TECHNICAL PROGRAM

SPIE. PHOTONICS WEST

27 JANUARY–1 FEBRUARY 2024

THE MOSCONE CENTER | SAN FRANCISCO, CALIFORNIA USA

OPTO DAILY CONFERENCE SCHEDULE

Check the conference schedule frequently for updates
Presentation times are subject to change

SATURDAY 27 January	SUNDAY 28 January	MONDAY 29 January	TUESDAY 30 January	WEDNESDAY 31 January	THURSDAY 1 February
Optoelectronic Materials and Devices (James G. Grote, Shibin Jiang)					
			12880 **Physics and Simulation of Optoelectronic Devices XXXII** *(Bernd Witzigmann; Marek Osiński; Yasuhiko Arakawa)* Location: Moscone Center, Room 2008 (Level 2 West)		
		12881 **Physics, Simulation, and Photonic Engineering of Photovoltaic Devices XIII** *(Alexandre Freundlich; Stéphane Collin; Karin Hinzer; Ian R. Sellers)* Location: Moscone Center, Room 2014 (Level 2 West)			
		12882 **Optical Components and Materials XXI** *(Shibin Jiang; Michel J. F. Digonnet)* Location: Moscone Center, Room 2012 (Level 2 West)			
				12883 **Organic Photonic Materials and Devices XXVI** *(William M. Shensky III; Ileana Rau; Okihiro Sugihara)* Location: Moscone Center, Room 2018 (Level 2 West)	
		12884 **Ultrafast Phenomena and Nanophotonics XXVIII** *(Markus Betz; Abdulhakem Y. Elezzabi)* Location: Moscone Center, Room 2020 (Level 2 West)			
		12885 **Terahertz, RF, Millimeter, and Submillimeter-Wave Technology and Applications XVII** *(Laurence P. Sadwick; Tianxin Yang)* Location: Moscone Center, Room 2016 (Level 2 West)			
		12886 **Gallium Nitride Materials and Devices XIX** *(Hiroshi Fujioka; Hadis Morkoç; Ulrich T. Schwarz)* Location: Moscone Center, Room 2024 (Level 2 West)			
		12887 **Oxide-based Materials and Devices XV** *(David J. Rogers; Ferechteh H. Teherani)* Location: Moscone Center, Room 2022 (Level 2 West)			
			12888 **2D Photonic Materials and Devices VII** *(Arka Majumdar; Carlos M. Torres Jr.; Hui Deng)* Location: Moscone Center, Room 2010 (Level 2 West)		
Photonic Integration (Yakov Sidorin, Jean-Emmanuel Broquin)					
		12885 **Terahertz, RF, Millimeter, and Submillimeter-Wave Technology and Applications XVII** *(Laurence P. Sadwick; Tianxin Yang:)* Location: Moscone Center, Room 2016 (Level 2 West)			
		12889 **Integrated Optics: Devices, Materials, and Technologies XXVIII** *(Sonia M. García-Blanco; Pavel Cheben)* Location: Moscone Center, Room 304 (Level 3 South)			
		12890 **Smart Photonic and Optoelectronic Integrated Circuits 2024** *(Sailing He; Laurent Vivien)* Location: Moscone Center, Room 302 (Level 3 South)			
		12891 **Silicon Photonics XIX** *(Graham T. Reed; Andrew P. Knights)* Location: Moscone Center, Room 301 (Level 3 South)			
		12892 **Optical Interconnects XXIV** *(Ray T. Chen; Henning Schröder)* Location: Moscone Center, Room 204 (Level 2 South)			
		12893 **Photonic Instrumentation Engineering XI** *(Lynda E. Busse; Yakov Soskind)* Location: Moscone Center, Room 312 (Level 3 South)			
		12894 **Next-Generation Optical Communication: Components, Sub-Systems, and Systems XIII** *(Guifang Li; Kazuhide Nakajima; Atul K. Srivastava)* 12894 Location: Moscone Center, Room 314 (Level 3 South)			

CONFERENCE 12891

Silicon Photonics XIX

29 - 31 January 2024 | Moscone Center, Room 301 (Level 3 South)

Conference Chair(s): **Graham T. Reed,** Optoelectronics Research Ctr. (United Kingdom); **Andrew P. Knights,** McMaster Univ. (Canada)

