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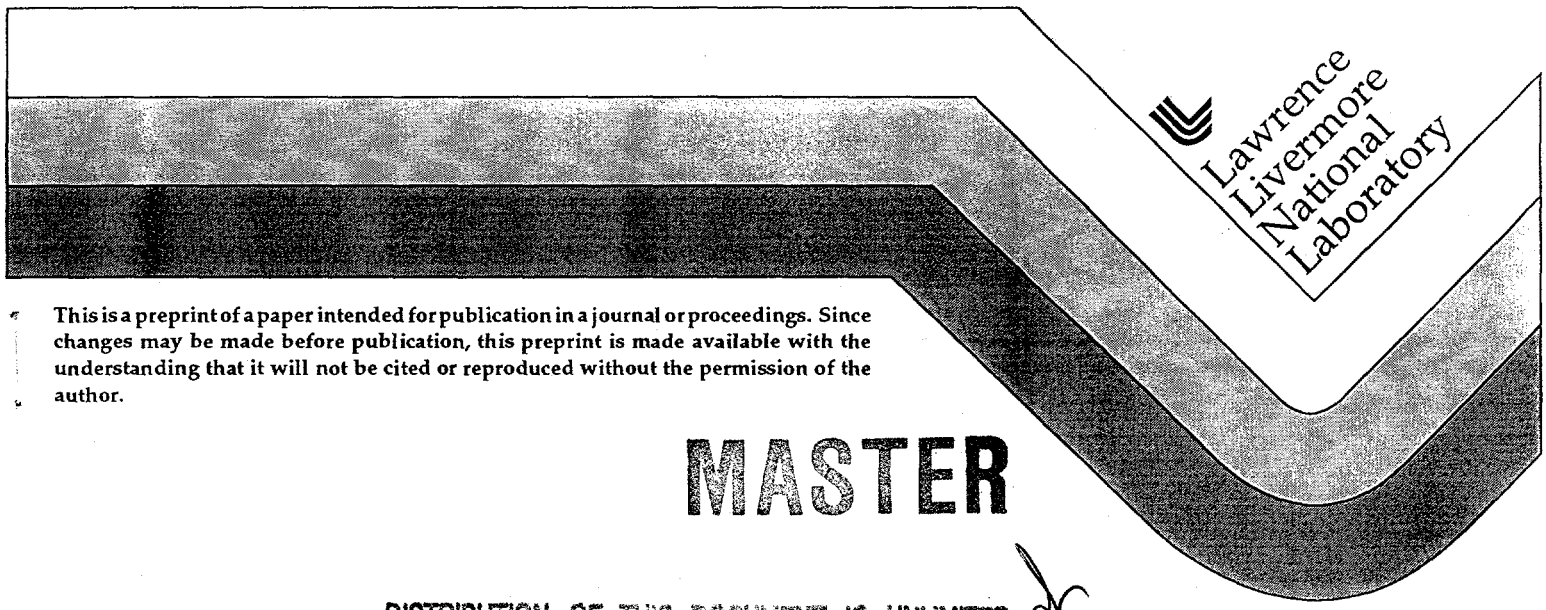

RESEARCH COLLABORATION OPPORTUNITIES AT LAWRENCE LIVERMORE NATIONAL LABORATORY

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Abstract:

The Lawrence Livermore National Laboratory (LLNL) is a major research facility within the Department of Energy (DOE) complex. LLNL's traditional mission is in Defense Programs, including a significant effort in non-proliferation and arms control. In terms of disciplinary areas, over 50% of our present research efforts are in the fields of large-scale computing, high energy-density physics, energy and environmental sciences, engineering, materials research, manufacturing, and biotechnology.

The present decade presents new challenges to LLNL. Many factors have influenced us in modifying our research approach. The main driver is the realization that many scientific problems in our mission areas can best be solved by collaborative teams of experts. At LLNL we excel in physical sciences, but we need the expertise of many others, beyond our established areas of expertise. For example, to find an acceptable solution to reduce earthquake damage requires contributions from engineering, soil mechanics, hydrology, materials sciences, Geosciences, computer modeling, economics, law, and political science. In the pursuit of our mission goals, we are soliciting increased research collaborations with university faculty and students.

