Compound Semiconductor Week (CSW'2021)

Online conference, May 9-13, 2021, Stockholm, Sweden

ISCS 2021
The 47nd International Symposium on Compound Semiconductors

IPRM 2021
The 32nd International Conference on Indium Phosphide and Related Materials

Welcome to Stockholm for

COMPOUND SEMICONDUCTOR WEEK 2021

CSW IS THE PREMIER FORUM FOR SCIENCE, TECHNOLOGY AND APPLICATIONS OF COMPOUND SEMICONDUCTORS

Come and listen to 220 presentations:

- 5 Keynote speakers
- 45 Invited talks
- 120 Contributed oral presentations
- 50 Poster contributions

Compound Semiconductor Week (CSW) 2021 will be held online during May 9–13, 2021. CSW 2021 follows a series of successful meetings last held in Berlin, Germany (2017), Boston, USA (2018) and Nara, Japan (2019), each attracting about 450 participants. As in previous years, CSW joins its predecessors ISCS and IPRM in one event. CSW 2021 is the joint venue for the 47th International Symposium on Compound Semiconductors (ISCS) and the 32nd International Conference on Indium Phosphide and Related Materials (IPRM). This conference was originally scheduled for 2020 in Stockholm, and more recently for 2021, also in Stockholm, but has now finally been rescheduled as an online event.

Compound Semiconductor Week takes the role of providing a broad overview of all aspects of compound semiconductors from basics to application. CSW covers new developments in materials and physics related to compound semiconductor technology and addresses applications in electronics, optoelectronics and new fields. Taking place annually, CSW is highly up-to-date.

CONFERENCE HOSTS

Sebastian Lourdudoss,
Department of Applied Physics, KTH

Mattias Hammar,
Department of Electrical Engineering, KTH

Anders Hallén,
Department of Electrical Engineering, KTH

Welcome to register for CSW 2021 online conference!

Please go to: www.csw2021.se/conference/conference-registration/

9-13 May, 2021 Online

Below you register your personal details. Your mobile number and your e-mail address will be used to communicate information before and during the conference.

The conference fee can be paid by invoice to your company or card through our secure SwedbankPay .

Early bird – until April 15: SEK 2800 (approx. USD 322 / EUR 274, excl. VAT)
Regular – from April 16: SEK 3500 (approx. USD 402 / EUR 342, excl. VAT)

Sponsor & Exhibition information for the online conference

Please go to: www.csw2021.se/conference/sponsorship-exhibitor-invitation/

VAT ON FEES – IMPORTANT INFORMATION

The fees are stated in SEK excluding Swedish VAT. Please note that delegates representing a company or organisation from a country outside of Sweden are NOT required to pay Swedish VAT on the registration fee.

If you are from an EU country (Sweden not included) – a valid VAT number is mandatory, otherwise VAT will be added to your registration fee. It is important that your number is stated exactly according to EU standards. Click **here** to see the number structure of each member state. To validate your number before registering, please click **here**. A VAT number can't be added afterwards to a confirmed registration.

If you are from a country outside of EU – you can register without a VAT number.
Delegates from Sweden and private persons are required to pay VAT on the registration fee (25%). You do not need to enter your VAT number at this stage.

Please have your VAT/TAX registration number ready to enter before you start the registration process to avoid TAX payment. It is not possible to add it at a later stage. Registration is binding but may be transferred to another person for a fee. Read more about this in the booking terms and conditions.
If you have any queries about the registration, please do not hesitate to contact Sweden Meetx AB at csw-2021@meetx.se .