Program Committee: **Delphine Marris-Morini,** Ctr. de Nanosciences et de Nanotechnologies (France); **Goran Z. Mashanovich,** Univ. of Southampton (United Kingdom); **Jurgen Michel,** Massachusetts Institute of Technology (United States); **Liam O'Faolain,** Munster Technological Univ. (Ireland); **Jason Ching Eng Png,** A*STAR Institute of High Performance Computing (Singapore); **Andrew W. Poon,** Hong Kong Univ. of Science and Technology (Hong Kong, China); **Haisheng Rong,** Intel Corp. (United States); **Bhavin J. Shastri,** Queen's Univ. (Canada); **Dries Van Thourhout,** Univ. Gent (Belgium); **Laurent Vivien,** Ctr. de Nanosciences et de Nanotechnologies (France); **Jeremy Witzens,** RWTH Aachen Univ. (Germany); **Winnie N. Ye,** Carleton Univ. (Canada); **Shui-Qing Yu,** Univ. of Arkansas (United States); **Zhiping Zhou,** Peking Univ. (China); **Aaron J. Zilkie,** Rockley Photonics Ltd. (United States)

Monday 29 January 2024

OPTO PLENARY SESSION

29 January 2024 • 08:00 AM - 10:15 AM | Moscone Center, Room 207/215 (Level 2 South)
Session Chairs: **Karin Hinzer**, Univ. of Ottawa (Canada) and **Ulrich T. Schwarz**, Technische Univ. Chemnitz (Germany)

8:00 AM - 8:15 AM: **Welcome and Opening Remarks**
Announcement of the Aden and Marjorie Meinel Technology Achievement Award

12891-501 • 08:15 AM - 08:55 AM
Silicon photonics: the quest for sustainable growth (Plenary Presentation)
Author(s): **Roel G. Baets,** Ghent Univ. (Belgium), imec (Belgium)

12890-501 • 08:55 AM - 09:35 AM
Neuromorphic photonics (Plenary Presentation)
Author(s): **Paul R. Prucnal,** Princeton Univ. (United States)

12904-501 • 09:35 AM - 10:15 AM
Semiconductor lasers pushed deeper into unseen wavelengths and frontiers (Plenary Presentation)
Author(s): **Åsa Haglund,** Chalmers Univ. of Technology (Sweden)

Coffee Break 10:15 AM - 10:45 AM

SESSION 1: OPTICAL COMPUTING AND OPTICAL PROCESSING

29 January 2024 • 10:45 AM - 12:15 PM | Moscone Center, Room 301 (Level 3 South)
Session Chair(s): **Andrew P. Knights**, McMaster Univ. (Canada)

12891-1 • 10:45 AM - 11:15 AM
Scalable heterogeneously integrated silicon photonics technology platform and its applications *(Invited Paper)*
Author(s): **Yuliya Akulova**, **Richard Jones**, **Ranju Venables**, **Pierre Doussiere**, **Mahbub Satter**, **Saeed Fathololoumi**, **Leimeng Zhuang**, **Daniel Zhu**, **Olufemi Dosunmu**, **Kejia Li**, **Ansheng Liu**, **Hari Mahalingam**, **Pegah Seddighian**, **Christian Malouin**, **Wenhua Lin**, **Ye Wang**, **Kadhair Al-hemyari**, **Pengyue Wen**, **Eric Snow**, **David Gold, Ling Liao,** Intel Corp. (United States)

12891-2 • 11:15 AM - 11:35 AM
Optical nonlinearities in silicon under extreme intensities in the optical communication (C-band) spectrum
Author(s): **Matthias F. Jenne**, **Isaac Spotts**, **Christopher M. Collier, Jonathan F. Holzman,** The Univ. of British Columbia (Canada)

12891-3 • 11:35 AM - 11:55 AM
An efficient optical/MEMS-based binary neural network hardware accelerator for harsh environments

Author(s): **Belal Jahannia**, **Chandraman Patil**, **Elham Heidari, Hamed Dalir,** Univ. of Florida (United States)

12891-4 • 11:55 AM - 12:15 PM
Automatic calibration of high-density photonic processor with reconfigurable micro-ring resonators for neuromorphic computing
Author(s): **Yongjin Ji, Woo-Young Choi,** Yonsei Univ. (Korea, Republic of)

Lunch Break 12:15 PM - 01:45 PM

SESSION 2: WAVEGUIDE DEVICES AND APPLICATIONS I

29 January 2024 • 01:45 PM - 03:15 PM | Moscone Center, Room 301 (Level 3 South)
Session Chair(s): **Graham T. Reed**, Optoelectronics Research Ctr. (United Kingdom)

12891-5 • 01:45 PM - 02:15 PM
Unlocking the power of silicon photonics through inverse design and heterogeneous integration *(Invited Paper)*
Author(s): **Jelena Vuckovic,** Stanford Univ. (United States)

12891-6 • 02:15 PM - 02:35 PM
Silicon photonics with ultra-broadband operation from 1.2 to 2.4 μm wavelength
Author(s): **Timo Aalto**, **Markku Kapulainen**, **Fei Sun**, **Mikko Harjanne, Srivathsa Bhat,** VTT Technical Research Ctr. of Finland Ltd. (Finland)

