

OVERVIEW OF THE

Engineering

DIRECTORATE



Lawrence Livermore
National Laboratory

The primary mission of Lawrence Livermore National Laboratory is national security, but LLNL also provides research and development (R&D) expertise in energy, the environment, and strengthening the country's economic competitiveness. Achieving this mission involves balancing the demand for short-term deliverables with the need for long-term technical competencies—a balance achieved largely through the efforts of Engineering Directorate personnel. Organized into five divisions, Engineering's staff of engineers, technicians, craftspeople, machinists, and other technical and administrative specialists form the foundation for most work performed at the Laboratory. This is because 80 percent of Engineering employees have work assignments in a wide range of Laboratory programs. Thus, through our highly skilled workforce, Engineering plays a unique role in providing not only engineering standards for the Laboratory, but also a degree of continuity and stability. By helping the Laboratory accomplish its mission, Engineering defines and accomplishes its own:

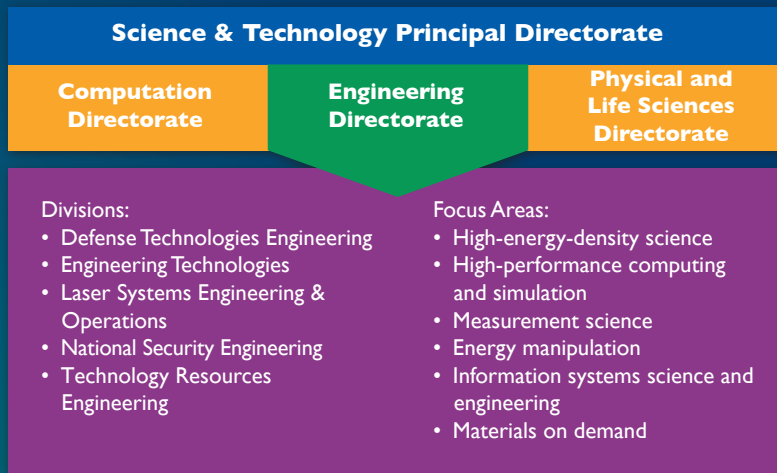
Enable program success today and ensure the Laboratory's vitality tomorrow.

As part of the Science and Technology Principal Directorate, Engineering undertakes projects with high techni-

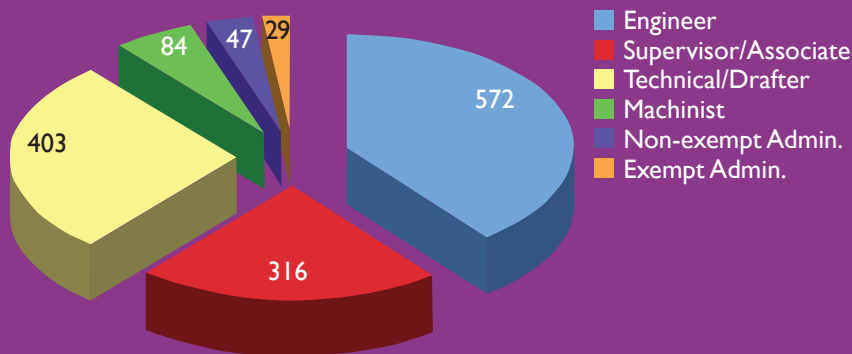
cal risk, integrates and extends technologies concurrently, and uses the extremes of both ultrascale and microscale to achieve results. We develop systems that push technologies to their extremes (such as very large and very precise at the same time). The thrust of our work reflects this competency:

- High-energy-density science
- High-performance computing and simulation
- Energy manipulation
- Information systems science and engineering
- Measurement science at extreme dimensionalities
- Materials on demand

