

Center for Space and Earth Science Town Hall, FY 23 Guidebook

Director, Lisa Danielson and Team CSES

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Agenda

CSES Organization - People and Programs

- New Astrophysics and Geophysics Science Focus Leads
- New Early Career Leader
- New Focus Area: PI-SATS
- New postdoctoral awardees
- Program overviews and descriptions

CSES FY23 Guidebook (includes call for proposals)

- General Programmatic Updates
- Special Rapid Response Topics
- Focused Science Topics

0 Q & A

tailored briefings available for your organization



CSES Organization – What We Do and Who We Are

- What We Do: The mission of the Center for Space and Earth Science (CSES) is to coordinate research and to foster innovation in six scientific focus areas – Astrophysics, Space Science, Geophysics, Planetary Physics, Earth Systems, and Bioscience Research. CSES provides a <u>gateway</u> for collaborations with academic institutions in these science areas, provides external visibility, brings new ideas in these areas to LANL, and acts as a catalyst for new project ideas in support of the Laboratory's mission.
- Who We Are: IDEA is at the front of our values as we build relationships and contribute to workforce development CSES is committed to inclusivity and upholds the LANL statement, "diversity fuels our innovative, agile, and principled workforce that is essential to solving problems of global importance." We seek to create and uphold a positive, professional environment for all participants and support the Director's Annual Diversity Memo (official Laboratory Policy PD712 and P712-3) as well as all levels of LANL policies intended to support diverse groups and eliminate bias against groups.





CSES Organization – Indirect Program



Workshop / Conference Support Review Panel Support, CSES Scholars

CSES Organization – Postdoctoral Program

- Current postdocs
 - Jeffrey Broll (ISR-1), Space, Research Associate
 - Justin Holmes (T-5), Space, Chick Keller Fellows
 - Evan Thaler (EES-14), Earth Systems, Chick Keller Fellows
- Congratulations to FY22 conversions
 - Christopher Ren (ISR-3), Earth Systems, Chick Keller Fellows
 - Marie Kroeger (B-11), Bioscience, Chick Keller Fellows
- Postdoc PIs 2 Rapid Response FY22
- Evaluating packets (May timeframe) for FY23 starts



CSES Programs - New for FY23

- CSES IPD model
- CSES Scholars
- Special Rapid Response call
 - MLAICS
 - Cross division teaming required
- Updates to Focus Area topics
- New Focus Topic, PI-SATS
- <u>R&D Central Announcements</u>
 - Most up to date information
 - Deadlines



CSES Programs

- CSES Student Fellow Program Due May 6th for FY 23 starts
 - Student salary working at LANL, LANL PI time, University PI visits (\$55-70K/yr)
 - Graduate (3 yrs), Post-Bac & Post-MS (2 yrs)
- CSES Chick Keller Fellowship and Research Associate
 - 50% / 50% / 25% postdoc funding profile.
 - Applications through Postdoc Office
 - Evaluate at the December/May meeting (depending contact CSES)
- CSES Rapid Response Program (\$70K)
 - R&D as funding allows, ~2 calls per year
 - Typically "3 6 month" duration, must be completed in FY
 - Possible follow-on funding?
- CSES Program Development (IPD, typically <\$10K, but may request more depending on complexity of project)
 - No due Date! (Request form from Sarah)
 - Tech demo/assessment, capability sustainment, travel, workshops, proposal development, other strategic initiatives
- CSES Scholars
 - Can be funded from R&D or PD, but must be cost shared
 - Priority given to LANL staff or Academic Researchers with Joint Appointments or seeking a JA



Astrophysics Focus Area: Ingo Tews

- Advance our understanding of astrophysical phenomena throughout the universe:
 - provide the necessary fundamental research and capabilities (theory, data science, computational studies, experiment)
 - Develop capabilities that map to needs in divisions involved in weapons research, national, and global security.
- Focus: Astrophysical Transients and their potential multi-messenger signatures.
- Interdisciplinary efforts combining different LANL capabilities / thrusts, e.g.,
 - LANL's strength in theoretical modeling of extreme astrophysical conditions,
 - Facilities such as the HAWC, Raptor, ZTF, HET, LSST, LANSCE, NIF, Omega, etc.,
 - Computational techniques, codes, and resources, such as FLAG, RAGE, Ristra, etc.





Astrophysics Focus Area:

Specific Focus Topics for FY23:

Developing Cross-Disciplinary Capabilities

Tie together two or more existing LANL capabilities, e.g., in theory, observation, instrumentation, simulation, or data science.

Electromagnetic Signatures of Multi-Messenger Transients

Focus on providing a better understanding of the engines behind electromagnetic signatures from astrophysical transients.

Extending LANL's Unique Capability Base

Advance existing or create new individual capabilities that contribute to new missions and facilities to understand Astrophysical Transients

Supporting upcoming NASA Astrophysical Mission participation

Build the capability for mission participation from either a theoretical or preferably an instrument development angle, for upcoming missions of interest to LANL

Link to Special Rapid Response: ML/AI techniques to facilitate a better modeling of the complex physics probed in astrophysical transients.