12891-7 • 02:35 PM - 02:55 PM
Design of 1×16 optical phased array in 45-nm SOI CMOS
Author(s): **Youngin Kim, Hua Wang,** ETH Zurich (Switzerland)

12891-8 • 02:55 PM - 03:15 PM
Multicore asymmetric star-routing (MASTR) switch
Author(s): **Janusz A. Murakowski**, **Timothy Creazzo**, **Chase Stine**, **Charles Harrity**, **Anna Bortle**, **Kevin Shreve**, **Samhit Dontamsetti,** Phase Sensitive Innovations, Inc. (United States); **Dennis Prather,** Univ. of Delaware (United States)

Coffee Break 03:15 PM - 03:45 PM

SESSION 3: QUANTUM PHOTONICS AND NANO-SCALE PROCESSING

29 January 2024 • 03:45 PM - 05:45 PM | Moscone Center, Room 301 (Level 3 South)
Session Chair(s): **Jonathan Bradley**, McMaster Univ. (Canada)

12891-9 • 03:45 PM - 04:15 PM
Integrated quantum photonics with single color centers in silicon *(Invited Paper)*
Author(s): **Mihika Prabhu**, **Valeria Saggio,** Massachusetts Institute of Technology (United States); **Lorenzo De Santis,** Massachusetts Institute of Technology (United States), Technische Univ. Delft (Netherlands); **Samuel Gyger,** Massachusetts Institute of Technology (United States), KTH Royal Institute of Technology (Sweden); **Marco Colangelo**, **Ian Christen**, **Christopher Panuski**, **Changchen Chen**, **Hamza Raniwala**, **Dalia Ornelas-Huerta**, **Connor Gerlach**, **Dirk R. Englund,** Massachusetts Institute of Technology (United States); **Carlos Errando Herranz,** Technische Univ. Delft (Netherlands), Massachusetts Institute of Technology (United States), Westfälische Wilhelms-Univ. Münster (Germany)

12891-10 • 04:15 PM - 04:45 PM
Ultra low density quantum dot for high purity and scalable single photon sources *(Invited Paper)*
Author(s): **Chen Shang,** Univ. of California, Santa Barbara (United States); **Marco De Gregorio**, **Sven Höfling,** Julius-Maximilians-Univ. Würzburg (Germany); **John Bowers,** Univ. of California, Santa Barbara (United States); **Andreas Pfenning, Tobias Huber,** Julius-Maximilians-Univ. Würzburg (Germany)

12891-11 • 04:45 PM - 05:05 PM
High-quality silicon single-photon source for practical quantum network
Author(s): **Jinyi Du,** National Univ. of Singapore (Singapore); **George F. Chen**, **Hongwei Gao,** Singapore Univ. of Technology and Design (Singapore); **Dawn Tan,** Singapore Univ. of Technology and Design (Singapore), A*STAR Institute of Microelectronics (Singapore); **James A. Grieve,** Ctr. for Quantum Technologies (Singapore), Technology Innovation Institute (United Arab Emirates); **Alexander Ling,** Ctr. for Quantum Technologies (Singapore), National Univ. of Singapore (Singapore)

Paper PC12891-4

Automatic calibration of high-density photonic processor with reconfigurable micro-ring resonators for neuromorphic computing

29 January 2024 • 11:55 AM - 12:15 PM PST | Moscone Center, Room 301 (Level 3 South)

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Abstract

The prevalent and complex AI-based services have caused the rapid growth of demand for high performance computing (HPC). The conventional accelerators such as graphic processing units (GPU) have faced obstacles regarding energy efficiency and computational resources. Optical approach, utilizing silicon photonic integrated chip provide solutions in terms of speed, parallelism, and energy efficiency. In this work, we propose a photonic processor with coupling ratio variable micro-ring resonators (MRR), consisting of asymmetric Mach-Zehnder Interferometers (MZI) as variable couplers. Considering the number of channels, the coupling ratio variable MMR customizes the FWHM, maximizing the bit resolution while minimizing the error rate. Also, the resonant wavelength is fixed during the entire process which facilitates significant increase in channel density. The entire calibration process is successfully verified with 4-channel photonic processor fabricated with the Si photonic foundry service.

Authors

Presenter

Yongjin Ji
Yonsei Univ. (Korea, Republic of)

Yongjin Ji received the B.S. degree in electrical and electronic engineering from Yonsei University, Seoul, South Korea, in 2020. He is currently with High-Speed Circuits and Systems Laboratory at the same university. His research interests include designing and optimizing Si photonic optical devices for various applications.

Paper PC12891-4

Automatic calibration of high-density photonic processor with reconfigurable micro-ring resonators for neuromorphic computing

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Abstract | Authors

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