

CSES 2018 Call for Proposals (FY19 New Starts)

Released March 9, 2018

Reiner Friedel - Center for Space and Earth Science (CSES)
National Science Education Center (NSEC) - LANL



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1 Introduction

The Center for Space and Earth Science (CSES) at Los Alamos National Laboratory (LANL) is one of the Science Institutes in the Lab's National Science Education Center (NSEC). It covers four specific science disciplines, each directed by a focus leader:

- Astrophysics and Cosmology (Hui Li; hli@lanl.gov)
(Chris Fryer; fryer@lanl.gov [Center for Theoretical Astrophysics])
- Space Science (Geoffrey Reeves; reeves@lanl.gov)
- Geophysics (David Coblenz; coblenz@lanl.gov)
- Earth Systems (Keeley Costigan; krc@lanl.gov)

CSES Science Discipline Portfolio:

1. **Astrophysics, and cosmology** - with the goal of advancing theoretical, modeling, computational and experimental sciences that map to capabilities needed in divisions involved in weapon simulation (e.g., nuclear physics, radiation hydrodynamics, plasma physics, Magneto HydroDynamics (MHD), uncertainty quantification) and national security (e.g., nuclear detection, transients, sensing, imaging, space weather).
2. **Space Science** - with the goal of advancing our understanding of the space environment from the Sun to the Earth and beyond - with the particular goal of understanding how the space environment affects the systems in space that support security and quality of life in our increasingly technological society. We include here planetary science.
3. **Geophysics** - with the goal of advancing theoretical, experimental, modeling, and simulation studies that address fundamental issues in basic earth processes as well as promoting capabilities needed for a better understanding the perturbation of natural geologic systems in response to human actions. These perturbations changes in pore pressure, temperature, permeability (e.g., fracturing), and fluid/gas chemistry. The overarching goals of this focus is twofold: improving both our *sensing* capability (e.g., how can we extract more knowledge from data and improving the detection of small events in noisy data sets) and our *predicting* capability (how can we better understand the behavior of complex Engineered Natural Systems despite the inherent uncertainty).
4. **NEW: Earth Systems** - with the goal of advancing and integrating theoretical, modeling, simulation, sensing, observational, and experimental sciences that push the frontiers of predictability of Earth Systems, their variability, interdependence, and their responses to forcing. This goal includes interactions of humans with the natural environment.

As one of the six strategic centers organized under the NSEC, CSES is chartered to foster high quality, multi-program and multi-division research efforts, specialized recruiting, and strategy development within its assigned scientific discipline areas.

The main purpose of strategic centers is to:

1. Focus, laboratory wide, on strategically important areas of science, engineering, or technology that span areas of expertise beyond that residing in any single management structure,
2. Provide external visibility and collaboration in strategic areas of need, that require a single laboratory voice,
3. Provide education of present and future scientists and engineers that are required to maintain LANL competency,
4. Help with recruitment or retention of technical talent.

This call supports initial research through student, postdoc and staff opportunities that build new capabilities or explore new approaches for the LANL mission, or that support anticipated future mission needs and new mission areas, in the science disciplines supported by CSES. The science goals for the CSES disciplines are in support of the broader strategic goals of the Laboratory (“Proud Legacy, Bold Future”) and the Science Pillars that map to it. The Laboratory’s Signature Science goals encapsulated in the Science Pillars is the LANL response to a range of national strategic plans that cover LANL’s mission area, such as the DOE/NNSA “Prevent, Counter, and Respond—A Strategic Plan to Reduce Global Nuclear Threats (FY 2016–FY 2020)” report along with the DOE/NNSA “Stockpile Stewardship and Management Plan”, the DOE “Strategic Plan 2014-2018”, and the science research priorities as set out by the DOE Office of Science Funding Calls.

For CSES there is also a large overlap in the CSES science disciplines with NASA’s Science Mission Directorates in the areas of Planetary Science, Earth Science, Astrophysics and Heliophysics, and CSES is interested in supporting capability that would enable LANL participation in the NASA mission arena. LANL’s involvement with NASA is an invaluable recruiting tool, helps retain highly qualified staff, pushes LANL technology to perform in extreme environments and provides a visible outlet for LANL excellence not available in other programmatic areas.

While the CSES discipline areas contribute to many of the Los Alamos National Laboratory Science Pillars, they are particularly applicable to the Science of Signature (SoS) Mission:

“Characterize measures, signals and properties in or of complex systems. Detect or attribute change and predict behavior and impact across scales of space (subatomic to astronomic) and time (femtosecond to geologic)”

Signature Science addresses emerging challenges in the CSES disciplines by developing the scientific underpinning of signatures and backgrounds, new measurement techniques

and strategies for signature identification, the discovery of alternate or nontraditional signatures, and new analysis and interpretation tools for development of knowledge from these signatures.

Each CSES call for proposals highlights a set of focused science topics for each of the four discipline areas, which will change from year to year. These topics are selected based on challenges facing the international scientific community as well as on the strategic need to extend scientific excellence supporting the Los Alamos National Laboratory mission (See Section 2).

We particularly encourage young staff scientists to submit proposals that will help them build research programs and establish productive collaborations with universities.

In order to encourage highly creative and innovative ideas and concepts, CSES encourages revolutionary and moderate to high-risk research. CSES funds collaborative research involving Laboratory staff members, postdocs, university PI's and their students. A small amount of funding may be provided to conduct a technical feasibility analysis of a revolutionary concept. While many collaborative projects extend up to three years duration, funding in each successive year is contingent upon adequate progress in the previous year and the availability of LANL funding.

