Scientific and Technical Directorate(STD)

Jay Hendricks, Scientific Director Katsuyuki Fukutani, Scientific Secretary

> ECM-138 In-person/Hybrid in Japan September 14th 2022





Scientific Director's Forward View

The Scientific and Technical Directorate (STD) coordinates the Scientific and Technical activities of the Nine IUVSTA Divisions

- **Communication:** "Serve as an international communication 'hub' that connects vacuum science and technology scientists around the world".
- Education: Work with Division Chairs to develop Workshops, Schools, Short Courses, and Technical Training
- IVC Scientific: Work with IUVSTA Division Chairs to Develop IVC-22 Program and abstract calls through the international program committee.
- **Society Impact:** Find Applications where our science has positive impact for society.
 - Support for science in less developed countries .
- Develop Focus Topics:
 - <u>Technologies for Sustainability</u> (clean water, air,
 - **Quantum Science** (AVS Quantum Science journal, Quantum Based Units, Quantum Computing/deep learning).
 - **Photonics and Nano photonics (**multiple technologies, including bio applications)
 - Role of Sensors and Sensor Science (AI, Self-driving cars)
 - Next Gen. Energy (Fusion, Solar, new materials and process enabling technologies, batteries)
 - FIGURE OUT HOW TO FUNCTION IN A PANDEMIC!!!

IUVSTA Division	<u>Chair</u>	Vice Chair	Secretary
ASSD - Applied Surface Science	Leszek Markowski	John T. Grant	
BID - Biointerfaces Division	Dmitri Petrovykh	Miguel Manso	Carlos R. Grandini
EMPD - Electronics Materials & Proc.	Ivana Capan	Monika Kwoka	Reinhard Schwarz
NSD - Nanometer Structures	Ana Gomes Silva	Shuji Hasegawa	Carla Bittencourt
PSTD - Plasma Science & Tech.	Satoshi Hamaguchi	Miran Mozetič	Deborah O'Connell
SED - Surface Engineering	Ivan G. Petrov	Peter Schaaf	Monika Jenko
SSD - Surface Science	María Carmen ASENSIO	Mario Rocca	Fumio Komori
TFD - Thin Film	Mile Ivanda	Papken Hovsepian	Diederik Depla
VSTD - Vac. Science & Tech.	Marcelo J. Ferreira	Martin Wüest	Joe Herbert



2023-2025 IUVSTA Scientific and Technical Division Officers

WELCOME to new and re-elected Division Chairs and Officers, Congratulations!

IUVSTA Division	<u>Chair</u>	Vice Chair	Secretary
ASSD - Applied Surface Science	John T. Grant	Mikołaj Lewandowski	Alenka Vesel
BID - Biointerfaces Division	Miguel Manso	Pedro Alpuim	Bohuslav Rezek
EMPD - Electronics Materials & Proc.	Monika Kwoka	Daniel Granados	Tom SHIMADA
NSD - Nanometer Structures	Carla Bittencourt	Yukio Hasegawa	Wojciech Koczorowsk
PSTD - Plasma Science & Tech.	Miran Mozetič	Deborah O'Connell	Satoshi Hamaguchi
SED - Surface Engineering	Christopher Muratore	Peter Schaaf	Monika Jenko
SSD - Surface Science	María Carmen ASENSIO	Mario Rocca	Fumio Komori
TFD - Thin Film	Andrea Ingenito	Francisco Yubero	Diederik Depla
VSTD - Vac. Science & Tech.	Martin Wüest	Oleg Malyshev	Marcelo J. Ferreira



2020-22 Triennium Saw Many New Challenges & Firsts!

