

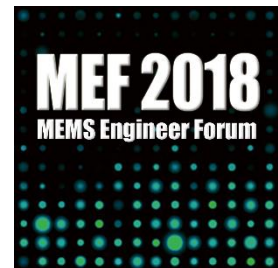
10th Anniversary

MEMS

Engineer Forum (MEF)

2018

SMART Society Driven by MEMS



April 25-26, 2018

KFC Hall

Ryogoku, Tokyo

Welcome to MEMS Engineer Forum 2018

SMART Society Driven by MEMS

MEMS Engineer Forum is a unique place operated mainly among engineers close to the MEMS technology, which is the vital key for the 21st century. We strongly believe that the key players in this field will drive the world in diversified business sectors over the next decades. Since the start of the 1st MEF in March 2009, this forum has been held annually with MEMS researchers, developers, engineers gathering in one place. We are very pleased to have the opportunity to hold the 10th annual MEF 2018.

The worldwide fusion and creation of the new movement based on MEMS fundamental, application, and interdisciplinary technology field as well as MEMS markets will be followed up by MEMS engineers via excellent vision and skills in the forum.

MEMS Engineer Forum (MEF)は、21世紀のキーテクノロジーとされるMEMS技術の現状と、向こう10年までの技術の将来に迫る、この分野のキープレイヤーの中でもエンジニアを中心に運営されるユニークな場です。世界中のMEMS研究者、開発者、技術者が一堂に集うこのフォーラムは、2009年3月の初開催以降、回を重ね、MEF2018で第10回を迎えることとなります。

MEMSに関する基礎技術ならびに隣接分野の技術において、エンジニアならではの視点と技量で、新しいカタチを形成し、そして融合させて参ります。さらに融合の過程や完成に向かう姿を国際的なレベルで検証することをミッションとしております。

第10回MEMS Engineer Forumは、2018年4月25日(水)～26日(木)、東京 両国のKFCホールで開催されます。MEMSのEngineerが世界から集まり、技術やビジネスの未来を語るユニークなグローバルミーティングです。講演セッション、技術展示、出展者プレゼンテーション、ネットワーキングレセプションなど、すべての機会を通して、技術ならびに事業展開の拡大の議論を深めて頂けますことを願っております。

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Committee Chairman
MEF 2018

MEF2018 実行委員会
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Masayoshi Esashi
Committee Vice Chairman
MEF 2018

MEF2018 実行委員会
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Susumu Kaminaga
Committee Vice Chairman
MEF 2018

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副委員長 神永 晋



Naoto Kobayashi
Committee Vice Chairman
MEF 2018

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副委員長 小林 直人

MEF 2018 Executive Committee

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委員	高尾 英邦	香川大学
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委員	野々村 裕	名城大学
委員	三宅 亮	東京大学
委員	和賀 三和子	University of California, San Diego, UCSD
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Committee member	Tomonori Seki	Omron
Committee member	Shuichi Shoji	Waseda University
Committee member	Tadatomo Suga	The University of Tokyo
Committee member	Kenichiro Suzuki	Ritsumeikan University
Committee member	Hidekuni Takao	Kagawa University
Committee member	Takehisa Takoshima	Tokyo Metropolitan University
Committee member	Miwako Waga	University of California, San Diego
Special Advisor	Mitsumasa Koyanagi	Tohoku University
Special Advisor	Momiji Kubo	Tohoku University

Celebrating its 10th Anniversary - MEF

第10回目のMEMS Engineer Forum 2018にご参加を頂きまして有難うございます。

思い起こしますと第1回目は2009年で2008年リーマンショックが訪れた直後でした。MEMS技術の動向およびMEMSを含むビジネス動向などを踏まえ、MEMSを世界でどのように生かし、世の中を変えて行くかを議論する場をつくることを目的としておりました。聴講参加費無料として展示会社からの出展費用で運営するというコンセプトで出発した本フォーラム運営上は必ずしも

楽とは言えませんが、毎年、延べ700名前後の来場者を数えており皆様には、好評の内に開催を続けております。10周年の今回は初回にもおいていただいた世界のMEMS技術、ビジネスを代表するKurt Peterson博士、UCB(当時、現UCSD)・Al Pisano教授、BoschのUdo Gomez氏などの諸氏も駆けつけていただけました。

2010年の第2回目からは上記のコンセプトを掲げつつ、マーケット、ビジネスなど出口側にも討論のスタンスを設けて、例年、欧米、アジアなど世界各地におけるMEMSの研究や開発、ベンチャービジネスを含む事業化まで、豊富な経験を持つ講師を迎えております。特に最近では、世界のIoT戦略、情報通信インフラを踏まえた社会システム構築戦略、センサビジネス戦略など上流から下流のビジネスまで目を放すことができない講演をお願いしており、本年はいよいよMEMSが主役として登場しつつあることが明らかになると思われまます。展示・スポンサーでもこれまでにない、有用な新しい出展社が多く参加致しますので、実ビジネスの場としてご活用いただければと願っております。

さて、10周年記念の今回は全体を俯瞰する講演として、初日には、国立研究開発法人新エネルギー・産業技術総合開発機構(NEDO)技術戦略研究センター長の川合知二先生を迎え、日本の技術戦略について論じていただきます。さらに世界各地のMEMSビジネストレンドとスマートシティ実現の観点から初回にも海外からおいでいただいた三氏に加え、Stanford大学Tom Kenny教授、スウェーデンKTHのFrank Niklaus教授などの海外勢に加え東北大学・中川 敦寛 准教授を始めとして最新の技術動向とともに技術潮流を踏まえた内外の有力研究開発グループからの講演が目白押しです。また、MEMS市場からのアプローチとしてYOLE Developpementなどからの発表も今後の指針を得る上で大変に参考になるものと考えられます。

IoTなどの新しい価値を創造するMEMSは既に主役です。この観点から、今回のMEMS Engineer Forum 2018には、MEMS関連の技術者だけではなく、大企業の経営や管理を担っている方々に、社内に眠っているMEMS技術の可能性を探り、日本の課題とされるイノベーション推進に向けてMEMS事業化を図ることを目指し是非、本フォーラムで活発な議論を展開して頂きたく願っております。

既存の技術や製品の置き換えでは無い新しい発想を見出し、新しいビジネスを開拓し、安全・安心なスマート社会を構築するために、MEMSに関連する技術者、経営者の価値も問われることになると思われます。10周年のEngineer Forum 2018を通じてこの10年を振り返りつつ今後の10年をご参加の皆様とともに考えたく存じます。



Celebrating its 10th Anniversary - MEF

Welcome to the 10th MEMS Engineer Forum (MEF) 2018.

Recalling the first MEF was 2009 just after the 2008 Lehman shock came. Based on the MEMS technologies and business trends, we aimed to create an interactive place to discuss how to make use of MEMS to change the world. Although it has not been necessarily easy to operate this forum, which started from the concept of free registration based on the financial support from the exhibitors and sponsors, every year it is counted over 700 participants during the forum. At the 10th anniversary event this year, the plenary speakers of the first MEF in 2009 came back to see us. The three plenary speakers include Dr. Kurt Petersen, Prof. Al Pisano, and Dr. Udo Gomez. I appreciate very much for their continuous support to MEF.

Starting from the second forum in 2010, MEF included market and business aspects, MEMS research and development projects, and venture business delivered from the speakers with extensive experience from all over the world. Especially recently MEF has been its scope to cover global IoT strategy, social system developing strategy based on information communication infrastructure, sensor business strategy, etc. It is clear that MEMS plays a leading role on various application. Many new and informative exhibitors will participate in exhibitions / sponsors as well. I hope that you visit the booths and see a place of actual business and market products.

On the first day of the 10th anniversary celebration, we will have Professor Tomoji Kawai of the National Institute of Advanced Industrial Science and Technology Development (NEDO) Director of Technology Strategy Research Center, Japan Technology Discuss the strategy as a keynote speaker. Furthermore, in addition to the three speakers who joined at the first MEF, we have exciting speakers from research and development field and business and marketing areas of all over the world.

MEMS that creates new value such as IoT plays already the leading role. From this point of view, the MEMS Engineer Forum 2018 explores the possibility of MEMS technologies that is sleeping in the company, not only for MEMS related engineers, but also for those who are responsible for the management of enterprises. I hope that the participants will have an interactive discussion to promote innovation in MEMS to create new possibilities in the business fields.

The value of engineers and management related to MEMS will also be questioned in order to find new ideas that are not only replacing existing technologies and products, but to develop new business, and to build a smart society that is safe and secure. Through the 10th anniversary of the Engineer Forum 2018, Let's share your idea thinking about the next 10 years with recalling the last decade.

Hiroki Kuwano
Executive Committee Chairman
MEF 2018

10 years History of MEF – 1st and 2nd



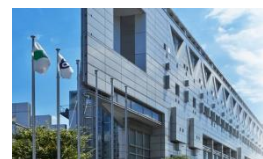
★The 1st MEMS Engineer Forum 2009
 March 17-19, 2009 TFT Hall, Ariake, Tokyo

Speakers		
Theme	Speakers	Affiliation
Plenary	Kurt Petersen Albert Pisano Udo Gomez	KP-MEMS UC Berkeley Robert Bosch
Keynote	Kazuo Sato Tadatomo Suga Mitsumasa Koyanagi Oliver Gradon	Nagoya Univ. Univ. of Tokyo Tohoku Univ. Nature Photonics
Special	Yoshiyuki Nozawa Tetsuji Onuki	Sumitomo Precision Products Nikon Engineering
Application	S. Wickramanayaka Hirokazu Sanpei Takahiro Usui Yoshitsu Taira Takao Someya	EVGroup Japan Advantest Seiko Epson, Macnica Univ. of Tokyo
Simulation, Evaluation, Testing	Momoji Kubo Hiroyuki Ishida Tatsuya Ito	Tohoku Univ. SUSS Microtec Fujikura
Process and Materials Technologies	Shuji Tanaka Shuichi Shoji Seiichi Hata Katsuyuki Machida	Tohoku Univ. Waseda Univ. Tokyo Institute of Technology NTT Advanced Technology
Exhibitors		
Adcom Media, Advanced Technology, Chip One Stop, EVGroup Japan, E2 Publishing, Electronic Journal, e.x.press, Gijutsu Chosakai, Hiroshima Univ., Keisoku Engineering System, KOBELCO, SPC ELECTRONICS CORP, MEMS Park Consortium, MIS Technology, Nagase Techno Engineering, Nikon Engineering, Park Systems Japan, Polytec Japan, Reed Business Information Sangyo Times, Sumitomo Precision Products, SUSS Microtec, Software Cradle, Takatori, Tanner Research, Techno System		

★The 2nd MEMS Engineer Forum 2010
 March 18-19, 2010 TFT Hall, Ariake, Tokyo

Speakers		
Theme	Speakers	Affiliation
Plenary	Kurt Petersen Susumu Kaminaga Masayoshi Esashi Kazuo Sato Hiroki Kuwano	KP-MEMS Sumitomo Precision Products Tohoku Univ. Nagoya Univ. Tohoku Univ.
Application	Koji Mitsubayashi Hiroshi Yoshimura	Tokyo Medical and Dental University NTT Electronics
Simulation, Evaluation, Testing, Process and Materials Technologies	Jun Mizuno Toshihito Shiotani Ko Kumagai Hidemi Takasu Sunil Wickramanayaka	Waseda Univ. Toppan Technical Design Center Tohoku Venture Capital ROHM EVGroup Japan
Exhibitors		
Electronic Journal, Elionix, EVGroup Japan, Keisoku Engineering System, Kobelco Research Institute, MIS Technology, Park Systems Japan, Sangyo Times, Sumitomo Precision Products, Takatori		

10 years History of MEF – 3rd & 4th



★The 3rd MEMS Engineer Forum 2011

March 7-8, 2011 Ota City Industrial Plaza PiO, Ota, Tokyo

Speakers		
Theme	Speakers	Affiliation
MEMS Asian Networks - Connection of People	Masayoshi Esashi Weileun Fang Susumu Kaminaga Hiroshi Ohki Jong-Uk Bu Shuichi Shoji Masakazu Sugiyama	Tohoku Univ. National Tsinghua Univ. Sumitomo Precision Products Hitachi High-Technologies SenPlus Waseda Univ. Univ. of Tokyo
MEMS Asian Networks - Connection of Technologies	Hiroki Kuwano Shoji Kamiya Kenichiro Suzuki Koji Izumi Tadatomo Suga Mitsumasa Koyanagi Kazuo Sato	Tohoku Univ. Nagoya Institute of Technology Ritsumeikan Univ. JAXA Univ. of Tokyo Tohoku Univ. Nagoya Univ.
Exhibitors		
Elionix, Hiroshima Univ., Kagawa Univ., Keisoku Engineering System, MEMS Park Consortium, Nagase Techno Engineering, Nagoya Univ., Park Systems Japan, Sumitomo Precision Products, SUSS Microtec, Tohoku Univ.-Esashi & S. Tanaka Lab., Tohoku Univ.-Kuwano & Nagasawa Lab.		

