Opportunity Title: Detection, Characterization, and Prediction of Novel Infectious Prion-Like and Amyloid Proteins and Peptides Fellowship
Opportunity Reference Code: ICPD-2024-06

Organization
Office of the Director of National Intelligence (ODNI)

Reference Code
ICPD-2024-06

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:

Prions are transmissible, self-templating protein agents that can induce abnormal folding of specific cellular proteins called cellular prion proteins (PrPc) which are found in the brain of most organisms*1. The onset of diseases linked to prions is typically followed by a rapid clinical progression of neurological deterioration, which results in a lethal outcome. Creutzfeldt–Jakob disease in humans *2, scrapie in sheep and goats *3, chronic wasting disease in cervids *4, and bovine spongiform encephalopathy *5 are well-known variants of these transmissible diseases. Certain non-infectious diseases, such as Alzheimer's *6, Parkinsons *7, and type 2 diabetes *8, also have linkages to abnormal protein conformations. Recent discoveries have described infectious transmission of amyloid-beta in humans, leading to iatrogenic cerebral amyloid angiopathy *9. Research of amyloid-like proteins in yeast and other fungi has described numerous prion-like formations and molecular control mechanisms for the host cell, and how it manages formation of these amyloid proteins, limiting detrimental impact and while also leading to potential benefit for the community *10.

While research in the past decades has drastically improved our understanding of prion, prion-like, and amyloid proteins to include structural *11, model hosts *12, and computational prediction *13, *14, the focus of published data is biased towards a limited number of severe diseases. The recognition of prion-like formations in yeast, especially those potentially with beneficial non-Mendelian inheritance traits *15, as well as novel human diseases, demonstrate how little the academic and clinical community know about these proteins and the potential range of functions they serve at a molecular, cellular, organismal, and community level. Further study on prions and prion-like proteins is essential; as a greater breadth of knowledge will improve capabilities to predict lethality, transmissibility, host specificity, environmental stability, tissue specificity, and/or disease severity, improving surveillance efforts and advance novel medical countermeasures. Proposers are encouraged to consider a wider definition of aggregate-prone proteins, including those with temperature sensitive or misfolded states with potential for altered function.

References:
1 "Prion Diseases | CDC."
2 Uttley et al., "Creutzfeldt-Jakob Disease."
3 Acín et al., "Classical and Atypical Scrapie in Sheep and Goats. Review on the Etiology, Genetic Factors, Pathogenesis, Diagnosis, and Control Measures of Both Diseases."
4 Rivera et al., "Chronic Wasting Disease In Cervids."
5 Collinge, "Human Prion Diseases and Bovine Spongiform Encephalopathy (BSE)."
6 Ma, Hong, and Yang, "Amyloidosis in Alzheimer's Disease."
7 Araki et al., "Parkinson's Disease Is a Type of Amyloidosis Featuring Accumulation of Amyloid Fibrils of a-Synuclein."

8 Marzban, Park, and Verchere, “Islet Amyloid Polypeptide and Type 2 Diabetes.”
9 Banerjee et al., “Iatrogenic Cerebral Amyloid Angiopathy.”
10 Liebman and Chernoff, “Prions in Yeast.”
11 Terry et al., “Structural Features Distinguishing Infectious Ex Vivo Mammalian Prions from Non-Infectious Fibrillar Assemblies Generated in Vitro.”
12 Liebman and Chernoff, “Prions in Yeast.”
13 Afsar Minhas, Ross, and Ben-Hur, “Amino Acid Composition Predicts Prion Activity.”
14 Charoenkwan et al., “AMYPred-FRL Is a Novel Approach for Accurate Prediction of Amyloid Proteins by Using Feature Representation Learning.”
15 Chakrabortee et al., “Intrinsically Disordered Proteins Drive Emergence and Inheritance of Biological Traits.”

Example Approaches:

Researchers seeking to reply to this topic should seek to advance our knowledge of prion or prion-like, and/or amyloid proteins beyond the well-studied disease descriptions known today. Such research should aim to expand the database of known or suspect targets through the development of new tools and leveraging of existing structural/mechanistic activities. With such studies, it is hoped that the academic and clinical communities may be able to better understand the impact of protein-based inheritance. This work may improve capabilities to detect, characterize, and model novel proteins which may be beneficial or detrimental to host systems. Proposed research efforts can be pursued in vitro, in vivo, and/or in silico but all proposals must describe advancing the current state of knowledge for the potential breadth of natural or unnatural prion and prion-like proteins.