Sunday 9 May	Monday 10 May	Tuesday 11 May	Wednesday 12 May	Thursday 13 May	China	Japan	US East	US West
08:00	08:00 MoA1 8:00-10:00 / MoA2 8:00-10:00	08:00 TuA1 8:00-10:15 / TuA2 8:00-10:15	08:00 MoA1 / MoA2	08:00 MoA1 8:00-10:00 / MoA2 8:00-10:00	08:00	14:00	15:00	02:00	23:00
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10:15	10:15 MoB1 10:15-12:00 / MoB2 10:15-12:00	10:15 Paus	10:15 Paus	10:15 MoB1 10:15-12:00 / MoB2 10:15-12:00	10:15	16:15	17:15	04:15	01:15
10:30	10:30	10:30 10:30 Plenary presentation: *Masataka Higashiwaki* Gallium Oxide: The Star of Hope for Compound Semiconductors?	10:30 Exhibition / Poster 10:30-12:00	10:30	10:30	16:30	17:30	04:30	01:30
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15:00 15:00 Conference opening	15:00 15:00 Plenary presentation: *Ursula Keller* Semiconductor disk lasers and SESAMs: material and design optimization	15:00 Paus	15:00 15:00 Plenary presentation: *Fredrico Capasso* Metasurfaces as heterogeneous nanostructured materials for multifunctional	15:00 15:00 Plenary presentation: *John Bowers* Epitaxial Growth of Quantum Dot Lasers on Silicon for Photonic Integrated Circuits	15:00	21:00	22:00	09:00	06:00
15:15 15:15 Plenary presentation: *Susumo Noda* Progress in Photonic Crystals — From Fundamental to State of the Arts for Society	15:15	15:15 MoD1 15:15-17:45 / MoD2 15:15-17:45	15:15	15:15	15:15	21:15	22:15	09:15	06:15
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16:00 Paus	16:00 16:00 ISCS & IPRM Award cermony	16:00 Oxide semiconductors, devices and applicatons II	16:00 16:00 Exhibition pitches	16:00 16:00 Student award cermony	16:00	22:00	23:00	10:00	07:00
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17:15	17:15 Women in STEM	17:15	17:15	17:15	17:15	23:15	00:15	11:15	08:15
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Conference keynote speakers

www.csw2021.se/keynote-speakers

Prof. John Bowers, Epitaxial Growth of Quantum Dot Lasers on Silicon for Photonic Integrated Circuits

Institute for Energy Efficiency, University of California at Santa Barbara, , California, USA

Abstract: InAs quantum dot lasers epitaxially grown on Si show promise for achieving lower cost and higher performance photonic integrated circuits. The discrete density of states inherent to quantum dot lasers has many benefits: 1) reduced threshold current, 2) higher temperature operation, 3) reduced linewidth enhancement factor resulting in reduced reflection sensitivity and reduced linewidth, 4) improved reliability. Prospects and results for integration of quantum dot lasers with photonic integrated circuits will be discussed along with important applications of this technology.

Biography: John Bowers (F'94) is Director of the Institute for Energy Efficiency and a professor in the Departments of Electrical and Computer Engineering and Materials at the University of California, Santa Barbara. His research interests are primarily concerned with silicon photonics, optoelectronic devices, optical switching and transparent optical networks and quantum dot lasers. Bowers received the M.S. and Ph.D. degrees from Stanford University. He worked for AT&T Bell Laboratories and Honeywell before joining UCSB. Bowers is a fellow of the IEEE, OSA and the American Physical Society, and a recipient of the IEEE Photonics Award, OSA/IEEE Tyndall Award, the IEEE LEOS William Streifer Award and the South Coast Business and Technology Entrepreneur of the Year Award. He is a member of the National Academy of Engineering and the National Academy of Inventors.

Prof. Susumu Noda, Progress in Photonic Crystals — From Fundamental to State of the Arts for Society 5.0

Department of Electronic Science and Engineering. Kyoto University, Japan

Abstract: Almost two decades have passed since the realization of complete three-dimensional (3D) photonic bandgap crystals at optical wavelengths. Since then, together with the discovery of 2.5D photonic bandgap crystal concept, the manipulation of photons by photonic crystals has progressed tremendously. For example, the concept of confining photons to a very small modal volume has been established and nanocavity Q-factors have exceeded 10 million, enabling platforms for strong light-matter interaction and quantum information processing.

Photonic crystals allow even a broad-area manipulation of photons, by which semiconductor lasers with a very bright, narrow-divergence beam and various functionalities including 2D beam steering have been realized. Such lasers are promising for applications in light-detection and ranging (LiDAR) and direct material processing, which are important for the forthcoming Society 5.0. Photonic crystals also enable thermal emission control, by which the issues of conventional thermal emission devices such as their extremely broad emission spectra and slow response speed have been fixed, and a renovation of thermal emission devices has been achieved. In this talk, I will review such progress of photonic crystals from the fundamental to State of the Arts for Society 5.0.

Biography: Susumu Noda is a full Professor, Department of Electronic Science and Engineering, Kyoto University, and also Director of Photonics and Electronics Science and Engineering Center, Kyoto University. His research interest includes physics and applications of photonic crystals and the related photonic nanostructures. He received various awards, including Optical Society of America Joseph Fraunhofer Award / Robert M. Burley Prize (2006), the IEEE Nanotechnology Pioneer Award (2009), Medal with Purple Ribbon (2014), the Japan Society of Applied Physics Outstanding Achievement Award (2015), and MOC Awards (2019).