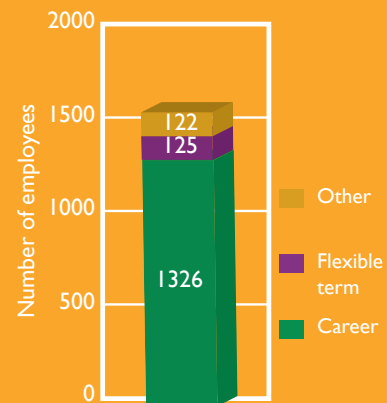
Engineering personnel have a hand in most of the Laboratory's deliverables, such as the engineering design for nuclear weapons or the design, fabrication, and installation of the target chamber, beampath infrastructure, and computer control systems for the National Ignition Facility. Our work emphasizes highly complex systems engineering that involves substantial technical risk. Engineering also designs, builds, and operates most of the unique experimental facilities at LLNL. In addition to reaching our programmatic milestones, we conduct multidisciplinary engineering R&D in broad-application technologies.

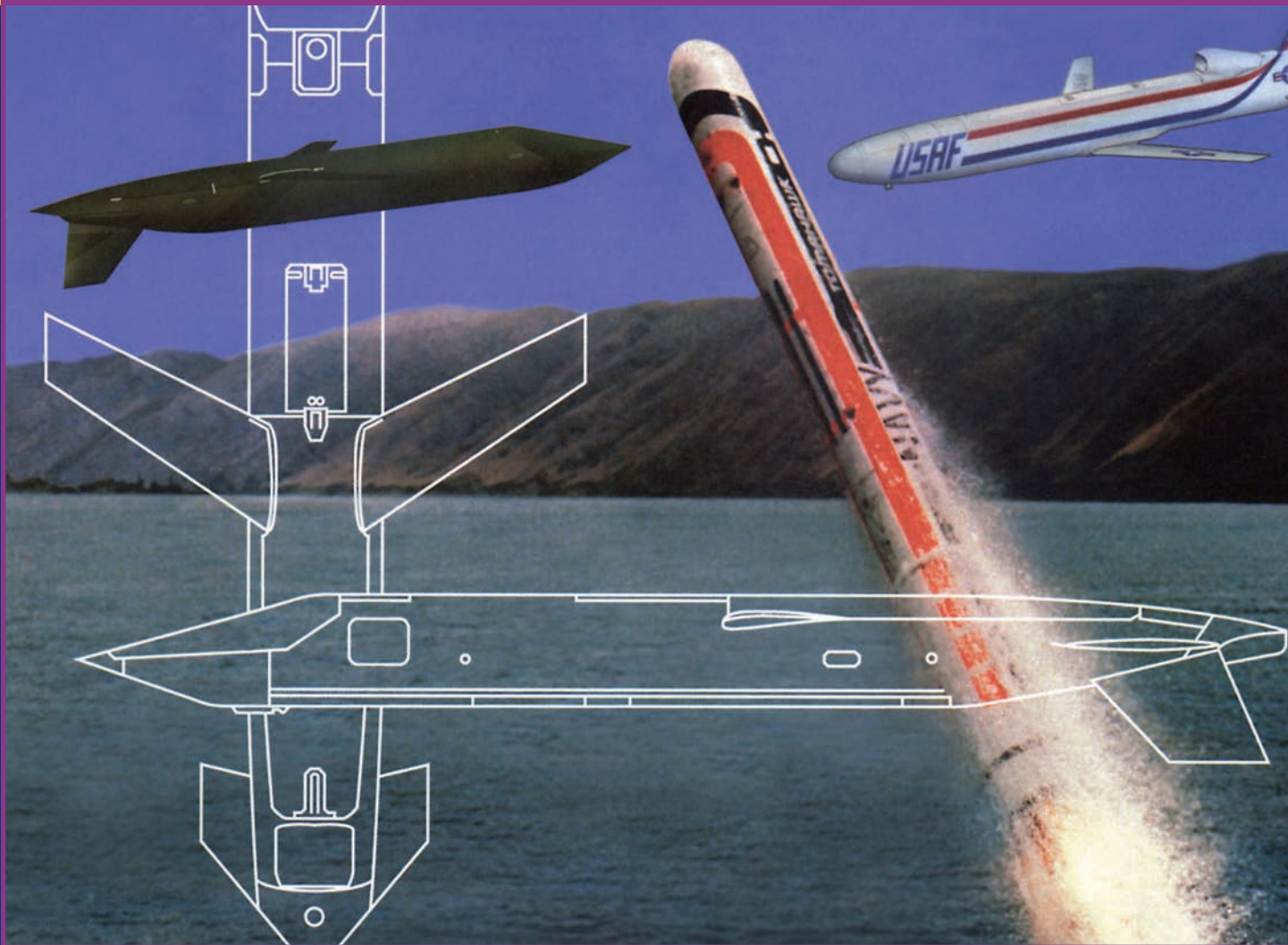


Engineering Core Population Classification Distribution

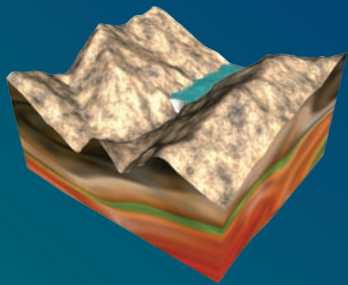


Engineering Total Population

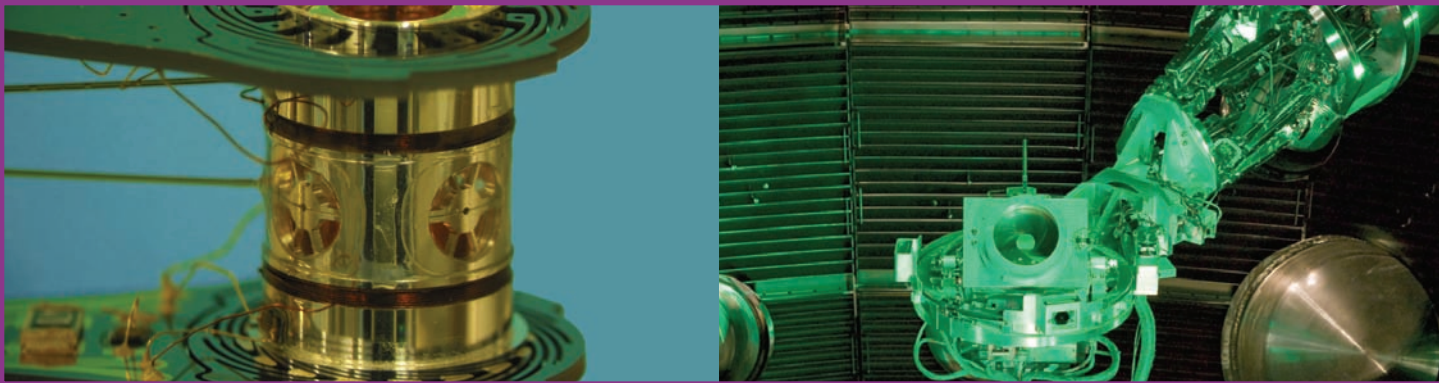
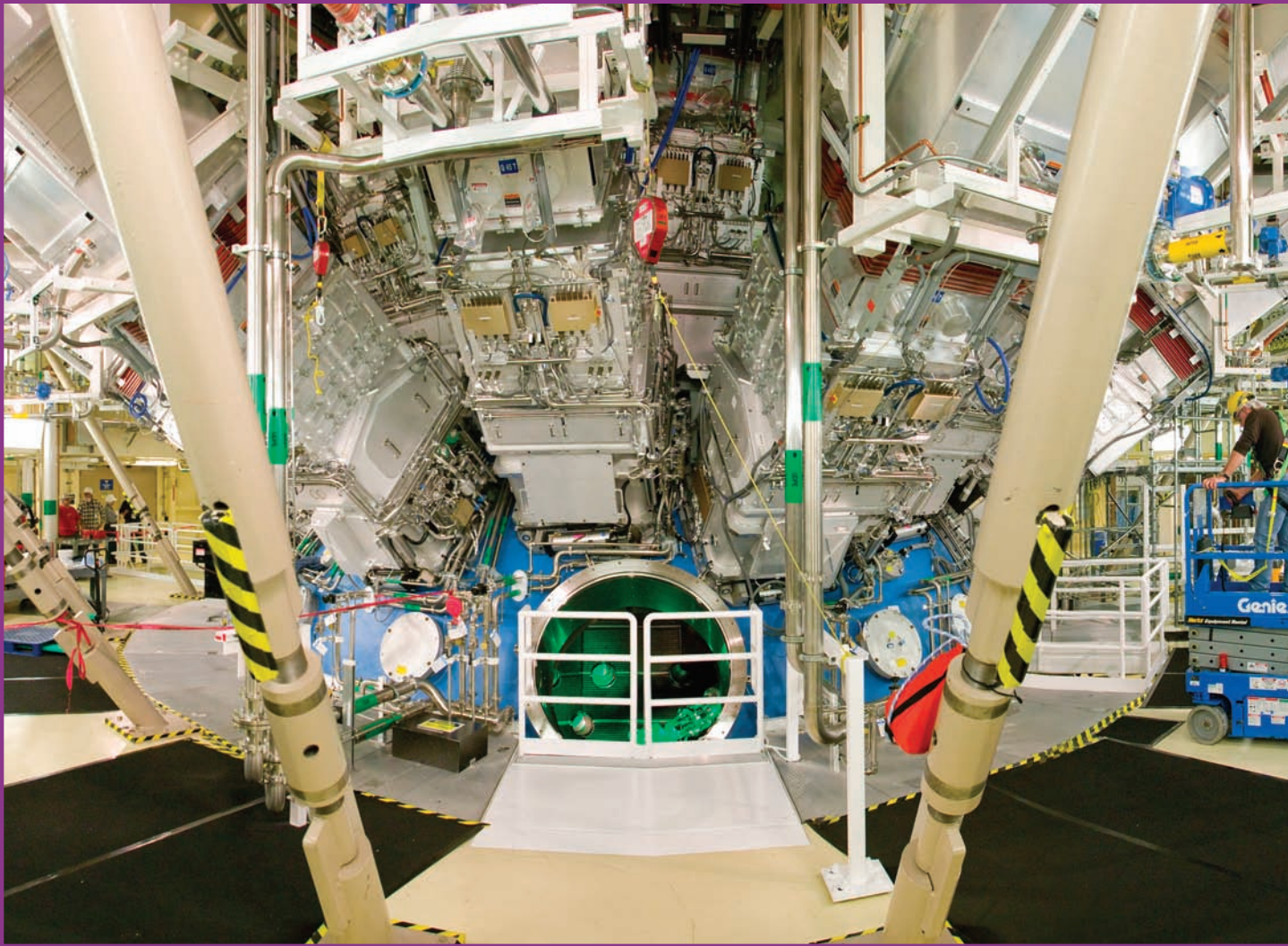