★The 4th MEMS Engineer Forum 2012

MEMS がけん引するスマートシティ - 東日本大震災を乗り越えて-

March 12-13, 2012 Toshi Center Hall, Tokyo

Speakers		
Theme	Speakers	Affiliation
Smart City - Role of MEMS --	Hiroki Kuwano Yasuaki Onoda Narito Kurata Hiroyuki Kazama Naoto Kobayashi Tomonori Seki Kazuo Yano Susumu Kaminaga	Tohoku Univ. Tohoku Univ. Kajima NTT Data Waseda Univ. OMRON Hitachi Sumitomo Precision Products
Smart City - Driving Factor of MEMS New Technologies --	Masayoshi Esashi Kazuo Sato Yoshinobu Baba Yutaka Katano Tsuyoshi Tajiri Kazunari Kaneyasu Koei Suzuki Hiroki Kuwano	Tohoku Univ. Nagoya Univ. Nagoya Univ. YOLE DEVELOPPEMENT Autoliv Figaro Engineering Ricoh Tohoku Univ.
Exhibitors		
Aichi Science and Technology Foundation, Berkeley Sensor and Actuator Center, Japan Laser, KUNOH Technocraft, MEMS Park Consortium, National Institute of Advanced Industrial Science and Technology(AIST), Park Systems Japan, SPP Technologies, Tohoku Univ.-Esashi & S. Tanaka Lab.,		



10 years History of MEF – 5th

★The 5th MEMS Engineer Forum 2013

**Create the new phase of MEMS key technology for rebirth!-
Toward reconstruction, regeneration and
building Smart Cities -**

MEMS を日本新生のキーテクノロジーに！

- 復興、再生、スマートシティ構築に向けて

-March 13-14, 2013 KFC Hall, Ryogoku, Tokyo



Speakers		
Theme	Speakers	Affiliation
Learn Successful Model of MEMS	Masayoshi Esashi Kurt Petersen Alert Pisano Ichiro Yamashita Julien Arcamone Weileun Fang Alissa Fitzgerald Joerg Froemel	Tohoku Univ. KP-MEMS UC Berkeley Panasonic Leti National TsingHua Univ. A.m. Fitzgerald & Associates Fraunhofer ENAS
The Great MEMS Market	Susumu Kaminaga Thomas Kenny Jean-Christophe Eloy Richard Dixon Kazuyoshi Itagaki Magnus Rimskog Jo de Boeck	Sumitomo Precision Products Stanford Univ. YOLE DEVELOPPEMENT IHS iSuppli EnOcean Alliance Silex Microsystems IMEC
Exhibitors		
Aichi Science and Technology Foundation, AIST, CRESTEC, EnOcean Alliance, EVGroup Japan, Hakuto, Hiroshima Univ.-Miyake Lab., Japan Laser, Kyodo International, Koken, Kunoh Technocraft, Leti, MEMS Park Consortium, Moritex, Murata Manufacturing, Polytec, SK Global Advisers, SPP Technologies, Samco, SUSS Microtec, Tohoku Univ.-Kuwana Lab., Tokyo Ohka Kogyo, UC Berkeley, University of Hyogo, YOUTEC		



10 years History of MEF – 6th

★The 6th MEMS Engineer Forum 2014
Smart City – MEMS Forefront and Each Strategy
-April 25, 2014 KFC Hall, Ryogoku, Tokyo

Speakers		
Theme	Speakers	Affiliation
MIG Conference Japan 2014 (April 24, 2014) jointly held		
	Takeshi Ito Daido Uchida J�r�mie Bouchaud Leopold Beer Babak Taheri Liang Shi Denise Kaske Xi Wang	Sony Mobile Communications OMRON IHS Inc. BOSCH Sensortec Freescale Semiconductor SunEdison Semiconductor Fraunhofer-Gesellschaft Shanghai Institute of Microsystem and Information Technology
MEF 2014 (April 25, 2014)		
Keynote	Susumu Kaminaga Thomas Gessner	SPP Technologies/SK Global Advisers Fraunhofer ENAS
Latest Status of MEMS	Karen Lightman Janusz Bryzek Albert Pisano Jean-Christophe Eloy	MEMS Industry Group Fairchild Semiconductor UC San Diego YOLE DEVELOPPMENT
Strategy of MEMS Manufacturer	Benedetto Vigna/ Hiroshi Noguchi Hyungjae Shin Eiji Fujii Yutaka Nonomura Armin Schober	STMicroelectronics Samsung Electronics Panasonic TOYOTA Central R&D Labs TDK-EPC
Future MEMS Business	Kentaro Totsu Kurt Huang	Tohoku Univ. UMC
R&D Status of the Leading Edge MEMS	Masayoshi Esashi	Tohoku Univ.
Sponsors		
Asahi Glass, Hitachi High-Technologies		
Exhibitors		
Advanced Technologies, Aichi Science and Technology Foundation, ALTATECH/SOITEC, Asahi Techno Solutions, Crestec, Fraunhofer ENAS, Furuya Metal, Kanto Aircraft Instrument, KST World, KUNOH Technocraft, MEMS Industry Group, Micromachine Center, OMRON, Polytec Japan, Quantum Design Japan, Ritsumeikan University, Shin-Etsu Polymer, Shuwa Industry, Silicon Sensing Systems, Soitec Japan, SPP Technologies, Tohoku University, UC San Diego, University of Hyogo, Ushio		



10 years History of MEF -7th

★The 7th MEMS Engineer Forum 2015
Smart City – MEMS Forefront and Each Strategy
-April 20-21, 2015 KFC Hall, Ryogoku, Tokyo

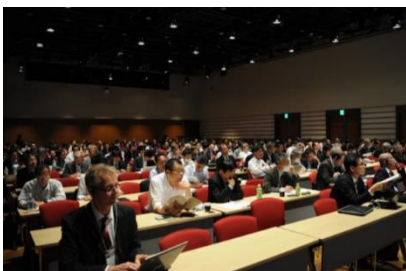
Speakers		
Theme	Speakers	Affiliation
Keynote	Kazuo Kyuma Junichi Kishigami	Cabinet Office, Japan Muroran Institute of Technology
MEMS Trends Overview	Yoshio Sekiguchi Guillaume Girardin Tetsuya Wadaki	MEMS Industry Group YOLE DEVELOPPMENT Nomura Securities
MEMS Trends Worldwide	Julien Arcamone Ryutaro Maeda Weileun Fang Aarne Oja Hiroya Tanaka Masayoshi Esashi	CEA-LETI AIST National TsingHua University VTT Keio University Tohoku Univ.
MEMS Sensor Systems and Applications	Udo-Martin Gomez Hiroyuki Morikawa Yutaka Nonomura Markus Lutz Takeshi Kunimi Shuji Tanaka Takao Someya Satoshi Koike Yang Ishigaki Kohei Higuchi Paul Werbaneth Shintaro Watanabe	Bosch Sensortech Univ. of Tokyo TOYOTA Central R&D Labs. SiTime Akebono Brake Ind. Tohoku Univ. Univ. of Tokyo Vegetalia Yaguchi Electric/Radiation Watch.org Affordsense 3D InCites NTT Data
MEMS Sensor Systems and IoT	Mai Ota Susumu Kaminaga	Development Bank of Japan SPP Technoloies
Sponsors		
Asahi Glass, Hitachi High-Technologies, Keyence		
Exhibitors		
Advanced Technologies, AffordSENS, ALPS Electric, Asahi Glass, Ayumi Industry, BumpRecorder, Central Glass, Crestec, Elionix, Fine Material System, Fraunhofer@Tohoku Univ., Gluon, IEEJ Sensors and Micromachines, Intertek, Japan Society of Next Generation Sensor Technology, Japan Laser, K&P/PA Metrology & Plasma Solutions, Keyence, Koken, Kunoh Technocraft, Kyodo International, Marubeni Information Systems, MEMS CORE, MEMS Industry Group, MEMS Park Consortium, Micronics Japan, Nano System Solutions, NGK Spark Plug, Oga, OMRON, Plan Optik, Rohm, SHUTECH, Silicon Sensing Systems Japan, SK Global Advisers, SPP Technologies, StayShift, SUSS MicrTec, TDC, Toppan Printing, Tosetsu, Univ. of Tokyo-Miyake Lab., Tohoku Univ.-Kuwano Lab., Tohoku Univ.-Yamanaka Lab., Tohoku Univ.-Tanaka Lab., Tohoku Univ.-Hands-on-access fab., Tosetz, Ushio,		



10 years History of MEF -8th

★The 8th MEMS Engineer Forum 2016
 Internet of Things for Smart City
 -May 11-12, 2016 KFC Hall, Ryogoku, Tokyo

Speakers		
Theme	Speakers	Affiliation
Keynote/Special Talks	Kyuuichirou Sano Andrei M. Shkel Masayoshi Esashi/Kentaro Totsu Ryutaro Kawamura Susumu Kaminaga Akira Matsuzawa	Ministry of Economy, Trade, and Industry (METI) UC Irvine Tohoku Univ. NTT SPP Technologies Tokyo Institute of Technology
Program Overview	Naoto Kobayashi	Waseda Univ.
MEMS Trends Worldwide	Claire Troadec Karen Lightman Julien Arcamone Aarne Oja Joerg Froemel/Thomas Gessner Xinxin Li	YOLE DEVELOPPMENT MEMS & Sensors Industry Group CEA-LETI VTT Fraunhofer Project Center for MEMS/NEMS devices and manufacturing technologies Chinese Academy of Sciences
MEMS Sensor Systems and IoT	Hiroshi Funakubo Weileun Fang Takayuki Ezaki Mark Wood Peter Zalar	Tokyo Institute of Technology National TsingHua Univ. Sony Semiconductor Solutions InvenSense Univ. of Tokyo
MEMS Sensor Systems and Application	Nobuaki Kawahara Georg Bischofink Takahiro Nakayama Yasumitsu Orii Naoki Nakashima Sadaharu Takimoto	DENSO Robert Bosch TOYOTA Motor IBM Research Tokyo Kyushu Univ. Hospital Hamamtsu Photonics
IoT and Society	Taizo Kinoshita Yang Ishigaki Masamitsu Kawasumi Hidehito Yamazaki Satoshi Takahashi	Hitachi Yaguchi Electric Development Bank of Japan Cloud Security Alliance Salesforce.com
Sponsors		
SUSS MicroTec, ELIONIX, Hitachi High-Technologies, KEYENCE, Philtech		
Exhibitors		
ADVANCED TECHNOLOGIES, ALPS Electric, ASAHI KASEI, Asahi Techno Solutions, Coventor, CRESTEC, DENSO, KOKEN, Lasertec. MEMS CORE, MEMS Park Consortium. NAGASE, NGK SPARK PLUG, OMRON, Plan Optik, ROHM, SHIBAURA MECHATRONICS, Silicon Sensing Systems Japan, SK Global Advisers, SPP Technologies, TDC, TOPPAN PRINTING, USHIO, YAMAMOTO-MS, Yokogawa Electric, 4-University Nano/Micro Fabrication Consortium, CEA-Leti, Fraunhofer Institute for Electronic Nano Systems ENAS, Hand-on-access fab., Tohoku University, IEEJ Sensors and Micromachines, Japan Society of Next Generation Sensor Technology (JASST), Tohoku University- Kuwano Lab., MEMS & Sensors Industry Group, Tohoku University- Tanaka Lab., Technology Research Association for Inertia Sensors and their Applications, Tohoku Univ.-Micro System Integration Center (μ SIC), The University of Tokyo - Miyake Lab., Oga, SHUTECH		



10 years History of MEF -9th

★The 9th MEMS Engineer Forum 2017

MEMS and IoT for Smart City

-April 26-27, 2017 KFC Hall, Ryogoku, Tokyo

Speakers		
Theme	Speakers	Affiliation
Keynote/Special Talks	Hideo Shindo Thomas Kenny Hidetoshi Katori Kurt Petersen Masayoshi Esashi	Cabinet Office, Japan Stanford Univ. Univ. of Tokyo Silicon Valley Band of Angels Tohoku Univ.
Program Overview	Naoto Kobayashi	Waseda Univ.
MEMS Trends Worldwide	Karen Lightman Frederic Breussin Raji Baskaran Julien Arcamone Hiroki Kuwano	MEMS & Sensors Industry Group, SEMI YOLE DEVELOPPMENT Intel CEA-LETI Tohoku Univ.
MEMS Sensor Systems and IoT	Igor Paprotny Koji Mitsubayashi Yoshinori Matsumoto David Horsley Aarne Oja Shinji Nishimura Shoji Kawahito Takaya Nagahata Tatsuo Torii Yuji Ohgi Keigo Saeki Susumu Kaminaga Osamu Koyanagi Sheng-Shian Li Jari Honkanen Vesa-Pekka Lempinen Sheng Xu Thomas Otto Hiroshi Noguchi	Univ. of Illinois Tokyo Medical and Dental Univ. Keio Univ. UC Davis Tikitin Hitachi Shizuoka Univ. ROHM Japan Atomic Energy Agency Keio Univ. Nara Medical Univ. SPP Technologies Development of Bank National TsingHua Univ. MicroVision Okmetic Oyj UC San Diego Fraunhofer Institute ENAS STMicroelectronics
Sponsors		
Okmetic, AYUMI INDUSTRY, Ebara, Goertek, Hitachi High-Technologies, OMRON		
Exhibitors		
4-University Nano/Micro Fabrication Consortium, ADVANCED TECHNOLOGIES, ARS, CEA LETI, Coventor, Dai Nippon Printing, DENSO, EVGroup Japan, Fraunhofer Institute for Electronic Nano Systems ENAS, Fuji Electric, Tohoku University- Hands-on-access fab., HiSOL, IEEJ Sensors and Micromachines, Japan Society of Next Generation Sensor Technology (JASST), Jedat, KANOMAX, KOKEN, Tohoku University- Kuwano Lab., MEMS & Sensors Industry Group, MEMS CORE, MEMS Park Consortium, Micromachine Center, The University of Tokyo- Miyake Lab., NAGANOKEIKI, NAGASE, New Japan Radio, NTK CERAMIC, Oga, PLAN OPTIK, Research Laboratories of Saigon High-Tech-Park, ROHM, Tohoku University- Shuji Tanaka Lab., Silicon Sensing Systems Japan, SK Global Advisers, SPP Technologies, SUSS MicroTec/Kanematsu PWS, Tanaka Kikinzoku Kogyo/Electroplating Engineers of Japan, TDC, TOKYO OHKA KOGYO, TOPPAN PRINTING, USHIO, YOKOGAWA ELECTRIC		



