*

11:40 a.m. **TEM OBSERVATION OF TENSILE DEFORMATION OF SILICON NANOWIRE BETWEEN MICROMACHINED SHARP OPPOSING TIPS**
T. Ishida[1], K. Kakushima[1], M. Mita[2] and H. Fujita[1]
[1]*University of Tokyo, JAPAN* and [2]*JAXA, JAPAN*

12:00 p.m. **MECHANICAL CHARACTERISTIC OF FIB DEPOSITED CARBON NANOWIRE BY ELECTROSTATIC ACTUATED NANO TENSILE TESTING DEVICE (EANAT)**
Y. Isono[1], M. Kiuchi[1], S. Sugiyama[1], T. Morita[2,3] and S. Matsui[2,3]
[1]*Ritsumeikan University, JAPAN,*
[2]*University of Hyogo, JAPAN* and
[3]Japan Science and Technology Agency, JAPAN

12:20 p.m. **CONFERENCE ADJOURNS**

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GENERAL INFORMATION

The 18th IEEE International Micro Electro Mechanical Systems Conference MEMS 2005 will be held in Miami Beach, FL, USA, at the Fontainebleau Hilton Resort. The landmark Fontainebleau Hilton Resort is located on the Atlantic Ocean, only minutes away from the famous nightlife in the South Beach area. The greater Miami Beach area is the launching point for numerous natural attractions including the Everglades and the Florida Keys. The Fontainebleau Hilton Resort has been the crown jewel of Miami Beach since its inception in 1954. Long before the trendy street cafes and nightlife scene erupted on South Beach, the famed Fontainebleau was the home to movie stars, politicians, major celebrities and more. Rich in history, and visited by every American president since Eisenhower, this legendary hotel has graced the Miami Beach landscape for nearly 50 years. Miami Beach and the Fontainebleau Hilton Resort continue to remain virtually synonymous, it's nearly impossible to imagine one without the other.

Conference Location

All sessions will be held at the Fontainebleau Hilton Resort.

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Conference Website

www.mems2005.org

Official Language

The official language of the conference is English and will be used for all presentations and printed materials.

Passport and Visa

All foreign visitors desiring to enter the United States must have a valid passport. Participants from countries requiring visas should apply to the American Consular offices or diplomatic mission in their countries. For details, please consult your travel agent or the nearest American consulate. Conference Management can send you a letter of invitation to the conference. Send a request by email to info@mems2005.org.

Climate

The average weather in Miami Beach in January is:
Normal High: 75° F/24° C
Normal Low: 59° F/5° C

Currency Exchange

Only US dollars are acceptable at regular stores and restaurants. The exchange rate fluctuates daily.
Visit http://europe.onada.com for current rates.

Traveler's Checks and Credit Cards

Credit cards, including MasterCard®, Diners Club®, Visa® and American Express®, and traveler's checks are accepted at most hotels, restaurants, department stores, and souvenir shops.

Tipping

15% is standard for meals. $1.00 per bag to skycaps, doormen, porters, and bellmen.

Electricity

Electricity throughout the United States is 110V, 60 Hz.

Insurance

The organizer cannot accept liability for accidents, injuries and losses, which might occur. Participants are encouraged to obtain travel insurance (medical, personal accident, and luggage) in their home country prior to departure.

REGISTRATION INFORMATION

The conference begins with registration for the Conference at the Fontainebleau Hilton Resort on Sunday, January 30th from 4:00 pm – 7:00 p.m. An informal Welcome Reception will be held in conjunction with registration from 4:30 p.m. – 8:30 p.m. The official technical program will begin Monday morning at 8:30 a.m. and adjourns on Thursday, February 3rd at approximately 12:20 p.m.

Registration & Information Desk

The Registration and Information desk will be open during the following times:

Sunday, January 30th	4:00 p.m.	-	7:00 p.m.
Monday, January 31st	7:00 a.m.	-	5:30 p.m.
Tuesday, February 1st	7:30 a.m.	-	5:00 p.m.
Wednesday, February 2nd	7:30 a.m.	-	5:20 p.m.
Thursday, February 3rd	7:30 a.m.	-	12:20 p.m.

Registration is an electronic process. To register for the conference please visit the website at *www.mems2005.org*. All attendees are encouraged to register in advance to avoid delays in registering at the conference. If you are unable to register online, a registration form is provided for you at the back of this brochure.