New/changed in the 2018 call:

The old "Climate" Focus area has been re-cast as the "Earth System" Focus area and its focused science topics have been updated accordingly – see Section 2.4.

2 Focused Science Topics

Proposals for Program Elements 3.1 (Student Fellow Program), 3.2 (Chick Keller Postdoctoral Fellow Program) and 4.4 (Large University Program) need to address the focused topics in their science discipline area as outlined below.

2.1 Astrophysics and Cosmology

Astrophysics and Cosmology in CSES is closely aligned with the two of the focus areas of the Nuclear and Particle Futures (NPF) Pillar - Nuclear, particle, Astrophysics and Cosmology (NPAC) and High energy density physics and fluids (HEPF&F). Furthermore, Astrophysics and Cosmology are relevant to some of the goals described in the Science of Signatures Pillar as well. See <http://www.lanl.gov/science-innovation/pillars/sos/index.php> and <http://www.lanl.gov/science-innovation/pillars/sos/index.php> for details.

Focus area. We emphasize advanced research in observation, theory, simulation, and instrumentation that strives to achieve fundamental understanding of the universe. In addition, this focus area benefits from and in turn strengthens its strong overlap with many on-going Laboratory programs in areas such as nuclear physics, particle physics, weapon physics, plasma physics, and condensed matter physics. It further utilizes and leverages the facilities and observatories both inside and outside of the Laboratory. We are interested in proposals that are innovative and forward-looking, especially those with strong potential leading to new capabilities and research directions.

It is strongly encouraged that proposals exploit unique resources at Los Alamos National Laboratory is involved:

1. Facilities such as the HAWC, Raptor, ZTF, etc.
2. Computational techniques, codes and resources, such as VPIC, RAGE, etc.
3. Broad knowledge base in a full range of physics that tie together theory, simulation, experiments, and observations.

Specific Topics for new projects starting in FY19:

Overall theme is to conduct cutting-edge research that enables breakthroughs in our understanding of Astrophysical Transients through innovative uses of unique LANL observational, theoretical, numerical and experimental capabilities. The area of Astrophysical Transients is a rapidly developing field in astrophysics, e.g., discoveries of gravitational wave sources, fast radio bursts, etc. The likely engines for such transients are astrophysical compact objects such as black holes, neutron stars and stellar explosions. Most of these subjects are tied closely to LANL expertise, some of which are quite unique (e.g., HAWC, Raptor).

Transients connect much of the natural phenomena observable in our universe to similar physical processes in LANL programmatic areas of the high temperature and pressure,

often turbulent physical regimes, while being at the forefront of current astrophysical research, and having the capability of attracting the brightest minds to Los Alamos.

1. **Advancing theory and modeling capabilities.** Development that sheds light on understanding Astrophysical Transients will be emphasized. Some examples include:
 - a. Center for Theoretical Astrophysics (CTA), such as modeling progenitors, engines and signals of transients, nuclear, particle and plasma physics processes
 - b. Simulation codes that are suitable for Exascale Computing platforms to study systems with radiation magnetohydrodynamics, charge particle energization and transport connecting fluid and kinetic regimes
 - c. Close collaboration between theory/modeling and observations of astrophysical transients.
 - d. Potential applications include neutron stars, pulsar wind nebulae, supernovae, fast radio bursts, gamma-ray bursts, gravitational wave sources, black hole formation, jets and flares, signatures from exoplanetary systems and protoplanetary disks, etc.
2. **Developing new technologies and tools.** Support activities that will develop new technologies and tools that contribute to new missions and facilities. These new missions and facilities should be strongly connected with Astrophysical Transit sciences. Some examples include:
 - a. HAWC data mining; other ground-based gamma-ray experiment development
 - b. Optical, X-ray and gamma-ray transient detections (possible NASA missions)
 - c. Laboratory plasma experimental innovations investigating astrophysical processes
3. **Supporting upcoming NASA Astrophysical Mission participation.** Work that supports mission participation from either a theoretical or preferably an instrument development angle, for upcoming missions of interest to LANL (e.g., AMEGO, the All-sky Medium Energy Gamma-ray Observatory, TAP - Transient Astrophysics Probe, LOX - Lunar Occultation Explorer, Astrophysical Transient Probe).

In addition, proposals that demonstrate strong collaborations (both internally and externally) as well as branch out to new Astrophysical Transit science areas are particularly encouraged.

2.2 Space Science

Space is one of the six leadership areas of the SoS pillar. The SoS strategy document lists goals for Space, and the topics chosen should relate to them. Space is also relevant to some of the goals of the Nuclear Event Characterization leadership area of the SoS pillar.

Refer to <http://www.lanl.gov/science-innovation/pillars/sos/index.php> for details.

The overarching research goals for this call in the Space Science focus area are to advance our understanding of the space environment (from the Sun to the Earth and beyond) and to advance our ability to operate systems in space that protect life and society. Space Science is distinct from other field, such as astrophysics or cosmology, in that Space Science utilizes in-situ measurements from high altitude rockets, balloons and spacecraft or ground-based measurements of objects and conditions in space.

Focus area. We particularly encourage proposals that lead to new capabilities for mission participation, new technologies, and/or innovative new uses of unique LANL data, simulation, or modeling capabilities. We recognize that LANL has a long history of research in space sciences that covers many diverse specialties. While that expertise and sustainment of capability is essential to future success, the CSES space science focus for this cycle emphasizes research that supports innovation and creativity leading to new capabilities for missions, new technologies, or new scientific discovery. New space science missions are the ‘ultimate prize’ because they lead to large, sustained research activities, high profile publications, recruitment and training opportunities, etc. Often, the path to new missions is paved with smaller projects involving the development of new instruments or new measurement capabilities. Those, in turn, often rely on numerical studies that identify the most important open scientific questions and establish the foundational basis for measurements and missions needed to answer such questions.

