PROCEEDINGS OF SPIE

Tenth International Symposium on Precision Engineering Measurements and Instrumentation

Jiubin Tan
Jie Lin
Editors

8–10 August 2018
Kunming, China

Organized by
International Committee on Measurements and Instrumentation (ICMI) • Instrumentation Committee of CSM (IC-CSM) • Harbin Institute of Technology (HIT)

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Published by
SPIE

Volume 11053

Part One of Two Parts

Proceedings of SPIE 0277-786X, V. 11053

Tenth International Symposium on Precision Engineering Measurements and Instrumentation, edited by Jiubin Tan, Jie Lin, Proc. of SPIE Vol. 11053, 1105301 · © 2019 SPIE
CCC code: 0277-786X/19/$18 · doi: 10.1117/12.2529589

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Please use the following format to cite material from these proceedings:
Author(s), "Title of Paper," in *Tenth International Symposium on Precision Engineering Measurements and Instrumentation*, edited by Jiubin Tan, Jie Lin, Proceedings of SPIE Vol. 11053 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 0277-786X
ISSN: 1996-756X (electronic)

ISBN: 9781510627819
ISBN: 9781510627826 (electronic)

Published by
SPIE
P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445
SPIE.org

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

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Optical fiber sensors for industrial applications

9:10–9:50, 9 August 2018
Session Chair: Tony Wilson, Univ. of Oxford (United Kingdom)

Prof. Kenneth Grattan

President of the International Measurement Confederation (IMEKO)
Dean, City Graduate School
Royal Academy of Engineering - George Daniels Professor of Scientific Instrumentation
City University of London (United Kingdom)

Professor Grattan graduated in Physics from Queen's University Belfast with a BSc (First Class Honors) in 1974 and a PhD in Laser Physics. His research involved the use of laser-probe techniques for measurements on potential new laser systems. Following Queen's, in 1978 he became a Research Fellow at Imperial College of Science and Technology, sponsored by the Rutherford Laboratory to work on advanced photolytic drivers for novel laser systems. This involved detailed measurements of the characteristics and properties of novel laser species and a range of materials involved in systems calibration. In 1983 he joined City University as a "new blood" Lecturer in Physics, being appointed Professor of Measurement and Instrumentation in 1991 and Head of the Department of Electrical, Electronic and Information Engineering. He was appointed Dean of the Schools of Engineering & Mathematical Sciences and of Informatics in 2008, serving until 2012 when he became Dean of the newly formed City Graduate School. His research interests include the use of fiber optic and optical systems in the measurement of a range of physical and chemical parameters. The work has been sponsored by a number of organizations including EPSRC, the EU, private industry and venture capital and he holds a number of patents for his work with industry. He obtained a DSc from City University in 1992 for his sensor work.

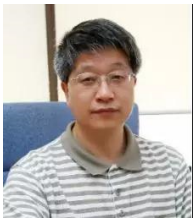
Professor Grattan is extensively involved with the work of the professional bodies having been Chairman of the Science, Education and Technology of the Institution of Electrical Engineers, the Applied Optics Division of the Institute of Physics and he was President of the Institute of Measurement and Control during the year 2000. He was awarded the Callendar Medal of the Institute of Measurement and Control in 1992, the Hartley Medal of the same Institution in 2015 and the Honeywell Prize for work published in the Institute's journal as well the Institute of Physics Applied Optics Divisional Prize in 2010. Professor Grattan had been Deputy Editor of the Journal Measurement Science and Technology for several years and currently serves on the Editorial Board of several major journals in his field in the USA and Europe. In January 2001 he was appointed Editor of the IMEKO Journal "Measurement" and now is Editor Emeritus of the Journal. After many years serving on their General Council, he was appointed the President of the

International Measurement Confederation (IMEKO) in 2015. He is the author and co-author of about 1300 publications in major international journals and at conferences and is the co-editor (with Professor B T Meggitt) of a five volumes topical series on Optical Fiber Sensor Technology. Professor Grattan was Dean of the School of Engineering & Mathematical Sciences and also Dean of the School of Informatics at City University from 2008 to 2012 and in that year was appointed as the Inaugural Dean of the new City Graduate School at the University.

