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TRANSDUCERS 2021 PROGRAM SCHEDULE

Block 1 - Monday, 21 June

All times are Universal Time Coordinated (UTC)

Welcome Address and Technical Program Information

13:00 - 13:30

TRANSDUCERS 2021 CONFERENCE CHAIRS
Jürgen Brugger, *École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND*
Amy Duwel, *Draper Laboratory, USA*
Yoshio Mita, *University of Tokyo, JAPAN*

Student Event

13:30 - 14:00

Industry Session 1

14:05 - 14:35

Invited Speaker I

14:40 - 14:50

B1-IS1 **TRANSFORMATION OF 2D PLANES INTO 3D SOFT STRUCTURES WITH ELECTRICAL FUNCTIONS** **1**
Hyunmin Moon, Byungwook Park, and **Sohee Kim**
Daegu Gyeongbuk Institute of Science and Technology (DGIST), KOREA

Invited Speaker II

14:40 - 14:50

B1-IS2 **DEMOCRATIZING DIGITAL MICROFLUIDICS** **4**
Chang-Jin "CJ" Kim
University of California, Los Angeles, USA

Invited Speaker III

14:40 - 14:50

B1-IS3 **UBIQUITOUS SENSING WITH MEMS-FTIR SPECTROSCOPY - APPLICATIONS IN AGRI-FOOD AND ENVIRONMENTAL MONITORING** **5**
Tarik Bourouina
Université Gustave Eiffel and CNRS, FRANCE

Invited Speaker IV

14:40 - 14:50

B1-IS4 **PUTTING ELECTRONICS TO WORK: HIGH-FREQUENCY DETECTION WITH CMOS NANOCAPACITOR ARRAYS**
Serge J.G. Lemay
University of Twente, NETHERLANDS

Session 1A - Soft Actuators

14:55 - 15:00

B1-1A1 **FABRICATION AND CHARACTERIZATION OF 3D PRINTED OUT-OF-PLANE TORSIONAL COMB-DRIVE ACTUATORS FOR MICROROBOTICS** **6**
Sukjun Kim and Sarah Bergbreiter
Carnegie Mellon University, USA

15:00 - 15:05

B1-1A2 **BIOINSPIRED LIGHT-DRIVEN SOFT ROBOTS BY A FACILE TWO-MODE LASER ENGRAVING AND CUTTING PROCESS** **10**
Yande Peng, Peisheng He, Ruiqi Guo, and Liwei Lin
University of California, Berkeley, USA

15:05 - 15:10

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Rodica-Cristina Voicu[1], Catalin Tibeica[1], Marius Pustan[2], Corina Birleanu[2], and Raluca Muller[1]
[1]National Institute for Research and Development in Microtechnologies, ROMANIA and
[2]Technical University of Cluj-Napoca, ROMANIA

15:10 - 15:15

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Takafumi Yamaguchi[1], Naoto Usami[1], Kei Misumi[1], Atsushi Toyokura[1], Akio Higo[1], Shimpei Ono[2], Gilgueng Hwang[1,3], Guilhem Larrieu[1,4], Yoshiho Ikeuchi[1], Agnès Tixier-Mita[1], Ken Saito[5], Timothée Lévi[1,6], and Yoshio Mita[1]
[1]University of Tokyo, JAPAN, [2]Central Research Institute of Electric Power Industry, JAPAN, [3]C2N-CNRS, FRANCE, [4]LAAS-CNRS, FRANCE, [5]Nihon University, JAPAN, and [6]University of Bordeaux, FRANCE

15:15 - 15:20

B1-1A5 **SELF-ACTUATED POLYMER-BASED CANTILEVERS WITH SHARP SILICON TIPS FOR HIGH-SPEED ATOMIC FORCE MICROSCOPY** **22**
Matthias Neuenschwander, Santiago H. Andany, Mustafa Kangül, Nahid Hosseini, and Georg E. Fantner
École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND

Session 1B - MEMS Ultrasound Transducers (MUTs)

14:55 - 15:00

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Chun-Yu Chou, Po-Chun Chen, Hong-Teng Wu, Tzu-Hsuan Hsu, and Ming-Huang Li
National Tsing Hua University, TAIWAN

15:00 - 15:05

B1-1B2 **A MULTI-FREQUENCY PMUT ARRAY BASED ON CERAMIC PZT FOR ENDOSCOPIC PHOTOACOUSTIC IMAGING** **30**

Haoran Wang[1], Hao Yang[2], Huabei Jiang[2], Zhenfang Chen[3], Philip X.-L. Feng[1], and Huikai Xie[4]
[1]University of Florida, USA, [2]University of South Florida, USA, [3]MEMS Engineering and Materials Inc., USA, and [4]BIT Chongqing Center for Microelectronics and Microsystems, CHINA

15:05 - 15:10

B1-1B3 **A 128x1 PHASED ARRAY PIEZOELECTRIC MICROMACHINED ULTRASOUND TRANSDUCER (PMUT) FOR MEDICAL IMAGING** **34**

Sina Sadeghpour, Marcus Ingram, Chen Wang, Jan D'Hooge, and Michael Kraft
University of Leuven (KU Leuven), BELGIUM

15:10 - 15:15

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Bernard Herrera, Michele Pirro, Gabriel Giribaldi, Luca Colombo, and Matteo Rinaldi
Northeastern University, USA