The triennium started off with the Scientific Director working with the Education Committee to develop a table that clarified the differences between Workshops (WS), Schools (SCH), Technical Training Courses (TTC) and Short Courses (SC). As was voted at GM20, the 2019-2022 triennium budget was increased for STD, so more activities can be supported, and additionally, the **funding maximum was increased from 6,000 Euro to 9,000 Euro** for Workshops and Schools. At ECM 132 the PSD was officially changed to PSTD "Plasma Science and Technology Division'. And then the Pandemic hit, this impacted ECM 132 with the first ever all virtual ECM. This did not slow IUVSTA down, there were 10 proposals submitted at the ECM (5 workshops, 1 school, 3 technical training courses and 1 short course). There was much discussion of the pros and cons for virtual events. It was encouraged that new proposals be put forward for virtual events. ECM133 saw the first ever all virtual events being proposed. The 96th IUVSTA workshop on "HiPIMS Today-Recent Development of High-Power Impulse Magnetron Sputter" was the first virtual IUVSTA workshop. This was followed by the 24th IUVSTA Virtual Technical Training Course, which was approved, and was successfully deployed as the first virtual TTC by the relatively new IUVSTA member, the vacuum society of the Philippines (VSP). ECM-134, also a virtual event, saw the first virtual school "IUVSTA Virtual School on Physics" at Nanoscale" approved. ECM 135 was the first hybrid ECM, taking place in-person and as a virtual event along with the first hybrid IUVSTA Short Course "Gas flows under vacuum conditions" in Marseille, France. ECM 136 was back to a virtual only event, yet still successful with 2 short courses, and 3 technical training courses approved. ECM 137 was also a virtual event, with 2 workshops, 1 school, and 1 technical training course approved.

7 IUVSTA Workshops funded

92nd IUVSTA Workshop

"Workshop on Advanced Spectroscopy and Transport for 2D Materials at Surfaces" Location: Okinawa, Japan Date: 18-21 September, 2022 Web: <u>https://hasegawa.issp.u-tokyo.ac.jp/workshop</u>

93rd IUVSTA Workshop

"Advances in the characterization of surface engineering structures, coatings, and thin films" Location: Castle Seggau, Austria Date: October 15-19, 2023

94th IUVSTA Workshop

"Reliable sensing and control of reactive plasmas" Location: Cerklje na Gorenjskem, Slovenia Date: 29th May to 2nd June, 2022 Web: <u>https://www.plasmadis.com/wp/94th-iuvsta-workshop/</u>

95th IUVSTA Workshop
"Plasmonic Thin Films: Theory, Synthesis and Applications"
Location: Guimarães, Portugal
Date: 20-23 June, 2022
Web: https://www.lab4nano.com/home/index.php/95th-iuvsta-workshop

96th IUVSTA Workshop Virtual Event

"HiPIMS Today-Recent Development of High-Power-Impulse Magnetron Sputtering" Location: Sweden (on-line) Date: 20-22 January, 2021

97th IUVSTA Workshop IUVSTA Workshop on Plasma-assisted conversion of gases for a sustainable future

98th IUVSTA Workshop "Functional nanostructured surface"



2 Schools Funded

"Physics at Nanoscale"
Location: Skalský Dvůr, Czech Republic (Hybrid)
Date: May 31-June 4, 2021
Web: https://www.iybssd2022.org/en/physics-at-nanoscale/

8 Technical Training Funded

TTC 21 "Vacuum technology, principles and applications" Location: Štrbské Pleso, Hotel Trigan Date: 13-16 October 2020 Web: http://svs.stuba.sk/svt22/ttc.html

TTC 22 "IUVSTA TTC on Vacuum Technology Applications" Location: Islamabad Hotel, Islamabad, Pakistan Date: April 14-16, 2020

TTC 23 "Introduction to Vacuum Science, Technology, and Applications: from Nano science to outer space" Location: Universidad Nacional de San Martin, Argentina Date: cancelled

TTC 24 "Plasma and Society" Virtual Location: Quezon City, Philippines (online) Date: 15-16 April 2021

TTC 25 "Vacuum, Plasma, Surfaces, and Thin Films" Location: Sorocaba, SP, Brazil Date: 08-9 August 2022

19th IUVSTA School "Surface Science Toolbox 2023"

Location: Poland Date: 1 week in Mid 2023

> **TTC 26** "Fundamentals of Vacuum Technique and Technologies" Location: Ljubljana, Slovenia Date: 25,26 May 2022

TTC 27 "Science and Technology of Vacuum" Location: Spain Date: Spring. 2023

TTC 28 "Plasma and Society II" Virtual Location: Philippines Date: 26-27 January 2023 *Vacuum Society of the Philippines*



Short Courses 4 short courses funded

IUVSTA Short Course "Low Energy and PhotoEmission Electron Microscopy" Location: Spain Date: 26 September 2022