10 years History of MEF -10th

★The 10th MEMS Engineer Forum 2018

Smart Society Driven by MEMS

-April 25-26, 2017 KFC Hall, Ryogoku, Tokyo

Speakers		
Theme	Speakers	Affiliation
Keynote/Special Talks	Tomoji Kawai Albert Pisano Masayoshi Esashi Frank Niklaus Kurt Petersen Susumu Kaminaga Thomas Kenny	NEDO UC San Diego Tohoku Univ. KTH Royal Institute of Technology in Stockholm, Sweden Silicon Valley Band of Angels SPP Technologies Stanford Univ.
Program Overview	Naoto Kobayashi	Waseda Univ.
MEMS Explore a New World	Jean-Philippe Polizzi Sadaharu Takimoto Christiane Kaden Sitaram Arkalgud	CEA-Leti Hamamatsu Photonics Fraunhofer IPMS Xperi-Invensas
MEMS & Smart City	Peter Zalar Mitsugu Ogiura Hiroki Kuwano	HOLST Centre Murata Electronics Oy Tohoku Univ.
Business Strategies for MEMS	Evangelos A. Angelopoulos Magnus Rimskog/Kenji Kato Jerry Liu Chun-Wen Cheng	Infineon Technologies Silex Microsystems/ Kyodo International Semiconductor Manufacturing Electronics (Shaoxing) Corp. tsmc
MEMS for the Next Decade	Jean-Christophe Eloy Atsuhiko Nakagawa Daisuke Eto Hiromi Yatsuda Udo-Martin Gomez	ROLE Developpement Tohoku Univ. FUJIFILM Wako Pure Chemical Japan Radio Robert Bosch
Sponsors		
ALPS ELECTRIC, AYUMI INDUSTRY, Bosch, Ebara, EV Group Japan, Goertek Technology Japan, Hitachi High-Technologies, Huawei Technologies Japan, KANOMAX, Okmetic, OMRON, Samco, TDK, Yole Développement		
Exhibitors		
4-University Nano/Micro Fabrication Consortium, ADVANCED TECHNOLOGIES, Asahi KASEI, Ball Wave, CEA LETI, Coventor Japan, DENSO, HEIDELBERG INSTRUMENTS, HiSOL, IEEJ Sensors and Micromachines, Infineon Technologies, INNOVATEST JAPAN, ITOCHU Aviation/ACUTRONIC, Japan Society of Next Generation Sensor Technology, Jedat KOKEN, Kyodo International/Silex Microsystems, Leave a Nest, M.T.C., MEMS CORE, MEMS Park Consortium, Micromachine Center, NAGANOKEIKI, New Japan Radio/Japan Radio, NTK Ceramic, Oga PLAN OPTIK, ROHM, ROKKO ELECTRONICS, Silicon Sensing Systems Japan, SK Global Advisers, SPP Technologies, SUSS MicroTec/Kanematsu PWS, TDC, Technology Research Association for Inertia Sensors Applications, TECNISCO, The University of Tokyo - Miyake Lab, Tohoku University - Hands-on-access fab., Tohoku University - Kuwano Labo., Tohoku University - S. Tanaka Laboratory for Smart System Integration, TOKYO OHKA KOGYO, Touchence, UC San Diego Jacobs School of Engineering, USHIO/Picosun Japan, Xperi - Invensas, Yokogawa Electric, ZEISS		

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Samco Inc. サムコ株式会社

MEF 2018 EXHIBITORS

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<五十音順>

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Xperi - Invensas
ZEISS
旭化成株式会社
株式会社アドバンステクノロジー
伊藤忠アビエーション株式会社
株式会社イノバテスト・ジャパン
インフィニオン テクノロジーズ ジャパン
ウシオ電機株式会社/PICOSUN JAPAN 株式会社
SK グローバルアドバイザーズ株式会社
SPP テクノロジーズ株式会社
NTK セラミック株式会社
株式会社M. T. C.
株式会社オーギャ
特定非営利活動法人 慣性センサ応用技術研究協会
株式会社協同インターナショナル/
Silex Microsystems AB
興研株式会社
株式会社ジーダット
一般社団法人 次世代センサ協議会
株式会社シリコンセンシングシステムズジャパン
新日本無線/日本無線
ズース・マイクロテック株式会社 /兼松 PWS 株式会社
タッチエンス株式会社
株式会社ティ・デイ・シー
株式会社テクニスコ
電気学会センサ・マイクロマシン部門
株式会社デンソー
東京応化工業株式会社
東京大学 三宅研究室
東北大学 試作コインランドリ
東北大学 田中(秀)研究室
東北大学 未来科学共同研究センター 桑野研究室
長野計器株式会社
ハイソル株式会社
ハイデルベルグ・インストルメンツ株式会社
ボールウェーブ株式会社
(一財) マイクロマシンセンター
株式会社メムス・コア
MEMS パークコンソーシアム
横河電機株式会社
4 大学ナノ・マイクロファブ리케이션コンソーシアム
株式会社リバナエス
ローム株式会社
六甲電子株式会社

<Alphabetical Order>

4-University Nano/Micro Fabrication Consortium
ADVANCED TECHNOLOGIES CO., LTD.
Asahi KASEI Corporation
Ball Wave Inc.
CEA LETI
Coventor Japan
DENSO CORPORATION
HEIDELBERG INSTRUMENTS
HiSOL, Inc.
IEEJ Sensors and Micromachines
Infineon Technologies
INNOVATEST JAPAN
ITOCHU Aviation Co., Ltd.
Japan Society of Next Generation Sensor Technology
Jedat Inc.
KOKEN LTD
Kyooo International, Inc. /Silex Microsystems AB
Leave a Nest Co., Ltd.
MEMS CORE Co., Ltd.
MEMS Park Consortium
Micromachine Center
M. T. C. Co., Ltd.
NAGANOKEIKI CO., LTD.
New Japan Radio/Japan Radio
NTK Ceramic Co., Ltd.
Oga Inc.
PLAN OPTIK AG
ROHM Co., Ltd.
ROKKO ELECTRONICS CO., LTD.
Silicon Sensing Systems Japan Ltd.
SK Global Advisers Co., Ltd.
SPP Technologies Co., Ltd.
SUSS MicroTec KK/Kanematsu PWS LTD.
TDC CORP.
Technology Research Association for Inertia Sensors
Applications
TECNISCO. LTD.
The University of Tokyo - Miyake Lab
Tohoku University - Hands-on-access fab.
Tohoku University - Kuwano Laboratory
Tohoku University - S. Tanaka Laboratory
TOKYO OHKA KOGYO CO., LTD.
Touchence Inc.
UC San Diego Jacobs School of Engineering
USHIO INC./Picosun Japan Co., Ltd.
Xperi - Invensas
Yokogawa Electric Corporation
ZEISS

MEF2018 プログラム

2018年4月25日(水)

- 9:00- 9:05 開催のご挨拶
桑野 博喜 氏
MEF 実行委員長/東北大学 未来科学技術共同研究センター 教授
- 9:05- 9:15 MEF 2018 の概要
「MEMS と SDGs (Sustainable Development Goals (持続可能な開発目標))」
小林 直人氏
MEF 実行副委員長/早稲田大学 研究戦略センター副所長 教授

●キーノートアドレス (セッションチェア: 早稲田大学 小林 直人氏)

- 9:15- 9:50 日本の技術戦略
川合 知二氏
国立研究開発法人新エネルギー・産業技術総合開発機構 (NEDO)
技術戦略研究センター長
- 9:50-10:25 MEMS and SYSTEMS in the Digital Future
Dr. Albert P. Pisano
Dean of Engineering, University of California San Diego

●MEMS の新展開 (セッションチェア: 株式会社日立ハイテクノロジーズ 野副 真理氏)

- 10:25-10:50 What's next in MEMS? - A view from a Research Institute
Mr. Jean-Philippe Polizzi
MEMS Business Development Manager
CEA-Leti
- 10:50-11:05 休憩時間/併設展示
- 11:05-11:30 浜松ホトニクス製の光 MEMS(MOEMS)技術
瀧本 貞治 氏
浜松ホトニクス株式会社
固体事業部 MEMS 部部長
- 11:30-11:55 Monolithic Integration for Photonic Applications: MEMS on CMOS
and Functional BSOI
Dr. Christiane Kaden
Group Manager, Engineering, Bulk MEMS-Technologies
The Fraunhofer Institute for Photonic Microsystems (IPMS)
- 11:55-12:20 Application of Direct Bonding in MEMS
Dr. Sitram Arkalgud
Vice President, 3D Applications, Xperi-Invensas

●出展者プレゼンテーション Part I (下記順に行われます)

- 12:20-13:00 出展者プレゼンテーション Part I
(セッションチェア: 首都大学東京 蛸島 武尚氏、HOLST Centre Japan 稲子 みどり氏)
- ・ ハイデルベルグ・インストルメンツのレーザー直接描画装置
ハイデルベルグ・インストルメンツ (株) 上瀧 英郎氏
 - ・ Rokko Electronics's Premium Process for MEMS wafer
六甲電子株式会社 天辻 喜則氏
 - ・ ズース・マイクロテックの MEMS, 電子部品製造向けウエハプロセス装置
ズース・マイクロテック株式会社 石田 博之氏

- ・ 新日本無線の MEMS 技術
新日本無線 茂浦口 明雄氏
- ・ High Resolution, Non-Destructive 3D Imaging and Analysis
ZEISS 松島 潤氏
- ・ 多軸触覚センサ
タッチエンス株式会社 丸山 尚哉氏
- ・ MEMS の発展に貢献する TOK の微細加工技術
東京応化工業株式会社 清水 大輝氏

13:00-13:40 昼食時間／併設展示会コアタイム

●キーノートアドレス (セッションチェア：東北大学 田中 秀治氏)

13:40-14:15 MEMS の温故知新
江刺 正喜氏
東北大学 マイクロシステム融合研究開発センター 教授

14:15-14:50 Integration of ICs and MEMS
Prof. Frank Niklaus
Professor, Department of Micro and Nanosystems
KTH Royal Institute of Technology in Stockholm, Sweden

●出展者プレゼンテーション Part II (下記順に行われます)

(セッションチェア：首都大学東京 蛸島 武尚氏、HOLST Centre Japan 稲子 みどり氏)

- 14:50-15:50 出展者プレゼンテーション Part II
- ・ Coventor MEMS Overview
Coventor Japan 合同会社 木下 好之氏
 - ・ ソフトマテリアルを使用した触覚フィルム
株式会社オーギャ 水島 昌徳氏
 - ・ Plan Optik AG - Materials for MEMS and Semiconductors
PLAN OPTIK AG Lorenz Granrath 氏
 - ・ トリリオン・センサ社会に向けた SPT の加工装置群
SPP テクノロジーズ株式会社 金尾 寛人氏
 - ・ MEMS 用設計ツール IntelliSuite ver9.0 と Total MEMS Solution(TM)の紹介
株式会社 アドバンスドテクノロジー 平出 隆一氏
 - ・ Silex Microsystems 及び協同インターナショナルのファンドリー
協同インターナショナル/Silex Microsystems 協同インターナショナル/加藤健二氏
 - ・ インフィニオン製気圧センサ、最先端 MEMS テクノロジー
インフィニオン テクノロジーズ ジャパン 伊達 奈央氏
 - ・ NTK セラミックパッケージの紹介
NTK セラミック株式会社 萩野 敬介氏
 - ・ Application of Xperi Direct Bonding in MEMS
Xperi - Invensas Sitaram Arkalgud 氏
 - ・ Super Precision Polishing/Lapping Technique
株式会社ティ・デイ・シー ウイレムセン 有査氏

15:50-16:20 休憩時間／併設展示会コアタイム

●MEMS とスマートシティ (セッションチェア：ズース・マイクロテック株式会社 石田 博之氏)

16:20-16:45 Towards Printed Conformable Sensing Surfaces
Dr. Peter Zalar
Senior Research Scientist, Hybrid & Printed Electronics Eindhoven
HOLST Centre