15:15 - 15:20

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Guo-Hua Feng[1] and Wen-Sheng Chen[2]
[1]National Tsing Hua University, TAIWAN and [2]National Chung Cheng University, TAIWAY

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Sheng Wu[1,2,3], Wei Li[1,3], Ding Jiao[1,3], Heng Yang[1,3], Tao Wu[2], and Xinxin Li[1,2,3]
[1]Chinese Academy of Sciences (CAS), CHINA, [2]ShanghaiTech University, CHINA, and [3]University of Chinese Academy of Sciences (UCAS), CHINA

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Lingmeng Yang, Zhezheng Zhu, Wenhan Chang, Fanrui Meng,
Chengchen Gao, Yilong Hao, and Zhenchuan Yang
Peking University, CHINA

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Daniel S. Drew and Sean Follmer
Stanford University, USA

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Jurij Simcic, Richard D. Kidd, Stojan Madzunkov, and Murray R. Darrach
NASA Jet Propulsion Laboratory, USA

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15:15 - 15:20

Session 1D - Pressure Sensors

14:55 - 15:00

15:00 - 15:05

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15:10 - 15:15

15:15 - 15:20

15:20 - 15:25

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Opportunities for Transducers in Healthcare

Moderator:
Ellis Meng, *University of Southern California, USA*

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Dan Wattendorf
Bill & Melinda Gates Foundation, USA

Panelists: John A. Rogers, *Northwestern University, USA*
Axel Scherer, *California Institute of Technology, USA*

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All times are Universal Time Coordinated (UTC)

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07:00 - 07:30

Invited Speaker V

07:30 - 07:40

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Nobuaki Kawahara
MIRISE Technologies Corporation, JAPAN

Invited Speaker VI

07:30 - 07:40

B2-IS6 **NANOGENERATORS AND SELF-POWERED MICRODEVICES APPLIED TO WIRELESS ELECTRICAL STIMULATION AT CELL LEVEL** **97**
Gonzalo Murillo
Spanish National Research Council (CSIC), SPAIN

Invited Speaker VII

07:30 - 07:40

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Stephan Sylvest Keller
Technical University of Denmark (DTU), DENMARK

Invited Speaker VIII

07:30 - 07:40

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Massimo Mastrangeli, Hande Aydogmus, Milica Dostanic, Paul Motreuil-Ragot, Nele Revyn, Bjorn de Wagenaar, Ronald Dekker, and Pasqualina M. Sarro
Delft University of Technology (TU Delft), NETHERLANDS

Session 2A - Accelerometer, Shock Sensor, and Switch

07:45 - 07:50

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Hemin Zhang[1], Madan Parajuli[1], Milind Pandti[2], Guillermo Sobreviela[2], Dongyang Chen[1], Jiangkun Sun[1], Chun Zhao[3], and Ashwin A. Seshia[1]
[1]University of Cambridge, UK, [2]Silicon Microgravity Ltd., UK, and [3]Huazhong University of Science and Technology, UK

07:50 - 07:55

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Akihiro Uchiyama[1], Takashi Ichikawa[1], Kohei Shibata[1], Shin-ichi Iida[2], Sangyeop Lee[1], Noboru Ishihara[1], Katsuyuki Machida[1], Kazuya Masu[1], and Hiroyuki Ito[1]
[1]Tokyo Institute of Technology, JAPAN and [2]NTT Advanced Technology Corporation, JAPAN

07:55 - 08:00

B2-2A3 **A 3 PPM/℃ TEMPERATURE COEFFICIENT OF SCALE FACTOR FOR A SILICON RESONANT ACCELEROMETER BASED ON CRYSTALLOGRAPHIC ORIENTATION OPTIMIZATION** **116**

Mengxia Liu, Jian Cui, Dong Li, and Qiancheng Zhao
Peking University, CHINA

08:00 - 08:05

B2-2A4 **MULTI-THRESHOLD MEMS SHOCK SENSOR FOR QUANTITATIVE ACCELERATION MEASEREMENTS** **120**

Qiu Xu, Lvjun Wang, Alhammam Niyazi, and Mohammad I. Younis
King Abdullah University of Science and Technology (KAUST), SAUDI ARABIA

08:05 - 08:10

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Srinivas Merugu[1], Jaibir Sharma[1], Sagnik Ghosh[1], Yul Koh[1], Amit Lal[1,2], and Eldwin J. Ng[1]
*[1]Agency for Science, Technology and Research (A*STAR), SINGAPORE and [2]Cornell University, USA*

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Zehua Lan[1], Qi Tao[2], Zili Tang[3], Toshiyuki Tsuchiya[4], Man Wong[3], and Xiaohong Wang[1]
[1]Tsinghua University, CHINA, [2]China Academy of Engineering Physics, CHINA, [3]Hong Kong University of Science and Technology, CHINA, and [4]Kyoto University, JAPAN

Session 2B - PowerMEMS 1 - Vibrational and Energy Transduction Systems

07:45 - 07:50

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Hiroaki Honma, Yukiya Tohyama, and Hiroshi Toshiyoshi
University of Tokyo, JAPAN

07:50 - 07:55

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Ling Bu[1,2], Emmanuelle Arroyo[2], and Ashwin A. Seshia[2]
[1]China University of Geosciences, CHINA and [2]University of Cambridge, UK