Miniature two-photon microscopy for brain imaging in freely behaving animals

9:50–10:30, 9 August 2018
Session Chair: Tony Wilson, Univ. of Oxford (United Kingdom)

Prof. Heping Cheng



Leader of Institute of Molecular Medicine, Peking University
Fellow of the Chinese Academy of Sciences (China)

Professor Heping (Peace) Cheng received his bachelor and master degrees in applied mathematics & mechanics and biomedical engineering, with physiology as his minor, from Peking University, China. Upon graduation, he served as a junior faculty member in the Department of Electrical Engineering at the same university before earning his Ph.D. degree in physiology in 1995 from the University of Maryland at Baltimore. He then joined the NIH Intramural Research Program as a senior staff fellow, was selected as a tenure-track investigator in 1998 and became the head of the Ca2+ Signaling Section in the Laboratory of Cardiovascular Science, National Institute of Aging, NIH. He was promoted to senior investigator in 2004. He is now a senior investigator heading the Laboratory of Ca2+ Signaling & Mitochondrial Biomedicine in the Institute of Molecular Medicine at Peking University. He was elected to the Chinese National Academy of Sciences in 2013. Co-discovering "Ca2+ sparks" in 1993 and mitochondrial "superoxide flashes" in 2008, he strives to resolve elemental physiological signals in the pursuit of principles of cell signaling. Currently he is engaged in developing novel imaging technology for reverse engineering of brain information processing.

Comb-based multidimensional coherent spectroscopy

10:45–11:25, 9 August 2018
Session Chair: Fu-Jen Kao, National Yang-Ming Univ. (Taiwan, China)

Prof. Steven Cundiff

Fellow Adjoint of JILA. Harrison M. Randall Collegiate Professor of Physics, University of Michigan, Ann Arbor (United States)
Fellow of the IEEE, Fellow of the APS, Fellow of the OSA, OSA Meggers Award, Humboldt Research Award

Professor Cundiff and his research group work on several aspects of ultrafast optics. One area involves generating and controlling ultrashort pulses, which, of course, provides the foundation for the field of ultrafast optics. However, the group is primarily interested in using ultrashort light pulses for a variety of scientific applications. A natural application is to use the very short duration of the pulses to study processes that occur on similar timescales, which is generally known as ultrafast spectroscopy. Ultrafast spectroscopy not only gives dynamical information, but it also provides information about the fundamentals of how light interacts with matter. One type of ultrafast spectroscopy, known as optical multidimensional coherent spectroscopy, has been developed over the last decade as has proven to be very powerful. The Cundiff group uses ultrafast spectroscopy, including multidimensional coherent spectroscopy, to study a range of system including semiconductors, semiconductor nanostructures and atomic vapors.

A novel high-precision mass measurement device for the new kilogram

11:25–12:05, 9 August 2018
Session Chair: Fu-Jen Kao, National Yang-Ming Univ. (Taiwan, China)

Dr. Christan Rothleitner

Leading scientist of the group mass metrology for Planck balances, Physikalisch-Technische Bundesanstaldt (PTB) (Germany)
Member of German Physical Society DPG and American Physical Society

Dr. Christian Rothleitner studied physics in Germany, Italy and Venezuela. He received his PhD in experimental physics at the Max Planck Institute for the Science of Light, in Germany, about the development of two free-fall absolute gravimeters in the group of Prof. Lijun Wang (now at Tsinghua University, China). After he received his PhD he made a postdoctorate at the University of Luxembourg where he developed a free-fall experiment to measure the Newtonian constant of gravitation. Thereafter, he joined the German national metrology institute, the Physikalisch-Technische Bundesanstaldt (PTB), where he gained several years of experience in length metrology with a special focus on computed tomography. Now he is the leading scientist of the group mass metrology for Planck balances at PTB. In this position he is responsible for developing a high-precision weighing instrument that will allow to make primary realizations of the SI unit kilogram after its re-definition by end of 2018. This is done in collaboration with the Technical University of Ilmenau where Dr. Rothleitner is also doing his 'habilitation', a qualification as a lecturer. Dr. Rothleitner published more than 30 scientific articles in international peer reviewed journals. He is member of the German physical society DPG and of the American physical society APS.