Prof. Masataka Higashiwaki, Gallium Oxide: The Star of Hope for Compound Semiconductors?

National Institute of Information and Communications Technology, Japan

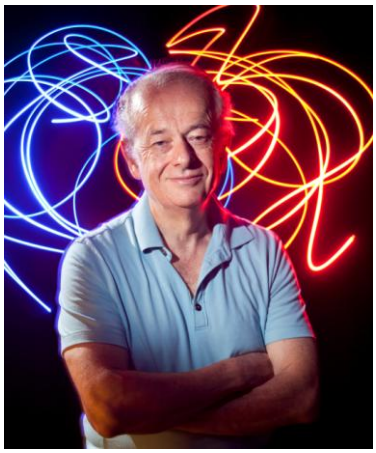
Abstract: Recently, gallium oxide (Ga_2O_3) has been getting much attention as a promising new compound semiconductor due to its excellent physical properties based on an extremely large bandgap of over 4.5 eV and the availability of large-size, high-quality, affordable single-crystal wafers produced from melt-grown bulk crystals. Much of the world-wide research and development has been motivated by the attractive material properties, and significant progress in all the aspects of Ga_2O_3 material and device technologies has been made over the past ten years. In fact, several milestones on the way to industrialization and commercialization of Ga_2O_3 power and RF devices have already been achieved. However, there is no room for doubt that the current device technologies are still immature, and that we still have a long way to introduce Ga_2O_3 transistors and diodes to practical markets.

In this talk, after an introduction of basic material properties of Ga_2O_3, I will provide a broad overview of the state-of-the-art Ga_2O_3 epitaxial growth and electronic device technologies. In addition, a brief outlook on Ga_2O_3 device applications will be given.

Biography: Masataka Higashiwaki received the B.S., M.S., and Ph.D. degrees in solid-state physics from Osaka University, Japan, in 1994, 1996, and 1998, respectively. After a two-year postdoctoral fellow, in 2000, he joined the Communications Research Laboratory (CRL), Japan. From 2007 to 2010, he took a temporary leave from the National Institute of Information and Communications Technology (NICT), which was renamed from CRL, and joined the Department of Electrical and Computer Engineering, University of California, Santa Barbara as a Project Scientist. He returned to NICT in 2010 and started a pioneering work on Ga_2O_3-based electronics. He is now a Director at Green ICT Device Advanced Development Center. Higashiwaki is a recipient of several awards, including the 2014 Japan Society for the Promotion of Science (JSPS) Prize and the 2007 International Symposium on Compound Semiconductors (ISCS) Young Scientist Award. His current research interest is in Ga_2O_3 device and material engineering.

Prof. Fredrico Capasso, Metasurfaces as heterogeneous nanostructured materials for multifunctional flat optics: from components to cameras

John A. Paulson School of Engineering and Applied Sciences Harvard University



Abstract: Metasurfaces are leading to the emergence of new optical components based on dispersion engineering of nanoscale structures, which enables circumventing the limitations of standard refractive and diffractive optics as well as the realization of new functions.[1] Broadband achromatic optics based on metasurface and on hybrid refractive/diffractive design have potential for a wide range of scientific and industrial applications, from miniature spectrometers to ultracompact camera modules with greatly reduced footprint and ease of optical alignment. A new approach to polarization optics has also emerged based on a powerful generalization of Fourier optics.[2] This has led to the demonstration of a compact, single shot, full Stokes polarization sensitive camera using a single metasurface, thus dramatically reducing the complexity of existing cameras and increasing their functionality.[2] New depth sensors based on co-design of metaoptics hardware and software are also being developed, which require far less computational resources than stereo, and time of flight cameras. This convergence between optical design and AI is an emerging trend with far-reaching implications. Flat optics will have a major impact because it will use semiconductor fabrication technologies, such as DUV lithography, to mass produce optical component ad subsystem: chip makers will also become optical foundries.[3,4] In this way it will take advantage of its inherent merits of better and easier aberration control, compactness and multifunctionality, compared to conventional optics.

