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**Hiroyuki Shiraga
Takeharu Goji Etoh**
Editors

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Hiroyuki Iwamoto, JASRI (Japan) and Spring8 (Japan)

Shingo Kagami, Tohoku University (Japan)

Yukiko Kitazawa, ISAS/JAXA (Japan)

Harald Kleine, University of New South Wales (Australia)

Mayuko Koga, University of Hyogo (Japan)

Takashi Komuro, Saitama University (Japan)

Toru Kondo, Olympus Corporation (Japan)

Shiro Kubota, AIST (Japan)

Rihito Kuroda, Tohoku University (Japan)

Takayuki Kusaka, Ritsumeikan University (Japan)

Guillaume Lajoinie, Universiteit Twente (Netherlands)

Osamu Matoba, Kobe University (Japan)

Alessio Morace, Osaka University (Japan)

Shigeru Murata, Kyoto Institute of Technology (Japan)

Yasuo Nabekawa, RIKEN (Japan)

Sabrina R. Nagel, Lawrence Livermore National Laboratory
(United States)

Kazuyuki Nakakita, Japan Aerospace Exploration Agency (Japan)

Hajime Nakamura, National Defense Academy of Japan (Japan)

Andrei Nomerotski, Brookhaven National Laboratory (United States)

Tomoo Okinaka, Kindai University (Japan)

Herbert Olivier, RWTH Aachen Universität (Germany)

Masanori Ota, Chiba University (Japan)

Alexander Rack, ESRF - The European Synchrotron (France)

Maarten Rosmeulen, IMEC (Belgium)

Jun Sakakibara, Meiji University (Japan)

Eiichi Sato, Iwate Medical University (Japan)

Kazuhiro Shimonomura, Ritsumeikan University (Japan)

Hiroyuki Shiraga, Osaka University (Japan)

Beric William Skews, University of the Witwatersrand (South Africa)

Graham W. Smith, AWE plc (United Kingdom)

Boleslaw Stasicki, Deutsches Zentrum für Luft- und Raumfahrt e.V.
(Germany)

Eleanor Stride, University of Oxford (United Kingdom)

Shu Takagi, The University of Tokyo (Japan)

Tsutomu Takagi, Hokkaido University (Japan)

Hiroyuki Takahira, Osaka Prefecture University (Japan)

Yasuhide Takano, Kindai University (Japan)

Kosei Takehara, Kindai University (Japan)

Yohsuke Tanaka, Kyoto Institute of Technology (Japan)
Sigurdur T. Thoroddsen, King Abdullah University of Science and
Technology (Saudi Arabia)
Renato Turchetta, STFC Rutherford Appleton Laboratory
(United Kingdom)
Michel Versluis, Universiteit Twente (Netherlands)
Zhehui Wang, Los Alamos National Laboratory (United States)
Keiko Watanabe, Ritsumeikan University (Japan)
Takayuki Watanabe, Kyushu University (Japan)
Peng Xia, AIST (Japan)

Introduction

The 31st International Congress on High-Speed Imaging and Photonics (ICHSIP-31) was held 6–10 November 2016, in Osaka, Japan. Co-organized by Osaka University and its Institute of Laser Engineering (Japan), Ritsumeikan University (Japan), and Kindai University (Japan), the Organizing Committee of ICHSIP-31 helped put the program and event together. It was supported by 25 societies and associations in Japan.

288 participants, including 56 students from 15 different countries, gathered at the conference. The conference program contained 51 invited talks, 152 oral talks, and 65 posters. A total of 268 papers were presented, 65 of which are included in these post-conference proceedings.

ICHSIP-31 was partially sponsored by the Tateisi Science and Technology Foundation (Japan), and by the Research Foundation for the Electrotechnology of Chubu (Japan). It was also partially supported by Vision Research Inc. (Canada)

The situation of ICHSIP-31 and its circumstances so far, must be mentioned here. Since 1952, the biennial international meeting on high-speed photography has brought together scientists, researchers, and engineers who may have different technical backgrounds, but who share one common interest: recording images of highly transient optical phenomena and photonic events. The purpose of these meetings was to provide opportunities to present their latest research results and discoveries, and mutually exchange their ideas and technical information on high-speed recording devices, as well as the application of these diagnostics to various fields of science and engineering.

