Chick Keller Postdoctoral Fellowship

The additional required memo included in a Chick Keller Postdoc Fellow candidate package provides you the opportunity to highlight the research the candidate will be doing, and specifically how it aligns with one or more of the research areas and their Focused Science Topics identified below.

- **Astrophysics and Cosmology** - with the goal of advancing theoretical, modeling, computational and experimental sciences to address fundamental questions in astrophysics and cosmology, and to map such capabilities to weapon physics (e.g., nuclear physics, radiation hydrodynamics, plasma physics, magneto-hydrodynamics, uncertainty quantification) and national security (e.g., nuclear detection, transients, sensing, imaging).

A. It is strongly encouraged that proposals exploit unique resources at Los Alamos National Laboratory which include:
   1. Facilities such as the HAWC gamma-ray observatory.
   2. Computational techniques, simulation codes and resources.
   3. Broad knowledge base in a full range of physics that tie together theory, simulation, experiments, and observations.

B. Specific Topics for 2017:
   1. Understanding Astrophysical Transients. Bursty and explosive events produced by different types of stars and black holes are providing very useful clues on understanding the origin and evolution of such objects and their feedback on their surroundings. These include (but not limited to) stellar flares, bursts from neutron stars, supernovae, gamma-ray bursts, tidal disruption events, gravitational wave events, flares from jets and outflows of black holes, formation of first stars, etc. Studies utilizing observational, theoretical and numerical approaches to improve our understanding of such systems are encouraged.
   2. Developing New Astronomical Instrumentation. New techniques in astronomical instruments are essential for discoveries. Feasibility studies of exploratory ideas and concepts for both ground-based and space-borne instruments are also encouraged.
   3. Probing Fundamental Physics. Astronomical observations can provide important constraints on understanding the fundamental physics problems such as dark matter, dark energy, neutrino physics and nucleosynthesis. Advancement in interdisciplinary areas will be especially critical in making progress on these challenging problems.
Observational tests of theoretical ideas are encouraged as well.

- **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.

  A. 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:

    1. LANL satellite experiments
    2. LANL satellite data
    3. LANL space science computer simulation codes, and algorithms.

  B. Specific Topics for 2017:

    1. Novel techniques. Understand complex, heterogeneous observations from or about space.
    2. Cube/Nano-sats. Research utilizing cubesats, nano-sats, and satellite constellations or research enabling design of such missions.
    3. Instruments/Measurements. Development of novel instrument and/or measurement techniques for space science or of systems that help characterize objects in space

- **Solid Earth Geoscience** - 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 of applied problems including natural hazards, repository science, natural resources and nuclear monitoring. We include terrestrial planets and similar solar system objects under "solid earth geoscience."

  A. In general, the geophysics focus area supports basic and applied research concerning planetary surfaces and interiors, including numerical, experimental, and field studies of the structure, properties, processes, and dynamics of terrestrial planets. It is strongly encouraged that proposals exploit unique resources at Los Alamos National Laboratory which include:

    1. Los Alamos National Laboratory high-performance computing
resources
2. The Los Alamos Neutron Science Center (LANSCE)
3. Geochemical analyses facilities resident in EES and C divisions
4. 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.

B. Specific Topics for 2017:
1. Geodynamics. The state of stress in the crust, earthquake seismology and seismotectonics, including rupture processes, rheology and friction of fault zones, and earthquake clustering. Understanding critically stressed faults and their use for mitigating seismic hazard.
2. Geomaterials. Strain localization, dynamics and elasticity of Earth geomaterials, Exploiting low-temperature thermal evolution of geomaterials or effects of ionizing radiation on geomaterials.
4. Quantitative Geomorphology. Dynamic interactions between climate, tectonics, and surficial and/or atmospheric processes. Quantitative geomorphology - including mechanics of erosion, biogeochemistry of permafrost thaw, and ecological feedbacks to climate change on all time and space scales. New techniques in passive (imaging) or active (e.g., lidar, radar) remote sensing and digital data analysis that can be used to quantify the geomorphology and aid in the construction of geologic frame work models for use in numerical modeling.

- **Climate Science** - with the goal of advancing and integrating theoretical, modeling and simulation with observational and experimental sciences that push the frontiers of predictability of weather/climate, its variability and its response to anthropogenic forcing, and to understand how to strengthen the resilience of interdependent infrastructure, both in todays and in future climate states.

A. It is recommended that proposals exploit unique Los Alamos National Laboratory resources, which include:
1. High performance computing
2. DOE sponsored process-resolving to global scale models (e.g. COSIM, ACME, and CESM) and data sets (e.g. ARM, ASR, NGEE/GoAmazon, and future campaigns and instruments)
3. Climate monitoring systems and sites in the arctic, tropics, and southwest
4. Models and data of climate change impacts on human systems

B. Specific Topics for FY17:

1. Polar Climate. Fundamental understanding of processes that lead to hydrological, land, and ocean changes and rapid retreat of sea ice, glaciers, and permafrost in Polar Regions. Arctic and Antarctic monitoring, including the release of CO2 and CH4 from tundra and ocean warming, for early detection and simulations to forecast tipping points. Studies that enable enhanced, high-resolution, coupled ocean-atmosphere-cryosphere-land models that are informed by observations, coupled physical-human system models, or increased predictability.

2. Impacts of Climate Change.
   a. Disturbance. Impacts of climate change on disturbances, such as drought, fire, floods, insects, and pathogens on ecosystems and feedbacks back to the climate system by landscape disturbances. The impacts of ecosystem response to climate change on water, carbon, and volatile organic aerosol precursor fluxes and the atmospheric feedbacks they trigger in the climate system. Development of coupled climate-carbon models in the tropics, including multi-scale observations (ground to satellite) of the tropical forests, greenhouse gases, and aerosol fluxes as well as shifts in the hydrological state.
   b. Coastal Zone. Assessments of impacts of climate change and sea level rise on shoreline erosion, sediment transport, storm surges, and waves, fall in this focus area. Studies of climate change impacts on habitat, ecosystems, water quality, ocean circulation, and ocean biogeochemistry. Next generation sensors, networks and platforms for climate change signal and process discovery and analysis. Forecasts of regional sea level rise and changes in storm and hurricane frequency and intensity in the coastal zone.
   c. Infrastructure. Impacts of regional and local climate change on people, natural resources, and transportation, energy, water, and other critical infrastructures. Resilience and adaptation to climate change, including the relationships between adaptation, economics, and climate uncertainty. Studies of remote sensing of infrastructure networks and vulnerabilities and studies of data fusion, including addressing disparities of spatial and temporal scales. Coupling of infrastructure to human and natural systems in models and the simulation of active climate adaptation strategies.

3. Greenhouse Gas Monitoring for Emissions and Climate Feedback Verification. Development or deployment of next generation sensors, networks, and platforms for emissions and fate of greenhouse gasses, including novel signature discovery for source attribution, new instrument capability (e.g. isotopes in the field), data analysis, and data fusion and reconciliation from
diverse observation systems. Proposals to understand the sources, sinks, transport, and evolution of GHG and aerosols in the atmosphere or better represent them in models. Transport modeling to infer fluxes from atmospheric observations, direct flux measurements and uncertainty quantification studies of greenhouse gas fluxes. Crosscutting themes that connect topic area (3) with focus areas (1) and (2) are encouraged.