Time resolved imaging with stimulated emission in pump-probe microscopy

13:30–14:10, 9 August 2018
Session Chair: Seung-Woo Kim, Korea Advanced Institute of Science and Technology (Korea, Republic of)

Prof. Fu-Jen Kao

Professor, Institute of Biophotonics, National Yang-Ming University (Taiwan, China) (2004-)
Association of Asia Pacific Physical Societies (2016-)

Professor Fu-Jen Gao is now in Institute of Biophotonics, National Yang-Ming University since 2004 and also the association of Asia Pacific Physical Societies. He was the president of Physics Society of ROC (2012-2014), vice president of Physics Society of ROC (2012-2014), associated Dean of Office of Research & Development, NYMU (2006-2011), and also the director, Institute of Biophotonics, NYMU (2004-2011). His research interests are in the field of Stimulated emission based pump-probe microscopy, 4-channel Stokes vector resolved SH polarization microscopy and biomedical optical instrument for endoscopy. During his academic career, the long working distance fluorescence and lifetime measurement via stimulated emission, and laser illumination for endoscopy are the two research highlights.

In the field of "long working distance fluorescence and lifetime measurement via stimulated emission", Prof Gao and his team are focusing on the unique aspect of spatial coherence as a result of stimulated emission, which is utilized for long distance fluorescence detection and lifetime imaging. In contrast with the case of spontaneous emission, high numerical aperture optics is not required to collect the stimulated emission signal efficiently.

Meanwhile, in the field of "Laser illumination for endoscopy", Prof Gao's team have successfully established a novel ultra-compact endoscopic imaging system, which uses a miniature CMOS sensor (O.D. <1.0 mm) and a few multimode fiber for light delivery. Critically, the illumination is realized by coupling the output of a supercontinuum or RGB laser into the fiber. In this way, very high brightness is possible with extremely small footprint on the illumination part. As a result, the overall diameter (< 1.2 mm) of the endoscope can be much smaller than the currently used models.

xxx

Size matters! Understanding and exploiting the length-scale dependence of material properties and nano/micro-scale measurements

14:10–14:50, 9 August 2018
Session Chair: Seung-Woo Kim, Korea Advanced Institute of Science and Technology (Korea, Republic of)

Prof. Nigel M. Jennett

Professor of Materials, Mechanics and Measurement at Coventry University *United Kingdom)
Chair of the BSI Indentation Hardness Committee

Professor Nigel M. Jennett BSc (Hons) (Physics), PhD (Physics), CSci CPhys MinstP has over 25 years' experience of fabrication and characterization of nano-structured materials and 20 years' developing nano-mechanical test methods. He is: Professor of Materials, Mechanics and Measurement at Coventry University, visiting Professor of Engineering at Leicester University, Associate Editor of Philosophical Magazine (and Philos. Mag. Letters), international chair of VAMAS Technical Working Area 22 'Mechanical properties measurement of thin films and coatings', UK technical expert on the CIPM consultative committee hardness working group (CCM-WGH), chairs the BSI indentation hardness committee, leads the UK delegation for ISO working groups drafting standards for indentation-based test methods. Nigel has also served two terms (six years) on the European Commission Certification Advisory Panel for Physical and Physicochemical Properties.

Nigel studied Physics at Bristol University (Physics Laboratory prize in 1984 and 1986, and the Raychem prize in 1985). He spent six years researching magnetic multilayers (1990 PhD, 1991 Chartered Physicist), before moving to NPL (1992) to develop traceable Scanned Probe Microscopy and nano-mechanical measurements. In 1998 he created his own research group focused on surfaces, coatings and nano-mechanics and was awarded a Glazebrook Fellowship in 2003 and the NPL Rayleigh award in 2010. Nigel is an experienced leader of projects (Government, Industry and European Commission), and is a regular invited speaker at international conferences.

Innovative techniques for contrast, spectrometric and viscoelastic measurements in small animal MRI

14:50–15:30, 9 August 2018
Session Chair: Seung-Woo Kim, Korea Advanced Institute of Science and Technology (Korea, Republic of)

Prof. Olivier Beuf

Senior CNRS Research Scientist
Team Leader "NMR and optics: From measure to biomarker"
Director of the CREATIS Lab, CNRS, INSERM (France)

Dr. Olivier Beuf is the senior CNRS research scientist in France. He obtained his PH.D in physics from Université Claude Bernard Lyon 1 in 1998. Dr. Beuf has widely research interests in the field of MR imaging, RF coils, multi-parameters quantitative imaging, liver analysis, cartilage ultra-structure and morphology, and so on.

