

# Up Close: Center for Materials Science at Los Alamos National Laboratory

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*This article is part of a series focusing on the research capabilities and goals of interdisciplinary laboratories pursuing materials research in universities, industry, and government.*

Los Alamos National Laboratory (LANL) has extensive and diverse activities and programs in materials science and engineering. The Center for Materials Science (CMS) was established to promote scientific collaboration and scientific excellence in materials research and engineering throughout the Laboratory and with individuals and institutions outside the Laboratory. The Center's objective is to enhance the Laboratory's materials science and technology contributions to the nation's defense, energy, and scientific missions.

Consistent with its main objective, Laboratory resources supply the principal funding for CMS programs. Additional funding for individual scientific research programs conducted by CMS members comes directly from outside sources.

To carry out its responsibilities, CMS has accepted four demanding missions:

1. Build a core group of qualified and established materials scientists and solid state physicists.
2. Promote and support top-quality, interdisciplinary materials research programs at Los Alamos.
3. Strengthen the interactions of materials scientists at Los Alamos with the external materials science community.
4. Establish and maintain modern materials research facilities in a readily accessible, central location.

The core group of CMS members has a broad charter to advance materials science and technology in directions expected to have long-term impact on LANL's mission. The acting director is Don M. Parkin. In addition to the director, six members presently constitute the CMS. James L. Smith heads an experimental effort in superconductivity. U. Fred Kocks leads a group of internal and external collaborators in research on polycrystal plasticity and texture development. Fred M. Mueller is actively engaged in research on electronic structure in heavy fermion systems, ferromagnetic materials, and high temperature oxide superconductors. Ricardo B. Schwarz and collaborators are conducting research on the synthesis and properties of amorphous alloys formed by mechanical alloying, electrodeposition, and interdiffusion. Albert M. Clogston is leading a theoretical effort on modeling nonlinear local-

ization of vibrational energy in solids. Terry E. Mitchell has recently joined CMS to establish programs in electron microscopy and materials microstructure.

Additionally, the Bernd T. Matthias Visiting Scholar position adds an outstanding materials scientist from outside Los Alamos to CMS each year. The current Matthias scholar is Andrew V. Granato of the University of Illinois. Previous scholars were David Turnbull of Harvard and David Pines of the University of Illinois.

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CMS supports a broad range of interdisciplinary research programs that usually cut across LANL organizational lines and scientific disciplines. These programs, as well as the members' research, allow the Laboratory to be flexible in its response to and recognition of important developments in materials research. Encouraging many of the CMS-supported researchers to redirect their efforts to the development of high temperature superconductors is a case in point. The focus of interdisciplinary research includes programs on nonlinear phenomena in condensed matter, polymers, materials modification by ion irradiation, and laser materials interactions.

The Center pursues its mission of strengthening the interactions between Los Alamos staff and the external materials science community on several fronts. CMS sponsors collaborative research between university faculty and Los Alamos researchers on a number of topics, including computational materials theory, that take advantage of LANL's computing resources. Two summer research groups—electronic properties headed by John Wilkins of Cornell University and materials

science headed by William Nix of Stanford University—meet each summer for two weeks at Los Alamos to focus on an important current research topic and to interact with Laboratory staff. CMS also sponsors Laboratory visitors and collaborators and workshops, conferences, and seminars on materials science and related fields. During the past year, the Laboratory brought a total of 149 visitors to Los Alamos for scientific interactions, CMS sponsored six workshops, and researchers presented 81 seminars.

CMS is actively engaged in establishing and maintaining modern materials research facilities for use by the Laboratory's materials community and by appropriate outside collaborators. These resources include offices, meeting rooms, computing resources, and laboratory research facilities for visitors, collaborators, and LANL staff. The two most significant resources are the Electron Microscope Laboratory (EML) and the Ion Beam Materials Laboratory (IBML). CMS is planning a major upgrade of its EML with the addition of two state-of-the-art 300 kV electron microscopes: one configured for high resolution work and the other configured as an analytical and high penetration instrument. This dual approach satisfies the divergent requirements of the Los Alamos microscopy community and will make the EML a significant new Laboratory resource. IBML became fully operational early this year and is described in an accompanying article in this issue of the MRS BULLETIN.

The Laboratory welcomes interaction with the materials science community, and CMS plays a major role in facilitating this interaction. With its multifaceted approach, CMS enhances the role of materials science in LANL's missions and has nurtured the development of a new intellectual community at Los Alamos in materials science.

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