The scientific and national security challenges facing us and our nation today are unprecedented. Pooling talents from universities, other research organizations, and the national laboratories will be an important approach to finding viable solutions.

Mission of the Lawrence Livermore National Laboratory

Our mission is to serve as a national resource in science and engineering. Our foci are on national security, energy, the environment, and Bioscience, with special responsibility for nuclear weapons.

LLNL's mission has always been to support the national needs of the United States Government. Emphasis has changed over the life of the laboratory. On the eve of entering our 45th anniversary, our Director has outlined the Core Values to guide us to the twenty first century and beyond.

Our Core Values are:

- Integrity in maintaining the highest ethical standards in science and technology,
- Excellence in creating innovative solutions to complex problems by attracting and encouraging the best available talents, and
- Commitment to meeting the goals and requirements of our customers, focusing our science and technology on national objectives[1].

The University Relations Program is set up to encourage and enhance collaborative research opportunity between LLNL and the University community. Organizations at LLNL specifically set up to welcome University research participation are the Institutes and Centers.

Institutes and Centers

There are four Institutes at LLNL, each focused on a discipline or around a facility. One of the major functions of an institute is to establish and strengthen collaborative research relationships with academic researchers. This is mostly a person(s) to person(s) relationship where the Principal Investigators at the university and LLNL share common interest in areas that provide mutual benefits. The project scale is often small. Funding is typically around $25K per year, sufficient to support the stipend of a graduate student and the associated expenses in carrying out the research project. For more information on opportunities for this type of collaborative research or to locate a potential collaborator at LLNL, please contact the Directors of these institutes.

The Institute of Geophysics and Planetary Physics (IGPP) is a branch of the UC Systemwide Multicampus Research Unit. Their research efforts are on Astronomy, Astrophysics and Geosciences. Each February a Call for Proposals goes out to the UC soliciting proposals for competition. The IGPP Director is Dr. Charles Alcock (510-423-0666), email address: alcock@igpp.llnl.gov

The Institute for Scientific Computing Research (ISCR) focuses its efforts on computer modeling and other scientific computing. Their Call for Proposals goes out in April. The ISCR Acting Director is Dr. Dennis Hewett (510-422-5432), email address: dhewett@llnl.gov

The Center for Accelerator Mass Spectrometry (CAMS) is a unique facility that measures minute quantities of specimens in Archaeology, Toxicology, Radiochemistry, Climatology and other fields. This Center also has an active collaborative research program. For information, please call the Acting Director, Dr. Ivan Proctor (510-422-4520) email address: idproctor@llnl.gov

The Institute for Laser Science and Applications (ILSA) is a new institute. In FY97 it plans to start a collaborative research program and hold workshops with university investigators. For information, please call the Acting Director, Dr. Hector Baldis (510-422-0101) email address: baldis1@llnl.gov

The Center for Fluid Dynamics and Applications has an on going research collaboration program with universities. Please call Dr. Rose McCallen (510-423-0958) or email mccallen1@llnl.gov for details.

Other Research Opportunities

Science Use of Nova

This is the second year of a program intended to utilize the unique LLNL Nova laser facilities by the scientific community for high energy density science investigations. In 1996, there were nine successful proposals out of 18 submitted. A total of approximately 100 shots on Nova facilities were used under this program in its first year.

The Nova laser is a well-diagnosed, versatile laser facility that has been extensively used. With the recent refinement of the DOE mission regarding science, we are soliciting proposals from the scientific community for the use of Nova facility for science-based investigations. This program is principally intended for facility time on the Nova facilities at LLNL. A broader grants program intended to increase support for DOE's Defense Program's (DOE-DP) science in the U.S. is being developed by DOE-DP. For information on this broader program please contact Dr. Joseph Kilkenny (510-423-4213) or email to kilkenny1@llnl.gov

Proposals for a set of experiments on Nova in FY97 are invited. Criteria for acceptance will be scientific quality tempered by the practicality of quickly achieving a well-defined goal on the existing Nova facilities. Proposal review will be by an independent Program Advisory Committee to the Nova management. This committee will be chaired by, and composed of, scientists external to the LLNL program.