- 16:45-17:10 ムラタ MEMS センサの紹介と取り組み市場について
荻浦 美嗣氏
ムラタエレクトロニクス フィンランド
Vice President, Product Development
- 17:10-17:35 日本において創立したばかりの MEMS 会社の一例
桑野 博喜氏
東北大学 未来科学技術共同研究センター 教授
- 17:35-17:55 休憩時間/併設展示コアタイム
- 18:00-20:00 MEF 2018 第 10 回記念懇親パーティ
第一ホテル両国 25F スカイバンケット「アジュール」にて開催

2018 年 4 月 26 日 (木)

- 9:00- 9:05 開会のご挨拶
東北大学 未来科学技術共同研究センター 教授 桑野 博喜氏
- キーノートアドレス (セッションチェア: 東京大学 三宅 亮氏)
- 9:05- 9:40 Trends in MEMS: Business and Technical
Dr. Kurt Petersen
Silicon Valley Band of Angels
- 9:40-10:15 MEMS 技術開発と事業経営
神永 晉氏
SPP テクノロジーズ株式会社
エグゼクティブシニアアドバイザー
- MEMS のビジネス開発 (セッションチェア: 東北大学 大高 剛一氏)
- 10:15-10:40 Highest performance Infineon MEMS microphones enable smarter voice user interfaces
Dr. Evangelos A. Angelopoulos
Senior Project Leader, RF & Sensors
Infineon Technologies AG
- 10:40-11:05 協同インターナショナルと Silex Microsystems の MEMS ビジネスのご紹介
Mr. Magnus Rimskog
Sales Director, Silex Microsystems
加藤 健二氏
協同インターナショナル 主任
- 11:05-11:20 休憩時間/併設展示コアタイム
- 11:20-11:45 How does foundry based manufacturing offer smart fabrication of MEMS in intelligent era?
Mr. Jerry Liu
EVP, Head of Technology & Business Development Center
Semiconductor Manufacturing Electronics (Shaoxing) Corporation,
Joint Venture of SMIC
- 11:45-12:10 MEMS sensor manufacturing technology for SMART Society applications
Dr. Chun-Wen Cheng (Emerson Cheng)
Deputy Director, MEMS Department
TSMC

●出展者プレゼンテーション **Part III** (下記順に行われます)

(セッションチェア：首都大学東京 蛸島 武尚氏、HOLST Centre Japan 稲子 みどり氏)

12:10-13:10 出展者プレゼンテーション **Part III** (下記順に行われます)

- ・ アキュトロニック モーションテーブルのご案内
伊藤忠アビエーション株式会社/Acutronic 社 向後 義寛氏
- ・ Development of Roll to Roll Nano-patterning Process for PE devices
旭化成株式会社 小松 和磨氏
- ・ クロスエッジ 微細加工のご紹介
テクニスコ 須崎 真年氏
- ・ メムス・コアのファウンドリーサービス
株式会社メムス・コア 日下 和彦氏
- ・ ボール SAW センサとその応用
ボールウェーブ株式会社 竹田 宣生氏
- ・ Lighting Edge Technology for MEMS
ウシオ電機株式会社 松本 望氏後送
- ・ アカデミアのネットワークを広げ、知恵を取り入れる「リバネス研究費」「L-RAD」
株式会社リバネス
- ・ 容易なマスク入力及び断面構造検討支援ツールのご紹介
株式会社ジータット 黒葛原 博之氏

13:10-13:50 昼食/併設展示会コアタイム

●キーノートアドレス (セッションチェア：名城大学 野々村 裕氏)

13:50-14:25 High-Temperature Epitaxial Silicon Encapsulation for High-Stability Clocks and Sensors
Prof. Thomas Kenny
Professor of Engineering and Senior Associate Dean of Engineering for Student Affairs
Stanford University

●MEMS-今後の10年を展望する (セッションチェア：オリンパス株式会社 宮島 博志氏)

14:25-14:50 MEMS in the heart of the mega trends: what can we expect for the next 10 years?

Mr. Jean-Christophe ELOY
CEO & President
YOLE Developpement

14:50-15:15 バイオデザイン：デジタルヘルス領域においても見極めるべきは”特徴づけられたニーズ”

中川 敦寛氏
東北大学病院臨床研究推進センター
脳神経外科、バイオデザイン部門、特任准教授

15:15-15:30 休憩時間/併設展示

15:30-15:55 微細流路チップを用いた臨床検査システム 「ミュータスワコー i30」、
「ミュータスワコー g1」の開発

衛藤 大亮氏
富士フイルム和光純薬株式会社
臨床検査薬事業部臨床検査薬開発本部 臨床検査薬研究所 主任研究員

15:55-16:20 弾性表面波素子を利用した迅速免疫測定キット

谷津田 博美氏

日本無線株式会社

研究所 バイオセンサプロジェクト室長

16:20-16:50 Smarter MEMS sensors for Automotive and Consumer Applications

Dr. Udo-Martin Gómez

Senior Vice President, Engineering MEMS Sensors

Robert Bosch GmbH, Automotive Electronics

★グランドフィナーレパネルディスカッション

16:50-18:00

Moderator:

神永 晋氏

SPP テクノロジーズ株式会社

Panelists:

Mr. Jean-Christophe ELOY YOLE Developpement

江刺 正喜氏

東北大学

Prof. Thomas Kenny

Stanford University

Prof. Frank Niklaus

KTH Royal Institute of Technology in Stockholm,
Sweden

Dr. Kurt Petersen

Silicon Valley Band of Angels

Dr. Udo-Martin Gómez

Robert Bosch GmbH, Automotive Electronics

18:00-18:05

閉会の辞

MEF 2018 Program Schedule

Wednesday, April 25, 2018

●Opening Remarks

9:00- 9:05 Prof. Hiroki Kuwano
MEF Executive Committee Chairman
Professor, New Industry Creation Hatchery Center
Tohoku University

●Program Overview

9:05- 9:15 Highlights of MEF 2018
– MEMS and SDGs(Sustainable Development Goals) -
Prof. Naoto Kobayashi
MEF Executive Committee Vice Chairman
Associate Director and Professor, Center for Research Strategy
Waseda University

●Keynote Session (Session chair: Naoto Kobayashi, Waseda University)

9:15- 9:50 Technology Strategy in Japan
Prof. Tomoji Kawai
Executive Director, Technology Strategy Center (TSC)
New Energy and Industrial Technology Development Organization (NEDO)

9:50-10:25 MEMS and SYSTEMS in the Digital Future
Dr. Albert P. Pisano
Dean of Engineering, University of California San Diego

●MEMS Explores a New World (Session Chair: Mari Nozoe, Hitachi High-Technologies)

10:25-10:50 What's next in MEMS? - A view from a Research Institute
Mr. Jean-Philippe Polizzi
MEMS Business Development Manager
CEA-Leti

10:50-11:05 Coffee Break/Exhibition

11:05-11:30 Optical MEMS (MOEMS) Technology of HAMAMATSU
Mr. Sadaharu Takimoto
General Manager, MEMS, Solid state division
Hamamatsu Photonics K.K.

11:30-11:55 Monolithic Integration for Photonic Applications: MEMS on CMOS
and Functional BSOI
Dr. Christiane Kaden
Group Manager, Engineering, Bulk MEMS-Technologies
The Fraunhofer Institute for Photonic Microsystems (IPMS)

11:55-12:20 Application of Direct Bonding in MEMS
Dr. Sitram Arkalgud
Vice President, 3D Applications, Xperi-Invensas

●Exhibitors' Presentation Time: Part I

12:20-13:00

(Session Co-Chair:Takehisa Takoshima, Tokyo Metropolitan University, Midori Inako, HOLST CENTRE Japan)

- Laser Direct Writers of Heidelberg Instruments
Hideo Jotaki, HEIDELBERG INSTRUMENTS
- Rokko Electronics's Premium Process for MEMS wafer
Yoshinori Amatsuji, ROKKO ELECTRONICS CO., LTD.
- SUSS MicroTec Wafer Processing Equipment for MEMS and Electronic Components Manufacturing
Hiroyuki Ishida, SUSS MicroTec KK
- MEMS Technology of NEW JRC
Akio Mouraguchi, New Japan Radio
- High Resolution, Non-Destructive 3D Imaging and Analysis
Jun Matsushima, Zeiss
- Multi-axis tactile sensor
Naoya Maruyama, Touchence Inc.
- Making Contribution to MEMS field by TOK's technology
Taiki Shimizu, TOKYO OHKA KOGYO CO., LTD.

13:00-13:40 Lunch Time/Exhibition Core Time

●Keynote Session (Session Chair: Shuji Tanaka, Tohoku University)

13:40-14:15 Finding a guide for future MEMS by learning from the past
Prof. Masayoshi Esashi
Professor, Micro System Integration Center
Tohoku University

14:15-14:50 Integration of ICs and MEMS
Prof. Frank Niklaus
Professor, Department of Micro and Nanosystems
KTH Royal Institute of Technology in Stockholm, Sweden

●Exhibitors' Presentation Time: Part II

(Session Co-Chair:Takehisa Takoshima, Tokyo Metropolitan University, Midori Inako, HOLST CENTRE Japan)

14:50-15:50

- Coventor MEMS Overview
Yoshiyuki Kinoshita, Coventor Japan
Flexible Tactile Film using Soft Materials
Masanori Mizushima, Oga
- Plan Optik AG - Materials for MEMS and Semiconductors
Lorenz Granrath, PLAN OPTIK AG
- SPT's Process Equipments toward Trillion Sensors Universe
Hiroto Kanao, SPP Technologies Co., Ltd.
- Introduction of MEMS design tool IntelliSuite ver9.0 and Total MEMS Solution™
Ryuichi Hirade, ADVANCED TECHNOLOGIES CO., LTD.
Silex Microsystems/Kyodo International foundry service introduction
Kyodo International/Silex Microsystems, Kenji Kato(Kyodo)

- Infineon's Unique MEMS Technology for Pressure sensor
Nao Date, Infineon Technologies
- NTK Ceramic Package Technologies
Keisuke Hagino, NTK Ceramic Co., Ltd.
- Application of Xperi Direct Bonding in MEMS
Sitaram Arkaud, Xperi – Invensas
- Super Precision Polishing/Lapping Technique
Alisa Willemsen, TDC CORP.

15:50-16:20 Coffee Break/Exhibition Core Time

● **MEMS & Smart City** (Session chair: Hiroyuki Ishida, SUSS Microtec)

- 16:20-16:45 Towards Printed Conformable Sensing Surfaces
Dr. Peter Zalar
Senior Research Scientist, Hybrid & Printed Electronics Eindhoven
HOLST Centre
- 16:45-17:10 Introduction of Murata MEMS sensor and focusing market
Mr. Mitsugu Ogiura
Vice President, Product Development
Murata Electronics Oy
- 17:10-17:35 An example of new born MEMS company in Japan
Prof. Hiroki Kuwano
Professor, New Industry Creation Hatchery Center
Tohoku University
- 17:35-17:55 Break/Exhibition Core Time
- 18:00-20:00 MEF 2018 the 10th Anniversary Reception
Azure (sky banquet room) , 25F, Daiichi Hotel Ryogoku

Thursday, April 26, 2018

● **Opening Remarks**

- 9:00- 9:05 Prof. Hiroki Kuwano
MEF Executive Committee Chairman
Professor, New Industry Creation Hatchery Center
Tohoku University

● **Keynote Session** (Session chair: Ryo Miyake, The University of Tokyo)

- 9:05- 9:40 Trends in MEMS: Business and Technical
Dr. Kurt Petersen
Silicon Valley Band of Angels
- 9:40-10:15 Technology Development and Business Management for MEMS
Mr. Susumu Kaminaga
Executive Senior Adviser
SPP Technologies

●**Business Strategies for MEMS** (Session chair: Koichi Ohtaka, Tohoku University)

- 10:15-10:40 Highest performance Infineon MEMS microphones enable smarter voice user interfaces
Dr. Evangelos A. Angelopoulos
Senior Project Leader, RF & Sensors
Infineon Technologies AG
- 10:40-11:05 MEMS business introduction of Kyodo international and Silex Microsystems
Mr. Magnus Rimskog
Sales Director, Silex Microsystems
Mr. Kenji Kato, Kyodo International
- 11:05-11:20 Coffee Break/Exhibition Core Time
- 11:20-11:45 How does foundry based manufacturing offer smart fabrication of MEMS in intelligent era?
Mr. Jerry Liu
EVP, Head of Technology & Business Development Center
Semiconductor Manufacturing Electronics (Shaoxing) Corporation,
Joint Venture of SMIC
- 11:45-12:10 MEMS sensor manufacturing technology for SMART Society applications
Dr. Chun-Wen Cheng (Emerson Cheng)
Deputy Director, MEMS Department
TSMC

●**Exhibitors' Presentation Time: Part III**

(Session Co-Chair: Takehisa Takoshima, Tokyo Metropolitan University, Midori Inako, HOLST CENTRE Japan)