Specific Topics for new projects starting in FY19:

Overall theme is to conduct cutting-edge research that enables fundamental breakthroughs in our understanding of the space environment through new missions, new technologies, and innovative uses of unique LANL data or numerical modeling resources.

1. **New Missions.** The first priority will be to support LANL’s intensifying efforts to participate in new NASA space missions, both for those in the current pipeline (e.g. CONNEX) and for new concepts. Foundational proposals enabling and/or supporting mission concept developments are encouraged.
2. **New Technologies.** Technology development and demonstration with an emphasis on technologies that can be applied to basic and national security research objectives:
 - a. Instrument and measurement concepts
 - b. Laboratory demonstrations
 - c. Instrument performance studies that enhance our existing sensors
3. **Innovative uses of unique LANL data or numerical modeling resources.** Release of GPS and LANL-Geo data provides new (or renewed) opportunities for collaboration and recruitment. We particularly encourage studies using limited-access data sets that can have open publications (e.g. GPS lightning data). We encourage new numerical model development or use of current model capabilities for completely different applications – particularly those leading to creative and innovative measurement, instrument, and mission concepts.

Proposals are solicited for theoretical, computational, and/or observational research. It is strongly encouraged that proposals exploit unique resources at Los Alamos National Laboratory which include:

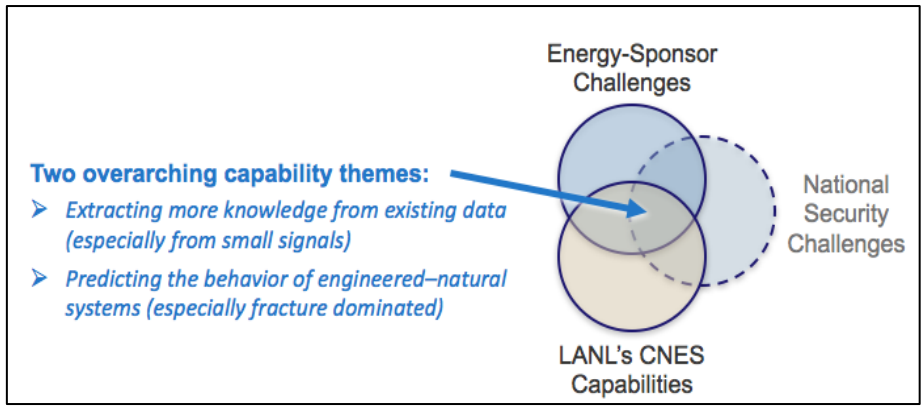
- a. LANL satellite experiments
- b. LANL satellite data
- c. LANL space science computer simulation codes, and algorithms.

2.3 Geophysics

The Geophysics Focus Area is grounded in two of the lab’s science pillars - *Integrating information, science, and technology for prediction (IS&T)*, and *Science of Signatures (SoS)*.

The integration of information science and the evaluation of signatures provides an avenue for improving LANL’s capability in *sensing* (improved extract of useful information from data and detection of small events in noisy data sets) and *predicting* (improved understand of the behavior of complex Engineered Natural Systems despite inherent uncertainty) See <http://www.lanl.gov/science-innovation/pillars/ist/index.php> for details; and *Science of Signatures (SoS)*, refer to <http://www.lanl.gov/science-innovation/pillars/sos/index.php> for details.

Broader Challenge. The core capability challenge addressed by LANL Geosciences is improving and optimizing our understanding of how natural (geologic) systems are perturbed by human actions. These systems are commonly referred to as Complex Natural Engineered Systems (CNES) and Los Alamos is concerned with two broad areas of such systems: Energy and National Security Applications. In particular, the CSES Focus Area seeks to identify the overlap between LANL’s CNES capabilities and the scientific challenges presented by Energy and National Security Systems.



The primary focus is to improve LANL’s capability to extract more knowledge form existing data (small signals in a noisy world) and improve

our ability to predict the behavior of engineered-natural systems (especially fracture dominated).

Focus Area. The Geophysics focus area supports basic and applied research concerning the Earth’s surface and lithosphere. This research includes numerical, experimental, and field studies of the structure, properties, processes, and dynamics of the Earth. It is

strongly encouraged that proposals exploit unique resources at Los Alamos National Laboratory which include:

- a. Los Alamos National Laboratory high-performance computing resources
- b. The Los Alamos Neutron Science Center (LANSCE)
- c. Geochemical analyses facilities resident in EES and C divisions
- d. Sensor technology capabilities resident in C, EES, ISR, and N divisions

We are particularly interested in innovative and collaborative research projects in areas of current, strong international scientific interest.