Relevance to the Intelligence Community:

The S&T priority on biotechnology directly aligns with this research topic as Synthetic biology, biotechnology, infectious diseases, biological sciences, biosurveillance, bioconvergence, biointelligence

Key Words: prions, cryogenic electron microscopy, structural biology, amyloid proteins, filamentous polymers, amyloid-beta, prionoids

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

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 👁)

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- **Mathematics and Statistics** (11 👁)
- **Other Non-Science & Engineering** (2 👁)
- **Physics** (16 👁)
- **Science & Engineering-related** (1 👁)
- **Social and Behavioral Sciences** (30 👁)

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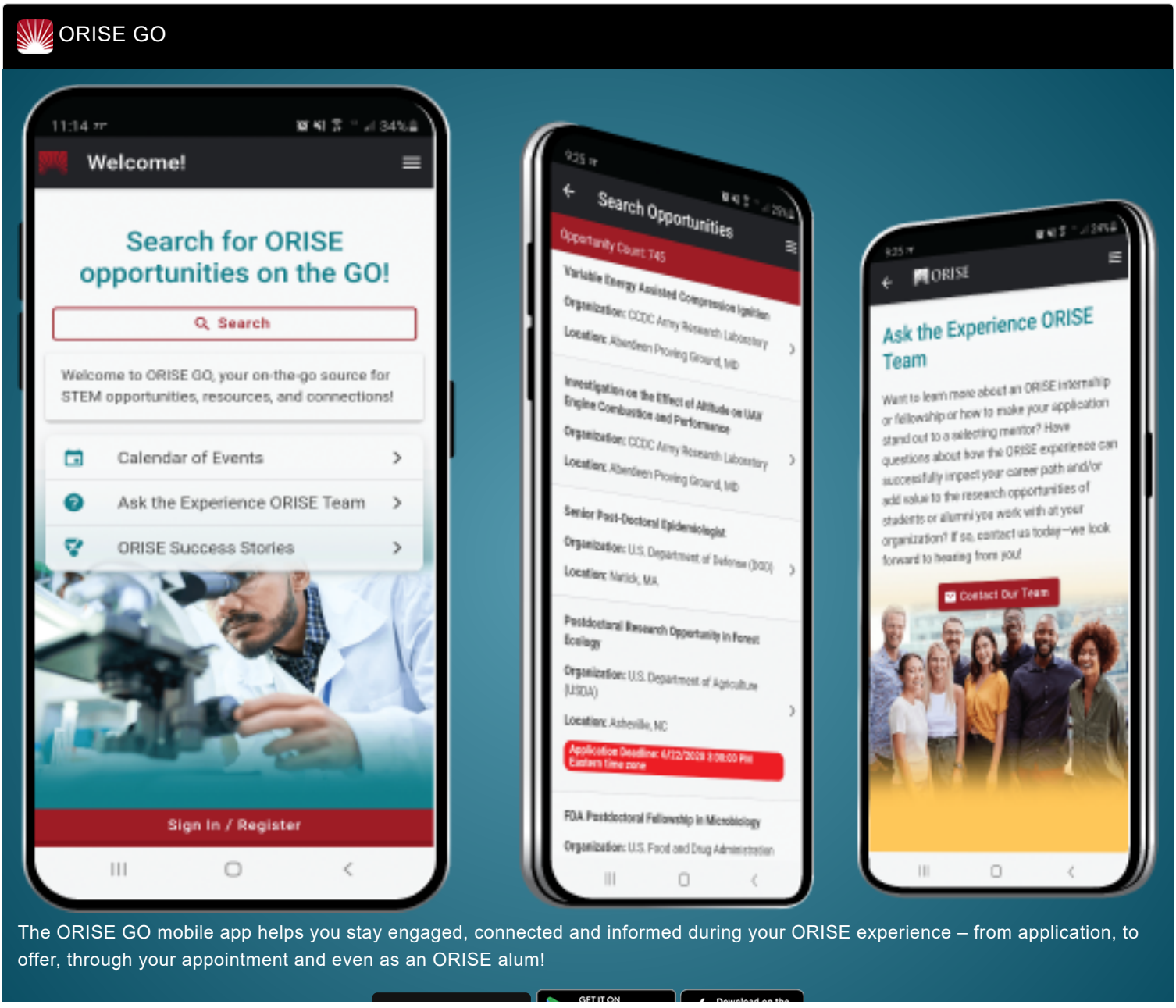

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