- 12:10-13:10
- Introduction of Acutronic Motion Tables
Yoshihiro Kogo, ITOCHU Aviation/Acutronic
 - Development of Roll to Roll Nano-patterning Process for PE devices
Kazuma Komatsu, Asahi KASEI
 - "Cross-edge" microprocessing technology
Masatoshi Suzaki, TECNISCO LTD.
 - MEMS Foundry Service of MEMS-CORE
Kazuhiko Kusaka, MEMS CORE
 - Ball SAW Sensor and Its Applications
Nobuo Takeda, Ball Wave Inc.
 - Lighting Edge Technology for MEMS
Nozomi Matsumoto, USHIO INC.
 - Expanding network and importing knowledge from academia "LNest Grant" and "L-RAD"
Leave a Nest Co., Ltd.
 - Introduction of the analysis tool for Mask and silicon structure
Hiroyuki Tsuzurahara, Jedat Inc.
- 13:10-13:50 Lunch Time/Exhibition Core Time

● **Keynote Session (Session Chair: Yutaka Nonomura, Meijo University)**

- 13:50-14:25 High-Temperature Epitaxial Silicon Encapsulation for High-Stability Clocks and Sensors
Prof. Thomas Kenny
Professor of Engineering and Senior Associate Dean of Engineering for Student Affairs
Stanford University

● **MEMS for the Next Decade (Session Chair: Hiroshi Miyajima, Olympus)**

- 14:25-14:50 MEMS in the heart of the mega trends: what can we expect for the next 10 years?
Mr. Jean-Christophe ELOY
CEO & President
YOLE Developpement
- 14:50-15:15 Biodesign: How to find unmet medical needs, create solution in medicine and digital health
Dr. Atsuhiro Nakagawa
Special appointed associate professor,
Clinical Research, Innovation and Education Center
Tohoku University Hospital
- 15:15-15:30 Coffee Break/Exhibition Core Time
- 15:30-15:55 Development of a fully automated immunoanalyzer "μTASWako i30" and a fully automated genetic analyzer "μTASWako g1" using disposable microfluidic chips
Mr. Daisuke Eto
Associate Manager, Diagnostics Research Laboratories, Diagnostics Development Operations, Diagnostics Division
FUJIFILM Wako Pure Chemical Corporation
- 15:55-16:20 Rapid test kit using surface acoustic wave immunosensor
Dr. Hiromi Yatsuda
Biosensor Project Leader, Research and Development
Japan Radio Co., Ltd.
- 16:20-16:50 Smarter MEMS sensors for Automotive and Consumer Applications
Dr. Udo-Martin Gómez
Senior Vice President, Engineering MEMS Sensors
Robert Bosch GmbH, Automotive Electronics

★ **10th Anniversary Grand Finale Panel Discussion**

- 16:50-18:00 Moderator:
Mr. Susumu Kaminaga SPP Technologies
- Panelists:
Mr. Jean-Christophe ELOY YOLE Developpement
Prof. Masayoshi Esashi Tohoku University
Prof. Thomas Kenny Stanford University
Prof. Frank Niklaus KTH Royal Institute of Technology in Stockholm, Sweden
Dr. Kurt Petersen Silicon Valley Band of Angels
Dr. Udo-Martin Gómez Robert Bosch GmbH, Automotive Electronics
- 18:00-18:05 Closing Remarks

MEF 2018 EXHIBITORS by Booth Number

一般企業展示

R-01	ハイデルベルグ・インストルメンツ株式会社
R-02	ズース・マイクロテック株式会社 / 兼松 PWS 株式会社
R-03	六甲電子株式会社
R-04	新日本無線/日本無線
R-05	株式会社シリコンセンシングシステムズ ジャパン
R-06	SK グローバルアドバイザーズ株式会社
R-07	SPP テクノロジー株式会社
R-08	Coventor Japan 合同会社
R-09	協同インターナショナル/ Silex Microsystems
R-10	ZEISS
R-11	株式会社 アドバンスドテクノロジー
R-12	NTK セラミック株式会社
R-13	興研株式会社
R-14	株式会社ティ・デイ・シー
R-15	東京応化工業株式会社
R-16	株式会社デンソー
R-17	株式会社メムス・コア
R-18	テクニスコ
R-19	ハイソル株式会社
R-20	ウシオ電機株式会社/ PICOSUN JAPAN 株式会社
R-21	PLAN OPTIK AG
R-22	旭化成株式会社
R-23	伊藤忠アビエーション株式会社/Acutronic 社
R-24	横河電機株式会社

Regular Exhibitors

R-01	HEIDELBERG INSTRUMENTS
R-02	SUSS MicroTec KK/Kanematsu PWS LTD.
R-03	ROKKO ELECTRONICS CO., LTD.
R-04	New Japan Radio/Japan Radio
R-05	Silicon Sensing Systems Japan, Ltd.
R-06	SK Global Advisers Co., Ltd.
R-07	SPP Technologies Co., Ltd.
R-08	Coventor Japan
R-09	Kyodo International/Silex Microsystems
R-10	ZEISS
R-11	ADVANCED TECHNOLOGIES CO., LTD.
R-12	NTK Ceramic Co., Ltd.
R-13	KOKEN LTD
R-14	TDC CORP.
R-15	TOKYO OHKA KOGYO CO., LTD.
R-16	DENSO CORPORATION
R-17	MEMS CORE Co., Ltd.
R-18	TECNISCO LTD.
R-19	HiSOL, Inc.
R-20	USHIO INC, /Picosun Japan Co., Ltd.
R-21	PLAN OPTIK AG
R-22	Asahi KASEI Corporation
R-23	ITOCHU Aviation Co., Ltd./ACUTRONIC
R-24	Yokogawa Electric Corporation
R-25	Jedat Inc.
R-26	Infineon Technologies
R-27	ROHM Co., Ltd.
R-28	Xperi - Invensas
R-29	NAGANOKEIKI CO., LTD.

R-25	株式会社ジーダット
R-26	インフィニオン テクノロジーズ ジャパン
R-27	ローム株式会社
R-28	Xperi - Invensas
R-29	長野計器株式会社

アカデミック展示

A-01	CEA LETI
A-02	UC San Diego Jacobs School of Engineering
A-03	東京大学 三宅研究室
A-04	4 大学ナノ・マイクロファブ리케이션コンソーシアム
A-05	東北大学未来科学共同センター桑野研究室
A-06	東北大学 試作コインランドリ
A-07	MEMS パークコンソーシアム
A-08	東北大学 田中(秀)研究室
A-09	(一財) マイクロマシンセンター
A-10	特定非営利活動法人慣性センサ応用技術研究協会
A-11	一般社団法人 次世代センサ協議会
A-12	電気学会センサ・マイクロマシン部門

ベンチャー展示

V-01	タッチエンス株式会社
V-02	株式会社オーギャ
V-03	株式会社イノバテスト・ジャパン
V-04	株式会社M. T. C.
V-05	ボールウェーブ株式会社
V-06	株式会社リバナース

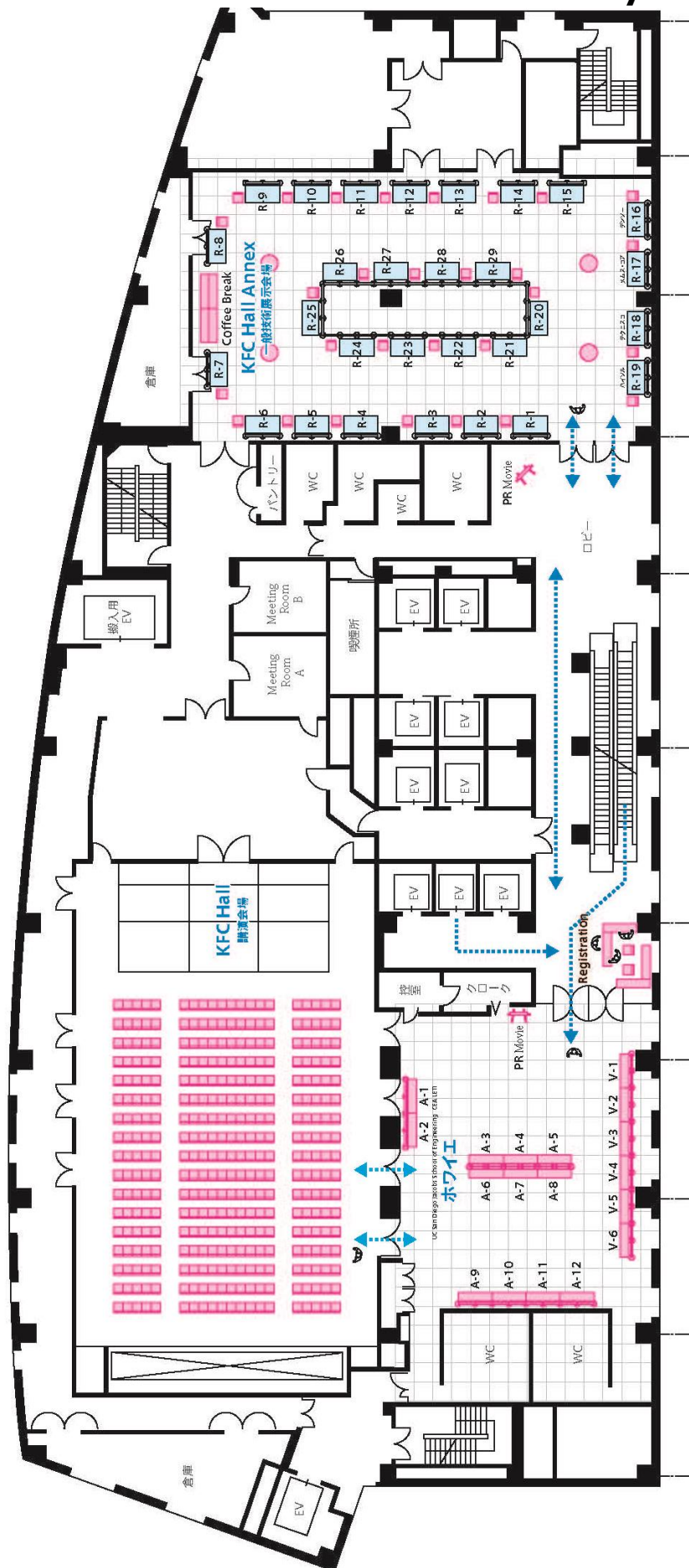
Academia

A-01	CEA LETI
A-02	UC San Diego Jacobs School of Engineering
A-03	The University of Tokyo - Miyake Lab
A-04	4-University Nano/Micro Fabrication Consortium
A-05	Tohoku University - Kuwano Laboratory
A-06	Tohoku University - Hands-on-access fab.
A-07	MEMS Park Consortium
A-08	Tohoku University - S. Tanaka Laboratory for Smart System Integration
A-09	Micromachine Center
A-10	Technology Research Association for Inertia Sensors Applications
A-11	Japan Society of Next Generation Sensor Technology
A-12	IEEJ Sensors and Micromachines

Start-up

V-01	Touchence Inc.
V-02	Oga Inc.
V-03	INNOVATEST JAPAN
V-04	M.T.C. Co., Ltd.
V-05	Ball Wave Inc.
V-06	Leave a Nest Co., Ltd.

MEF 2018 EXHIBITION – FLOOR Layout





MEF 2018 SPEAKERS

<p>9:05- 9:15, April 25 MEMS and SDGs Prof. Naoto Kobayashi Associate Director and Professor, Center for Research Strategy Waseda University</p> <p>MEF2018 概要 「MEMS と SDGs」 小林 直人氏 MEF 実行副委員長/早稲田大学 研究戦略センター副所長・教授</p>	
<p>CV Dr. Naoto Kobayashi received the B.S. degree in Physics in 1973, the M. Eng. degree in Nuclear Engineering in 1975, and Ph.D. degree in 1978 from Kyoto University. In 1978, he joined the Electrotechnical Laboratory (ETL). He was engaged in the research of quantum beam material interaction. From 1998 through 2001 he worked as the Director of Quantum Radiation Division of ETL for quantum beam frontier technologies. In 2001, he became the Director of Photonics Research Institute of the National Institute of Advanced Industrial Science and Technology (AIST). He worked as the supervisor of the national project of 'Femtosecond Technology (1995-2005)'. From 2003 to 2009 he has been Vice President of AIST. He worked especially for the research evaluation system in AIST. Since April 2009, he is professor at Center for Research Strategy, Waseda University, Tokyo and also emeritus advisor of AIST. He currently performs research in the field of research strategy and evaluation in addition to the photonics research. He works as chairman of the research evaluation committee for METI and NEDO.</p>	
<p>9:15- 9:50, April 25 Keynote Speech: Technology Strategy in Japan Prof. Tomoji Kawai Executive Director, Technology Strategy Center(TSC) New Energy and Industrial Technology Development Organization(NEDO)</p> <p>日本の技術戦略 川合 知二氏 国立研究開発法人新エネルギー・産業技術総合開発機構 (NEDO) 技術戦略研究センター センター長</p>	
<p>Abstract Where are the technical strengths and industrial strengths in Japan? In what direction will Japanese industrial technology go? With the emphasis on the role of sensors in the IoT era, the prospects of what kind of features the Nano-IoT technology including MEMS has and what direction it should develop toward will be discussed.</p> <p>CV Tomoji Kawai is currently Executive Director of Technology Strategy Center in NEDO, and Specially Appointed Professor at Osaka University. He was the Director of Nanoscience and Nanotechnology Center, the executive director of ISIR and Presidential Aide at Osaka University. His research area is Nanoscience and Nanotechnology in material and bioscience. He has promoted FIRST Project and ImpACT Project on the Innovative Nano-biodesigns, one of the biggest research projects in Japan.</p>	
<p>9:50- 10:25, April 25 Keynote Speech: MEMS and SYSTEMS in the Digital Future</p> <p>Prof. Albert P. Pisano Dean of Engineering University of California San Diego</p>	
<p>Abstract In this presentation, the speaker will share a vision about the next decade in which MEMS and systems will make possible a new SMART society. After a short introduction of the Jacobs School of Engineering, the speaker will offer a definition of "The Digital Decade" and describe the features of technology and industries in that coming decade. Finally, the speaker will give examples about how MEMS and systems will make possible a new SMART Society from the point of view of digital health, personal wellness and autonomous microtransit systems. These systems use MEMS to implement human health monitoring as well as fleets of short-range autonomous vehicles to create a future of enhanced mobility and health.</p> <p>CV Albert ("Al") P. Pisano was appointed as the Dean of Engineering at UC San Diego 1 September 2013. He held appointments at the University of California Berkeley for 30 years, serving in a number of leadership positions. He was elected to the U.S. National Academy of Engineering in 2001 and to Fellow status in the ASME in 2004. As the Dean of Engineering, he holds the Walter J. Zable Chair of Engineering, and is appointed as Distinguished Professor both in Mechanical and Aerospace Engineering as well as in Electrical and Computer Engineering. From 1997-1999, he served as Program Manager for MEMS at the Defense Advanced Research Projects Agency (DARPA) where he expanded the research portfolio to 83 contracts awarded nationwide with a total MEMS research expenditure in excess of \$168 million over 3 fiscal years. Having graduated nearly 70 Ph.D. students and 75 MS students, he is an author of over 400 journal papers and 36 patents. He is a 10-time entrepreneur and his research interests include MEMS for a wide variety of applications, including harsh environment sensors systems and wearable sensors.</p>	

