Identified Research Areas
Agnew and Metropolis Postdoc Fellow

Agnew National Security Postdoc Fellow

• Advanced Engineering Analysis – Explore finite element analysis, with an emphasis on the development of techniques that incorporate plasticity, creep, and damage. The selected candidates will also support experimental activities to characterize relevant mechanisms and validate constitutive models.

• Advanced Hydrodynamics – Design, develop and field experiments in advanced hydrodynamics including magneto-, radiative and fluid driven instabilities, mixing processes involving condensed matter, fluids and plasmas, and turbulence.

• Computational Astrophysics – Development and application of sophisticated computational model to the investigation of fundamental issues in stellar astrophysics from star formation through stellar end states.

• Computational Fluid Dynamics – Developing and testing a wide variety of models, from LES to unsteady RANS, capturing turbulence and turbulent mixing of different fluids under extreme conditions.

• Dynamic Material Properties and Shock Physics – Develop advanced experimental techniques and new diagnostics to support research in multi-phase thermodynamic properties, equations-of-state, and dynamic constitutive properties of materials including flow stress and phase aware strength, kinetics, and damage properties for metals, polymers, foams, and high explosives.

• High Energy Density Physics (HEDP) and Inertial Confinement Fusion (ICF) – Design and analyze complex HEDP/ICF experiments using radiation-hydrodynamics simulations; design, execute, and analyze complex experiments at the world's largest laser facilities; design, build, field, and interpret advanced diagnostic instrumentation that measures fusion products, x rays, or gamma rays; and inertial fusion energy system design.

• High Explosive and Detonator Technologies – Design and engineering, modeling and simulation, and testing of explosive systems and the application of explosive engineering to issues in Stockpile Stewardship; including ultra high speed testing and diagnostics, initiation and detonation technologies.

• Magneto-Hydrodynamics – Develop 3D MHD simulation techniques for application to condensed matter, warm dense matter and strongly coupled and conventional plasmas including design, simulation and analysis new experiments and simulation and analysis of exiting experimental results.
Agnew National Security Postdoc Fellow (continued)

• Nuclear Physics and Neutral/Charged Particle Transport – Experimental and computational investigation of nuclear and thermonuclear processes resulting in improved models for burn and reaction product transport.
• Plasma Physics – Investigation of fundamental plasma physics questions at small and intermediate laboratory scale with emphasis on energy equilibration mechanisms, radiation–plasma interactions, and the property and behavior of warm dense matter.
• Radiographic Technology for Hydrodynamic Testing – Develop and field advanced radiographic techniques such as continuous imaging at 50 MHz (and higher) rates, as well as new or enhanced techniques for image analysis that may complement Bayesian methods.

Nicholas C. Metropolis Postdoc Fellow in Computational and Computer Sciences

• Research into complex, multiphysics, integrated numerical simulations and algorithms, including efficient use of advanced architectures for multiphysics codes.
• Development, validation, and incorporation of new physics and engineering models for integrated codes. These models include research into fluid mechanics, turbulence, microscopic and macroscopic models of material properties, warm dense matter, high explosives, plasma, nuclear, and atomic physics, and the transport of particles and x-rays.
• Development and application of fundamental physics codes to investigate relevant physics phenomena in these disciplines, including efficient use of advanced architectures.
• Verification and validation methodology and application, including development of a technically rigorous foundation to assess the confidence of simulation code results.
• Computer science and system development, including emerging technologies and investigation of advanced architectural concepts, system software, programming models, advanced storage and networking technologies, system and application resiliency, and numerical algorithms; system and application co–design for emerging technologies.