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Hailing Fu[1], Yuan Zhang[2], Mengzhou Liu[3], Yong Qin[3], and Eric M. Yeatman[4]
[1]Loughborough University, UK, [2]Beijing Institute of Graphic Communication, CHINA, [3]Beijing Jiaotong University, CHINA, and [4]Imperial College London, UK

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08:05 - 08:10

08:10 - 08:15

Session 2C - Gas Sensors

07:45 - 07:50

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08:00 - 08:05

08:05 - 08:10

Session 2D - Cells and Organs on a Chip

07:45 - 07:50

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Jiandong Yang[1], Satoshi Imamura[1], Yoshikazu Hirai[1],
Ken-ichiro Kamei[1], Toshiyuki Tsuchiya[1], and Osamu Tabata[1,2]
[1]Kyoto University, JAPAN and [2]Kyoto University of Advanced Science, JAPAN

07:50 - 07:55

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Arn van den Maagdenberg[2], GuoQi Zhang[1], Massimo Mastrangeli[1], and Pasqualina M. Sarro[1]
[1]Delft University of Technology (TU Delft), NETHERLANDS and
[2]Leiden University Medical Centre, NETHERLANDS

07:55 - 08:00

B2-2D3 **REALIZATION OF ON-CHIP MICROFLUIDIC SYSTEM WITH FILTER-FREE FLUORESCENCE SENSOR FOR LENS-LESS FLOWCYTOMETRY** **184**

Tomoya Ide, Yong-Joon Choi, Yasuyuki Kimura, Takeshi Hizawa, Kazuhiro Takahashi, Hiromu Ishii,
Toshihiko Noda, and Kazuaki Sawada
Toyohashi University of Technology, JAPAN

08:00 - 08:05

B2-2D4 **MINIATURIZED ELECTROCHEMICAL DEVICE FOR IN-SITU MONITORING OF GLUCOSE, LACTATE, DISSOLVED OXYGEN, PH, AND TEMPERATURE IN YEAST CULTURE** **188**

Nurul Izni Rusli[1,2], Pablo Lopez Espinar[1], Frederik Ceyssens[1], Irene Taurino[1], and Michael Kraft[1]
[1]University of Leuven (KU Leuven), BELGIUM and [2]Universiti Malaysia Perlis (UniMAP), MALAYSIA

08:05 - 08:10

B2-2D5 **MICROCHIP FOR SURFACE-ENHANCED RAMAN SCATTERING DETECTION OF LIVE SINGLE CELL** **192**

Shengsen Zhang and Rong Zhu
Tsinghua University, CHINA

08:10 - 08:15

B2-2D6 **A MICROFLUIDIC DEVICE TO STATISTICALLY DETERMINE THE DISTRIBUTION OF SICKLE RED CELL SUBPOPULATIONS USING BIOIMPEDANCE** **197**

Tieying Xu[1], Maria A. Lizarralde-Iragorri[2], Jean Roman[1], Emile Martincic[3],
Valentine Brousse[2], Olivier Français[4], Wassim El Nemer[2], and Bruno Le Pioufle[1]
[1]Université Paris-Saclay, FRANCE, [2]Université de Paris, FRANCE, [3]C2N, CNRS, FRANCE, and
[4]ESIEE Paris, FRANCE

Poster Session I and Exhibit Inspection

08:15 – 10:15 **Presentations are listed by topic category with their assigned number starting on page 27.**

10:15 **Conclusion of Block 2**

Block 3 - Wednesday, 23 June

All times are Universal Time Coordinated (UTC)

Industry Session 3

00:00 - 00:30

Invited Speaker IX

00:35 - 00:45

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Nils J. Engelsen[1], Aman R. Agrawal[2], and **Dalziel J. Wilson**[2]

[1]École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND and [2]University of Arizona, USA

Invited Speaker X

00:35 - 00:45

B3-IS10 **HIGH THROUGHPUT SIZE CONTROLLED MICRODROPLET GENERATION** **206**

Shuichi Shoji, Dong Hyun Yoon, Daiki Tanaka, and Tetsushi Sekiguchi

Waseda University, JAPAN

Invited Speaker XI

00:35 - 00:45

B3-IS11 **SPECTROCHIP FOR COVID-19 PANDEMIC** **209**

Cheng-Hao Ko

National Taiwan University of Science and Technology, TAIWAN

Invited Speaker XII

00:35 - 00:45

B3-IS12 **NEURAL STIMULATION: NEW DESIGNS FOR ENHANCED CONTROL**

Shelley I. Fried

Harvard Medical School, USA

Session 3A - Force/Tactile Sensors

00:50 - 00:55

B3-3A1 **A NOVEL CMOS-MEMS TRI-AXIAL TACTILE FORCE SENSOR USING CAPACITIVE AND PIEZORESISTIVE SENSING MECHANISMS** **210**

Yen-Lin Chen, Yu-Cheng Huang, Meng-Lin Hsieh, Sheng-Kai Yeh, and Weileun Fang

National Tsing Hua University, TAIWAN

00:55 - 01:00

B3-3A2 **WIDE RANGE BRIDGE TYPE 3D TACTILE SENSOR WITH VARIABLE SENSITIVITY THROUGH REPLACEABLE ELASTIC LAYER ATTACHING ON PDMS CAP** **214**

Cheng Hou[1], Kaiyao Wang[1], Liang Lou[2], Songsong Zhang[2], Huicong Liu[1], and Lining Sun[1]