<p>10:25-10:50, April 25 What's next in MEMS ? A view from a Research Institute</p> <p>Jean-Philippe POLIZZI MEMS Business Development Manager CEA Leti, France</p>	
<p>Abstract The proliferation of MEMS into high volume consumer markets has given an unprecedented boost to this industry, transforming deeply the actor's names and rankings, and allowing the rise of a few billion dollar winners. But this has led to a commoditization of the sensors found in smartphones (accelerometers, gyrometers, magnetometers and pressure sensors) with extremely stiff price decrease for these markets. In order to restore margins, MEMS companies have no other choice than pushing innovation, developing new components for disruptive applications. As a key R&D actor in the field of MEMS, CEA Leti is strongly participating to this trend. This presentation will provide a glimpse at some ongoing developments targeting large volume applications.</p> <p>CV Jean-Philippe Polizzi has been involved for more than 25 years in the field of microsystem based products developments in different companies and Research Institutes. At SAGEM, he participated to micromachined pressure sensors and accelerometers development for the automotive markets. He joined Auxitrol in 1997 as the pressure sensor group manager, where he developed a variety of MEMS based aerospace sensors for clients such as Airbus or Boeing. From 2002 to 2004, he was the head of the MEMS group in Thales corporate research centre, where he worked on RF switches and piezo-electric sensors and actuators. He joined CEA Leti in 2004 as project leader in the field of RF MEMS. He is currently in charge of strategy and business development for the MEMS sensors and actuator activity at CEA Leti.</p>	
<p>11:05-11:30, April 25 Optical MEMS (MOEMS) Technology of HAMAMATSU Sadaharu Takimoto General Manager, MEMS, Solid state division Hamamatsu Photonics K.K.</p> <p>浜松ホトニクス<small>の</small>光 MEMS (MOEMS) 技術 瀧本 貞治 氏 浜松ホトニクス株式会社 固体事業部 MEMS 部 部長</p>	
<p>Abstract Hamamatsu Photonics K.K. has developed a wide variety of optical sensors such as PMT, PD, Photo-IC, and Image-sensor since the establishment. Furthermore, MEMS technique will expand the possibility of the optical sensor drastically. We will develop an innovative optical sensor with the combination of our optical technique and MEMS technique. We call it MOEMS (Micro Opt Electro Mechanical Systems). In this presentation, I will introduce our MOEMS products and MOEMS technology and a future development trend.</p> <p>CV Sadaharu Takimoto graduated from Musashi Institute of Technology in 1982, and joined the Hamamatsu Photonics K.K. Since entering a company, Mr. Takimoto has been engaged in development of CMOS image sensor and the CCD image sensor. In 2011, Mr. Takimoto was transferred to MEMS division and is directing production and development of MEMS products.</p>	



MEF 2018 SPEAKERS

<p>11:30-11:55, April 25 Monolithic Integration for Photonic Applications: MEMS on CMOS and Functional BSOI</p> <p>Dr. Christiane Kaden Group Manager Engineering, Bulk MEMS-Technologies Fraunhofer Institute for Photonic Microsystems IPMS</p>	
<p>Abstract Due to exploding use of sensors and actuators in mobile and industrial applications smaller systems combined with low power consumption and higher versatility are required. Innovative solutions are necessary to enhance integration density, to drive system feature size down, to suppress parasitics and/ or to reduce power consumption. As a highly specialized MEMS fab Fraunhofer IPMS employs surface and bulk micromachining for a large variety of MEMS devices e.g. for spatial light modulators (SLM), capacitive micro-machined ultrasonic transducers (CMUT), and scanning micro mirrors. For surface MEMS the monolithic integration called MEMS-on-CMOS technology is often the choice to serve these demands. A combination of standard CMOS manufacturing using foundries with subsequent MEMS processing offers the use of adequate CMOS nodes and processes to achieve required functionalities. Based on a CMOS compatible inorganic sacrificial layer technique we will present solutions for the integration of MEMS on foundry-fabricated CMOS backplanes. For bulk MEMS products often BSOI wafers are used as wafer material. To increase the degrees of freedom in MEMS design IPMS is implementing interconnects in the handle wafer of BSOI material, connected through the device wafer. We present a fully CMOS compatible approach of fabricating the interconnects, either by doping or by embedding n-doped poly-silicon in an insulating oxide.</p> <p>CV Dr. Christiane Kaden studied from 1984 to 1990 at the Georg-August-University of Göttingen physics and received her PhD in 1995 from the University of Stuttgart in the fields of semiconductor-lasers. From 1995 to 2009 she had different positions within quality management and process integration at microelectronic companies Infineon and Qimonda, dealing with technology nodes from 0.25 µm to 75 nm. She joined IPMS in 2010, working in the fields of micro bolometers, micro scanning mirrors and wafer direct bonding. Since 2013 she is leading the group "Bulk MEMS Technology" at IPMS.</p>	
<p>11:15-12:20, April 25 Application of Direct Bonding in MEMS Dr. Sitaram Arkalgud</p> <p>VP – 3D Applications Xperi-Invensas</p>	
<p>Abstract A wide variety of MEMS technologies, covering inertial, environmental, optical and acoustic applications, are commonly used in daily life. The smartphone exemplifies this phenomenon by integrating all of the above into a compact and powerful platform. The IoT revolution, in its turn, promises to drastically increase the usage of both smart and passive sensors as they get adopted into the personal and commercial aspects of our lives. One of the common features of MEMS processing is wafer bonding. There are several different bonding technologies in production today, and each has its advantages and disadvantages. Xperi has developed ZiBond (oxide to oxide direct bonding) and DBI (Cu/oxide hybrid bonding) for a variety of 3D stacked applications. In MEMS processing, ZiBond offers low temperature bonding to a variety of substrates, low cost and high bond strength. In addition to the above, DBI promises increased hermeticity and greater architectural flexibility when stacking MEMS on ASIC. Data supporting these attributes will be presented and discussed.</p> <p>CV Dr. Sitaram Arkalgud is driving the utilization of Ziptronix bonding technologies (ZiBond® and DBI®) in numerous 3D applications since January 2016. Prior to this role, he led the 3D R&D group as VP, 3D Technology and Portfolio at Invensas. Before joining Xperi (Invensas), he started and led 3D-IC development at SEMATECH, where the focus was on delivering manufacturable process technologies for TSV, Cu-Cu wafer/die bonding and wafer thinning for 3D IC. Previously, Dr Arkalgud worked in a variety of roles spanning R&D and manufacturing in memory and logic technologies at Infineon/Qimonda and Motorola. He is the author of several publications and holds 33 U.S. patents. Sitaram holds a master's degree and a Ph.D. in materials engineering from Rensselaer Polytechnic Institute in Troy, N.Y., and a bachelor's degree in metallurgical engineering from Karnataka Regional Engineering College (NIT-K), Surathkal, India.</p>	


<p>13:40-14:15, April 25 Keynote Speech: Finding a guide for future MEMS by learning from the past Prof. Dr. Masayoshi Esashi Professor, Micro System Integration Center (μSIC) Tohoku University</p> <p>MEMS の温故知新 江刺 正喜 氏 東北大学 マイクロシステム融合研究開発センター(μSIC) 教授</p>	
<p>Abstract MEMS which have not only circuits but also sensors, actuators by extended semiconductor fabrication have been playing important roles in systems. Its development requires basic technologies and knowledge of different fields, applications and past as well. The presentation is aimed at supporting new MEMS development by showing initial stages of MEMS used now. Pressure sensors were pioneered by piezoresistive type developed for automotive engine control by Dr. Isemi Igarashi in Toyota Central Research Laboratory. MEMS accelerometer was first developed at Stanford University as piezoresistive type. It was followed by capacitive type used as crash sensors for air-bag systems and lately used for user interfaces for smartphones being combined with gyroscopes and microphones. In addition to these mechanical sensors, optical MEMS for mirror arrays for projectors, resonators for frequency sources and RF filters, fluidics for on-chip micro analytical systems and other MEMS have been developed and used.</p> <p>CV Masayoshi Esashi received B.E. and Dr.E. degrees in electronic engineering from Tohoku University in 1971 and 1976, respectively. He served as a research associate from 1976 and an associate professor from 1981 at the Department of Electronic Engineering, Tohoku University. Since 1990 he has been a professor and he is now in Micro System Integration Center (μSIC) and concurrently a research fellow in Center of Innovation (COI) in Tohoku University. His research interests include MEMS (Micro Electro Mechanical Systems), integrated sensors, microsystems and MEMS packaging. Books (Japanese) : "Fundamentals of semiconductor integrated circuit design" Baifukan (1981), "Introduction of MEMS" Morikita publishing (2011), "Future of MEMS" Morikita publishing (2016) etc. Awards : Purple Ribbon Award (2006), IEEE Andrew S. Grove Award (2015), IEEE Andrew Jun-ichi Nishizawa medal (2016) etc.</p>	
<p>14:15-14:50, April 25 Keynote Speech: Integration of ICs and MEMS</p> <p>Prof. Frank Niklaus Professor at Department of Micro and Nanosystems KTH Royal Institute of Technology in Stockholm, Sweden</p>	
<p>Abstract The vast majority of commercial MEMS devices, such as accelerometers, gyroscopes and micro-mirror arrays, have to be integrated with ICs to perform useful functions. In this presentation we will review and discuss the traditional as well as emerging innovative approaches for integrating ICs and MEMS. These include approaches based on the hybrid integration of multiple chips (multi-chip solutions) as well as system-on-chip solutions based on wafer-level monolithic integration and heterogeneous integration technologies. The advantages and disadvantages of the commonly used technologies will be discussed and the implications of the different integration approaches for packaging, testing and final system costs will be reviewed.</p> <p>CV Prof. Frank Niklaus received his M.Sc. degree in mechanical engineering in 1998 from the Technical University of Munich (TUM), Germany. In 2002 he received his PhD degree in microelectromechanical systems (MEMS) from KTH Royal Institute of Technology in Stockholm, Sweden. Since 2013 he is a Professor with the Department of Micro and Nanosystems at KTH, where he is heading the Micro and Nanofabrication Group. The current research interests of Dr. Niklaus include innovative manufacturing, integration, and packaging technologies for MEMS and nanoelectromechanical systems (NEMS) and graphene-based NEMS devices. He has published more than 160 journal and conference papers and has more than 10 granted patents. Dr. Niklaus is a member of the Young Academy of Europe (YAE) and IEEE Senior Member.</p>	