The Defense Technologies Engineering Division (DTED) provides engineering expertise in support of the Laboratory's nuclear weapons program and stockpile stewardship mission. The Laboratory's Nuclear Weapons Engineering Program, which is responsible for weapons engineering assessments and certification, weapon component surveillance, and weapon design activities to support the nation's enduring and future nuclear weapons stockpile, is managed through DTED. Core competencies include weapons engineering design and analysis, weapons system testing (ground and flight), engineering code development, field engineering support of high explosives and special nuclear materials testing, design and testing of initiation systems, program and project management, and emergency response. DTED personnel are working with the entire NNSA Nuclear Weapons Complex to transform the enterprise to be better, safer, faster, and smarter.



The mission of the Engineering Technologies Division (ETD) is to bring together core experimental and computational technologies, drive innovation, and advance applications in support of Laboratory programs. ETD nurtures key engineering disciplines of importance to multiple programs, promotes new R&D initiatives to transform engineering capabilities, and enhances the visibility and external recognition of the Engineering Directorate to facilitate recruiting and partnering. Innovative applications to which ETD has contributed include a proton radiotherapy accelerator, through-wall ultrawideband tomography for building interrogation, a compact reusable neutron generator, and precision engineering for high-energy-density targets for the National Ignition Facility (NIF). The division's core competencies include materials engineering, nondestructive evaluation, precision engineering, computational engineering, micro- and nanotechnologies, adaptive optics, and image processing.