[1]Soochow University, CHINA and [2]Shanghai Industrial μTechnology Research Institute (SITRI), CHINA

01:00 - 01:05

01:05 - 01:10

01:10 - 01:15

Session 3B - MEMS Acoustic Sensors, Imaging, and Speakers

00:50 - 00:55

00:55 - 01:00

01:00 - 01:05

01:05 - 01:10

01:10 - 01:15

Session 3C - MEMS for Environmental Sensing

00:50 - 00:55

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01:00 - 01:05

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01:10 - 01:15

Session 3D - Brains, Drugs Test and Screening

00:50 - 00:55

00:55 - 01:00

01:00 - 01:05

B3-3D3 **FABRICATION OF ULTRA-THIN MICRO-POROUS PDMS MEMBRANE FOR CELL CO-CULTURE IN BLOOD BRAIN BARRIER MODEL ON CHIP** **279**

Fengyi Zheng[1,2], Qiushi Li[1], Panhui Yang[1,2], Shihui Qiu[1,2], Hongju Mao[1,2], and Jianlong Zhao[1,2]
[1]Chinese Academy of Sciences (CAS), CHINA and
[2]University of Chinese Academy of Sciences (UCAS), CHINA,

01:05 - 01:10

B3-3D4 **ENDOTHELIAL CHEMICAL REACTION AND DRUG TEST REPRODUCED ON MOLDED FLEXIBLE COLLAGEN HYDROGEL TUBE** **283**

Shun Itai and Hiroaki Onoe
Keio University, JAPAN

01:10 - 01:15

B3-3D5 **A TUBING-FREE SAMPLE-TO-DROPLET INTERFACE ENABLES FACILE SAMPLE LOADING OF DROPLET MICROFLUIDICS DEVICES TOWARD HIGH-THROUGHPUT SCREENING** **287**

Fangchi Shao, Kuangwen Hsieh, Pengfei Zhang, Aniruddha M. Kaushik, and Tza-Huei Wang
Johns Hopkins University, USA

01:15 - 01:20

B3-3D6 **A SILK-BASED OPTO-ELECTRONIC INTEGRATED NEURAL PROBE FOR ANIMAL MOTION CONTROL** **291**

Chi Gu[1,2], Huiran Yang[1], Bohan Zhang[3], Haoyuan Li[4], Xueying Wang[1,2],
Zhitao Zhou[1], Zhifeng Shi[4], Ying Mao[4], Xiaoling Wei[1,2], and Tiger H. Tao[1,2,3,5]
[1]Chinese Academy of Sciences, Shanghai, CHINA, [2]University of Chinese Academy of Sciences (UCAS), CHINA, [3]Shanghai Tech University, CHINA, [4]Huashan Hospital of Fudan University, CHINA, and [5]Shanghai Research Center for Brain Science and Brain-Inspired Intelligence, CHINA

Poster Session II and Exhibit Inspection

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03:20 **Conclusion of Block 3**

Block 4 - Wednesday, 23 June

All times are Universal Time Coordinated (UTC)

TRANSDUCERS Early Career Award Presentation

13:00 - 13:15

Transducers 2023 Conference Announcement

13:15 - 13:27

Transducers 2023 Conference Chairs
Satoshi Konishi, *Ritsumeikan University, JAPAN*
Shuji Tanaka, *Tohoku University, JAPAN*

Hilton Head 2022 Workshop Announcement

13:27 - 13:30

Hilton Head 2022 Workshop Chair
Reza Ghodssi, *University of Maryland, USA*

Invited Speaker XIII

13:35 - 13:45

B4-IS13 **QUANTUM CONTROL OF SPIN AND ORBITAL STATES WITH A DIAMOND MEMS RESONATOR** **295**
Gregory D. Fuchs
Cornell University, USA

Invited Speaker XIV

13:35 - 13:45

B4-IS14 **ORGAN CHIP MODELS OF HUMAN PHYSIOLOGY**
Anna Herland
KTH Royal Institute of Technology, SWEDEN

Invited Speaker XV

13:35 - 13:45

B4-IS15 **INTERROGATION AND CHARGING OF EMBEDDED SENSORS BY AUTONOMOUS VEHICLES** **296**
Juan M. Arteaga, James O'Keeffe, David E. Boyle, Paul D. Mitcheson, and **Eric M. Yeatman**
Imperial College London, UK

Invited Speaker XVI

13:35 - 13:45

B4-IS16 **DRAWING FEATURE MAPS OF MOLECULAR COMPUTATION** **300**
Teruo Fujii
University of Tokyo, JAPAN

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Session 4B - MEMS for Human Sensing and Machine Interfacing

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Session 4C - Microrobots and Microswimmers

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B4-4C6 **FABRICATION OF BIOINSPIRED ARTIFICIAL BACTERIAL FLAGELLA VIA TWO PHOTON LITHOGRAPHY AND WET METALLIZATION** **369**
Roberto Bernasconi[1], Gea Prioglio[1], Carlos C.J. Alcantara[2], Salvador Panè[2], and Luca Magagnin[1]
[1]Politecnico di Milano, ITALY and [2]ETH Zurich, SWITZERLAND

