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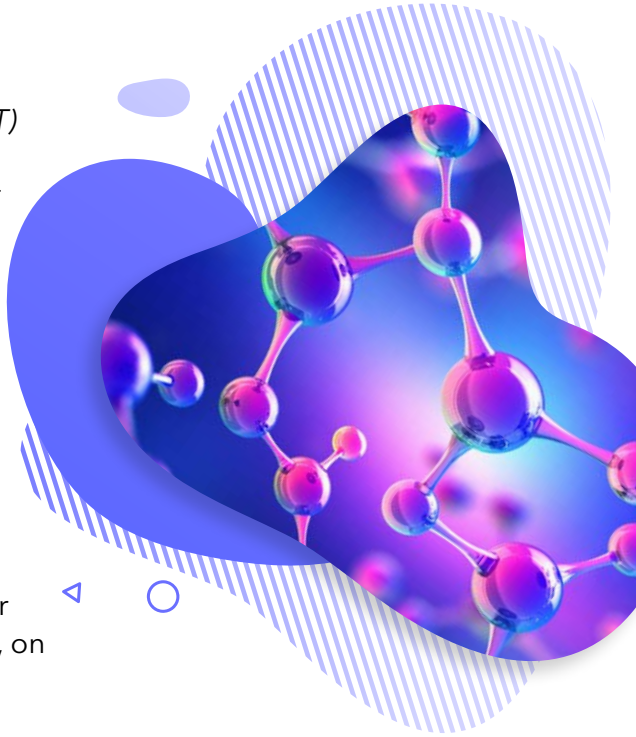
The *ITU Journal on Future and Evolving Technologies (ITU J-FET)* is an international journal providing complete coverage of all communications and networking paradigms, free of charge for both readers and authors. The ITU Journal considers yet-to-be-published papers addressing fundamental and applied research. It shares new techniques and concepts, analyses and tutorials, and learnings from experiments and physical and simulated testbeds. It also discusses the implications of the latest research results for policy and regulation, legal frameworks, and the economy and society. This publication builds bridges between disciplines, connects theory with application, and stimulates international dialogue. Its interdisciplinary approach reflects ITU's comprehensive field of interest and explores the convergence of ICT with other disciplines. The ITU Journal welcomes submissions at any time, on any topic within its scope.



Special issue on

Internet of Bio-Nano Things for health applications

Call for papers

As Internet of Things (IoT) approaches technological maturity with growing number of applications on the market, new integrative ideas emerge to push the current boundaries of IoT and extend its application range. One such approach follows a holistic view and regards the universe as an interconnected entity which is to be observed, understood, and manipulated with new information and communication technologies (ICT). At the center of this approach lies an emerging ICT framework, the Internet of Bio-NanoThings (IoBNT), envisioning the heterogeneous collaborative networks of natural and artificial nano-biological functional devices (e.g., engineered bacteria, human cells, nanobiosensors), seamlessly integrated to the Internet infrastructure. IoBNT is positioned to extend our connectivity and control over non-conventional domains (e.g., human body) with unprecedented spatiotemporal resolution, enabling paradigm-shifting applications, particularly in the healthcare domain, such as intrabody continuous health monitoring and theranostic systems with single molecular precision.

The broad application prospects of IoBNT have attracted significant research interest at the intersection of ICT, bio-nanotechnology, and medical sciences, with the great majority of studies directed towards (i) the design and implementation of Bio-NanoThings (BNTs), (ii) the understanding of natural IoBNT (e.g., nervous nanonetwork), (iii) the development of communication and networking methods for IoBNT (e.g., molecular communications), (iv) the design of bio/cyber and nano/macro interfaces, and (v) the development of new IoBNT applications.

Along the aforementioned directions, this special issue will present the most recent advances with respect to the theoretical foundations and practical implementation of IoBNT towards health applications.

