



ICQNM 2023

The Seventeenth International Conference on Quantum, Nano/Bio, and Micro
Technologies

ISBN: 978-1-68558-095-7

September 25 - 29, 2023

Porto, Portugal

ICQNM 2023 Editors

Petre Dini, IARA, USA/EU

ICQNM 2023

Forward

The Seventeenth International Conference on Quantum, Nano/Bio, and Micro Technologies (ICQNM 2023), held on September 25-29, 2023, continued a series of events covering research in the field of software system integration.

Quantum technologies and nano technologies have a great potential to transform communications telecommunications infrastructure and communication protocols, and computers and networking devices. Nanotechnologies and micro-technologies already made their mark on smart materials, nano-medicine, nano-devices, molecular manufacturing, biotechnology, metrology, airspace.

The advancements in material science and computer science have allowed the building, launching and deploying of space exploration systems that continually do more and more as they become smaller and lighter. As an example, carbon nano-tubes have been created that are 250 times stronger than steel, 10 times lighter, and transparent. Similar advances are occurring in glass, plastics and concrete. Spacecraft are being launched, with hulls that are composed of carbon fibers, a light weight high strength material.

Swarms is another concept of nano-robotics; swarms act in unison like bees. They theoretically will act as a flexible cloth like material, as strong as diamond. Interplanetary exploration can be foreseen as being carried on by nano-robots as well.

Electronic devices, medicine, environment, metrology, aerospace programs, clothes and materials, telecommunications, cryptography, semiconductors, manufacturing, and other domains are impacted by the progress on the areas mentioned above. Particularly, micro imaging, nano-medicine: (drug delivery; nano-particles i.e. viruses; proteins.), bio-nanostructures: (nano-tubes, nano-particles), microsystems, micro fluidics: (including nano-fluidics, modeling; fabrication and application), micro instrumentation / implantable microdevices (miniaturized bio-electronic systems etc.) and micro sensors benefits from the progress on quantum, nano and micro technologies.

We take here the opportunity to warmly thank all the members of the ICQNM 2023 technical program committee, as well as all the reviewers. The creation of such a high quality conference program would not have been possible without their involvement. We also kindly thank all the authors who dedicated much of their time and effort to contribute to ICQNM 2023.

We also thank the members of the ICQNM 2023 organizing committee for their help in handling the logistics and for their work that made this professional meeting a success.

We hope that ICQNM 2023 was a successful international forum for the exchange of ideas and results between academia and industry and to promote further progress in the area of quantum, nano/bio, and micro technologies. We also hope that Porto provided a pleasant environment during the conference and everyone saved some time to enjoy the historic charm of the city.

ICQNM 2023 Chairs

ICQNM 2023 Steering Committee

Alexander Zhanov, Gwangju Institute of Science and Technology (GIST), South Korea

Kyle Sundqvist, San Diego State University, USA

ICQNM 2023 Publicity Chairs

Lorena Parra Boronat, Universitat Politecnica de Valencia, Spain

Laura Garcia, Universitat Politecnica de Valencia, Spain

ICQNM 2023

Committee

ICQNM 2023 Steering Committee

Alexander Zhanov, Gwangju Institute of Science and Technology (GIST), South Korea
Kyle Sundqvist, San Diego State University, USA

ICQNM 2023 Publicity Chair

Lorena Parra Boronat, Universitat Politecnica de Valencia, Spain
Laura Garcia, Universitat Politecnica de Valencia, Spain

ICQNM 2023 Technical Program Committee

Osman Adiguzel, Firat University, Turkey
Michele Calabretta, STMicroelectronics, Catania, Italy
Stefania Carapezzi, CNRS, Montpellier, France
Sang H. Choi, NASA Langley Research Center, USA
Thierry Ferrus, Hitachi Cambridge Laboratory, UK
Liangxing Hu, Nanyang Technological University, Singapore
YoungPak Lee, Hanyang University, Seoul, Korea / Fuda University, Shanghai, China
Maximilian Lübke, Friedrich-Alexander University Erlangen-Nürnberg, Germany
Stefano Mancini, School of Science and Technology - University of Camerino, Italy
Johann M. Marquez-Barja, University of Antwerp - imec, Belgium
Angelo Messina, STMicroelectronics, Catania, Italy
Md. Golam Sarwar Murshed, Clarkson University, USA
Telhat Ozdogan, Amasya University, Turkey
Parvinder Singh, Deenbandhu Chhotu Ram University of Science & Technology, Murthal, Sonapat, India
Maciej Sitarz, AGH University of Science and Technology, Poland
Marco Antonio Sotelo Monge, Universidad de Murcia, Spain
Sandro Sozzo, University of Leicester, UK
Ivo Stachiv, Harbin Institute of Technology, Shenzhen China & Institute of Physics - Czech Academy of Sciences, Prague, Czech Republic
Kyle Sundqvist, San Diego State University, USA
Daniel Tomaszewski, Łukasiewicz Research Network - Institute of Electron Technology, Warsaw, Poland
Vincenzo Vinciguerra, STMicroelectronics srl, Italy
Maciej Wiatr, GlobalFoundries, Dresden, Germany
Zhipei Yan, Bytedance Inc., USA
Katerina Zaharieva, Institute of Catalysis | Bulgarian Academy of Sciences, Bulgaria
Alexander Zhanov, Gwangju Institute of Science and Technology (GIST), South Korea

Copyright Information

For your reference, this is the text governing the copyright release for material published by IARIA.

The copyright release is a transfer of publication rights, which allows IARIA and its partners to drive the dissemination of the published material. This allows IARIA to give articles increased visibility via distribution, inclusion in libraries, and arrangements for submission to indexes.

I, the undersigned, declare that the article is original, and that I represent the authors of this article in the copyright release matters. If this work has been done as work-for-hire, I have obtained all necessary clearances to execute a copyright release. I hereby irrevocably transfer exclusive copyright for this material to IARIA. I give IARIA permission to reproduce the work in any media format such as, but not limited to, print, digital, or electronic. I give IARIA permission to distribute the materials without restriction to any institutions or individuals. I give IARIA permission to submit the work for inclusion in article repositories as IARIA sees fit.

I, the undersigned, declare that to the best of my knowledge, the article does not contain libelous or otherwise unlawful contents or invading the right of privacy or infringing on a proprietary right.

Following the copyright release, any circulated version of the article must bear the copyright notice and any header and footer information that IARIA applies to the published article.

IARIA grants royalty-free permission to the authors to disseminate the work, under the above provisions, for any academic, commercial, or industrial use. IARIA grants royalty-free permission to any individuals or institutions to make the article available electronically, online, or in print.

IARIA acknowledges that rights to any algorithm, process, procedure, apparatus, or articles of manufacture remain with the authors and their employers.

I, the undersigned, understand that IARIA will not be liable, in contract, tort (including, without limitation, negligence), pre-contract or other representations (other than fraudulent misrepresentations) or otherwise in connection with the publication of my work.

Exception to the above is made for work-for-hire performed while employed by the government. In that case, copyright to the material remains with the said government. The rightful owners (authors and government entity) grant unlimited and unrestricted permission to IARIA, IARIA's contractors, and IARIA's partners to further distribute the work.

Table of Contents