Specific Topics for new projects starting in FY19:

Overall theme for the Geophysics Focus Area is research to help our understanding of natural systems that are perturbed by human actions. Studies that integrate theoretical, experimental, modeling and simulation efforts to address the fundamental technical changes in understanding the earth's subsurface are of particular interest. Geoscience topics that play a fundamental role in supporting LANL's core mission include understanding the state of stress in the subsurfaces, the dynamics of rock fracturing and how it affects permeability, and how fluid (gas and liquid) flow through fractured rock. A thorough understanding of these topics is critical for LANL mission in evaluating underground explosions, characterizing oil/gas reservoirs, and developing geothermal resources. The following four subtopics underpin this mission:

1. **Geodynamics.** The state of stress in the crust, earthquake seismology, seismoacoustics, and seismotectonics. Understanding critically stressed faults and their use for mitigating seismic hazard. Development of Quantitative Geomorphology techniques and analysis to understand the dynamic interaction between climate, tectonics, and the character of the Earth's topographic surface. New techniques in remote sensing and digital data analysis that provide information for geologic framework models used in numerical modeling of subsurface processes.
2. **Evaluation of Geomaterials.** Strain localization, dynamics and elasticity of Earth geomaterials. The development of realistic material models for use in numerical simulations (Abaqus). Upscaling of material properties for use in numerical models.
3. **Geomechanics of the Subsurface.** Computational geomechanics; dynamic subsurface processes in porous and fractured media; transient and steady-state behavior in geologic and hydrologic processes, including multi-phase fluid flow in porous and fractured media. Advanced finite-element and fluid-flow modeling.
4. **Low-Magnitude Signals for Subsurface Investigations.** Development of techniques to characterize background signals; HPC and quantum computing approaches for prompt (real-time) evaluation of signals (events/leaks); and development of a machine-learning-based multi-physics method for an accurate characterization of the subsurface.

In these topical areas, proposals that address the following future challenges are particularly encouraged:

- **Big Data.** The volume of data collected has grown exponentially. Growing need to interpret data in real time (minutes to hours instead of days to weeks). Increased emphasis on decision-making based on evaluation of problem complexity and uncertainty. Use Data Analytics to minimize data paralysis and eliminate interpretation bias.
- **Extracting Relevant Information from a Noisy World.** Typical problems of interest for the Lab/Sponsors are data collected from a large area (100's of km), small signals, lots of noise, keep costs down, and provide feedback in real time. Relevant questions: Are there new signatures we are not using? How to optimize existing signatures? Can the analysis of multi-phenomenological data help solve our problems? Two drivers: “**did** something happen” vs “**is** something happening”?
- **The Earth as a Filter.** Important for building learning sets. All signals and signatures are recorded after passing through a heterogeneous Earth. How can we use upscaling to improve our physics models of geoscience phenomenology?

2.4 Earth Systems

The Earth Systems Focus Area contributes to two of LANL's science pillars. Climate Signatures and Biological Signatures are two of the six leadership areas within the Science of Signatures pillar. Additionally, Energy-Climate Impact and Energy Infrastructure is a program area within the Integrating Information, Science, and Technology for Prediction pillar. Refer to <http://www.lanl.gov/science-innovation/pillars/ist/index.php> and <http://www.lanl.gov/science-innovation/pillars/sos/index.php> for details.

Focus Area. The Earth System focus area emphasizes process to predictive level understanding of the coupled atmosphere, ocean, hydrosphere, terrestrial, biogeosphere, and anthroposphere of planet Earth by studies at multiple scales. This focus area examines fundamental climate processes and the impacts of climate change. It also supports projects that improve our understanding of mechanisms from microbe to plant, aerosol to cloud, eddy to global circulation scale, including targeted laboratory and field studies, aimed toward the improvement of models. This focus area promotes understanding of the interactions between natural and human systems and developing capabilities to strengthen security and resilience. Integration of measurements and models to fill outstanding gaps, particularly in sensitive regimes and high impact regions (e.g. Arctic) are encouraged.

It is recommended that proposals exploit unique Los Alamos National Laboratory resources, which include:

- a. LANL high performance computing

- b. DOE-sponsored process-resolving to global scale models (e.g. HiGrad/Firetec, Amanzi-Advance Terrestrial Simulator, CICE, and E3SM)
- c. Experimental data sets (e.g. NGEE Arctic and ARM)
- d. Climate monitoring systems (e.g. SUMO, Pinon-Juniper woodland, and CAFÉ)

Specific Topics for new projects starting in FY19:

Overall theme is to conduct cutting-edge research that enables fundamental breakthroughs in our understanding of Earth Systems signatures and impacts and secure and resilient response strategies, through integration of LANL's theoretical, experimental, measurement, and numerical modeling resources.

1. **Signatures.** Transforming technologies and methods for identifying or attributing Earth System change.
 - a. Revolutionary sensors and integrated sensor networks.
 - b. Innovative analytical methods, including cross disciplinary data fusion, data analytics, and integrative assessment.
2. **Impacts.** Advancing fundamental understanding of Earth Systems interactions and impacts to improve the application of models to energy, water, food, and health security problems.
 - a. Extreme or catastrophic events (e.g. drought, fire, epidemics, or storm surge).
 - b. Influences on regional stability.
3. **Secure and resilient responses.** Development and demonstration of information and tools for integrated decision support capabilities.
 - a. Integration of Earth System models, assessment models, and response models, incorporating uncertainty quantification.
 - b. Regional predictions on seasonal to multi-decadal time scales.
 - c. Integrated observations and models, including data assimilation capabilities for models.

3 PROGRAM ELEMENTS

CSES offers several program elements. **New/changed in the 2018 call:**

1. The *Chick Keller Postdoctoral Fellowship*, will accept nominations at each one of the quarterly Postdoc Committee review meetings.
2. The *Emerging Ideas Programs* will have three selection rounds during FY19 with published deadlines.
3. The *Large University Program* is not offered in this call. Next opportunity will be in the FY20 call for FY21 new starts.