He published more than 80 peer reviewed international journal articles and 8 book chapters. His research works are 1105 citations in WOS and the h-index is as high as 19. Meanwhile, the transfer of technology are 3 patents. Dr. Beuf is also the supervisor of 17 PhD students (14 defended and 3 still supervised). Dr. Beuf is the chairman of the "journées scientifiques sur les nouvelles méthodologies en imagerie du vivant", Lyon, France (300 delegates). He is the distinguished reviewer of Journal of Magnetic Resonance Imaging (2011 and 2014) and Magna Cum Laude Merit Award of the 30th Meeting of the International Society for Magnetic Resonance in Medicine (2012).

Interferometric microscopy for detection and visualization of biological nanoparticles

15:45–16:25, 9 August 2018
Session Chair: Nigel M. Jennett, Coventry Univ. (United Kingdom)

Prof. M. Selim Ünlü

Distinguished Professor of Engineering appointed in electrical and computer engineering, biomedical engineering, physics, and graduate medical sciences. Boston University (United States)
IEEE Fellow and OSA Fellow
Editor-in-Chief for IEEE Journal of Quantum Electronics
Contact Information: selim@bu.edu, www.bu.edu/OCN

Professor M. Selim Ünlü received the B.S. degree from the Middle East Technical University, Ankara, Turkey, in 1986, and the M.S.E.E. (1988) and Ph.D. (1992) degrees from the University of Illinois at Urbana-Champaign, all in electrical engineering. Since 1992, he has been a professor at Boston University. He is currently a Distinguished Professor of Engineering appointed in electrical and computer engineering, biomedical engineering, physics, and graduate medical sciences. He has also served as the Associate Dean for Research and Graduate Programs in engineering. His research interests are in the areas of nanophotonics and biophotonics focusing on high-resolution solid immersion lens microscopy of integrated circuits and development of biological detection and imaging techniques, particularly in high-throughput digital biosensors based on detection of individual nanoparticles and viruses.

Dr. Ünlü was the recipient of the NSF CAREER and ONR Young Investigator Awards in 1996. He has been selected as a Photonics Society Distinguished Lecturer for 2005-2007 and Australian Research Council Nanotechnology Network (ARCNN) Distinguished Lecturer for 2007. He has been elevated to IEEE Fellow rank in 2007 for his "contributions to optoelectronic devices" and OSA Fellow rank in 2017 for his "for pioneering contributions in utilization of optical interference in enhanced photodetectors and biological sensing and imaging." In 2008, he was awarded the Science Award by the Turkish Scientific Foundation. His professional service includes serving as the chair of the Annual Meeting for IEEE Photonics Society and Editor-in-Chief for IEEE Journal of Quantum Electronics.

Plasmonics: Exotic nanophotonics beyond the limits

16:25–17:05, 9 August 2018
Session Chair: Nigel M. Jennett, Coventry Univ. (United Kingdom)

Prof. Satoshi Kawata

Professor Emeritus, Osaka University (Japan)
Honorary Scientist RIKEN (Japan)
Osaka University, Suita (Japan)
Office: P3-300, Photonics Center
Email:kawata@ap.eng.osaka-u.ac.jp

Professor Satoshi Kawata is now Professor Emeritus at Osaka University and Honorary Scientist of RIKEN. He is the founder and the Chairman of the Board of Nanophoton Corp. He is a Fellow of OSA, IOP, SPIE, and JSAP.

Satoshi Kawata received his BSc, Msc, and PhD all in Applied Physics in 1974, 76, and 79, respectively, from Osaka University. After the experience of postdoctral fellow of JSPS, he spent two years in University of California, at Irvine as a Research Associate. He joined Osaka University as a faculty member in 1981 and was promoted to Professor of Applied Physics in 1993, and then Distinguished Professor in 2013. In 2002, he joined RIKEN as a Chief Scientist as Head of Nanophotonics Laboratory until his retirement in 2012, and Team Leader of RIKEN until 2015.

Professor Kawata is now the Professor Emeritus of Osaka University and Honorary Scientist of RIKEN. He has served as the President of JSAP (Japan Society of Applied Physics) from 2014 to 2016, and the President of Spectroscopical Society of Japan from 2007 to 2008, the Editor of Optics Communications from 2000 to 2009.