Registration payment, in US dollars only, is due within 10 days of receipt of your registration. The registration fee includes program material, (1) Technical Digest and CD-ROM, exhibit hall access, welcome reception, refreshment/coffee breaks, Wednesday Evening Conference Banquet, and a 20% non-refundable cancellation fee. A $50.00 fee will be charged for all substitutions. Pre-registration will close on January 14, 2005. After January 14, 2005, all prospective attendees will need to register on-site at the standard rate.

Cancellation Policy

A 20% non-refundable cancellation fee will be assessed to all cancellations on or before January 5, 2005. No refunds will be made after that date. Cancellation notice and refunds must be requested in writing.

Technical Digest and CD-ROM

An extended abstract of each paper presented at the Conference will be published in a Technical Digest and on a CD-ROM, which will be distributed to participants at the Conference. One copy of the Technical Digest and the CD-ROM is included in the registration fee. Additional copies may be ordered at the time of registration, or purchased at the Conference. Purchase price of the Technical Digest will increase after the conference. Be sure to order your additional copies in advance.

Conference Management

Preferred Meeting Management, Inc.
307 Laurel Street, San Diego, CA 92101-1630
Phone: 1-619-232-9499 • ***Fax:*** 1-619-232-0799
E-mail: info@mems2005.org

SOCIAL PROGRAM

Sunday Welcome Reception

Registration will begin at 4:00 p.m. on Sunday evening in conjunction with the Welcome Reception. The reception will be held outside on the lawn of the Fontainebleau Hilton Resort.

Conference Banquet

No conference is complete without a banquet. Join us for a wonderful evening.

Registration includes 1 ticket. Additional Guest Ticket - $80.00

TRAVEL INFORMATION

Miami International Airport

For a complete list of the commercial airline carriers that provide service please visit:
http://www.miami-airport.com/html/airlines_at_mia.html

Ground Transportation

Please contact SuperShuttle directly to make a reservation. One way from the Miami International Airport to the Fontainebleau Hilton Resort is $15 per person. Please have all your flight information, including connecting flights, available when making your reservation.
SuperShuttle reservations by phone: 1-305-871-2000
Please visit the following website for information regarding additional ground transportation services:
http://www.miami-airport.com/html/ground_transportation_service.htm

Car Rental

The conference has selected Budget Rent a Car as the official car rental company.
To get to your meeting successfully with Budget, follow these simple steps:
1.Call Budget directly at 1-800-772-3773 or visit the their website at *www.budget.com* to receive the best car rental rates available. **2.**Rates are available for any airport in Florida. **3.**Refer to the Convention Discount # U061347

Driving Directions

For directions, please visit the following website: *http://maps.yahoo.com/dd*

HOTEL RESERVATIONS

To make your reservation, please mail or fax your hotel reservation form directly to the Fontainebleau Hilton Resort.
Reservation can also be made on-line, by visiting the website at: *www.mems2005.org/attendees/hotel.html*
To receive the group discount rate when making reservation on-line, please use the following code: IEE

Fontainebleau Hilton Resort

4441 Collins Avenue
Miami Beach, Florida 33140
Phone: 1-305-538-2000 • ***Fax:*** 1-305-673-5351
Website: *www.fontainebleau.hilton.com*

A block of rooms has been reserved for the MEMS 2005 attendees at the following special low rate:

$195.00	Standard Room	Single	$205.00	Standard Room	Double
$215.00	Bay View Room	Single	$225.00	Bay View Room	Double
$239.00	Ocean View Room	Single	$249.00	Ocean View Room	Double

You must identify yourself as an attendee of IEEE MEMS 2005 to receive the group room rate. These non-commissioned, per-night, rates are subject to a room tax, presently at 13%. Reservations made after January 4, 2005 will be confirmed subject to availability of space and special group rate. A credit card is required to guarantee all reservations with a one-night advance deposit due at the time of booking. Reservations must be cancelled 72 hours in advance of arrival date. To avoid an early check-out fee, please advise the Hotel at or before check-in of any change in planned length of stay.

If you have any problems securing a room at the Fontainebleau Hilton Resort, please contact us at 1-619-232-9499 or at info@mems2005.org

CONFERENCE REGISTRATION FORM

Registration is an electronic process. To register online for the conference please visit the website at **www.mems2005.org**. If you are unable to register online, complete this form and mail it to the address below. Please complete ALL sections and type or print clearly.

