



Quantum Effects and Measurement Techniques in Biology and Biophotonics (BO605)

Conference Chairs: **Clarice Aiello**, Univ. of California, Los Angeles (United States); **Sergey V. Polyakov**, National Institute of Standards and Technology (United States); **G. Sitta Sittampalam**, National Ctr. for Advancing Translational Sciences (United States)

Because light is quantum, photonics plays a key role in accessing quantum properties in artificial and natural systems. Moreover, biology and medicine have historically relied on optics and photonics for a range of applications from diagnostics to drug discovery. Photonic quantum effects may also be responsible for life as we know it; for instance, the biosensing of electromagnetic fields may rely on nonclassical phenomena, such as electron spin superpositions. The objective of this conference is to cover progress in (1) the use of quantum tools for sensing biological activity and (2) our understanding of quantum effects in biology and biomedical science. As such, this conference will bring together researchers in photonics, biology, chemistry, biomedicine and physics who are interested in identifying and harnessing quantum effects in the “warm, wet, and noisy” context of biological applications.

The field of “quantum biology” has emerged through theoretical and experimental progress over the past few decades with the development of quantum tools (from complex spectroscopies to quantum sensors) as one of the main enabling factors.

The conference will cover, among other modalities of “quantum for biology”, the study of quantum sensors – devices that take advantage of nonclassical phenomena to deliver new measurement capabilities beyond what is achievable classically. Those sensors are being developed specifically for biological and biomedical uses. Many of these sensors are either optics-based or have an optical readout. In addition to unprecedented sensitivity, some sensors can preserve the quantum character of the underlying process.

At the same time, quantum effects have been shown to play a defining role in biological processes and functions (“quantum in biology”). Particularly, photosynthesis, spin-dependent chemical reactions, and enzymatic activity in living organisms are often associated with quantum effects. The area of quantum-related biology and medicine is new, rapidly growing, and exciting, attracting a broad interest from both theoretical and experimental communities, and with unparalleled commercialization potential.

List of topics:

- Use of quantum light including entanglement, to enhance signal-to-noise and avoid phototoxicity
- Single-Photonics and Photon-number-resolving measurement and imaging methods
- Quantum imaging and super-resolution in biology
- Color-center based quantum sensors
- Quantum materials-based quantum sensors
- Atomic magnetometers for biomedical use
- Quantum effects in charge and energy transfer
- Coherent interactions in biomolecules, such as chromophore-protein and protein-protein interactions
- Quantum enzymology
- Magnetic and spin-related effects (spin-dependent chemical reaction, chiral-induced spin selectivity)
- Quantum properties of chromophores
- Theory of quantum effects in biology and biophotonics
- Computational methods to study quantum effects in biology and biophotonics.

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Follow the instructions below to develop a successful abstract for submission to a conference and review policies for publication in the Proceedings of SPIE in the SPIE Digital Library. Submissions subject to chair approval.

Important dates

Abstracts due	19 July 2023
Registration opens	October 2023
Authors notified and program posts online	9 October 2023
Submission system opens for manuscripts and poster PDFs*	27 November 2023
Poster PDFs due for spie.org preview and publication	3 January 2024
Manuscripts due	10 January 2024
Advance upload deadline for oral presentation slides**	25 January 2024

*Contact author or speaker must register prior to uploading

**After this date slides must be uploaded onsite at Speaker Check-in

What you will need to submit

- Presentation title
- Author(s) information
- Speaker biography
- 250-word abstract for technical review
- 100-word summary of abstract for display in the program
- Keywords used in search for your paper (optional)
- Check the individual conference call for papers for additional requirements (for example, some conferences require 2- to 3-page extended summary for technical review, or have instructions for award competitions)

Note: Only original material should be submitted. Commercial papers, papers with no new research/development content, and papers with proprietary restrictions will not be accepted for presentation.

How to submit your abstract

- Visit the conference page: www.spie.org/BO605call
- You may submit more than one abstract, but submit each abstract only once
- Submit by clicking the "Submit an Abstract" button on the conference page
- Sign in to your SPIE account, or create an account if you do not already have one
- Follow the steps in the submission wizard until the submission process is completed
- If your submission is related to an application track below, indicate the appropriate track when prompted during the submission process

Application track

Listed below are the application tracks available for this meeting. Application tracks aggregate presentations and focus on emerging technical and societal needs that require a multidisciplinary approach.

- **AI/ML:** Papers that highlight the use of artificial intelligence, machine learning, and deep learning to create and implement intelligent systems across multiple sectors, technologies, and applications
- **Sustainability:** Papers that highlight the use of optics and photonics for renewable energy, natural resource management, sustainable manufacturing, and greenhouse gas mitigation in support of the UN Sustainable Development Goals
- **Brain function:** Papers that highlight the development of innovative optics and photonics technologies that increase our understanding of brain physiology and function
- **Translational research:** Papers that highlight the transition from bench to bedside using the latest photonics technologies, tools, and techniques for healthcare
- **3D printing:** Papers that highlight the innovative use of optics and photonics in multidisciplinary applications for multidimensional manufacturing

Submission agreement

All presenting authors, including keynote, invited, oral, and poster presenters, agree to the following conditions by submitting an abstract:

- Register and pay the author registration fee.
- Oral presenters: recording and publication of your onsite presentation (slides synched with voice) for publication in the Proceedings of SPIE in the SPIE Digital Library
- Poster presenters: submit a poster PDF by the advertised due dates for publication in the Proceedings of SPIE in the SPIE Digital Library; poster PDFs may also be published and viewable in the spie.org program during and immediately after the event. Each poster must have a unique presenter; one person may not present more than one poster per session
- Email messaging for the conference series
- Submit a manuscript by the advertised due date for publication in the Proceedings of SPIE in the SPIE Digital Library
- Obtain funding for registration fees, travel, and accommodations
- Attend the meeting
- Present at the scheduled time

Review and program placement

- To ensure a high-quality conference, all submissions will be assessed by the conference chair/editor for technical merit and suitability of content
- Conference chairs/editors reserve the right to reject for presentation any paper that does not meet content or presentation expectations
- Final placement in an oral or poster session is subject to chair discretion

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