Session 4D - MEMS with Beyond AI and Novel Computing Methods

13:50 - 13:55

B4-4D1 **AN EXPERIMENTAL STUDY OF THE PHOTORESPONSE OF 1T-1R OSCILLATORS BASED ON VANADIUM DIOXIDE: TOWARDS SPIKING SENSING SYSTEMS** **373**
Teodor Rosca, Fatemeh Qaderi, Marco Riccardi, Olivier J.F. Martin, and Adrian M. Ionescu
École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND

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B4-4D2 **TOPOMEMS CIRCUIT: STEP-VARIABLE-RESETTABLE MEMS CAPACITOR FOR TOPOLOGICAL ELECTRICAL CIRCUIT** **377**
Yoshio Mita[1], Eric Lebrasseur[1], Motohiko Ezawa[1], Keigo Tsuji[1], Minoru Kawamura[2], and Akio Higo[1]
[1]University of Tokyo, JAPAN and [2]RIKEN, JAPAN

14:00 - 14:05

B4-4D3 **DOUBLE-COFFEE RING NANOPLASMONIC EFFECTS WITH CONVOLUTIONAL NEURAL LEARNING FOR SARS-COV-2 DETECTION** **381**
Kamyar Behrouzi and Liwei Lin
University of California, Berkeley, USA

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B4-4D4 **AI ON A CHIP FOR IDENTIFYING MICROALGAL CELLS WITH HIGH HEAVY METAL REMOVAL EFFICIENCY** **385**
Muzhen Xu[1], Jeffrey Harmon[1], Tomohisa Hasunuma[2], Akihiro Isozaki[1,3], and Keisuke Goda[1,4,5]
[1]University of Tokyo, JAPAN, [2]Kobe University, JAPAN, [3]Kanagawa Institute of Industrial Science and Technology, JAPAN, [4]Wuhan University, CHINA, and [5]University of California, Los Angeles, USA

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B4-4D5 **MACHINE LEARNING AUGMENTED VOC IDENTIFICATION BY MID-INFRARED NANOANTENNAS WITH MICROFLUIDICS CHAMBERS** **389**
Zhihao Ren, Zixuan Zhang, Jingxuan Wei, Haibo Wang, Bowei Dong, and Chengkuo Lee
National University of Singapore, SINGAPORE

Poster Session III and Exhibit Inspection

14:20 – 16:20 **Presentations are listed by topic category with their assigned number starting on page 27.**

16:20 **Conclusion of Block 4**

Block 5 - Thursday, 24 June

All times are Universal Time Coordinated (UTC)

Plenary Speaker II & III Panel Presentation
Opportunities for Transducers in Global Good

Moderator:
Hiroyuki Fujita, *Canon Medical Systems Corporation, JAPAN*

07:00 - 07:30

B5-PS2 **DIGITAL TECHNOLOGY MEETS ETHICS: HOW TO THINK ABOUT THE GLOBAL GOOD WHEN YOU ARE CHANGING THE WORLD** **393**
Andrea Renda
Centre for European Policy Studies (CEPS), BELGIUM

B5-PS3 **DIGITAL SOCIAL INNOVATION: TAIWAN CAN HELP** **394**
Audrey Tang
Digital Minister, TAIWAN

Invited Speaker XVII

07:35 - 07:45

B5-IS17 **MEMS TOOLS FOR ACCELERATING MATERIALS SCIENCE** **395**
Alfred Ludwig
Ruhr Universität, Bochum (RUB), GERMANY

Invited Speaker XVIII

07:35 - 07:45

B5-IS18 **SILICON NANOMECHANICAL RESONATORS AND LARGE SCALE OPTOMECHANICS FOR SENSING** **396**
Sébastien Hentz
CEA, FRANCE

Invited Speaker XIX

07:35 - 07:45

B5-IS19 **SMART 3D VOLUMETRIC PRINTING** **397**
Paul Delrot[2], Damien Loterie[2] and **Christophe Moser**[1]
[1]École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND and [2]Readily3D, SWITZERLAND

Invited Speaker XX

07:35 - 07:45

B5-IS20 **EMERGING FUNCTIONS OF ELECTRICALLY-INDUCED BUBBLES AND ITS BIOMEDICAL APPLICATIONS** **400**
Yoko Yamanishi
Kyushu University, JAPAN

Session 5A - Gyroscope, Magneto/Electrical Field, and Gravimater

07:50 - 07:55

07:55 - 08:00

08:00 - 08:05

08:05 - 08:10

08:10 - 08:15

08:15 - 08:20

Session 5B - Optical MEMS

07:50 - 07:55

07:55 - 08:00

08:00 - 08:05

B5-5B3 **CLOSED-LOOP CONTROL OF QUASI-STATIC SCANNING PZT MICROMIRRORS WITH EMBEDDED PIEZORESISTIVE SENSING AND SPURIOUS MODE REJECTION** **435**

Paolo Frigerio[1], Luca Molinari[2], Andrea Barbieri[2], Roberto Carminati[2], Nicolò Boni[2], and Giacomo Langfelder[1]
[1]Politecnico di Milano, ITALY and [2]STMicroelectronics, ITALY

08:05 - 08:10

B5-5B4 **ACOUSTICALLY LEVITATED SPINNING OPTICAL SCANNER** **439**

Takashi Sasaki and Kazuhiro Hane
Tohoku University, JAPAN

08:10 - 08:15

B5-5B5 **MODELLING AND EXPERIMENTAL VALIDATION OF PIEZOELECTRICALLY DRIVEN MICRO-LENS ACTUATOR** **443**

Syed Mamun R Rasid[1], Aron Michael[2], Hemanshu Roy Pota[1], Ssu-Han Chen[2], and Chee Yee Kwok[2]
[1]University of New South Wales, Canberra, AUSTRALIA and
[2]University of New South Wales, Sydney, AUSTRALIA

