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BioPhoton: light at the interface of life

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Modern medicine has largely been built by looking at life with light. The next chapter will be written by acting on it. Yet the knowledge required to act - the physics of how photons deposit energy at the nanoscale, the chemistry of how materials convert that energy into charge, heat, or a chemical signal, the biology of how cells interpret it - lives in journals that rarely cite one another, each with its own vocabulary and its own standard of proof. *BioPhoton* is founded to close that gap. It is conceived as a flagship venue for the interaction between optoelectronic functional materials and living systems, organized around a single continuous chain - theory, technology, innovation, application - running from molecular design to clinical translation. Our ambition is to establish a new academic paradigm and a translational standard for this field, in which a mechanism, a material, a device, and a therapy are recognized as four expressions of one problem rather than four separate specialisms.

The scientific spine of the journal is the Light-Matter-Life interaction. Photons carry energy and information; materials convert one into the other; living systems respond, adapt, and remember. The questions we care most about concern energy transfer, information exchange, and physiological regulation across the interface between optoelectronic materials and biological systems - and the cross-scale, multidisciplinary theories, methods, and technologies needed to describe and control them. We welcome work that treats this interface not as a boundary to be crossed but as a system to be understood: from the quantum and molecular scale of absorption and charge transfer, through the cellular and tissue scale of stimulation and recording, to the organismal and clinical scale of diagnosis, therapy, and regulation.

Two forces are now reshaping the field. The first is computation. Artificial intelligence (AI) is compressing the distance between hypothesis and device: inverse design is opening regions of photonic and optoelectronic materials space that intuition cannot reach; learned reconstruction is turning imaging from a problem of optics into a problem of inference, recovering information that no lens delivers; and data-driven models are beginning to close the loop between stimulation, response, and adaptation in living tissue. The second is biointegration - the mechanically, chemically, and biologically matched union of device and tissue - which is moving

Check for updates

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optoelectronics off the benchtop and into the body. *BioPhoton* places explicit emphasis on these two frontiers, AI-enabled biophotonics and biointegrated optoelectronics, because together they decide whether light-based medicine remains a mode of observation or becomes a mode of intervention.

Neither frontier can be advanced by a single discipline. Physics and chemistry define what is possible; materials science makes it manufacturable; electrical engineering makes it dependable; biology and medicine define what matters; and the social sciences determine whether it reaches the people who need it. *BioPhoton* is committed to that conversation, and to the global challenges that make it urgent: cancer and neurodegenerative disease, antimicrobial resistance, healthy aging, and the persistent inequality of access to advanced medical technology. Engineering does not merely optimize existing modes of care. It creates entirely new ways of seeing, sensing, and healing.

BioPhoton is a new open-access, peer-reviewed journal dedicated to publishing original research, reviews, perspectives, and news & views at the intersection of photonics, functional materials, electronics, and the life sciences. Its purpose is to confront a defining problem of the coming decade: how to understand, and then harness, the interactions between light, matter, and living systems - and how to convert that understanding into fundamental discoveries and technological breakthroughs that advance healthcare and the life sciences. Our commitment is to build the premier international platform for interdisciplinary innovation in this field, connecting a community that is currently scattered across optics, materials chemistry, device engineering, biology, and clinical medicine, and shaping the future of biophotonic research.

BioPhoton embraces significant advances across seven core areas:

• Fundamental mechanisms of light-matter-life coupling - from photon absorption and nanoscale energy deposition to the signaling pathways that translate light into physiology.

• Biophotonic and photonic functional materials - designer emitters, upconversion and persistent-luminescence systems, plasmonic and quantum materials, and materials engineered to speak the language of biology.

• Light-driven precision diagnosis and therapy - image-guided intervention, photodynamic and photothermal modalities, and closed-loop theranostic platforms.

• Optoelectronic biointerfaces and intelligent biomedical systems - neural interfaces, adaptive stimulation, and devices that sense, compute, and act.

• Biointegrated physics and electronics - mechanics-matched, degradable, and self-powered platforms designed to reside within the body.

• Flexible materials and devices - stretchable optoelectronics, conformal sensors, and wearable photomedicine.

• Emerging optoelectronic biomedical technologies - the instruments, methods, and hybrid systems whose significance is not yet fully named.

The journal is led by an international editorial board of active researchers who are leaders in their respective fields, supported by rigorous, fair, and rapid peer review, transparent editorial policy, and a deliberate

commitment to international representation among authors, reviewers, and readers. We hold a simple standard: every published work should move the field, and should still be worth reading a decade after it appears.

Light has always been medicine's oldest tool. It is now being engineered as never before. *BioPhoton* exists to make light a sharper instrument. We invite you to submit your most ambitious work, to review generously, and to argue with us in print - the questions that matter most in this field sit between disciplines, and that is exactly where we intend to be.

DECLARATIONS

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