

**Opportunity Title:** Integrated Modeling, Gaming, and Simulation Tools for Understanding Complex Systems

**Opportunity Reference Code:** IC-16-37

**Organization** Office of the Director of National Intelligence (ODNI)

**Reference Code** IC-16-37

**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 2 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.

**Application Deadline** 4/15/2016 6:00:00 PM Eastern Time Zone

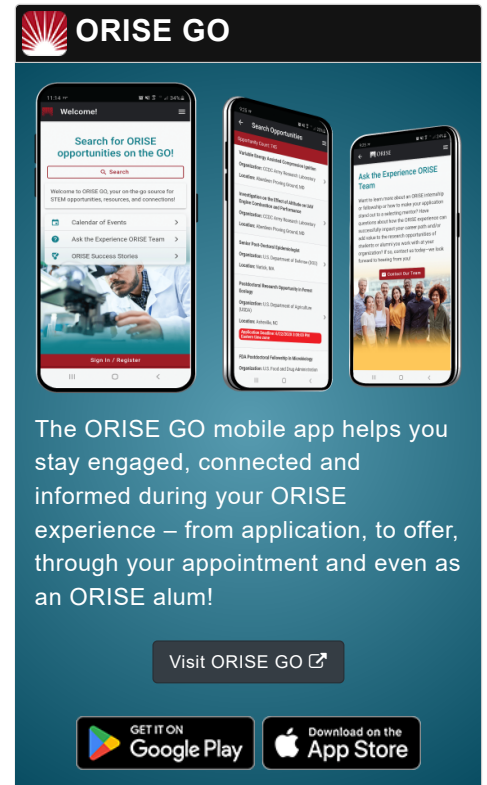
**Description** The principle aim of this research is to identify and employ tools and techniques in computational and social sciences in an integrated fashion to produce new insights about complex phenomena to support decisions. An integrated modeling, gaming, and simulation-based decision support system would provide an important analytic and assessment capability for better understanding dynamic interactions in complex social environments. The integration of these tools and techniques hold considerable promise for exploratory modeling<sup>1</sup> to potentially gain better insight about options and optimal decision paths from often ambiguous information.

Attention should be placed on methods to integrate modeling, gaming, and simulation tools and technique in novel ways that can serve as a useful basis for visualizing a range of plausible policy choices and assist in the formulation of strategy. The analytical tools required for making sense of increasingly uncertain, turbulent, and complex environments<sup>2</sup> must be able to:

- Scale from small to large systems (small terrorist cells to whole societies)
- Contain many interacting variables that may have no, few, or extensive interdependencies;
- Model non-linear relationships where inputs can have multiplicative, rather than merely additive effects;
- Capture unexpected emergence of new phenomena; and
- Provide a view of the range of possible outcomes with sensitivities and variations rather than point-predictions described in terms of likelihood based on expert judgment.<sup>3</sup>

#### Example Approaches:

Proposals may be focused on theoretical or experimental aspects of developing methods using combinations of



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computational social sciences models alongside traditional Delphic-techniques such as gaming and simulation in serial form.

- How might integration of inputs and outputs from one computational model to another drive better inquiry and discovery? For example, how might an ensemble of agent-based modeling (ABM), systems dynamics modeling (SD), and dynamic social network analysis (SNA)—for examples—work in series to produce insights into complex systems?
  - How might computational modeling be ensembled with gaming and simulation and how might they together enable better thinking and sense-making?
  - How might these models, taken together, be validated and verified in a systematic, transparent, and replicable manner? Proposals may also focus on how we might improve the quality of conclusions that we draw from the models.
  - Because computational social science models have been described as tools and techniques that support inferential thinking<sup>4</sup>, how might the outcomes of these models help with the formulation and development of strategies in support of policy choices?
  - What kinds of qualitative methods might be developed and employed to draw appropriate inferences about observed phenomena?

<sup>1</sup> Exploratory modeling, for the purposes of this request for proposals, is the use of series of modeling, gaming, and simulation to explore the implications of various assumptions and hypothesis. See, Steve Bankes, *Exploratory Modeling for Policy Analysis* (Santa Monica, CA: RAND Corporation, 1993).

<sup>2</sup> See for example, Josh Kerbel, “The Complexity Challenge: The U.S. Government’s Struggle to Keep Up with the Times,” *The National Interest*, 26 April 2015.

<sup>3</sup> Models, computational or otherwise, cannot successfully make point-predictions due to the extreme complexity of the world, so they must instead forecast distributional probabilities that help analysts to better comprehend the implications of potential futures and outcomes.

<sup>4</sup> See for examples: Joshua Epstein, *Generative Social Science: Studies in Agent-Based Computational Modeling* (Princeton, NJ: Princeton University Press, 2006); Robert Axelrod, *The Complexity of Cooperation: Agent-Based Models of Competition and Cooperation* (Princeton, NJ: Princeton University Press, 1997).














**Eligibility  
Requirements**

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.

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- **Discipline(s):**

- **Business** (11 )
- **Chemistry and Materials Sciences** (12 )
- **Communications and Graphics Design** (6 )
- **Computer, Information, and Data Sciences** (16 )
- **Earth and Geosciences** (21 )
- **Engineering** (27 )
- **Environmental and Marine Sciences** (14 )
- **Life Health and Medical Sciences** (45 )
- **Mathematics and Statistics** (10 )
- **Other Non-Science & Engineering** (13 )
- **Physics** (16 )
- **Science & Engineering-related** (1 )
- **Social and Behavioral Sciences** (28 )