MEF 2018 SPEAKERS

<p>16:20-16:45, April 25 Towards Printed Conformable Sensing Surfaces</p> <p>Dr. Peter Zalar Senior Research Scientist Holst Centre</p>	
<p>Abstract Interest in flexible and stretchable printed electronic devices has increased due to the demand for the simultaneous combination of conformability, ruggedness, and light weights that traditional electronics cannot deliver. Many interesting applications require conformable sensing surfaces. In this presentation, Holst Centre's progress towards these sensing surfaces will be discussed.</p> <p>CV Peter Zalar obtained his Ph.D. in materials chemistry from the University of California, Santa Barbara (UCSB) in 2014. His doctoral research focused on the fundamental characterization of the optical and electronic properties of novel n-conjugated polymers. In 2014, he joined the group of Prof. Takao Someya at The University of Tokyo as a project researcher in the JST ERATO Someya Bio-Harmonized Electronics Project. In that time he worked on the development of optoelectronic devices based on organic semiconductors for electronic skins and medical monitoring. Since January 2017, he is a Senior Research Scientist at Holst Centre in Eindhoven, The Netherlands in the group of hybrid and printed electronics, where his research focuses on printed sensor systems.</p>	
<p>16:45-17:10, April 25 Introduction of Murata MEMS sensor and focusing market Mitsugu Ogiura Vice President, Product Development Murata Electronics Oy, Finland</p> <p>ムラタ MEMS センサの紹介と取り組み市場について 荻浦 美嗣氏 ムラタエレクトロニクス フィンランド Vice President, Product Development</p>	
<p>Abstract Murata has been supplying various types of the sensors into the market. Silicon MEMS inertial sensors are one of products. In this presentation, we will introduce our products, technologies, and our focusing markets such as automotive, industrial and healthcare.</p> <p>Regarding the automotive market, we recognize autonomous driving as a next. Many sensors must be required to achieve dead reckoning and many activities will be seen in the field. To understand this application and requirement for sensors, we are trying to get them by ourselves. We will introduce these marketing activities and summary in this presentation.</p> <p>CV Mitsugu Ogiura received master of engineering in electronics from Kanazawa University in 1989. Ogiura joined Murata MFG Co., Ltd. in 1989. Through the careers including product development of piezo-ceramic inertial sensor, sales engineering of sensors, and QC of ceramic sensor production, he started development of MEMS inertial sensor in 2008. Ogiura moved to Murata Electronics Oy in Finland in 2016 and has been responsible for product development of MEMS inertial sensors. In April, 2018, he moved back to products development dept.2, sensor products division of Murata MFG.</p>	

<p>17:10-17:35, April 25 An example of new born MEMS company in Japan Prof. Hiroki Kuwano Professor, New Industry Creation Hatchery Center Tohoku University</p> <p>日本において創立したばかりの MEMS 会社の一例 桑野 博喜氏 東北大学 未来科学技術共同研究センター 教授</p>	
<p>Abstract The speaker founded a new born MEMS company, "Sendai Smart Machines Co., Ltd.". Prof. Kuwano will talk about a motive, development, strategy with some impressions.</p> <p>CV Hiroki Kuwano received the B.Eng. and M.Eng. degrees in mechanical engineering and the Ph.D. degree in electrical engineering from Tohoku University, Sendai, Japan, in 1975, 1977, and 1990, respectively. He was a Member of the Electrical Communication Laboratories, Nippon Telephone and Telegraph Public Corporation (NTT) for 26 years. He was a visiting scholar at Cornell University in 1988. Since 2003, he has been a Professor at Tohoku University. He has 40 years of experience in research and development and has authored or coauthored over 120 technical papers and books in the fields of MEMS and particle beam processing such as focused ion beams and neutral beams. His interests are SAW sensors, energy harvesters, sensor networks, and multi micro-machined focused ion beam systems particularly for cost effective safety and medical applications.</p>	
<p>09:05-09:40, April 26 Keynote Speech: Trends in MEMS: Business and Technical Dr. Kurt Petersen</p> <p>Silicon Valley Band of Angels</p>	
<p>CV Kurt Petersen received his BS degree cum laude in EE from UC Berkeley in 1970. In 1975, he received a PhD in EE from the Massachusetts Institute of Technology. Dr. Petersen established a micromachining research group at IBM from 1975 to 1982, during which he wrote the review paper "Silicon as a Mechanical Material," published in the IEEE Proceedings (May 1982). This paper is still the most frequently referenced work in the field of micromachining and micro-electro-mechanical systems (MEMS). Since 1982, Dr. Petersen has co-founded six successful companies in MEMS technology, Transensory Devices Inc. in 1982, NovaSensor in 1985 (now owned by Amphenol), Cepheid in 1996 (now a public company on NASDAQ: CPHD), SiTime in 2004 (still private), Profusa in 2008 (still private), and Verreon in 2009 (acquired by Qualcomm). In 2011, Dr. Petersen joined the Band of Angels in Silicon Valley. The Band is an angel investment group which mentors and invests in early stage, high-tech, start-up companies. Today, he spends most of his time helping and mentoring such companies. Dr. Petersen has published over 100 papers, and has been granted over 35 patents in the field of MEMS. In 2001 he was awarded the IEEE Simon Ramo Medal for his contributions to MEMS. Dr. Petersen is a member of the National Academy of Engineering and is a Life Fellow of the IEEE in recognition of his contributions to "the commercialization of MEMS technology".</p>	

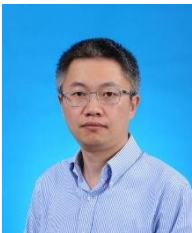

MEF 2018 SPEAKERS

<p>09:40-10:15, April 26 Keynote Speech: Technology Development and Business Management for MEMS Susumu Kaminaga President of SKGA, Executive Senior Advisor SPP Technologies Co., Ltd. MEMS 技術開発と事業経営 神永 晋氏 SPP テクノロジーズ株式会社 エグゼクティブシニアアドバイザー</p>	
<p>Abstract MEMS technology has contributed to emerging applications in the last 20-30 years. Among various new applications, automotive and smartphones have been remarkably developed thanks to MEMS in the last 10 years. IoT (Internet of Things) will be a big opportunity for MEMS contribution with its unique features in the next 10 years. In this talk, what has been made to commercialize MEMS technology for the success of the emerging applications and what will be challenges for MEMS to explore possibilities to contribute to the comfortable life of the people, "smart society" will be discussed from the viewpoint of importance of technology development and business management to be worked together.</p> <p>CV Susumu Kaminaga studied Mechanical Engineering at the University of Tokyo and graduated in 1969. He joined Sumitomo Precision Products Co., Ltd. (SPP) and was President of the company from 2004 to 2012. He is currently Executive Senior Adviser at SPP Technologies Co., Ltd. He lived in Germany in the 1980s and U.K. in 1990s. Having been involved with MEMS activities since 1988, he played a major role to develop and commercialize Deep Reactive Ion Etching (DRIE) technology based on Robert Bosch patented switching process at Surface Technology Systems (STS), UK subsidiary of SPP and introduced the world first DRIE equipment into the market in 1995. The DRIE has enabled MEMS world to expand rapidly in the last decades since then. Following his achievement to establish MEMS business with the processing technologies, gyroscopes and wireless sensor network systems, he became a member of the organizing committee of Trillion Sensors (TSensors) Summit to drive TSensors Initiative. He is Fellow of JSME (The Japan Society of Mechanical Engineers) and a member of JSAP (The Japan Society of Applied Physics), IEE (The Institute of Electrical Engineers of Japan) and IEEE (The Institute of Electrical and Electronic Engineers).</p>	

<p>10:15-10:40, April 26 Highest performance Infineon MEMS microphones enable smarter voice user interfaces Dr. Evangelos A. Angelopoulos</p> <p>Senior Project Leader, RF & Sensors Infineon Technologies AG</p>	
<p>Abstract Intelligence is built on processing information gained through interfaces to the environment, the sensors. Therefore, apart from the processing capability, it is the amount and quality of information that determines the level of intelligence that a smart system is able to achieve. Utilizing our in-house capacitive MEMS technology, Infineon's ambient sensing solutions offer the performance characteristics required for building intelligence into the systems of the future.</p> <p>Infineon has continuously innovated MEMS microphones and is now introducing the third MEMS technology generation with again improved acoustic performance. High signal-to-noise-ratio (SNR) microphones are needed for detecting speech in noisy environments, while their high dynamic range enables the clear capturing of voice despite loud background sources. In addition, miniaturization allows for seamless integration into any system, from smartphones to home appliances. Finally, similar capacitive MEMS principles are used in new applications such as Infineon's highly accurate barometric pressure sensor or the photoacoustic gas sensor, enabling systems with wider sensing abilities.</p> <p>CV Evangelos A. Angelopoulos is currently a Senior Project Leader in the RF & Sensors group at Infineon Technologies AG in Munich, Germany. He is responsible for the development of high performance MEMS microphones for consumer applications, contributing to Infineon's leading position in this market.</p> <p>Evangelos received a Physics Diploma from the University of Athens in 2004 and a M.Sc. in Communications Technology from the University of Ulm in 2007, focusing in semiconductor technology. After his graduation he joined the Institute of Microelectronics Stuttgart (IMS CHIPS) where he co-developed a novel process for fabricating flexible silicon chips and in 2011 he received his Doctorate in Engineering from the University of Stuttgart. The same year, he was awarded the GMM Prize from the Society of Microelectronics, Microsystems and Precision Engineering in Germany for his publication "Ultra-thin chip technology for system-in-foil applications" featured at the 2010 International Electron Devices Meeting (IEDM). Since 2013, Evangelos is a member of the RF & Sensors group at Infineon Technologies AG.</p>	

<p>10:40-11:05, April 26 MEMS business introduction of Kyodo international and Silex Microsystems Kenji Kato Assistant manager Kyodo international, Inc.</p> <p>協同インターナショナルと Silex Microsystems の MEMS ビジネスのご紹介 加藤 健二氏 株式会社協同インターナショナル 主任</p>	
<p>Magnus Rimskog Sales Director Silex Microsystems AB</p>	
<p>Abstract Kyodo International</p> <p>We Kyodo support customer MEMS business by offering the right solution of MEMS design, development tools, ASIC design, bio-chip providing, prototyping fabrication and volume production which fits your budget and schedule by utilizing our own facilities, knowledge and global partner network. Especially by partnership with Swedish MEMS foundry, Silex Microsystems, we are able to provide volume production service of customer designed MEMS device.</p> <p>Silex Microsystems</p> <p>The sensor industry is constantly inventing new ideas that are changing our everyday lives. MEMS based sensors have been marching into the world we live in over the last two decades and there is no sign that this evolution will come to a halt anytime soon. In fact, we have most likely only seen the beginning as the industry is getting busier every day, creating new innovations for Med-Tech, Smart Cities, IoT, VR/AR, Autonomous Vehicles and more. Silex is a leading Pure Play MEMS foundry provider with decades of experience manufacturing customized MEMS products for innovation leaders in the MEMS industry. This presentation will share some of the fundamental support systems and protocols developed by Silex to help MEMS foundry customers get to market with a competitive product in the fastest possible time. The presentation will also share Silex plans to build out large scale wafer foundry manufacturing capacity for new and innovative MEMS and sensors in its 200mm wafer "Fab3" currently under construction in Beijing.</p> <p>CV</p> <p>Kenji Kato, Kyodo international graduated from Tokyo university of science in 1992. Worked for precision device manufacturer in the R&D department and developed some MEMS devices, inertial MEMS device, optical device for future memory application etc. From 2003 moved to semiconductor device maker and engaged to design and manufacture MEMS component to be used in mobile equipment. From 2009 worked for Kyodo international, belong to oversee business development section, sold semiconductor/MEMS items to oversee customer and support to introduce unique and superior MEMS items from overseas supplier.</p> <p>Magnus Rimskog, Silex Microsystems has 15 years of experience in MEMS at Silex Microsystems and has taken part in bringing a wide variety of MEMS products to market. The latest 12 years Magnus has been responsible for Silex market in North America working with clients and colleagues both on engineering and business side. Prior to Silex Magnus has 5 years of experience working as a consultant in product development engineering. Born and raised in Sweden Magnus now lives in Bay Area. He holds a M.Sc. in Physics from Lund Institute of Technology with major in Atomic Physics.</p>	

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<p>11:20-11:45, April 26 How does foundry based manufacturing offer smart fabrication of MEMS in intelligent era? Jerry Liu</p> <p>EVP Head of Technology & Business Development Center Semiconductor Manufacturing Electronics (Shaoxing) Corporation, Joint Venture of SMIC</p>	
<p>Abstract New applications are expanding rapidly in our intelligent society. Specialty MEMS devices play a vital role in new technology revolution in our society, however, the lack of advanced and very large scale manufacturing facilities are the gating items for MEMS products commercialization. Foundry can provide large scale, high quality, cost effective and quick delivery manufacturing capability to MEMS designers. Smart fabrication can offer expandable and flexible solutions even on specialty process. Extended production line including CMOS ASIC, MEMS, 3D wafer level package and special module assemble will enable more complicated integration of front end and back end manufacturing. Based on all above, fabless designers will be able to provide commercial MEMS products on a large scale to their customers. One stop service and one eco-system, including research at universities and institutes, prototyping at R&D process base and mass production at professional foundry, open the door for the advancement of supply chain in China.</p> <p>CV Jerry Liu is EVP of Semiconductor Manufacturing Electronics (Shaoxing) Co, Joint Venture of SMIC, responsible for the technology development and marketing & sales. He has more than 15 years' experience on MEMS, Power, RF, advanced package and other special technology development in SMIC. His more than 40 patents had been authorized. In addition, he is granted as alliance director of Shanghai MEMS and smart sensor chip technology innovation strategy and the master mentor of Shanghai Jiao Tong University because of his contribution on MEMS.</p>	
<p>11:45-12:10, April 26 MEMS sensor manufacturing technology for SMART Society applications Dr. Chun-Wen Cheng (Emerson Cheng)</p> <p>Deputy Director, MEMS Department tsmc</p>	
<p>Abstract Much more MEMS sensor are required to achieve IoT and smart society. Foundry to support MEMS sensors on various applications count on manufacturing technology readiness together with different material handling. New manufacturing trend shows not only horizontally integrate different MEMS devices for sensor hub usage, but also vertically integrate CMOS and MEMS device, especially 12 inch CMOS show power saving benefit for low power application. The presentation will discuss value-added and benefit through different integration ways, as well as the associated drawback and challenges. It is foundry's obligation to explore integration and package way for manufacturing readiness on foundry available process, to speed up various application for SMART Society.</p> <p>CV Chun-Wen Cheng is responsible for the MEMS technology development at tsmc. After received his BS degree in ME from NCTU in 1993, more than ten years' semi-conductor experience on different technology including DRAM, e-fuse, embedded memory, SoC and 90nm CMOS platform with timely delivery enrich his creativity sharply. Then first 3 years in MEMS field as senior fab director of 6 inch MEMS foundry gave him in depth understanding on the gap between CMOS / MEMS and MEMS design / MEMS manufacturing. To resolve CMOS-MEMS integration challenge he joined tsmc in 2008. Within 10 years, he not only successfully delivered MEMS technology for various products to make tsmc become one of biggest MEMS foundry today, but also received a PhD in ME. from NTHU with support from tsmc and professor Weileun Fang. He has published 10 papers, and has been granted over 40 patents in the field of MEMS. Now he spends most effort on MEMS roadmap plan and execution for future MEMS manufacturing technology.</p>	