Current CSES program elements:

1. **Student Fellow Program.** Needs to address the CSES Focused Science Topics for this call. One selection per year.
2. **Chick Keller Postdoctoral Fellow Program.** Needs to address the CSES Focused Science Topics for this call. Submissions through LANL PostDoc Program, four times a year.
3. **Emerging Ideas Program.** While alignment to the CSES Focused Science Topics is encouraged, this program element is open to all emerging scientific ideas in the CSES science disciplines. Three selections during the FY.
4. **Large University Program.** Needs to address the CSES Focused Science Topics. One call every three years.

Each program element is described below and lists the typical maximum budget and the anticipated number of awards that can be made. Proposals requesting less than the maximum budget will have a competitive advantage.

Details of the proposal writing and submission process are in Section 4.

3.1 Student Fellow Program

University and LANL collaborative research program. Frequency of call: Once a year.

Submission: April 20, 2018

Selections: May 11, 2018

Program New Starts: at start of FY19

Program duration: 1 year, 2 years or 3 years

Program Outline

- Each proposal is required to have a University Student Researcher, a University Principal Investigator (PI) and a Los Alamos National Laboratory PI.
- The University Postgraduate Student Researcher needs to be enrolled in a Ph.D. program, and ready to embark on their Thesis project (passed their qualifiers).

- The University PI may be any university scientist entitled by the university to be a Ph.D. program supervisor.
- Visiting scientists, adjunct faculty and postdocs do not qualify as University PIs.
- A Los Alamos National Laboratory PI is any Los Alamos Technical Staff Member.
- The collaborative University-LANL research project will typically consist of a jointly agreed Ph.D. thesis research project.
- **A Los Alamos National Laboratory Mentor must submit the proposal.**

The objective of this program is to support a University Student Researcher to perform part of their Ph.D. thesis work at Los Alamos National Laboratory in close collaboration with their Los Alamos PI.

The funding profile for this program consists of three parts:

1. Support for the University Student Researcher to spend a significant fraction of the year at Los Alamos. GRA Support for a typical 12-week summer stay at LANL cost ~\$35K. Note that the student can be at LANL at any time(s) during the year, and while summers are typical we encourage other times and much as possible. Preferred by CSES would be a spring timeframe.
2. Support for the Los Alamos PI to devote a significant fraction of their time to the collaborative research project (~\$15K).
3. Support to the University PI to visit LANL for periods of 1-2 weeks/year (~10K travel and subsistence).

The individual funding items are negotiable with a total cap for this program not to exceed \$60K/year of LDRD-type funding.

No direct funding support to a University is envisaged under this program. Note that while no direct funds flow to a LANL University partner, there are benefits to the University PI and the student:

- a. The University Student Researcher requires no University financial support during the time spent at LANL (typically ~3 months/year).
- b. LANL Graduate Assistant Student rates may be higher than many Universities' postgraduate salaries, helping to attract students to both the University and the CSES Student Fellow Program.
- c. Exposure of student to an outside organization with many career opportunities for post-doctoral work and beyond.
- d. University PI travel support for extended LANL visits.

Only under exceptional circumstances, when some of the required Ph.D. thesis work cannot be done at LANL (e.g. use of a unique University facility), will CSES be prepared to write a University subcontract for that part of the work. This must be clearly motivated in the proposal.

Successful proposals need to include some form of matching support for the student from their universities or other institutions. Acceptable forms of matching support are the same as, but not restricted to, those accepted by the National Science Foundation or other Federal research funding agencies.

Proposals may be submitted for collaboration with any national or international university. Collaborations with New Mexico universities are particularly encouraged and may qualify for supporting funds through The New Mexico Consortium.

The number of new starts anticipated in the CSES Student Fellow Program is approximately 4-6 across all CSES discipline areas.

Expectations

The Student Fellow Program's aim is to build and foster new and/or long-term relationships with University Researchers. This program is to be viewed as a stepping-stone for both the student (as a prospective LANL postdoc) and the LANL and University PI to build a strong relationship. The work performed here should be able to form the basis for a follow-on joint proposal by the LANL and University PI to a Lab internal or external funding source.

If offered and applicable, the student should be encouraged to participate in one of the CSES summer schools. The University PI should be encouraged to offer a lecture in a CSES summer school as part of his/her visit to LANL. The university PI should also be encouraged to give a topical seminar on his research area during his visit to LANL.

The student is expected to present a technical seminar at LANL on his/her work once per year, and to submit the presentation to CSES. In addition, CSES will collect project metrics once a year from each LANL PI through a fillable PDF form.

3.2 Chick Keller Postdoctoral Fellow Program

LANL Named Postdoctoral Fellow support. Frequency of call: Four times per year.

Submission: Conforming to the LANL PostDoc's Office Quarterly meeting schedule

February Review - Submit early December, outcome mid February

May Review - Submit early March, outcome mid May

August Review - Submit early June, outcome mid August

December Review - Submit mid September, outcome mid-December

<http://www.lanl.gov/careers/career-options/postdoctoral-research/postdoc-program/postdoc-appointment-types.php>

Selections: One week after the Quarterly meetings.

Program New Starts: As soon as PostDoc Candidate is available.

Program duration: 2-year maximum or 1 year for a 3rd year extension of an existing CK Fellow.

Program Outline

This program is aligned with the Lab's prestigious named Postdoctoral Fellow Program (Director's, Distinguished, Agnew, Metropolis and now with the Chick Keller Fellows in Earth and Space Sciences). Candidates must meet the fellows quality bar of the postdoctoral committee in order to be considered for the Chick Keller fellowship. CSES solicits postdoctoral research proposals from Los Alamos National Laboratory mentors for postdoctoral research on a new, independent, revolutionary scientific idea in the CSES focus areas. The emphasis here is on supporting new, emerging scientific areas rather than supporting postdocs in ongoing research areas.