IUVSTA Short Course "Gas flows under vacuum conditions: from theory to applications " Location: Marseille, France (Hybrid) Date: 22-25 November 2021 (included in EVC 16)

IUVSTA Short Course "8 courses associated with IVC-22" Location: Sapporo Convention Center, Hokkaido, Japan (Hybrid) Date: 10, 11, 16, Sep. 2022 Web: https://ivc22.org/index.html

IUVSTA Short Course "Secondary Ion Mass Spectrometry Short Course" Location: Hyatt Regency, Minneapolis MN, USA Date: 18-23, Sep. 2022



21 events were approved from ECM 132-137

- 5 workshops funded for a total of €45,000
- 2 Schools **€13,000**
- 8 technical training Courses funded for a total of €16,530
- 4 short courses totaling €7,000

In all, for a total of €81,730

A Statement for IUVSTA President-Elect

Jay H. Hendricks

VISION for the Future



Strategic goal #1 Become an even more inclusive, diverse, equitable and accessible union.

First of all, this is hard. But it is worth the effort. We together will stand up and challenge ourselves to seek out, support, and bring forward candidates that look the humankind of the world and promote them into organizational and leadership roles in conference program committees, we ask these questions in every committee and division, we promote early career and young researchers wherever possible, and LISTEN AND LEARN FROM THEM. The example discussed yesterday of prompting each division to develop early career members is spot on (thank you lvan!). I make this strategic goal my #1 priority because I believe it is our #1 way to succeed into the future. Examples: New blood can teach us better ways to communicate and guide us to relevant real-world challenges. Creative solutions to this problem could (for example) figuring out to kick-start and micro-fund science education learning, research and technology in regions of the world not yet reached by IUVSTA.

Strategic goal #2 "Tell a better story" One that connects the science we do to the good that it does for society.

The challenges for Society have never been greater, we have an expanding populations, and ever increasingly sick planet due to climate change, and shrinking resources. I believe that the science we do can/does/will have tremendous impacts on direct solutions to these problems. We need to figure out to better tell our story. How does IUVSTA science show up in your home, your car, your healthcare, your food supply and your home? I am making this my #2 goal, in part because I already see important steps by both Anouk and Francois to tackle this. But sustained effort will be needed. Key areas are sustainability to reduce carbon footprint, technologies that underlie ENERGY (Energy, Energy, Energy!) Example clean energy saves us from climate change impact, Cheap and affordable energy will solve social inequities and prevents war over limited resources, and powers the future of clean water, air, and food production. I actually think that with a bit of work, this can be done! It will be fun and help us (as researchers) get the funding we need to do our science!

Strategic goal #3

Add value to our member societies and expand our influence, impact, and global reach.

We are here to support, connect, and focus the energy of our member societies around the world. We continue to improve our website; we experiment with better ways to reach untapped parts of the world. Asking our member societies what we can do for them is a great way to start this conversation. How can we learn from the pandemic and focus some of the newly attained technology skills to expand our global reach? What platforms can we add to aid in this? While the in-person meeting will be our core platform, we need to develop creative ways of micro-funding (where appropriate) for new innovations that will allow us to experiment and grow in this new space.

New ways to look a AVS nomination, CV and Statement of intent



Science and Technology of Materials, Interfaces, and Processing





Dr. Jay H. Hendricks National Institute of Standards and Technology 100 Bureau Drive, Stop 8363 Gaithersburg, MD 20899-8363 (301) 975-4356 jay hendricks@nist.gov

A world-class expert in low pressure and vacuum metrology, Dr. Hendricks is the Deputy Program Manager for NIST on a Chip program and is the former leader of the NIST Thermodynamic Metrology Group, Jay received his MA. and PhD. in Physical Chemistry from Johns Hopkins Duiversity, and his B.S. in Chemistry from Penn State University. In 1996, he started his career at NIST as a post-doctoral fellow conducting research on a novel low-temperature CVD that resulted in a US patent. He is currently the Scientific Director for IUVSTA.

statement for IUVSTA President-Elect





Why it matters.... How science has a positive impact on society



IYBSSD2022 International Year of Basic Sciences for Sustainable Development

THE 2240 ATTERNATIONAL VACUUM CONGRESS UV C-220 DATE 9.11± -16± 2022 9.11± -16± Date Centralin Centry Engine June

Personal story in looking to a more sustainable future Go 10 miles on 25 cents electricity!