Laser Systems Engineering and Operations Division (LSEO) provides multidisciplinary engineering support to LLNL's NIF and Photon Science Principal Directorate. LSEO personnel play vital roles in the design, construction, and commissioning of the NIF laser facility and the development of advanced laser technologies. Some of these technological developments include automated optics inspection, cryogenic target systems and target fabrication, automated alignment systems, and high average power and short-pulse laser technologies. In addition, LSEO personnel provide expertise in adaptive optics and high average power lasers to other LLNL programs. The division's core competencies include mechanical, electrical, and optical engineering design; system and project engineering; system integration; optical, optomechanical, and thermal analysis; optics fabrication and vacuum technology; pulsed power, controls, and diagnostics; operations; and construction and facility maintenance and operations.

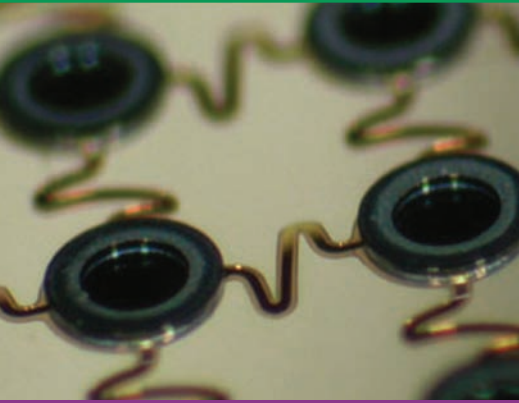


The work of the National Security Engineering Division (NSED) focuses on developing solutions to the challenges facing our nation in national defense, homeland security, energy, climate, and fundamental physics research. NSED provides a broad spectrum of programs with multidisciplinary, state-of-the-art engineering expertise including control and software engineering, pulsed power, digital signal processing, intelligence analysis, structural mechanics, hazards analysis, applied mathematics and statistics, and nuclear engineering. Core competencies of the NSED workforce include intelligence applications, instrumentation and sensors, weapons systems, field deployments and large-scale experiments, and systems and decision sciences.

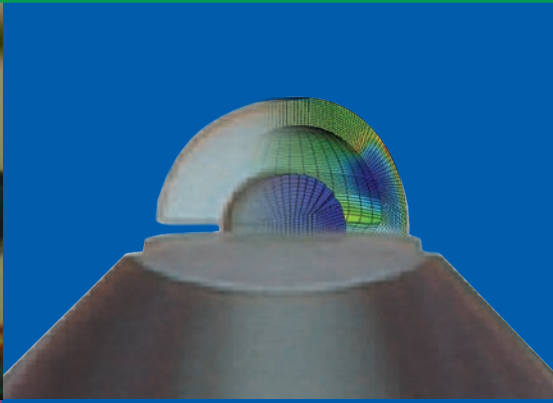


Technology Resources Engineering Division (TRED) delivers technology resources and engineering services that cannot be effectively acquired in the commercial marketplace. We are responsible for the Laboratory's major technology infrastructure capabilities such as mechanical and electronics manufacturing, advanced networks, and emergency communications systems. Programs seek TRED when turnaround time, quality, precision, hazardous, classified, and developmental requirements exceed the capabilities of external sources. Core competencies include project engineering, manufacturing engineering, information engineering, performance and asset management, and materials management.

CENTERS OF EXCELLENCE



Engineering's Center for Micro- and Nanotechnology (CMNT) has been a leader in spurring the commercial growth of micro-electronics and sensors while simultaneously customizing these same technologies for unique applications that are mission-specific to LLNL and the Department of Energy. The CMNT combines world-class R&D talent and unique fabrication facilities to enable highly innovative solutions to technology needs.