08:15 - 08:20

B5-5B6 **CONTINUOUSLY TUNABLE SILICON PHOTONIC MEMS 2×2 POWER COUPLER** **447**

Alain Y. Takabayashi[1], Hamed Sattari[1], Pierre Edinger[2], Peter Verheyen[3], Kristinn B. Gylfason[2], Wim Bogaerts[3,4], and Niels Quack[1]
[1]École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND, [2]KTH Royal Institute of Technology, SWEDEN, [3]Interuniversity Microelectronics Centre (IMEC), BELGIUM, and
[4]Ghent University-IMEC, BELGIUM

Session 5C - PowerMEMS 2 - Thermo - Tribo - Electro - Magnetic

07:50 - 07:55

B5-5C1 **A STRATEGY TO REDUCE AIR BREAKDOWN EFFECT AND BOOST OUTPUT ENERGY FOR CONTACT-SEPARATION MODE TRIBOELECTRIC NANOGENERATOR** **451**

Zeyuan Cao, Yao Chu, Shiwen Wang, Zibo Wu, Rong Ding, and Xiongying Ye
Tsinghua University, CHINA

07:55 - 08:00

B5-5C2 **MAGNETICALLY EXCITED PIEZOELECTRIC ENERGY HARVESTER FOR MICROPOWER SUPPLY AND WAKEUP APPLICATIONS** **455**

Björn Gojdka[1], Torben Dankwort[1], Marc A. Nowak[1], Mani T. Bodduluri[1], Minhaz Ahmed[1,2], Sven Grünzig[1], and Fabian Lofink[1]
[1]Fraunhofer Institute for Silicon Technology ISIT, GERMANY and [2]Furtwangen University, GERMANY

08:00 - 08:05

B5-5C3 **AN ENERGY HARVESTING SCHEME WITH TEMPERATURE THRESHOLD TRIGGERED GENERATION FOR HEAT EVENT AUTONOMOUS MONITORING** **459**

Ruofeng Han, Nianying Wang, Qisheng He, Jiachou Wang, and Xinxin Li
Chinese Academy of Sciences (CAS), CHINA

08:05 - 08:10

B5-5C4 **COUPLING EFFECTS IN PARALLEL THERMOMAGNETIC GENERATORS BASED ON RESONANT SELF-ACTUATION** **463**

Joel Joseph[1], Mira Wehr[1], Hiroyuki Miki[2], Makoto Ohtsuka[2], and Manfred Kohl[1]
[1]Karlsruhe Institute of Technology (KIT), GERMANY and [2]Tohuku University, JAPAN

08:10 - 08:15

B5-5C5 **FLEXIBLE THERMOELECTRIC GENERATOR USING KIRIGAMI-FOLDING STRUCTURE** **467**
Shingo Terashima and Eiji Iwase
Waseda University, JAPAN

08:15 - 08:20

B5-5C6 **FABRICATION OF μTEGs BASED ON NANO-SCALE THERMOELECTRIC MATERIAL DISPERSIONS** **471**
Swathi Krishna Subhash, Timo Gerach, Negin Sherkat, Harald Hillebrecht, Peter Woias, and Uwe Pelz
University of Freiburg, GERMANY

Session 5D - MEMS for Clinical Applications

07:50 - 07:55

B5-5D1 **A NEGATIVE DEPLETION-ENHANCED FILTRATION SYSTEM FOR HIGH-PURITY CIRCULATING TUMOR CELL ENRICHMENT FROM WHOLE BLOOD** **475**
Qingmei Xu[1,2], Tingyu Li[1], Tingting Hun[1], Jianyu Du[1,3], Zheng Liu[1], Kunzhe Song[1], Xiao Ma[4], and Wei Wang[1]
[1]Peking University, CHINA, [2]Taiyuan Institute of Technology, CHINA, [3]China University of Geosciences, CHINA, and [4]Hangzhou Branemagic Medical Technology Co. Ltd., CHINA

07:55 - 08:00

B5-5D2 **A MICROFLUIDIC DEVICE PLATFORM RECONSTRUCTING LUNG PATTERN FOR CANCER IMMUNOTHERAPY APPLICATIONS** **479**
Yu-Chen Chen[1], Han-Jung Liao[1], Jean-An Chieh[1], Pin-Tzu Lai[1], Yi-Ying Liang[1], Kang-Yun Lee[2], Wei-lun Sun[2], Shu-Chuan Ho[2], Yu-Shiuan Wang[2], Wan-Chen Huang[3], Wei-Chiao Chang[2], Sung-Yang Wei[1], and Cheng-Hsien Liu[1]
[1]National Tsing Hua University, TAIWAN, [2]Taipei Medical University, TAIWAN, and [3]Academia Sinica, TAIWAN

08:00 - 08:05

B5-5D3 **GRAVITY AND FILM STRESS ANALYSIS FOR MEMS DEFORMABLE MIRROR WITH ELECTROSTATIC PISTON ARRAY** **483**
Toshiyuki Tsuchiya[1], Toshiki Ema[1], Yoshikazu Hirai[1], Christopher Welham[2], and Hideyuki Maekoba[2]
[1]Kyoto University, JAPAN and [2]Coventor, Inc., FRANCE