- **Support is limited to 50% of the postdoc's salary in the first two years of the postdoc appointment. Third year support is limited to 25% of the postdoc's salary and is subject to a new proposal.**
- New postdocs or postdocs in their first year at Los Alamos are eligible. Preference will be given to new postdocs starting at Los Alamos.
- *While the proposed CSES work can be related to the research funding providing the balance of support to the postdoc, it cannot directly support tasks from the statement of work of that research funding.*
- **A Los Alamos National Laboratory Mentor must submit the proposal.** It is expected that the named postdoc provides a significant contribution to the writing of the proposal.

CSES strives to have a roster of ~8 CK Fellows at any one time, about 2 per focus area. Approximately 2-4 new CSES Postdoctoral Fellows can generally be funded each year, although this number will fluctuate with available funding.

Expectations

The postdoc is expected to present a technical seminar at LANL on the CSES funded work once per year, and to submit the presentation to CSES. In addition, CSES will collect project metrics once a year from each LANL PI through a fillable PDF form.

The LANL mentor is expected to have identified funding from other program resources prior to submission to the CSES Postdoctoral Fellow Program. For 3rd year postdocs a viable path to conversion is expected to be in place, with strong programmatic support, which is why the CSES support level drops to 25%.

3.3 Emerging Ideas Program

Small LANL project support. Frequency of call: 3 times a year

Emerging Ideas Program Development Call
Emerging Ideas Research & Development

Call Submissions:

Round one - September 7, 2018 for October 9, 2018 Start

Round two - January 11, 2019 for February 4, 2019 Start

Round three - May 10, 2019 for June 3, 2019 Start

Selections: Up to 3 selections a year (every four months, see above).

Program duration: 3 or 6 Months, need to be completed in FY19

Every 4 months CSES will assess its stock of received proposals and make selections based on number of proposals received and/or new funds becoming available.

At each selection date, proposals will be divided into three categories:

1. Fund Now – these will go forward immediately
2. Defer – these will remain on the books and be considered again and the next selection date together with any new proposals received.
3. Do not fund – proposal is denied and can only be submitted again after a significant re-write.

3.3.1 Emerging Ideas Program Development

The Emerging Ideas Program Development Program (EI-PD) is funded out of the CSES G&A portfolio and **cannot** be used to support technical work.

Program Outline

CSES solicits proposals for three or six-month studies that support activities such as proposal writing, white paper idea development, literature searches, small equipment purchases, publication costs, collaborative visits, and teaming activities such as support for proposal team meetings.

We further invite proposals that meet the requirements laid out in the Lab's Pathfinder Fund Call, specifically projects that catalyze innovation in the CSES Science discipline areas, aimed at enhanced program development enabled by technology demonstration. Again, no research development can be undertaken in these projects, as the objective is to demonstrate performance for existing technologies, not to develop new technologies.

While proposals along the lines of this call's focuses science topics are encouraged, the program element is open to all new ideas relevant to the CSES discipline areas.

Funding maximums are \$20K for a 3-month and \$40K for a 6-month study, and the program is open to Los Alamos National Laboratory Technical Staff Members and/or Los Alamos National Laboratory postdocs.

We anticipate that 4-6 EI-PD studies may be supported throughout the fiscal year, although this number will fluctuate depending on available funding.

Expectations

CSES will organize one afternoon session for the presentation of all Emerging Ideas projects in each focus area. Reports and/or presentations and copies of any proposals submitted need to be sent to CSES. In addition, CSES will collect project metrics from each PI through a fillable PDF form.

3.3.2 Emerging Ideas Research and Development

The Emerging Ideas Research and Development Program (EI-R&D) is funded out of the CSES LDRD portfolio and can be used to support technical work.

Program Outline

CSES solicits proposals for three or six-month studies that support small but crucial projects in support of new, high-risk ideas, feasibility studies or other basic R&D in support of upcoming proposal opportunities across the spectrum of LANL programs, and in the CSES Focus Areas. Scientific feasibility analyses are reserved for revolutionary scientific ideas that are mission relevant, at their early stage of development, and involve a multi-disciplinary approach.

While proposals along the lines of this call's focuses science topics are encouraged, the program element is open to all new ideas relevant to the CSES discipline areas.

Funding maximums are \$30K for a 3-month and \$60K for a 6-month study, and the program is open to Los Alamos National Laboratory Technical Staff Members and/or Los Alamos National Laboratory postdocs.

We anticipate that 8-10 EI-R&D studies may be supported throughout the fiscal year, although this number will fluctuate depending on available funding.

Expectations

CSES will organize one afternoon session for the presentation of all Emerging Ideas projects in each focus area. Reports and/or presentations and copies of any proposals submitted need to be sent to CSES. In addition, CSES will collect project metrics from each PI through a fillable PDF form.

3.4 Large University Program

Frequency of call: Three yearly in step with CSES LDRD cycle (FY18, FY21, FY24...)

Not offered in FY19

However: PI's are encouraged to plan ahead for a submission to this program element by building new relationships with prospective university partners through the Student Fellow Program (Section 3.1).

Program Outline

The CSES research portfolio is funded by a single LDRD-DR sized proposal that is re-competed every three years. In each cycle, the overall scientific goals for the CSES science disciplines will be renewed, and the science areas themselves will be up to review with disciplines changing or being updated. The start of a new CSES cycle offers the opportunity for new and exciting science thrust areas to be highlighted, in step with or ahead of the LANL strategic planning landscape.