Prospective authors are cordially invited to submit their original manuscript (research or survey/tutorial article) on the following topics:

Suggested topics (but not limited to):

Design and implementation of Bio-NanoThings (BNT)	• Engineered cell based BNT designs (e.g., engineered bacteria, exosomes) • Synthetic cells as BNT • DNA origami-based BNT designs • Design of nanobiosensors and nano-stimulators • Functional biomolecules as BNT (DNA, proteins, other macromolecules) • Chemical reaction networks for computation in BNT • Energy harvesting mechanisms for BNT
Modeling and analysis of natural IoBNT	• ICT-based abstractions, models, and simulations for human-body nanonetworks (e.g., nervous and hormonal nanonetworks, immune system), bacterial nanonetworks, plant communications • ICT-based disease modelling, and development of ICT-based disease hallmarks • Propagation models of infectious diseases (e.g., airborne transmission of viruses, bacteria, parasites) • Modeling and analysis of interkingdom communication channels (e.g., gut-brain axis, plant-bacteria and plant-animal communication channels)
Communication and networking methods for IoBNT	• Design, modeling and implementation of molecular communication (MC) systems • Nanomaterial-based and synthetic biology-based transmitter and receiver architectures for MC • Experimental MC testbeds and demonstrations • Modeling of MC channels in different environments (e.g., airborne/ liquid-borne MC, microfluidic MC) • Development of low-complexity and energy-efficient MC methods (modulation, detection, synchronization, channel coding, channel estimation etc.) • Human-body as an IoBNT infrastructure (e.g., gut-brain axis, vagus nerve, bone conduction) • New communication modalities for IoBNT (e.g., nano-mechanical, electromagnetic, acoustic, magnetic, quantum, FRET)

Bio-cyber and nano/ macro interfaces	• Proposal, design and modelling of new interfacing methods • Physical design and experimental demonstration of optogenetic, redox-based, and electrical interfaces • Neural interfaces • Proposal, modeling and analysis of signal transduction methods (e.g., biochemical/electrical transduction with electrical biosensors and stimuli-responsive hydrogels) • Implantable, wearable, and on-skin tattoo interfaces as IoBNT gateways
IoBNT applications	• Health applications of IoBNT (e.g., detection and mitigation of infectious diseases, intrabody continuous health monitoring, theranostic systems, smart drug delivery, microfluidic lab-on-chips, organ-on-chips) • Smart agriculture (e.g., health monitoring and growth control of plants and cattle), • Biocomputing, ultra-dense data storage with DNA, high-rate data transfer with bacteria • Covert communication systems • Food safety and quality monitoring • Environmental applications (e.g., monitoring and removal of toxic agents and pollutants)
Security and privacy aspects of IoBNT (Confidentiality, integrity, availability, authentication)	• Artificial immune systems • Swarm security • DNA-inspired encryption techniques
Big data management and analytics for IoBNT	
Co-existence and biocompatibility challenges regarding IoBNT applications in human-body	
Link, network, transport, and application layers of IoBNT	

Additional information:

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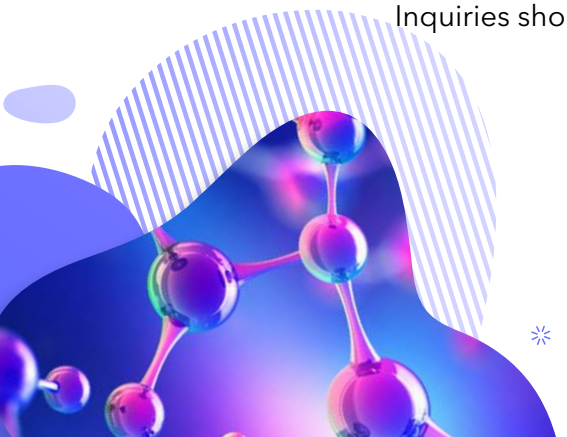

Keywords
Internet of Bio-Nano Things, nanonetworks, molecular communications, nanobiosensors, synthetic biology, bio-cyber interfaces, neural interfaces, nanoscale energy harvesting, human-body networks, big data, security, smart drug delivery, continuous health monitoring, chemical reaction networks, gut-brain axis, transmitter/receiver architectures, detection, modulation, coding, channel sensing, medium access

Extended deadlines
Paper submission: 22 April 2021
Paper acceptance notification: 24 May 2021
Camera-ready paper submission: 24 June 2021

Paper submission
This special issue calls for original scientific papers. Submitted papers should not be under consideration for publication elsewhere. Submissions must be made electronically using EDAS: Editor's Assistant at https://edas.info/N27875. Templates and guidelines can be found at https://www.itu.int/en/journal/j-fet/Pages/submission-guidelines.aspx

Publication
As soon as they get accepted, papers will be continuously published on the ITU digital library. They will then be bundled into the special issue digital publication.

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