While the fields of high-speed imaging have been rapidly and largely expanding, the style of the conference has not been changed for a long time. As such, changes of some kind in the process of holding the conference were inevitable. Some active colleagues discussed a scheme to energize the conference, and came to a conclusion that we should try to modify the structure of operation. Thus, we decided to start up a new committee named the International Scientific Advisory Board (ISAB) by inviting many new world-leading members from various novel and active fields related to high-speed imaging. The ISAB is a driving body for the series of the ICHSIP conferences. The members of the ISAB are expected to support the coming conference by giving their honest advice to the organizing committee and to activate the scientific field for continuation and further expansion of the conferences.

In ICHSIP-31, we aimed to review the wide range of the fields by summarizing the state-of-the-art high-speed imaging. In addition to new discoveries and technical

innovations presented in usual scientific meetings, we also intended to introduce cutting-edge ultra-fast imaging technologies and applications reviewed by leading scientists in the world in various related fields. ICHSIP-31 covered three major categories: Instrumentation and Solution Tools, Physical Applications, and Medical and Biological Applications. It was one of the highlighted features of the ICHSIP-31 to survey new ongoing research and developments in Medical and Biological Applications by introducing high-speed imaging technologies.

On the evening of Wednesday, 9 November, a panel discussion titled "Expansion and Fusion of the High-speed Imaging World: From Attosecond Pump and Probe Imaging to 10-fps AFM Imaging of Stepping Myosin-" occurred. Intense discussions on high-speed imaging and photonics from various aspects took place, resulting in exchange of information between, and finding common solutions of, totally different topics.

We have set up a three-stage publication system for "the greatest happiness of the greatest numbers:"

Abstract Book: All submitted abstracts were included in the printed abstract book delivered on-site at the conference.

Conference Proceedings: All submitted papers were included on a USB memory device delivered on-site.

Post-conference Proceedings: The submitted papers were peer-reviewed by referees, and those accepted for publication are included in these proceedings published by SPIE. A special acknowledgement must be expressed to the support of SPIE for facilitating the submission of manuscripts and assisting the compilation of the post-conference proceedings.

Three awards were established for ICHSIP-31:

The "nac High-Speed Imaging Award" was presented to outstanding contributions made in the field of high speed imaging and photonics. It was supported by nac Image Technologies Inc. (United States)

"Slow Motion Video Awards (Slow MOVA)" were presented to the executors in these categories: Excellent Slow Motion Video, Scientific Slow Motion Video, Artistic Slow Motion Video, and Entertaining Slow Motion Video. Slow MOVA was open not only to the congress participants, but to everyone. It was supported by Photron Ltd. (Japan)

"Best Poster Awards" were presented to top-evaluated poster presentations in three categories. The awards were supported by Specialised Imaging Ltd. (United Kingdom)

Winners of the Best Poster Awards were selected by participant vote. Award winners of the other two awards were selected by each selection committee. Winners were recognized during the banquet. Selected videos were shown at the banquet, which were excellent, interesting, beautiful, and fun.

An exhibition of high-speed imaging instruments took place in parallel with the scientific sessions. The latest and cutting-edge high-speed imaging devices from 15 leading companies were shown for three days. It also was an attractive event to the conference participants.

On behalf of the organizing committee of the 31st International Congress on High-Speed Imaging and Photonics, we express our most cordial acknowledgement with thanks to the great contributions made by many people for making the ICHSIP-31 a great success. It was virtually impossible to hold such a big and successful meeting without their collaborative efforts.

We consider it appropriate to express thankful acknowledgements to the distinguished authors for presenting high-quality papers, the chair persons for smooth handling of the sessions, the session participants for deep and fruitful discussions, the reviewers of the papers for their sincere efforts to make the proceedings valuable, the members of the Organizing Committee and the International Scientific Advisory Board for operation and guidance of the conference, the exhibitors for displaying cutting-edge high-speed imaging devices, the secretaries and graduate students for wonderful support, and finally, all the participants for their cooperation in all aspects of the conference.

