

Opportunity Title: Tools and Techniques for Quantum Biology Fellowship

Opportunity Reference Code: ICPD-2024-07

Organization Office of the Director of National Intelligence (ODNI)

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How to Apply **Create and release your Profile on Zintellect** – Postdoctoral applicants must create an account and complete a profile in the on-line application system. **Please note: your resume/CV may not exceed 3 pages.**

Complete your application – Enter the rest of the information required for the IC Postdoc Program Research Opportunity. The application itself contains detailed instructions for each one of these components: availability, citizenship, transcripts, dissertation abstract, publication and presentation plan, and information about your Research Advisor co-applicant.

Additional information about the IC Postdoctoral Research Fellowship Program is available on the program website located at:
<https://orise.orau.gov/icpostdoc/index.html>.

If you have questions, send an email to ICPostdoc@orau.org. Please include the reference code for this opportunity in your email.

Application Deadline 2/28/2024 6:00:00 PM Eastern Time Zone

Description **Research Topic Description, including Problem Statement:**

Despite of the development of plethora of tools and techniques enabling incredible progress in current ability to study biological systems and dynamics at increasingly small scales, the understanding of the extent to which quantum mechanical effects influence living systems is extremely limited.

Quantum processes may play critical roles in the function of living systems. Quantum mechanical states may influence biochemical pathways. Quantum processes maybe important for sensing magnetic or electric fields and regulating migration patterns. It is also possible that quantum processes optimization is used by living systems to fit their ecological niche, thereby improving their fitness and survival. Quantum effects may also influence electron transport in biomolecules and phenomenon such as circadian rhythm. By understanding and subsequently by controlling quantum effects in biological systems, it may be possible to develop novel therapeutics, biological sensors, or solar cells or understand and manipulate human cognition. However, the study of quantum mechanical effects in biology is only possible if state-of-the-art quantum-inspired tools for measuring short time scales, small length scales and subtle heterogeneity that give rise to physiological outcomes are developed. Currently, tools that can directly prepare, control and measure endogenous quantum degrees of freedom in biology do not exist and there is no concerted effort to build the high-tech tools required to drive the quantum biology field forward.



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Quantum computing (QC) holds the promise to resolve, speed up or refine the analysis of a wide range of computational biology problems. However, in order to do so further development of hardware capacity and better strategies to model complex biomolecular systems is needed.

The Intelligence Community Postdoc program seeks post-doctoral level research proposals, focused on improving our understanding of quantum biology with a specific focus on developing the tools and methods for studying quantum biology in living systems, especially at a molecular, atomic, or sub-atomic scale. This can include research to enhance the understanding of or the actual design of methods, tools, techniques, data bases or repositories formation for pushing the boundaries of what is possible regarding measuring quantum effects and manipulation of these effects biologically.

Example Approaches:

Recommended references for related research:

<https://arye.substack.com/p/the-future-of-biology-is-quantum>

[Frontiers | Chronobiology Meets Quantum Biology: A New Paradigm Overlooking the Horizon? \(frontiersin.org\)](https://www.frontiersin.org/articles/10.3389/fnins.2023.1158481/full)

[Quantum Reports | Free Full-Text | Quantum Biology: An Update and Perspective | HTML \(mdpi.com\)](https://www.mdpi.com/2673-8246/4/1/1)

[Quantum Reports | Free Full-Text | Quantum Biology Research Meets Pathophysiology and Therapeutic Mechanisms: A Biomedical Perspective \(mdpi.com\)](https://www.mdpi.com/2673-8246/4/1/1)

[Quantum computing algorithms: getting closer to critical problems in computational biology | Briefings in Bioinformatics | Oxford Academic \(oup.com\)](https://www.oup.com/academic/view/9780190090864)

Key Words: Quantum biology, physiology, electron transport, degrees of freedom, electromagnetic field, circadian, chronobiology

Qualifications

Postdoc Eligibility

- U.S. citizens only
- Ph.D. in a relevant field must be completed before beginning the appointment and within five years of the appointment start date
- Proposal must be associated with an accredited U.S. university, college, or U.S. government laboratory
- Eligible candidates may only receive one award from the IC Postdoctoral Research Fellowship Program

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Research Advisor Eligibility

- Must be an employee of an accredited U.S. university, college or U.S. government laboratory
- Are not required to be U.S. citizens

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
 - **Chemistry and Materials Sciences** (12 )
 - **Communications and Graphics Design** (4 )
 - **Computer, Information, and Data Sciences** (17 )
 - **Earth and Geosciences** (21 )
 - **Engineering** (27 )
 - **Environmental and Marine Sciences** (14 )
 - **Life Health and Medical Sciences** (45 )
 - **Mathematics and Statistics** (11 )
 - **Other Non-Science & Engineering** (2 )
 - **Physics** (16 )
 - **Science & Engineering-related** (1 )
 - **Social and Behavioral Sciences** (30 )