He is one of the pioneers in near field optics (the inventor of tip-enhanced near-field microscopy), three-dimensional microscopy (laser CT microscopy, 3D optical data storage), plasmonics (SPR sensors, plasmon holography, plasmon laser, plasmonic microscopy), two-photon engineering (two-photon polymerization, two-photon isomerization, two-photon photorefraction, two-photon SPP, etc), bio-imaging, and signal recovery. The "8-micron bull" fabricated with his invented two-photon technology has been awarded in Guinness World Record Book 2004 Edition.

Drive operational excellence through intelligent quality

17:05–17:45, 9 August 2018
Session Chair: Nigel M. Jennett, Coventry Univ. (United Kingdom)

Ms. Liao Lu

Hexagon Manufacturing Intelligence
Global Product Marketing Manager

Ms. Liao Lu is now Hexagon Manufacturing Intelligence Global Product Marketing Manager. She is also HxGN SMART Quality Product Marketing Manager. With more than 20 years of industrial experience in precision measurement, Ms. Liao Lu has extensive market knowledge and internationalized view on measuring technology and customer application, and has made important contributions to the application and popularization of advanced measuring technology. She received her MSc degrees in Precision Measuring Technology from Tianjin University in 2003.

Introduction

The International Symposium on Precision Engineering Measurements and Instrumentation (ISPEMI) is an international symposium held every other year since 1999, in different cities of China with English as its working language. ISPEMI 2018 is the 10th ISPEMI, and was held 8–10 August 2018, in Kunming, Yunnan Province. It is sponsored by the International Committee on Measurements and Instrumentation (ICMI), National Natural Science Foundation of China (NSFC), Chinese Society for Measurement (CSM), and China Instrument and Control Society (CIS) and organized by Harbin Institute of Technology (HIT), International Committee on Measurements and Instrumentation (ICMI), and Instrumentation Committee of CSM (IC-CSM), in cooperation with Kunming University of Science and Technology, Beijing Information Science and Technology University, Hefei University of Technology, and the Electricity and Magnetism Committee of CSM.

The purpose of ISPEMI 2018 is to bring together young and senior researchers and engineers working in the fields of precision engineering measurements and instrumentation all over the world and provide an international technical forum for them to present their research and develop their knowledge of the recent advances on this particular aspect.

The theme of this conference is measurement and instrument for new industrial era. The morning glow of a new round of a science and technology revolution has already emerged in recent years. New technologies, such as a new generation of internet, big data, cloud computation, three-dimensional printing, artificial intelligence, quantum communication, quantum computation, and quantum measurement are developing fast. They will bring about a new generation of industrial revolution. Intelligent manufacturing marked by intelligent equipment and intelligent factory has already appeared. At the same time, International Measurement Organization has implemented the redefinition of seven basic quantities. All these put forward a significant challenge for precision engineering measurement and instrument technologies. How do measurement and instrument play guiding and supporting roles in this science and technology revolution and industrial revolution? This is the historic mission all the measurement and instrument experts and scientists in this new era are now facing. We are going to continue the discussion on this historic issue at the conference.

At ISPEMI 2018, ten plenary speakers from the United Kingdom, Germany, the United States, France, Japan, and China, made excellent presentations. From the 270 received manuscripts, we accepted only 104 papers for oral and 139 papers for poster presentation. Professor Tony Wilson concluded that the conference was very successful in terms of subject and organization.

While the Proceedings of ISPEMI 2018 is now ready for delegates, we would like to thank National Natural Science Foundation of China (NSFC), International Committee on Measurements and Instrumentation (ICMI), Chinese Society for Measurement (CSM), China Instrument and Control Society (CIS), Harbin Institute of Technology (HIT), SPIE, Kunming University of Science and Technology, Beijing Information Science and Technology University, and Hefei University of Technology for their funds and assistance provided. Our thanks go to the procedure and organizing committee members, especially honorary chairman, co-chairmen, and plenary speakers, Prof. Kenneth Grattan, Prof. Heping Cheng, Prof. Steven Cundiff, Dr. Christian Rothleitner, Prof. Fu-Jen Kao, Prof. Nigel M. Jennett, Prof. Olivier Beuf, Prof. M. Selim Ünlü, Prof. Satoshi Kawata, and Dr. Liao Lu for their efforts to make the meeting fruitful and successful. Our special thanks go to SPIE for its efforts to enable us to do these things so well. It was also declared the ISPEMI 2020 will be held in Guilin in Guangxi Province. See you again then.

Jiunin Tan