Each CSES discipline will have the opportunity in this program to propose for a single, large three-year project that addresses a discipline science thrust area as identified in Section 2. This large program will be structured around 2-3 Student Fellow Programs (See Section 3.1) involving an intensive collaboration with a single university. Total budget is not to exceed 180K/year. This project can involve up to three LANL Investigators (one of them identified as Project lead) and up to three University Investigators.

It is anticipated that at most 1-2 Large University Programs will be awarded in each 3-year cycle, with at most one Large University Program per CSES science discipline. Note that for the science discipline that gets awarded a Large University Program no normal Student Fellow Programs will be awarded in the same year.

Expectations

The main purpose for this program element is to establish new and significant university partnerships in new areas of research that LANL wants to develop. The goal is to provide access to LANL to areas of scientific expertise that are weak or lacking at the lab but for which there is a clear strategic need.

The Project Lead is expected to present progress in the form of a seminar per year, given to an audience of their peers and relevant lab management and program directors.

Seminars presented by the Student fellows are preferred, and depending on the scope of the project more than a single seminar is encouraged.

Seminar presentation need to be send to CSES. In addition, CSES will collect project metrics once a year from each PL through a fillable PDF form.

4 PROPOSAL PROCESS

4.1 Proposal Preparation

4.1.1 Student Fellow Program

Cover Sheet. Please use the CSES fillable PDF cover sheet, available at <http://www.lanl.gov/projects/national-security-education-center/space-earth-center/assets/docs/cses-proposal-cover-sheet.pdf>

Main Body Use the following formatting outline for the main body; *please limit to five total pages* of text and figures (for Sections I through VIII), plus one budget page and biographical sketches:

- I. Theoretical, numerical, or experimental activity
- II. Methods used, history of problem, scientific debate, hypotheses to test
- III. Any relevant leveraging or necessary coordination, e.g., other projects or facilities
- IV. Resources to be used in the project such as resources at Los Alamos National Laboratory, at the University, if relevant
- V. Statement of Work
 - i. Tasks to be performed
 - ii. Milestones
 - iii. Schedule of visits at Los Alamos National Laboratory
- VI. Proposing Team
 - i. Role of University Principal Investigator
 - ii. Role of LANL PI, including efforts at mentoring
 - iii. Role of graduate student
 - iv. Other participants
- VII. Significance and timeliness
 - i. How does this research support the CSES Focuses science topics?
 - ii. What is the significance of the project? Why Now? Who will use the results?
- VIII. References
- IX. Budget summary (1 page max). PEM sheets not required. Totals by fiscal year and cumulative for multiyear projects. Not to exceed \$60K/year.
 - i. Support for the University Student Researcher to spend a significant fraction of the year at Los Alamos.
 - ii. Support for the Los Alamos PI to devote a significant fraction of his time to the collaborative research project.
 - iii. Support to the University PI to visit LANL
 - iv. Other Travel
 - v. Supplies & Equipment, including Computer usage costs
- X. Biographical sketches of PIs including already identified graduate student, ~1 page each. Note: Identification of a named student is desirable but not essential for top tier selection

4.1.2 Chick Keller Postdoctoral Fellow Program

The Chick Keller Fellowship application will be administered through the Los Alamos Postdoc Program in an analogous manner to the already existing named Postdoctoral Fellow programs (Director's, Agnew, Metropolis). Please prepare a normal Postdoc Named Fellows package as outlined by LANL's PostDoc program.

In addition: As part of your submission you are required to submit a one-page justification memo on how the proposed research contributes to the focused science topics of CSES.

4.1.3 Emerging Ideas Program

Cover Sheet. Please use the CSES fillable PDF cover sheet, available at <http://www.lanl.gov/projects/national-security-education-center/space-earth-center/assets/docs/cses-proposal-cover-sheet.pdf>

Main Body Use the following formatting suggestions for the main body; *please limit to two total pages* of text and figures (for Sections I through V), plus one page biographical sketches:

- I. Statement of problem to be addressed (please indicate any time constraints, e.g. proposal deadlines).
- II. Statement of Work
- III. Significance and Timeliness
- IV. Which targeted funding opportunity does this work support
- V. Short budget justification. PEM sheets not required.

4.1.4 Large University Program

Since this program element consist of essentially three bundled Student Fellow Programs, the proposal guidelines are the same as for the Student Fellow Program, with the following changes / additions:

1. The main body of the proposal can be up to 10 pages.
2. Budget justification can be up to 2 pages
3. The project should have a LANL and University Lead PI but can include up to two additional LANL and two additional University Co-Is.
4. The LANL lead PI takes responsibility for the overall execution of the program and submits the proposal.

4.1.5 General Instructions

While CSES supports publication page charges, such charges are NOT to be included in the proposed budget. PI's are asked to send an email to the CSES director requesting funds on an as needed basis to cover publication page charges.

4.2 Submission process

Proposals (one PDF for cover page, one PDF for main body including budget) must be submitted by email to CSES, to be received by the proposal's program element deadline.

1. Student Fellow program Apr 20, 2018|
2. Chick Keller Postdoctoral Fellow Program
Follows the Quarterly Postdoc committee Meeting Schedule. Upcoming dates:
May Q: April 4 2018
August Q: July 5, 2018
December Q: October 24, 2018
3. Emerging Ideas Program
Round one: September 7, 2018
Round two: January 11, 2019
Round three: May 10, 2019
4. Large University Program Not Offered

NOTE: All Student Fellow, Emerging Ideas and Large University proposals must be submitted to CSES through the Los Alamos Principal Investigator from their LANL email account. Chick Keller Postdoc packages are submitted to the LANL postdoc office.