Short proposals (eight pages or less including the body of the proposal and supporting materials) for a series of experiments with up to 20 shots in FY97 should be sent to Bruce Hammel, LLNL, P.O. Box 808, L-473, Livermore, CA 94551,

Proposals should also contain requests for limited associated expenses (travel, per diem, special equipment). Investigators and associated personnel who come on site to use Nova will need to satisfy standard requirements to visit a DOE facility.

The Nova facilities include the Nova 10-Beam laser (30 KJ, 0.35 mm, 1-ns) and the Nova 100 TW (nominally 40 J, 1 mm, 400 fs) laser, which is now operational with a demonstrated irradiance of $1x10^{20}W/cm^2$. Points of Contacts are:

Astrophysics	— Bruce Remington	Remington2@LLNL.gov
Hydrodynamics and Implosions	— Gail Glendinning	Glendinning1@LLNL.
Atomic Physics	— Ted Perry	Perry15@LLNL.gov
Charged Particle Slowing	— Mike Cable	Cable@LLNL.gov
High Intensity Phys. ($>10^{19}$ W/cm^2)	— Mike Key	KTarlow@LLNL.gov
Imaging by X-Ray Laser	— Jim Trebes	Trebes1@LLNL.gov
Materials Physics	— Luiz DaSilva	DaSilva1@LLNL.gov

Massively Parallel Computing

LLNL believes that computing is an important tool in doing science, complementing the time-honored theoretical and experimental approaches. LLNL has always acquired the state-of-the-art scientific supercomputers to reach this goal. Computational scientists at LLNL have amassed an enormous amount of knowledge in the use of the most advanced scientific computers for numerical studies and simulations of highly complicated scientific processes.

The Cray T3D is a massively parallel processor (mpp) with 256 processors. The H4P system consists of a front-end machine - a CRAY Y-MP, and the actual parallel machine; data transfers between processors can be performed at 140 MB/s. There is a total memory of 16.9GB.

The operating system is the Unix Cray Operating System (UNICOS). There are 32 DA301 disks available for a total of 176 GB of external memory. The CRAY- Y-MP handles all disk resources and the T3D accesses disk through this front-end computer.

All programming activities, including the editing, compiling, and linking of programs, are done on the Y-MP host. The H4P system supports compilers for Standard C, C++, Fortran 77, Cray Fortran 77 , Fortran 90 and CRAY MPP Fortran. The number of processors required for a specific run must be specified. This must be a power of 2, the number of processors must be 2,4,16,...256. Programs can run interactively or in batch mode.

A Cray Total/View debugger is available. This is a source level debugger and has an X interface that contains features for debugging multiprocessor programs. An APPRENTICE performance tool is available. This tool helps to find and correct performance anomalies and inefficiencies in multiprocessing programs.

Short proposals (less than five page scientific text, a one page vita, and a one page budget) requesting computer time in performing scientific computing or to research for improving utilization of the machine using this array of machine is welcomed. Limited associated expenses, e.g., travel, per diem, phone line computer connection cost, and in some cases partial salary support of a graduate student or post doctoral fellow will be considered. For research opportunity and the names of potential collaborators at LLNL, please call Dr. Dennis Hewett (510-422-5432), email address: dhewett@llnl.gov

The Education Outreach Program

LLNL has a comprehensive Education Outreach program. Its main thrust is K-12 systemic improvement in Mathematics and Science education through teacher training. This office also serves as a front door to the graduate and under graduate student programs on site and at the campuses. A comprehensive guide on all the educational opportunities at LLNL is available from Mr. Barry Goldman (510-422-5177) or email to goldman1@llnl.gov

For general educational programs, research collaboration opportunities and general inquiries regarding university interactions, please call Chris Budwine at the University Relations Program office: 510-423-4476, email address: budwine2@llnl.gov

LLNL has extensive information on research opportunities and educational programs on the World Wide Web. Please consult this resource. Address is http://www.llnl.gov

Reference

1. Institutional Plan. FY1996 - 2001, Lawrence Livermore National Laboratory, (October 1995) UCAR 10076-14

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