<p>13:50-14:25, April 26 Keynote Speech: High-Temperature Epitaxial Silicon Encapsulation for High-Stability Clocks and Sensors Prof. Dr. Thomas Kenny</p> <p>Professor of Engineering and Senior Associate Dean of Engineering for Student Affairs Stanford University</p>	
<p>CV Dr. Thomas Kenny is currently the Richard W. Weiland Chaired Professor of Mechanical Engineering and Senior Associate Dean for Student Affairs. His research investigates fundamental issues and applications of micromechanical structures. Dr. Kenny has been co-founder of 3 startup companies (Cooligy - acquired by Emerson, SiTime - acquired by Megachips, and Applaud Medical - currently in human clinical trials). He served as Program Manager in the Microsystems Technology Office at DARPA from 2006-2010. He was General Chair for Transducers 2015 (just concluded), and has been involved in several other conferences. He has advised more than 50 PhD students and co-authored more than 250 technical publications and more than 50 issued patents.</p>	
<p>14:25-14:50, April 26 MEMS in the heart of the mega trends : what can we expect for the next 10 years ? Jean-Christophe ELOY</p> <p>CEO and President YOLE Developpement</p>	
<p>Abstract Mega trends are impacting our day to day life, with autonomous driving and robotic cars, the emergence of 5G, the development of artificial intelligence, the opening of the world of augmented reality, the growth of data centers... behind all these trends, Mems devices and Mems technologies are here to get access to the data, provide better data transfer, make fast decisions in order to keep our world going. The presentation will highlight the existing Mems applications, how we have reached such level as well as what we can expect for the next 10 years in term of market growth but also new devices and new applications.</p> <p>CV Jean-Christophe Eloy is CEO and Founder of Yole Développement, the "More than Moore" market research and strategy consulting company. Since 1991, he has been involved in the analysis of the evolution of MEMS markets at device, equipment and also materials suppliers' level. Jean-Christophe Eloy is also board member in several organisations in Europe and in North America.</p>	

MEF 2018 SPEAKERS

14:50-15:15, April 26

Biodesign: How to find unmet medical needs, create solution in medicine and digital health

Dr. Atsuhiko Nakagawa

Special appointed associate professor,
Clinical Research, Innovation and Education Center, Tohoku University Hospital
Department of Biodesign, Tohoku University Hospital
Department of Neurosurgery, Graduate School of Medicine
Tohoku University



バイオデザイン：デジタルヘルス領域においても見極めるべきは”特徴づけられたニーズ”

中川 敦寛 氏

東北大学病院臨床研究推進センター 特任准教授

東北大学病院 バイオデザイン部門

東北大学大学院医学系研究科 脳神経外科

Abstract

Understanding the characterized need of target customer is essential and critical part of innovation. However, this has often been ignored; the projects have often been started in the laboratories or conference instead. We will introduce Academic Science Unit (Tohoku University Hospital Bedside Solution Program) which serve as an infrastructure for finding medical needs, and Biodesign, which is world known successful entrepreneur Stanford University program for medical device based on design thinking.

The biodesign innovation process developed by Stanford Biodesign emphasizes the importance of starting with a well-characterized, compelling clinical need before focusing on the development of any solution, including digital health. This shift from addressing medical needs entirely with traditional medical devices to a mixture of devices and digital solutions reflects the changing healthcare landscape within which care is migrating from the hospital to alternate, more affordable environments. It also shows the timelessness and broad applicability of the biodesign innovation process, which is technology agnostic. By requiring innovators to start with a well-defined clinical need rather than any preconceived invention ideas, the process allows for many different types of solutions to emerge as new care paradigms become possible through the application of emerging technologies.


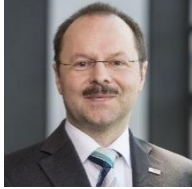
CV

Dr. Nakagawa serves as attending physician for Department of Neurosurgery and Emergency Medicine. He had been trained as Neurotrauma Clinical Fellowship at UCSF and San Francisco General Hospital (2008-2010, mentor: Prof. Geoffrey Manley). He was trained at Global Faculty at Stanford Biodesign in 2015, now serving as Co-Director of Japan Biodesign and also deputy director for ASU clinical immersion program (>35 companies, >700 industry researchers have been participated since 2014). He had received degree for medical application of shock wave at Institute of Fluid Science, Tohoku University (mentor: Prof. Kazuyoshi Takayama, recipient of Ernst Mach Award) and the work evolved to mechanism of blast induced traumatic brain injury. He is serving as project managers in several projects including class III surgical device for clinical trial using pulsed water jet, cell searching engine, and hydrogel soft electrical electrodes.

Published 212 papers (including proceedings in Fluid Engineering and Medical Engineering), 231 presentation as presenting author (including 62 oversea and 40 domestic invited lectures), 138 competitive grants and contracts, awards including Ogino Award from Japanese Society of Biomedical Engineering, Makino Award from Japanese Society of Neurotraumatology.

<p>15:30-15:55, April 26 Development of a fully automated immunoanalyzer “μTASWako i30” and a fully automated genetic analyzer “μTASWako g1” using disposable microfluidic chips Daisuke Eto Associate Manager, Diagnostics Research Laboratories Diagnostics Development Operations, Diagnostics Division FUJIFILM Wako Pure Chemical Corporation</p> <p>微細流路チップを用いた臨床検査システム 「ミュータスワコー i30」、「ミュータスワコー g1」の開発 衛藤 大亮 氏 富士フイルム和光純薬株式会社 主任研究員 臨床検査薬事業部 臨床検査薬開発本部 臨床検査薬研究所</p>	
<p>Abstract Applications of the micro Total Analysis System (μTAS) have been evolving over the last 20 years, including in the field of clinical diagnostics, in expectation of totally minimized system providing a reduction of reagent/sample consumption and a shortening reaction time. Based on our microfluidic chip technologies, We have developed fully automated immunoanalyzer “μTASWako i30” and fully automated genetic analyzer “μTASWako g1”. In μTASWako i30, we employed LBA-EATA method which enables us to achieve high sensitivity and resolution in a short reaction time using capillary isotachopheresis (CITP) followed by capillary gel electrophoresis (CGE) in microfluidic channels. It allows sandwich immune-complex formation and detection of the complex by Laser-Induced Fluorescence (LIF). μTASWako i30 is approved as an IVD device in Japan, US, Canada and China, and has been on the world clinical diagnostics market since 2009. In μTASWako g1, we employed polymerase chain reaction (PCR) followed by capillary gel electrophoresis (CGE) in microfluidic channels. μTASWako g1 is approved as an IVD device in Japan and has been on the clinical diagnostics market since 2016.</p> <p>CV Daisuke Eto is an associate manager of Diagnostics Research Laboratories at FUJIFILM Wako Pure Chemical Corporation. He has 12+ years’ experience in clinical diagnostic system development. Mr. Eto joined FUJIFILM Wako Pure Chemical Corporation (previously named Wako Pure Chemical Industries, Ltd.) in 2006 and has developed microfluidic chip based clinical diagnostic system, including chip design, instrument control algorithm, instrument production, and data analysis software. Prior to working at FUJIFILM Wako Pure Chemical Corporation, Mr. Eto worked as a mechanical engineer for Sanyo Electric Co., Ltd. and engaged in the automated cell culture system development for regenerative medicine. Mr. Eto received his bachelor’s and master’s degree in mechanical engineering from Kyoto University in 2000 and 2002.</p>	

MEF 2018 SPEAKERS

<p>15:55-16:20, April 26 Rapid test kit using surface acoustic wave immunosensor Dr. Hiromi Yatsuda Biosensor Project Leader, Research and Development Japan Radio Co., Ltd.</p> <p>弾性表面波素子を利用した迅速免疫測定キット 谷津田 博美氏 日本無線株式会社 研究所 バイオセンサプロジェクト室 室長</p>	
<p>Abstract Immunoassay-based rapid test kits are required in a point-of-care testing (POCT) which is defined as medical diagnostic testing at or near the site of patient care. They are widely required in various applications; for infectious diseases such as flu, HIV/AIDS, chlamydia and for monitoring health such as chronic diseases, pregnancy, cancers and so on. On the other hand, surface acoustic wave (SAW) devices have been widely used in wireless communications, mainly as frequency filters. Recently, more than twenty of SAW filters can be used in a smart phone. They can be mass manufactured easily and cost effective. We have developed a SAW-based immunosensor system which can detect immunoreactions of nanometer scale proteins such as antibodies and antigens. Since the SAW-based immunosensor system is small and quantitative and has advantages of ease of use and wireless connectivity, it is very suitable for POCT applications.</p> <p>CV Dr. Hiromi Yatsuda was born in Sendai, Japan, in 1959. He received his B. Eng. and M. Eng. degrees in electrical engineering from the Technical University of Nagaoka, Niigata, Japan, in 1982 and 1984, respectively. In 1999, he received his Doctor of Engineering degree from Tohoku University, Japan. In 1984, he joined Japan Radio Co., Ltd., (JRC) Japan, where he was engaged in research and development on surface acoustic wave devices. His current research interests are on SAW-based sensors. He published a lot of technical papers on SAW technologies and he received the Best Paper Award 2008 from the Photopolymer Science and Technology. He has also provided over 50 patents in the world. In 2009, he joined OJ-Bio Ltd., Newcastle, UK, which is a joint company of JRC and a UK-based bio-company, ORLA protein technologies. He has developed SAW-based immunosensors. He is a biosensor project leader of research and development department of JRC.</p>	
<p>16:20-16:50, April 26 Smarter MEMS sensors for Automotive and Consumer Applications Dr. Udo-Martin Gómez</p> <p>Senior Vice President Engineering MEMS Sensors Robert Bosch GmbH Automotive Electronics</p>	
<p>Abstract MEMS have been making an inexorable entry into our lives since the early 1990s. They are the basis for the control and safety functions that have become standard in today's vehicles and form the basis for many mobile devices such as smartphones and wearables. As one of the first MEMS pioneers, Bosch accompanies this development with new products and continuous technological developments from the very beginning and beyond: The advancing automation and the desire for more comfort are constantly driving MEMS forward. Driver assistance and especially highly autonomous driving require more robust and precise inertial sensors for e.g. navigation purposes. At the same time, products for passenger infotainment and emission-free driving are becoming increasingly important, especially in conurbations. In addition to automotive applications, Bosch also provides innovative solutions for the growing number of IoT applications as Smart Homes or Industry 4.0: MEMS components for infotainment, environmental monitoring or motion detection form the basis of smart system solutions in a connected world. New multi-layer MEMS processes open up additional design possibilities in the realization of complex 3D structures and the development of new sensors for a SMARTer society.</p> <p>CV Dr. Gómez is Senior Vice President of Robert Bosch GmbH. He is heading the Sensor Engineering at Bosch Automotive Electronics (AE/NE-SE) in Reutlingen, Germany, the world's largest MEMS supplier serving the Automotive, Consumer Electronics and IoT industry. Having completed his doctorate in physics, Dr. Gómez started his career at Robert Bosch GmbH in 1999 at Corporate Sector Research and Advanced Engineering (MEMS technology). Before joining Bosch Automotive Electronics in April 2018, he worked in various management positions at Bosch and also held the position of Chief Expert for MEMS sensor technology. From 2013 to March 2018, he was Chief Technical Officer of Bosch Sensortec GmbH - a fully-owned subsidiary of Robert Bosch GmbH, responsible for research and development of micro-electro-mechanical sensors (MEMS) for consumer electronics, smartphones, security systems, industrial technology and logistics. Since 2014, Dr. Gómez is Deputy Chairman of the Board of VDE/VDI-Society Microelectronics, Microsystems and Precision Engineering (GMM). Since 2015, he is also member of the GSA (Global Semiconductor Alliance) EMEA Leadership Council.</p>	