Please mark the subject line of your email with the program element and science discipline area, for example:

Subject: CSES Student Fellow/Astro Proposal Submission

Send to: cses@lanl.gov with copies to the appropriate discipline leader:

- Astrophysics and Cosmology: Hui Li; hli@lanl.gov
Chris Fryer, fryer@lanl.gov
- Space Science: Geoffrey Reeves; reeves@lanl.gov
- Geosciences: David Coblentz; coblentz@lanl.gov
- Climate: Keeley Costigan; krc@lanl.gov

A confirmation of receipt will be sent by email to the Principal Investigators of each proposal.

4.3 Review Process

4.3.1 New Proposals

All new proposals undergo peer review. There is a separate review panel for each discipline area, which consists of the Focus Lead and his/her team (typically 2-3 LANL

staff), and which is augmented by 2-3 external review members of subject matter experts primarily from academia when needed (no external members for the Emerging Ideas program element).

Reviewers are given a set of questions to address, i.e., concerning scientific merit, balance of risk versus innovation or importance, depth of multi-institutional collaborations, growth potential of research topic, quality of participants, and budget.

In preparing proposals, PIs should be aware of the following reasons why some proposals are rejected:

1. The proposal was good but could not be funded because of insufficient CSES funds.
2. Objectives and background are unclear or inadequately argued.
3. Ideas are not innovative.
4. Methods are inadequately described or do not reflect state-of-the-art.
5. Approach is not convincing enough to satisfy the objectives.
6. For research proposals involving University-LANL collaborations, collaborations are weak.
7. Important and relevant Los Alamos National Laboratory facilities are not considered or exploited.
8. Lack of commitment by the Los Alamos National Laboratory Principal Investigator to the research or mentoring process.
9. Subject matter is not relevant to CSES's and Institutional scientific interests or Laboratory research priorities.

Notification of proposal award will be made according to the schedule for the program element as outlined in Section 0. For proposals utilizing the following fiscal years funding, please be aware of the budget caveats (Section 4.4).

4.3.2 Renewals

All multi-year proposals need to undergo a review process at the end of each fiscal year (typically in August/September). The review shall consist of a formal technical seminar given at LANL by the CSES student or postdoc, optionally together with their respective LANL and/or University PIs. The only restriction is that the CSES director and the respective focus leads are available to attend the Seminar.

Student renewal proposals going into their second year of work are generally approved, as it is often unrealistic to expect results early in the project.

Renewal is normally denied for the following reasons:

1. There are indications from the LANL PI or Discipline Focus Leader that collaborations are ineffective or little progress is being made.
2. Departure of student or postdoc from the project.
3. Departure of the University PI if no substitute can be found.

4. Departure of the LANL PI if no substitute can be found.
5. Funding cuts beyond CSES control (see section 4.4).

Notification of project renewal will be given within a week of the seminar. For proposals utilizing the following fiscal years funding, please be aware of the budget caveats (Section 4.4).

4.3.3 Conflict of Interest

CSES is committed to a fair review process and will adopt guidelines similar to those used in the Lab's LDRD proposal review process. In addition:

1. CSES Director and Focus leads are not allowed to submit or be part of CSES proposals.
2. CSES External Advisory Committee Members may not be external reviewers if their institution is a University partner on any of the CSES proposals in a given discipline area.

4.3.4 Written Proposal Feedback

All CSES proposal that are not successful will receive a short written email feedback within a few weeks of review. Unsuccessful PIs are encourage to discuss their proposal with their respective Focus lead to develop strategies that can lead to a successful future CSES submittal.

4.4 Budget Caveats

CSES will make every effort to honor the budget requests in the original proposal. However, CSES is dependent on budget resources that at most are known for the current fiscal year only. The CSES research portfolio is funded by the Lab's Laboratory Directed Research and Development Program (LDRD), which is subject to Congressional approval. Thus, CSES project funding will always be subject to available funding to the Center.

New or renewal proposal awards will always be subject to some uncertainty on the available funding. This can lead to awards with a reduced budget, or in the worst-case award cancellation. CSES will inform awardees of final proposal budget as soon as the next year's budget is known, typically within a few weeks of the start of the fiscal year (October).

CSES assumes that the proposal cost is accurate and when a project is approved for funding CSES expects the out year budgets to be as originally proposed and approved. Requests for changes in funding must be well justified and will be considered on a case-by-case basis.

4.5 Miscellanea

4.5.1 Authority to start work

Because all CSES funding is dispersed at LANL any work by A LANL PI or postdoc can only start once a valid program code has been established for the project. University student visits cannot commence before that time.

For the rare cases where a project involves a University subcontract work cannot begin until the Los Alamos contracting officer formally authorizes the initiation of work. There will likely be a delay of about two months (no earlier than December 1 of a given year) when the “start work” order is issued. Invoices submitted for work conducted prior to the “start work” order will not be reimbursed.

If your Student Fellow / Large University project involves a subcontract you are encouraged to start the subcontract process as soon as possible in order to have the subcontract in place at the beginning of the fiscal year.

4.5.2 Security considerations

Classified work is not supported under the Student Fellow Program or the University Large Program.

4.5.3 Policy regarding prejudice and bias

There is no prejudice based on race, gender, or nationality, for PI’s, postdocs, and students.

4.5.4 Further information

CSES Center: ces.lanl.gov
CSES general email: ces@lanl.gov (preferred)

Melissa Martinez, Professional Staff Assistant: melissamtz@lanl.gov , 505- 665-0391
Reiner Friedel, Director, rfriedel@lanl.gov, 505-695-8894