08:05 - 08:10

B5-5D4 **QUANTITATIVE FORCE MEASUREMENT OF THE EYE SURGICAL SIMULATOR FOR ILM PEELING BY USING QCR FORCE SENSOR** **487**
Yuta Taniguchi[1], Hirotaka Sugiura[1], Toshiro Yamanaka[1], Shiro Watanabe[2], Seiji Omata[3], Kanako Harada[1], Mamoru Mitsuishi[1], Takashi Ueta[1], Tomoyasu Shiraya[1], Koichiro Sugimoto[1], Kiyohito Totsuka[1], Fumiyuki Araki[1], Muneyuki Takao[1], Makoto Aihara[1], and Fumihito Arai[1]
[1]University of Tokyo, JAPAN, [2]Nagoya University, JAPAN, and [3]Kumamoto University, JAPAN

08:10 - 08:15

B5-5D5 **BIOFUNCTIONAL AND SELF-CONTRACTABLE SILK-BASED SENSING THREADS** **491**
Yating Xie[1,2], Keyin Liu[2], and Tiger H. Tao[1,2,3,4]
[1]ShanghaiTech University, CHINA, [2]Chinese Academy of Sciences (CAS), CHINA, [3]University of Chinese Academy of Sciences (UCAS), CHINA, and [4]Shanghai Research Center for Brain Science and Brain-Inspired Intelligence, CHINA

Poster Session IV and Exhibit Inspection

08:20 – 10:20 **Presentations are listed by topic category with their assigned number starting on page 27.**

10:20 **Conclusion of Block 5**

Block 6 - Friday, 25 June

All times are Universal Time Coordinated (UTC)

Student Event

00:00 - 00:30

Invited Speaker XXI

00:35 - 00:45

B6-IS21 **SILK-DRIVE: PROTEIN-BASED HARD DRIVE USING NEAR-FIELD NANO-OPTICS** **495**

Zhitao Zhou[1], Jianjuan Jiang[1], and **Tiger H. Tao**[1,2,3,4]

[1]Chinese Academy of Sciences (CAS), CHINA, [2]University of Chinese Academy of Sciences (UCAS), CHINA, [3]ShanghaiTech University, CHINA, and

[4]Shanghai Research Center for Brain Science and Brain-Inspired Intelligence, CHINA

Invited Speaker XXII

00:35 - 00:45

B6-IS22 **NANOSTRUCTURED BIOSENSORS AND INTEGRATED SYSTEMS FOR HEALTH MONITORING** **498**

Yuanjing Lin

Southern University of Science and Technology, CHINA

Invited Speaker XXIII

00:35 - 00:45

B6-IS23 **NATURE-INSPIRED SURFACES FOR WATER-ENERGY NEXUS** **501**

Wanghuai Xu and **Zuankai Wang**

City University of Hong Kong, CHINA

Invited Speaker XXIV

00:35 - 00:45

B6-IS24 **RESEARCH AND DEVELOPMENT ON MEMS BASED ELECTRIC FIELD SENSOR** **505**

Shanhong Xia[1,2,3], Hucheng Lei[1,4], Jun Liu[1,4], Simin Peng[1,4],
Chunrong Peng[1,2], Pengfei Yang[5], Xiaolong Wen[6] and Zhaozhi Chu[1]

[1]Chinese Academy of Sciences (CAS), CHINA, [2]Beijing TFlying Transducer Technology Co., Ltd. CHINA, [3]Beijing Institute of Collaborative Innovation, CHINA, [4]University of Chinese Academy of Sciences (UCAS) CHINA, [5]Beijing Information Science and Technology University, CHINA,

[6]University of Science and Technology Beijing, CHINA

Session 6A - Novel Lithography Techniques

00:50 - 00:55

B6-6A1 **SOFT LITHOGRAPHY-BASED FABRICATION METHOD FOR FLEXIBLE SUPEROMNIPHOBIC SURFACE** **509**

Thanh-Vinh Nguyen, Yuki Okamoto, Hironao Okada, Atsushi Takei, Yusuke Takei, and Masaaki Ichiki

National Institute of Advanced Industrial Science and Technology (AIST), JAPAN

Session 6B - Novel Nano Materials and Devices

01:05 - 01:10

01:10 - 01:15

01:15 - 01:20

Session 6C - PowerMEMS 3 - Zero-Power MEMS

00:50 - 00:55

00:55 - 01:00

01:00 - 01:05

01:05 - 01:10

01:10 - 01:15

01:15 - 01:20

Session 6D - IR Sensors and Modulators

00:50 - 00:55

B6-6D1 **SINGLE (111)-WAFER FABRICATION OF 100-µM SCALE THERMOPILE/ABSORBER DOUBLE-DECK STRUCTURE FOR HIGH-DETECTIVITY IR-DETECTION** **581**

Dan Xue[1,2], Wenhan Zhou[1,2], Haozhi Zhang[1,2], Zao Ni[1], Wei Li[1], Jiachou Wang[1,2], and Xinxin Li[1,2]
[1]Chinese Academy of Sciences (CAS), CHINA and
[2]University of Chinese Academy of Sciences (UCAS), CHINA