The 32nd International Congress on High-Speed Imaging and Photonics will be held at Universiteit Twente, Netherlands, in 2018. We look forward to seeing you again in Twente, and at subsequent conferences.

Hiroyuki Shiraga
Takeharu Goji Etoh

Awards

nac High-speed Imaging Award

Rihito Kuroda, Shigetoshi Sugawa, Tohoku University (Japan)

For their development of an Ultra High Speed CMOS Image Sensor with improved light sensitivity that is capable of capturing 20 million frames per second with a significant reduction in power consumption. This sensor is now, commercially employed in the Shimadzu Hyper Vision HPV-X2 camera.

Sponsored by **nac Image Technology Inc.** (Japan)

Selection Committee

Keisuke Goda, University of Tokyo (Japan)

Hiroyuki Shiraga, Osaka University (Japan)

Vyshnavi Suntharalingam, Massachusetts Institute of Technology
(United States)

Renato Turchetta, Rutherford Appleton Laboratory (United Kingdom)

Michel Versluis, Universiteit Twente (Netherlands)

Award Administrator

Jim Walton, 4Dvideo (United States)

Slow Motion Video Awards

Excellent Video Award

Phred Peterson, Royal Melbourne Institute of Technology (Australia)
"Supersonic soda jet"

Scientific Video Award

Chihiro Inoue, The University of Tokyo (Japan)
"Senko-hanabi as Dancing Drops"

Artistic Video Award

Harald Kleine, University of New South Wales (Australia)
"Shock Wave Kaleidoscope"

Entertaining Video Award

Kentaro Takesute (Japan)
“Candle Experiment”

Sponsored by **PHOTRON Ltd.** (Japan)

Selection Committee

Shin-ichiro Ito, Chair, Kogakuin University (Japan)
Eleanor Stride, University of Oxford (United Kingdom)
Ryohei Funatsu, NHK Japan Broadcasting Corporation (Japan)
Takeharu Goji Etoh, Osaka University (Japan) and Ritsumeikan University (Japan)

Best Poster Awards

Instrumentations and Solution Tools

Shaorong Chen, Jun Zhang, Hui Jia, Qinglin Zhai, Xishun Liu, Dawei Lu, Tao Wang, Jinshou Tian, Yuman Fang, Kai He, National University of Defense Technology (China)
“Theoretical research on dynamic range and sensitivity of all optical solid-state ultrafast imaging sensor”

Physical Applications

S. R. Nagel, H.Chen, T. J. Hilsabeck, P.M. Bell, D.K. Bradley, A.K.L. Dymoke-Bradshaw, J.D. Hares, A.U. Hazi, S.M. Kerr, J.D. Kilkenny, E.V. Marley, J. Park, G.J. Williams, Lawrence Livermore National Laboratory (United States)
“Ultra-high speed imaging of K-alpha emission from short-pulse laser-plasma interactions using DIXI (dilation x-ray imager)”

Bio-Medical Applications

T. Baba, K. Ikezaki, H. Sekiguchi, T. Kubo, Y. C. Sasaki, The University of Tokyo (Japan)
“X-ray imaging of single protein's motion with Ultra-high speed and accuracy”

Sponsored by **Specialised Imaging, Ltd.** (United Kingdom)

Selection by Participant Vote

Award Administrator

Hiroyuki Shiraga, Osaka University (Japan)

Exhibitors

CORNES Technologies, Ltd. (Japan)
HAMAMATSU PHOTONICS K.K. (Japan)
Nobby Technologies, Ltd. (Japan)
Vision Research Inc. (Canada)
Specialised Imaging, Ltd. (United Kingdom)
KOKEN Company, Ltd. (Japan)
Shimadzu Corporation (Japan)
DITECT Corporation (Japan)
PHOTRON, Ltd. (Japan)
nac Image Technology, Inc. (United States)
TORECK Company, Ltd. (Japan)
Ken Automation, Inc. (Japan)
ASTRODESIGN, Inc. (Japan)
Invisible Vision, Ltd. (United Kingdom)
Video Scope International, Ltd. (United States)