1. T. Chen, A. Y. Zhu, and F. Capasso Nature Reviews Materials 5, 604 (2020)
2. Rubin et al. Science 365, 6448 (2019)
3. Capasso Nanophotonics 7, 6953 (2018)
4. S. Park, at al. Nano Letters 19, 8673 (2019)

Prof. Ursula Keller, Semiconductor disk lasers and SESAMs: material and design optimization

ETH Zurich(Swiss Federal Institute of Technology in Zurich), Switzerland

Abstract: We have observed a rapidly developing field of optically pumped vertical emitting semiconductor disk lasers (SDLs) such as VECSELs (Vertical External Cavity Surface Emitting Lasers) and MIXSELs (Modelocked Integrated eXternal-cavity Surface Emitting Lasers). The VECSELs have been successfully commercialized for power scaling at more unrestricted operation wavelength. In a VECSEL, the light is emitted perpendicular to the epitaxial layers, unlike edge-emitting lasers, where the beam propagates in the epitaxial layers. In contrast to a VCSEL (i.e. a Vertical Cavity Surface Emitting Laser), the external cavity of the VECSEL offers additional mode control for excellent transverse beam quality even at highest power levels and enables the integration of elements for nonlinear intracavity frequency conversion, wavelength tuning elements, passive modelocking with a semiconductor saturable absorber mirror (SESAM) and dual-comb generation. For the MIXSEL (Modelocked Integrated eXternal-cavity Surface Emitting Laser) the SESAM is integrated into the VECSEL layer stack. The MIXSEL then generates a modelocked pulse train from a simple linear straight cavity defined by the MIXSEL chip and the output coupler as the two end mirrors. The cavity length then adjusts the pulse repetition rate as demonstrated from 1 to 100 GHz with excellent noise performance. An additional intracavity birefringent plate enables dual-comb generation with an adjustable difference in the individual comb spacing. The performance of ultrafast SDLs has been constantly improved and this plenary talk will review the material and design optimization for shorter pulse durations, higher output powers from near infrared (IR) to mid-IR.

Biography: Ursula Keller has been a tenured professor of physics at ETH Zurich since 1993 (www.ulp.ethz.ch), and serves as a director of the Swiss research program NCCR MUST in ultrafast science since 2010 (www.nccr-must.ch). She received a „Diplom" at ETH Zurich in 1984, a Ph.D. at Stanford University USA in 1989, was a Member of Technical Staff at Bell Labs USA 1989 to 1993. From 2014-2018 she has been a member of the research council of the Swiss National Science Foundation. She is the first elected president and co-founder of the ETH Women Professors Forum (https://eth-wpf.ch). She has been a co-founder and board member for Time-Bandwidth Products (acquired by JDSU in 2014) and for GigaTera (acquired by Time-Bandwidth in 2003). Her research interests are exploring and pushing the frontiers in ultrafast science and technology. Awards include the SPIE Gold Medal (2020), IEEE Edison Medal (2019), the European Inventor Award for lifetime achievement (2018), IEEE Photonics Award (2018), OSA Charles H. Townes Award (2015), LIA Arthur L. Schawlow Award (2013), ERC advanced grants (2012 and 2018), EPS Senior Prize (2011), OSA Fraunhofer/Burley Prize (2008), Leibinger Innovation Prize (2004), and Zeiss Research Award (1998).

Women-in-Electronics/Photonics Symposium

www.csw2021.se/women-in-stem-symposium


Deepa Venkitesh


Andrews Nirmala Grace


Linda Höglund


Irina Bouianova

Linda Mondin


Qin Wang


Ani Khachatrian


Nikzad, Shouleh

To promote personal and professional growth for women in Science, Technology, Engineering and Mathematics (STEM), a Women-in-Electronics/Photonics symposium with two sessions will be arranged as part of CSW2021 in the afternoon and evening on **Monday, May 10, 2021**. Eight female invited speakers will present their scientific results with theme on Electronics/Photonics. This symposium aims to inspire young professionals and PhD students to embrace the new technology leap in the STEM fields.