00:55 - 01:00

B6-6D2 **HETEROGENEOUS $LiNbO_3$/SI DIRECT BONDING FOR WAVELENGTH-DEPENDENT MID-INFRARED IMAGING** **585**

Jikai Xu[1,2], Zhihao Ren[1], Xinmiao Liu[1], Cheng Xu[1], Chenxi Wang[2], Yanhong Tian[2], and Chengkuo Lee[1]
[1]National University of Singapore, SINGAPORE and [2]Harbin Institute of Technology, CHINA

01:00 - 01:05

B6-6D3 **ULTRA-SMALL PIXEL IR SENSING ARRAY FABRICATED WITH A POST-CMOS COMPATIBLE PROCESS** **589**

Wenhan Zhou[1,2], Haozhi Zhang[1,2], Dan Xue[1,2], Wei Li[1], Zao Ni[1], and Xinxin Li[1,2]
[1]Chinese Academy of Sciences (CAS), CHINA, and
[2]University of Chinese Academy of Sciences (UCAS), CHINA

01:05 - 01:10

B6-6D4 **ELECTRICAL MODULATION TRAMSMITTED IR LIGHT THROUGH VO_2 THIN FILM ON GAN MEMBRANES** **593**

Ferhat Bayram[1], Durga Gajula[2], Balaadithya Uppalapati[1], Digangana Khan[1], and Goutam Koley[1]
[1]Clemson University, USA and [2]Georgia Institute of Technology, USA

01:10 - 01:15

B6-6D5 **ZERO-BIAS LONG-WAVE INFRARED WAVEGUIDE PHOTODETECTOR VIA GRAPHENE/SILICON/HALIDE HETEROGENEOUS INTEGRATION** **597**

Yiming Ma, Yuhua Chang, Bowei Dong, Jingxuan Wei, and Chengkuo Lee
National University of Singapore, SINGAPORE

01:15 - 01:20

B6-6D6 **A PHOTOTHERMAL TRANSDUCER BASED ON 3D THERMAL MANAGEMENT** **601**

Jinying Zhang, Defang Li, Zhuo Li, Xin Wang, and Suhui Yang
Beijing Institute of Technology, CHINA

Invited Speaker XXV

01:30 - 01:40

B6-IS25 **DEVELOPMENT OF ADVANCED DYNAMIC ANGIO MODEL (ADAM) SIMULATOR: ENABLING A REALISTIC SIMULATION OF ENDOVASCULAR INTERVENTION** **605**

Joonwon Kim
Pohang University of Science and Technology (POSTECH), KOREA

Invited Speaker XXVI

01:30 - 01:40

B6-IS26 **SENSING WITH SERIAL OR PARALLEL MICROMECHANICAL RESONATORS** **606**

Honglong Chang
Northwestern Polytechnical University, CHINA

Invited Speaker XXVII

01:30 - 01:40

B6-IS27 **MICROMECHANICAL VIBRO-IMPACT RESONATOR-ENABLED SENSING APPLICATIONS** **609**
Wei-Chang Li
National Taiwan University, TAIWAN

Invited Speaker XXVIII

01:30 - 01:40

B6-IS28 **SOFT MICROFLUIDIC WEARABLE SENSORS FOR BIOMEDICAL APPLICATIONS** **614**
Chwee Teck "CT" Lim
National University of Singapore, SINGAPORE

Just-In Press Presentations

01:50 - 02:40

02:40 **Conclusion of Block 6**

Block 7 - Friday, 25 June

All times are Universal Time Coordinated (UTC)

Award Ceremony and Closing Remarks

13:00 - 14:00

TRANSDUCERS 2021 CONFERENCE CHAIRS
Jürgen Brugger, *École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND*
Amy Duwel, *Draper Laboratory, USA*
Yoshio Mita, *University of Tokyo, JAPAN*

14:00 **Conclusion of 2021 Transducers Conference**

Poster Presentations

All times are Universal Time Coordinated (UTC)

B2	–	Tuesday, 22 June	08:15 - 10:15
B3	–	Wednesday, 23 June	01:20 - 03:20
B4	–	Wednesday, 23 June	14:20 - 16:20
B5	–	Thursday, 24, June	08:20 - 10:20

Classification Chart

(last character of poster number)

a	**Actuators and Microsystems**
b	**Bio-Sensors and Microsystems Including In-Vitro Medical Applications**
c	**Chemical Sensors and Microsystems**
d	**Composite Materials, Polymers, and Fabrication Processes**
e	**Energy, Power and Thermal Management**
f	**Microfluidics Platform Technologies**
g	**Nanoscale Materials and Fabrication**
h	**Optical and Atomic Transducers**
i	**Packaging & Solid-State Materials and Fabrication Processes**
j	**Physical Sensors and Microsystems**
k	**RF MEMS, Resonators and Oscillators**
l	**Wearable and In-Vivo Medical Devices and Microsystems**

a - Actuators and Microsystems

b - Bio-Sensors and Microsystems Including In-Vitro Medical Applications

c - Chemical Sensors and Microsystems

d - Composite Materials, Polymers, and Fabrication Processes

e - Energy, Power and Thermal Management

f - Microfluidics Platform Technologies

g - Nanoscale Materials and Fabrication

h - Optical and Atomic Transducers

i - Packaging & Solid-State Materials and Fabrication Processes

j - Physical Sensors and Microsystems

k - RF MEMS, Resonators and Oscillators

l - Wearable and In-Vivo Medical Devices and Microsystems