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Title: Center for Nonlinear Studies (CNLS) Leader Position

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Center for Nonlinear Studies (CNLS) Leader Position

IRC 91223 Scientist 5/6

Irene Qualters ALD for Simulation and Computation

February 8, 2022

Theoretical Division (T) and the National Security Education Center (NSEC) are searching for a Director for the Center for Nonlinear Studies (CNLS)

The Center Director provides <u>scientific leadership and line management of the CNLS</u> while fostering collaborations with scientists throughout the Laboratory. The CNLS Center Director is expected to develop and lead a program to target and <u>create cooperative longterm research programs consistent with the Laboratory's strategic research</u> <u>objectives</u>, to <u>develop a strong working relationship with the CNLS External Advisory</u> <u>Committee</u>, and to maintain effective working relationships throughout all levels of the Laboratory, government entities, academia and industry. The successful candidate will be expected to <u>maintain an active research program while providing technical vision</u> to nurture and support existing programs of others at the Center.



CNLS

Mission

- Identifies and studies <u>fundamental</u> complex nonlinear <u>research</u> challenges
- **Promotes use of results** in <u>applied</u> research
- **Stimulates** <u>interdisciplinary</u> <u>approaches</u> to nonlinear research
- Facilitates intellectual interchange with external centers of excellence



Current Scientific Themes

- Machine Learning Enhanced Modeling
- Theory and Computation of Quantum Systems
- Dynamics of Systems Far From Equilibrium
- Mechanistic Studies of Human Disease



CNLS Executive Committees determine research direction



Kipton Barros Condensed Matter Theory T-1



Russell Bent Optimization Theory T-5



Malcolm Boshier AMO/Quantum MPA-Q



Jeffrey De'Haven Hyman Earth Sciences EES-16



Applied Mathematics

A-1



Gian Luca Delzanno Space Plasmas T-5



Chris Fryer Astrophysics CCS-2



Gnana Gnanakaran Biophysics T-6



Jenn Hollingsworth Nanomaterials MPA-CINT





Eddy Timmermans XCP-5



Sergei Tretiak Quantum Chemistry T-1



CNLS Research Themes are regularly reviewed and revised

Dynamic of Systems Far From Equilibrium

- Applied mathematics methods for plasma physics
- Space plasmas
- Structural properties of materials
- Fluid dynamics and turbulence
- Soft matter
- Active matter
- Dynamical systems
- Mechanistic Studies of Human Disease

Theory and Computation of Quantum Systems

- Quantum information
- Quantum many-body physics
- Bose-Einstein condensates
- Strongly correlated electron systems
- Molecular physics
- Non-adiabatic excited-state dynamics
- Warm dense matter

Machine Learning Enhanced Modeling

- Physics informed machine learning
- Deep learning
- Optimization theory
- Applications to grids
- Materials and Biology
- Interference and Algorithms
- Smart Grid applications
- Complex Networks
- Materials Informatics

Mechanistic Studies of Human Disease

- Stochastic gene regulation
- Biomolecular simulations
- Disease modeling
- Viral dynamics



CNLS Scientific Themes support LANL's Capability Pillars

Theory and Computation of Quantum Systems

- IS&T: Quantum computing
- <u>Materials for the Future</u>: correlated electron systems, quantum materials, functional materials
- Machine Learning Enhanced Modeling
 - **IS&T**: Machine learning, HPC, theory and algorithms
 - **<u>CNES</u>**: Modeling infrastructure
 - WS : algorithms, multiscale physics, reduced dimensionality
- Dynamics of Systems Far From Equilibrium
 - **IS&T**: Applied mathematics, numerical methods
 - <u>Materials for the Future</u>: mechanical deformations in metals at the mesoscale
 - **<u>NPF</u>**: Astrophysics, High Energy Density Plasmas and Fluids
 - SOS: environmental impacts, climate modeling
 - **WS**: Advanced manufacturing, algorithms, multiscale physics
- Mechanistic Studies of Human Disease
 - CNES: Modeling biological systems; Global security biosciences
 - Materials for the Future: Biomimetic materials
 - <u>SOS</u>: Global health, Biofuel research, National Security, Global Security

MATERIALS FOR THE FUTURE	Defects and Interfaces Extreme Environments Emergent Phenomena
NUCLEAR AND PARTICLE FUTURES	Accelerator Science & Technology Applied Nuclear Science & Engineering High Energy Density Plasmas & Fluids Nuclear, Particle, Astrophysics & Cosmology
INTEGRATING INFORMATION, SCIENCE, AND TECHNOLOGY FOR PREDICTION	Computing Platforms Computational Methods Data Science
Science of Signatures	Nuclear Detonation Nuclear Processing, Movement, Weaponization Natural and Anthropogenic Phenomena
COMPLEX NATURAL AND ENGINEERED SYSTEMS	Human–Natural System Interactions: Nuclear Engineered Systems Human–Natural System Interactions: Non-Nuclear
WEAPONS SYSTEMS	Design Manufacturing Analysis



As a National Security Education Center, CNLS

- Stimulates interdisciplinary research and information exchange inside and outside the Laboratory
- Provides a Laboratory focal point for collaboration with academic and other centers of excellence in nonlinear science
- Introduces students and postdoc researchers to nonlinear science
- Focuses on attracting and retaining excellence through student, postdoc, university and industry collaborations
- Supports seminars, workshops, conferences, visitors and a resident scholars program.