Conference Presenter ☐

Region ☐ Europe/Africa ☐ Asia/Oceania ☐ Americas

First/Given Name _____ Family/Last Name _____

Preferred Salutation _____ First Name On Name Tag _____

Title _____ Degree _____

Position _____ Organization _____

Department _____ Division _____

Street Address _____ City _____

State/Province _____ Country _____ Zip/Postal Code _____

Telephone _____ Fax _____

Email _____

IEEE Member Number _____ Member of which IEEE Society _____

Name on electronic mailing list to be available to commercial supporters and conference attendees ☐ YES ☐ NO

If you require special arrangements, please indicate your request below.
Dietary _____ Physical _____

Conference Fee

	EARLY BIRD On or Before 09/01/04	ADVANCED After 09/01/04	STANDARD From 12/01/04 To 01/17/05	ONSITE After 01/17/05	
☐ IEEE Member	$550	$650	$750	$800	$ _____
☐ Non-Member	$690	$775	$850	$900	$ _____
☐ Student (with confirmation ☐)	$550	$650	$750	$800	$ _____
☐ Benefactor Free Ticket	$0	$0	$0	$0	$ 0.00
					Total $ _____

Registration payment in US Dollars only, is due within 10 days of receipt of your registration. The registration fee includes program material, (1) Technical Digest and CD-ROM, Exhibit Hall access, Welcome Reception, refreshments/coffee breaks, Wednesday Evening Conference Banquet, and a 20% non-refundable cancellation fee. A $50 fee will be charged for all substitutions. All requests for refunds must be received in writing no later than January 6, 2005. No refunds will be made after that date.

Conference Proceeding and CD-ROM, additional set *(conference fee includes 1 set / prices do not include shipping)*

☐ IEEE Member Cost per set: $100 No. of sets ____ **Total** $ _____

☐ Non-Member Cost per set: $125 No. of sets ____ **Total** $ _____

Wednesday Evening Conference Banquet, additional tickets *(1 ticket is included in the conference fee)*

Cost per guest ticket: $80 No. of tickets _____ **Total** $ _____

Grand Total $ _____

Payment

☐ Bankwire ☐ Check/Money Order - Make checks payable to: IEEE MEMS 2005 Conference

☐ Credit Card ☐ Visa® ☐ Mastercard® ☐ American Express®

Card Holder _____ Expiration Date ____ / ____ (MM/YY) Verification Code _____

(Last 3 digits on back of credit card)

Card Number |_|_|_|_|—|_|_|_|_|—|_|_|_|_|—|_|_|_|_|

Signature of Cardholder _____

Billing Address _____

City _____ State _____ Zip/Postal Code _____ Country _____

If you prefer to pay by check or money order, please complete and submit this form, with your check or money order payable to:
IEEE MEMS 2005 Conference c/o PMMI, 307 Laurel Street, San Diego, CA 92101-1630 USA / Phone: 1-619-232-9499 / Fax: 1-619-232-0799 / Email: info@mems2005.org

HOTEL RESERVATION FORM

Call, mail or fax this form to:

Fontainebleau Hilton Resort
4441 Collins Avenue, Miami Beach, Florida 33140
Phone: 1-305-538-2000 • ***Fax:*** 1-305-673-5351
Website: *www.fontainebleau.hilton.com*

You must identify yourself as an attendee of IEEE MEMS 2005 attendee to receive the group room rate.

Reservation Deadline: January 4, 2005
Reservations made after January 4, 2005 will be confirmed subject to availability of space and special group rate.

Last Name _____ First Name _____

Institute/Organization _____

Street Address _____

City _____

State/Province _____ Zip/Postal Code _____

Country _____ Email _____

Telephone _____ Fax _____

Number of people sharing room with you _____

Arrival Date _____ Departure Date _____

Room Reservation: These non-commissioned, per-night rates are subject to a room tax, presently at 13%.

- ☐ $195.00-Standard Room-Single
- ☐ $205.00-Standard Room-Double
- ☐ $215.00-Bay View Room-Single
- ☐ $225.00 -Bay View Room-Double
- ☐ $239.00-Ocean View Room-Single
- ☐ $249.00-Ocean View Room-Double

☐ Smoking ☐ Non-smoking

A credit card is required to guarantee all reservations with a one-night advance deposit due at the time of booking. Reservations must be cancelled 72 hours in advance of arrival date. To avoid an early check-out fee, please advise the Hotel at or before check-in of any change in planned length of stay.

Please indicate card ☐ MasterCard ☐ VISA ☐ American Express ☐ Discover Novus

Card Number |_|_|_|_|-|_|_|_|_|-|_|_|_|_|-|_|_|_|_| Expiration |_|_|-|_|_|

Signature ✗ _____