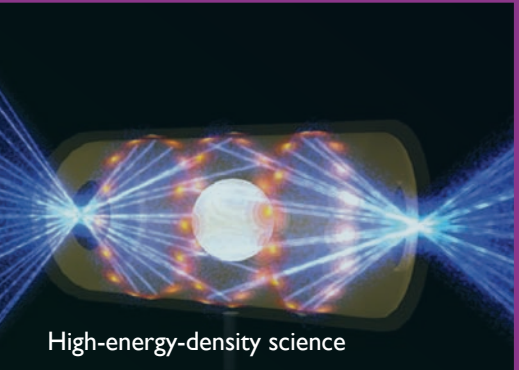


The Center for Nondestructive Characterization researches, develops, applies, and advances nondestructive characterization modeling and measuring technology to inspect, design, and refurbish systems and components at LLNL.

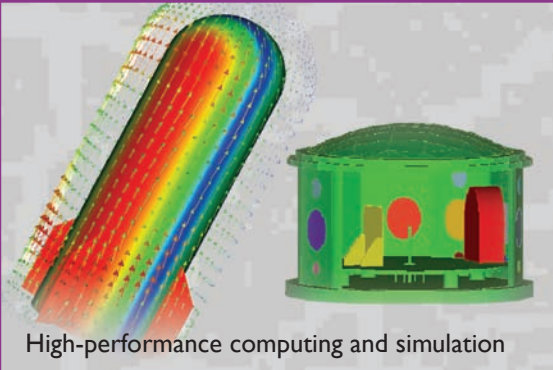


Continuing a history of leadership in precision engineering that began in the 1950s, the Center for Precision Engineering uses a multidisciplinary systems approach in manufacturing, assembly, and dimensional metrology to advance LLNL's high-precision capabilities toward accuracies that are an order of magnitude greater than those currently reached.

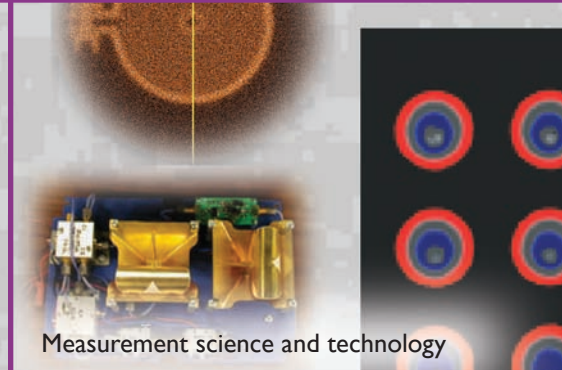
SCIENCE, TECHNOLOGY & ENGINEERING FOUNDATIONS



High-energy-density science



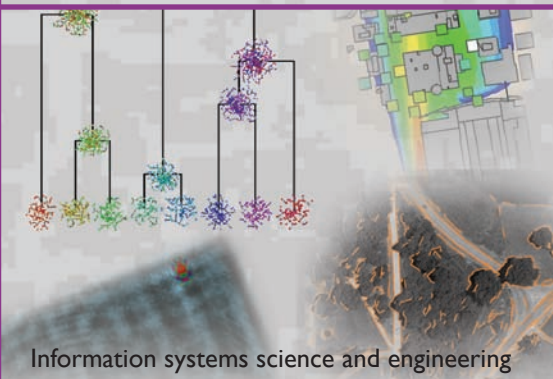
High-performance computing and simulation



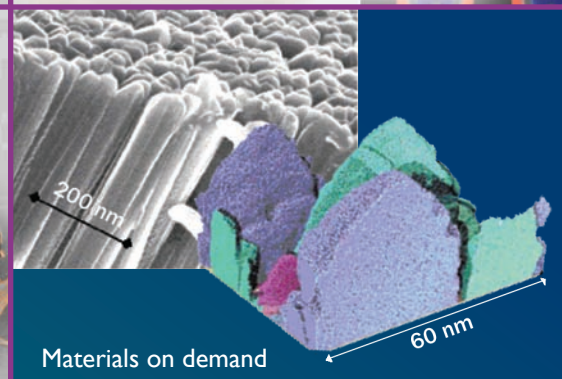
Measurement science and technology



Energy manipulation



Information systems science and engineering



Materials on demand



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