CNLS achieves its goals through :

- A robust and diverse postdoctoral fellowships that pairs postdoctoral fellows with laboratory staff (PD fellows from: Cambridge, Oxford, MIT, Stanford, ETH, Columbia, U Penn, Northwestern, UIUC, UCSD, etc.)
- A large visitors program (~200 visitors/ year from academia and industry). Visits range from a few days to 4 months.
- Active colloquium and seminar series (CNLS Colloquium, Quantum lunch, Postdoctoral fellows seminar, and other visitors seminars)
- Organization of international conferences that explore science at the interfaces (~10-12 / year, before COVID-19)
- The Ulam Scholar program that hosts long term (sabbatical) visitors at CNLS
- A graduate student program during the <u>calendar</u> year (typically PhD students) and a <u>summer</u> student program that hosts HS, UG and Graduate students from New Mexico and elsewhere.



CNLS jointly hosts a vibrant, diverse community of Postdoctoral Research Associates/ Fellows

- Allen, Alice (aallen@lanl.gov) T-1/CNLS
- Andrews, Elizabeth (eandrews@lanl.gov) EES-16/CNLS
- Brunner, James (jdbrunner@lanl.gov) B-11/CNLS
- Bryant, Eric (ecbryant@lanl.gov) W-13/CNLS
- Burrill, Daniel (djburrill@lanl.gov) T-1/CNLS
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- Cerezo de la Roca, Marco (cerezo@lanl.gov) -T-4/CNLS
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- Wang, Kun (kunw@lanl.gov) T-3/EES-16, CNLS
- Wych, David (dwych@lanl.gov) CCS-3/CNLS
- Yan, Bin (byan@lanl.gov) T-4/CNLS
- Zhou, Guoqing (guoqingz@lanl.gov) T-1/CNL



CNLS resides in T Division





Minimum Qualifications of Center Leader

- Demonstrated record of scientific accomplishment in one or more areas relevant to the Center as evidenced by an outstanding publication portfolio and/or a demonstrable national or international reputation.
- Demonstrated **experience in establishing and maintaining research collaborations**, from the identification of new potential topics to forming teams, promoting proposals and executing projects.
- Experience and accomplishments in strategic and tactical planning and in collaborative execution of the plans.
- Ability to **balance competing interests with available resources** and establish clear priorities and focus.
- Demonstrated **record of effective management and leadership** in the following areas: financial management, facilities and operational management (safety, security, environment), and personnel management.
- Demonstrated *effective interpersonal skills*, including uncompromising honesty and integrity; and ability to earn the respect of subordinates, supervisors, peers, and customers
- Record of effective two-way written and oral communications skills, as evidenced by internal and external interactions, including briefings, presentations, publications, and meetings



Desired Qualifications

- Research experience with DOE/NNSA laboratories and US Universities.
- Knowledge of national and international programs of relevance to the Center's activities.
- Ability to obtain and maintain a DOE Q clearance, which generally requires U.S. citizenship.



Search details

- Screening Committee Chair: Sergei Tretiak, (CNLS Executive Committee, T-1)
 - Gowri Srinivasan (P), Jennifer Hollingsworth (CNLS EC, MPA-CINT), Sandrasegaram Gnanakaran (CNLS EC, T-6), Alan Bishop (DDSTE), Bill Daughton (XTD), Vanessa Gonzales (CNLS), David Campbell (Boston University)
- HR Generalist: Melanie Vigil
- Talent Acquisition Specialist: Lorna Hall
- Final Candidate Interviews: Marianne Francois (T), Dave Clark (NSEC)
- Hiring Official: Irene Qualters (ALDSC)



Priorities

- Candidates drawn from a Diverse qualified pool:
 - internal/external candidates; a <u>range</u> of relevant disciplines represented among candidates; gender/cultural diversity
- Ability to execute the Center Mission:
 - Identifies and studies <u>fundamental</u> complex nonlinear <u>research</u> challenges
 - Promotes use of results in <u>applied</u> research
 - Stimulates interdisciplinary approaches to nonlinear research
 - Facilitates intellectual interchange with external centers of excellence
- Function as an NSEC Center, residence within T division, and funding through (LDRD)
 - A robust and diverse postdoctoral fellowships that pairs postdoctoral fellows with laboratory staff
 - A large visitors program (~200 visitors/ year from academia and industry).
 - Active colloquium and seminar series
 - Organization of international conferences that explore science at the interfaces
 - The Ulam Scholar program that hosts long term (sabbatical) visitors at CNLS
 - A graduate student program during the <u>calendar</u> year (typically PhD students) and a <u>summer</u> student program that hosts HS, UG and Graduate students from New Mexico and elsewhere.
- Thrust priorities may naturally change as part of new leadership