Vacuum Science in your Car?



ASSD, BI, EMPED, NSD, PSTD, SED, SSD, TFD, VSTD is all represented



For crash/automatic breaking and pedestrian warning

Vacuum Science in your home? Future solar panel install site?





Shingles impregnated with copper nanoparticles Resist algae growth and will last 50 years. (Bio Interfaces, NSD, VTD)

Double pane windows with IR coatings reduce Both heat gain in summer, and heat loss in winter. (TFD, PSTD, VTD...)

High efficiency heat pump is up to 5X more efficient than electric resistance heating. (TFD, PSTD, VTD, NSD, EMPD,SSD,SED,ASSD...)

Hybrid Electric Hot water heater 28 cents a day heats hot water for a family of 5 (saved > \$300 in electricity last year) Uses environmentally friendly freon, sophisticated electronics, wifi, high efficiency electric motors and fans. (TFD, PSTD, VTD, NSD, EMPD,SSD,SED,ASSD...)





4 months later producing power, currently up 20 kWH produced over consumed since the system was commissioned on June 12th

Thanks!

This concludes the STD Triennium Report. Thank you to the President, Scientific Secretary, The Education Committee, and to the Division Chairs and Officers for their work over the past triennium, it has been a pleasure serving as your Scientific Director!

Jay Hendricks

September 14th, 2022 Sapporo Japan

Jay Hendricks Scientific Director, 2019-2022



National Institute of Standards and Technology 100 Bureau Drive Gaithersburg, MD 20899



4. Continued...Status of existing Proposals TTC/SC, Scientific Director (3min)

Title	Place/ Country	Status/Date	Organizer (underwriter	IUVSTA Committee	Primary Contact	Title	(€)
TTC 21	Štrbské Pleso, Hotel Trigan	Spring 2023 as in person meeting	Slovak Vacuum Society	(EC)	Andy Vincze	"Vacuum technology, principles and applications"	2,500
TTC 27	Spring 2023	Spanish Vacuum Society	(EC)		Miguel Manso	Science and Technology of Vacuum	1,100
SC	Córdoba, Spain	In person Sep. 26, 2022 in-person https://leempeem1 2.secv.es/	Vacuum Society- Spain	(EC)	miguel.manso @uam.es	"Low Energy and PhotoEmission Electron Microscopy"	1,000
SC	Sapporo Convention Center, Hokkaido, Japan	10, 11, 16, Sep. 2022	Japan Society of Vacuum and Surface Science	(EC)	Yasunori Tanimoto	8 Courses	2,000
SC	Hyatt Regency, Minneapolis MN, USA	18-23, Sep. 2022	AVS	(EC)	John Grant	SIMS (Secondary Ion Mass Spectrometry) Short Course	2,250

Maximum allowed funding (Euro): WS/Sch = 9,000, TCC= 2,500, SC=2,000



5. WS/SC/TTCs Approved AT ECM 137

proposals presented HERE... Katsuyuki to project

PDF file name	Place/ Country	Status/Date	Organizer (underwriter)	IUVSTA Committ ee	Primary Contact	Presenting	Title	(€)
97 th IUVSTA Workshop	Slovenia	3-7 December 2023	Slovenian Vacuum Society	PSTD	Miran Mozetič	<mark>Miran Mozetič</mark>	IUVSTA Workshop on Plasma-assisted conversion of gases for a sustainable future	9,000
98 th IUVSTA Workshop	Belgium	11-14 July 2023	University of Mons	NSD	Carla Bittencourt	<mark>Carla Bittencourt</mark>	"Functional nanostructured surface"	6,000
19 th IUVSTA School	Poland	1 week in Mid 2023	Adam Mickiewicz University	ASSD	Mikołaj Lewandowski	<mark>Mikołaj</mark> Lewandowski	"Surface Science Toolbox 2023"	9,000
28 th IUVSTA TTC	Philippines	26-27 January 2023	Vacuum Society of the Philippines	PSTD	Kathrina Lois M. Taaca	<mark>Kathrina Lois M.</mark> <mark>Taaca</mark>	"Plasma and Society II"	2,000

Maximum allowed funding (Euro): WS/Sch = 9,000, TCC= 2,500, SC=2,000

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