Program

Afternoon session (13:00-14:45 CET)

Chair: Dr. Ayodeji Coker, Science Director from USA Office of Naval Research Global

13:00 Charlotte Karlsson, Vice President RISE, Welcome speech
13:10 Prof. Deepa Venkitesh, Indian Institute of Technology Madras. Title of talk: IEEE Photonic Society Women in Photonic Initiative
13:30 Prof. Andrews Nirmala Grace, Centre for Nanotechnology Research, Vellore Institute of Technology, India. Title of the talk: Vanadium nitride nanostructures as efficient Pt-free counter electrodes for dye sensitized solar cells
14:00 Dr. Linda Hoglund, IRnova AB. Title of the talk: T2SL and QWIP infrared detectors for gas sensing applications
14:30 Prof. Irina Bouianova Linkoping University, Sweden. Title of the talk: III-V nanowires from highly-mismatched alloys

Evening session (16:30 to 18:00 CET)

Chair: Dr. Ayodeji Coker, Science Director from USA Office of Naval Research Global

18:00 Dr. Linda Mondin, European Space Agency (ESA). Title of the talk: Laser Interferometer Space antenna
18:30 Prof. Qin Wang RISE/KTH. Title of the talk: GaN based HEMTs for power and RF applications
19:00 Dr. Ani Khachatrian, USA Naval research Lab (NRL). Title of the talk: Single Event Effects in wide bandgap semiconductors
19:30 Dr. Shouleh Nikzad, NASA Jet Propulsion Laboratory (JPL). Title of the talk: Nanoscale Engineered Silicon Imagers Reaching Theoretical Limit Performance and their Application in Space Exploration and Synergistic Fields

Information

Time: Monday, May 10th, 13:00-14:45 CET and 16:30 to 18:00 CET
Place: Online
Organizer: Prof. Qin Wang, RISE/KTH and IEEE Photonics Sweden Chapter
Sponsors: The symposium is sponsored by IEEE photonics Society and RISE/KTH

Program schedule 9th -13th May (time in CET)

	Sunday 9 May		Monday 10 May	
08:00			**MoA1 8:00-10:00**	**MoA2 8:00-10:00**
08:15				
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10:00			**Paus**	
10:15			**MoB1 10:15-12:00**	**MoB2 10:15-12:00**
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12:00			**Lunch break**	
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13:00			**MoC1 13:00-14:45**	**MoC2 13:00-14:45**
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13:45				Women in STEM
14:00				
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14:45			**Paus**	
15:00	**15:00 Conference opening**		**15:00 Plenary presentation:**	
15:15	**15:15 Plenary presentation:**		*Ursula Keller*	
15:30	*Susumo Noda*		Semiconductor disk lasers and SESAMs: material and design optimization	
15:45	Progress in Photonic Crystals — From Fundamental to State of the Arts for Society 5.0			
16:00			**16:00 ISCS & IPRM Award cermony**	
16:15	**Paus**			
16:30	**SuD1 16:30-18:15**	**SuD2 16:30-18:15**		**MoD2 16:30-18:00**
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	Tuesday 11 May		Wednesday 12 May	
08:00	**TuA1 8:00-10:15**	**TuA2 8:00-10:15**	**MoA1**	**MoA2**
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10:15	**Paus**		**Paus**	
10:30	**10:30 Plenary presentation:**		**Exhibition / Poster 10:30-12:00**	
10:45	*Masataka Higashiwaki*			
11:00	Gallium Oxide: The Star of Hope for Compound Semiconductors?			
11:15				
11:30	**11:30-12:00 Exhibitior's pitches**			
11:45				
12:00	**Lunch break**		**Lunch break**	
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13:00	**MoC1 13:00-14:45**	**MoC2 13:00-14:45**	**MoC1 13:00-14:45**	**MoC2 13:00-14:45**
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13:30	Oxide semiconducors, devices and applicatons I			
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14:45			**Paus**	
15:00	**Paus**		**15:00 Plenary presentation:**	
15:15	**MoD1 15:15-17:45**	**MoD2 15:15-17:45**	*Fredrico Capasso*	
15:30			Metasurfaces as heterogeneous nanostructured materials for multifunctional flat optics: from components to cameras	
15:45				
16:00	Oxide semiconductors, devices and applicatons II		**16:00-16:30 Exhibitior's pitches**	
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16:30				**MoD2 16:30-18:00**
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17:45	**Paus**			
18:00	**Exhibition / Poster 18:00-20:00**		**Paus**	
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	Thursaday 13 May		China	Japan	US East	US West
08:00	**MoA1 8:00-10:00**	**MoA2 8:00-10:00**	14:00	15:00	02:00	23:00
08:15			14:15	15:15	02:15	23:15
08:30			14:30	15:30	02:30	23:30
08:45			14:45	15:45	02:45	23:45
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09:15			15:15	16:15	03:15	00:15
09:30			15:30	16:30	03:30	00:30
09:45			15:45	16:45	03:45	00:45
10:00	**Paus**		16:00	17:00	04:00	01:00
10:15	**MoB1 10:15-12:00**	**MoB2 10:15-12:00**	16:15	17:15	04:15	01:15
10:30			16:30	17:30	04:30	01:30
10:45			16:45	17:45	04:45	01:45
11:00			17:00	18:00	05:00	02:00
11:15			17:15	18:15	05:15	02:15
11:30			17:30	18:30	05:30	02:30
11:45			17:45	18:45	05:45	02:45
12:00	**Lunch break**		18:00	19:00	06:00	03:00
12:15			18:15	19:15	06:15	03:15
12:30			18:30	19:30	06:30	03:30
12:45			18:45	19:45	06:45	03:45
13:00	**MoC1 13:00-14:45**	**MoC2 13:00-14:45**	19:00	20:00	07:00	04:00
13:15			19:15	20:15	07:15	04:15
13:30			19:30	20:30	07:30	04:30
13:45			19:45	20:45	07:45	04:45
14:00			20:00	21:00	08:00	05:00
14:15			20:15	21:15	08:15	05:15
14:30			20:30	21:30	08:30	05:30
14:45	**Paus**		20:45	21:45	08:45	05:45
15:00	**15:00 Plenary presentation:**		21:00	22:00	09:00	06:00
15:15	*John Bowers*		21:15	22:15	09:15	06:15
15:30	Epitaxial Growth of Quantum Dot Lasers on		21:30	22:30	09:30	06:30
15:45	Silicon for Photonic Integrated Circuits		21:45	22:45	09:45	06:45
16:00	**16:00 Student award cermony**		22:00	23:00	10:00	07:00
16:15			22:15	23:15	10:15	07:15
16:30			22:30	23:30	10:30	07:30
16:45			22:45	23:45	10:45	07:45
17:00			23:00	00:00	11:00	08:00
17:15			23:15	00:15	11:15	08:15
17:30			23:30	00:30	11:30	08:30
17:45			23:45	00:45	11:45	08:45
18:00			00:00	01:00	12:00	09:00
18:15			00:15	01:15	12:15	09:15
18:30			00:30	01:30	12:30	09:30
18:45			00:45	01:45	12:45	09:45
19:00			01:00	02:00	13:00	10:00
19:15			01:15	02:15	13:15	10:15
19:30			01:30	02:30	13:30	10:30
19:45			01:45	02:45	13:45	10:45
20:00			02:00	03:00	14:00	11:00