Biological Systems Focus Area: Jeanne Fair

- Multiomics and Bioinformatics: new approaches to elucidate interspecies interactions
- Impacts and consequences: approaches for understanding impacts of significant events or environmental change
- Disease dynamics at the human/environment interface: highly complex environment and disease dynamics
- Life Sciences Seminar Series please submit speaker suggestions of scientists in the field solving global challenges to: jmfair@lanl.gov





Earth Systems Focus Area: Sanna Sevanto



- Managed Systems
- Complex coupled processes scaling
- System security, resilience and climate change mitigation

Link to Special Rapid Response: ML/AI methods for understanding climate change and impacts of climate change mitigation strategies including the human component.



Earth Systems science covers large range topics





Earth Systems science covers large range of scales



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Geophysics Focus Area: Youzuo Lin

Problem scope relates to national security and energy security subsurface applications

Many subsurface applications (such as earthquake monitoring, CO_2 sequestration, geothermal exploration) rely on accurate and efficient geophysical tools for site selection, monitoring, visualization, and risk mitigation.

Technical challenges & opportunities facing current geophysical methods

Current geophysical methods are challenged by the limited data coverage, high financial/computational cost and subjective human factors.

Domain Aware Al and Data Analytics

The goal is to embed unique physics knowledge in machine learning to improve current State-of-the-Art.





Carbon Capture & Geological Sequestration



CO₂

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Planetary Science Focus Area: Ann Ollila

- Enabling planetary science instruments, missions, advanced computation
- Lunar exploration sustainability in space (e.g. the Artemis program), student hardware collaborations
- NASA Participating Scientist Program applying LANL expertise in planetary missions and establishing connections





Perseverance & Ingenuity on Mars
(NASA/JPL/CalTech)

Artistic rendering of the Europa Clipper mission (europa.nasa.gov)

Buzz Aldrin conducting a seismic experiment on the Moon (NASA)

Planetary Science Focus Area:

Specific Focus Topics for FY23

Advanced Computation/Modeling



Impact modeling from Caldwell et al. (2020)

Analog Studies



CalTech collaborators (Lingappa & Fischer) at Black Point Lava Flows AZ working on an LDRD-ER led by C. Yeager

Experimental Work



OrganiCam lab setup (Gasda et al. 2021)

Tool Development



LIBS data analysis tool developed by Oyen et al. (2015) to detect layers in rocks.



Space Science Focus Area: Vania Jordanova

- Exploration and support for LANL participation in future space-based missions (including high altitude rockets, balloons and spacecraft)
- Advance computational and data analysis capabilities for space plasmas
- Innovative uses of unique LANL data or numerical modeling resources
- Link to Special Rapid Response topics: ML/AI in Complex Systems
- Applied projects in this area are encouraged to submit to PI-SATS





PI-SATS Focus Area: Ann Ollila & Peter Bloser

Pipelining Initiative for Space Applied Technology and Science



"Pipelining" in the sense of both workforce development AND technology development

Recruitment

Pipelining \rightarrow Workforce Development:



Sponsorship, competition judging



Engineering capstone project for students from NM institution(s)







In general, involving students & postdocs to support applied STE projects!

New short courses Space Science and **Exploration Symposium**



PI-SATS Focus Area: Ann Ollila & Peter Bloser



Concept Studies \rightarrow Raising TRL

Some available LANL resources to leverage:





Hand-launch balloon platform: Test technologies in near-space environment

Agile Space Team: Concept studies for CubeSat missions to propose to NASA

 \rightarrow Technology Development:

Some topics of interest for FY23:

- **Propulsion:** New propellants, enhanced maneuverability
- Detectors: Novel materials, data integration at sensor, quantum sensing
- Advanced Manufacturing: In-Situ
 Resource Utilization (ISRU), lunar
 surface, extreme environments
- Space Systems Engineering: Autonomous operation, new power sources

All CSES program elements may submit to PI-SATS! **Proposals must show a strong pipelining component and/or workforce development**



Special Rapid Response Machine Learning\Al in Complex Systems

- **Geophysics** subsurface security and energy problems
- Earth Systems climate change and impacts of climate change mitigation strategies
- **Planetary science** remote exploration, data optimization*
- **Space** space weather forecasting*
- Astrophysics and Cosmology modeling complex physics probed in astrophysical transients

Cross-Division teaming required

* If appropriate proposals may be co-submitted to PI-SATS



How do I participate in CSES?

- Conduct a research project
 - Submit a RR, SRR, Student Fellows, Postdoc Fellows proposal
- Mentor a postdoc or student
 - Submit a RR, SRR, Student Fellows, Postdoc Fellows, PD proposal
 - Summer School leader or mentor
- Give a seminar
 - Contact the seminar coordinator or Focus Lead
- Hold a workshop
 - Submit a PD proposal
- o Go on a sabbatical/host a sabbatical visitor
 - Submit a RR and/or PD proposal
- Become a Focus Lead
 - Contact CSES Leader
 - Talk to current Focus Leads
- Be the next Early Career Leader
 - Contact relevant Focus Lead for ~FY 24 rotation



Q&A – final notes

- Contact your Focus Leads ahead of time for feedback on your proposals
 - Student Fellows due May 6th
- Focus Area end of FY22 Symposia coming this September/October
- Request a briefing for combined CSES and Space Programs
- Sign up for CSES updates in R&D Central!