Compound Semiconductor Week 2021

Awards

Award nomination deadline: **March 26, 2021**

Award nomination form

To be announced on May 10, 2021

The International Symposium on Compound Semiconductors

The Welker Award was initiated in 1976; the recipients will be selected by the International Symposium on Compound Semiconductors Award Committee for outstanding research in the area of III-V compound semiconductors. The Award is established by Siemens AG, Munich, in honor of the foremost pioneer, Heinrich Welker, in III-V compound semiconductor development. This award is currently sponsored by OSRAM GmbH.
The Quantum Devices Award was established in 2000 by Fujitsu Quantum Devices, Ltd; the recipients will be selected by the International Symposium on Compound Semiconductors Award Committee for pioneering contributions to the fields of compound semiconductor devices and quantum nanostructure devices, which have made a major scientific or technological impact in the past 20 years. The fields of the Award covers: invention of new device concepts and structures, device physics and modeling, device realization and characterization. This award is currently sponsored by the ISCS Japanese Committee.
The Young Scientist Award was initiated in 1986; the recipients will be selected by the International Symposium on Compound Semiconductors Award Committee for technical achievements in the field of compound semiconductors by a scientist under the age of forty. Nominees should be younger than 40 years of age on the first day of the symposium.

The International Conference on Indium Phosphide and Related Materials

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The Michael Lunn Award was established in 1993 to commemorate a young research scientist at Wafer Technology Ltd. who became a victim of a car accident. Awardees were chosen by the organizing committee of IPRM on behalf of the III-Vs Review magazine. The award was given for the best paper presented at IPRM in the first three years following its introduction (1993-1995). The criteria were subsequently revised in 1996 to recognize individuals who have made "outstanding contributions to the InP community". In 2007, the award was renamed **the IPRM Award** and has since been sponsored by the IPRM international steering committee.

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