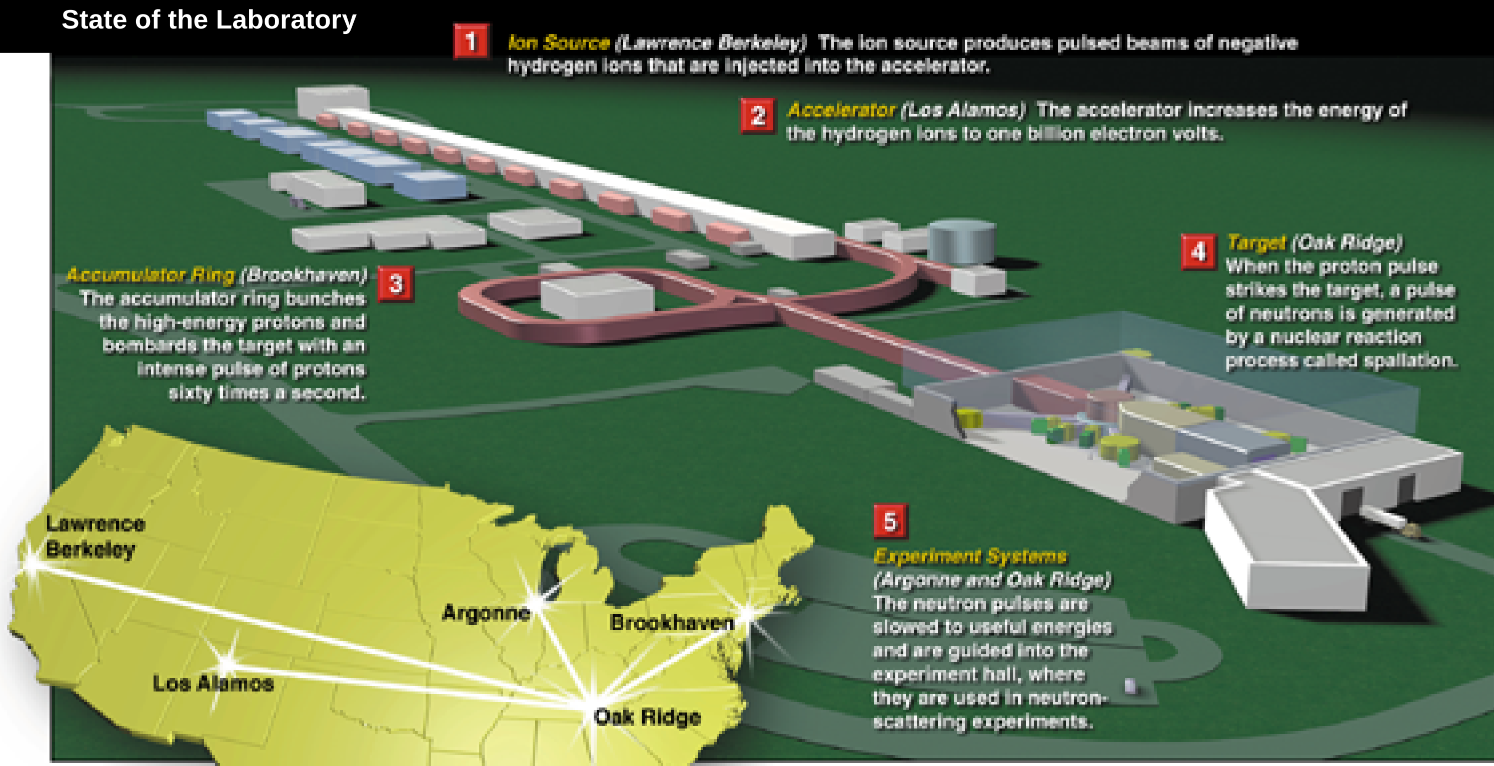
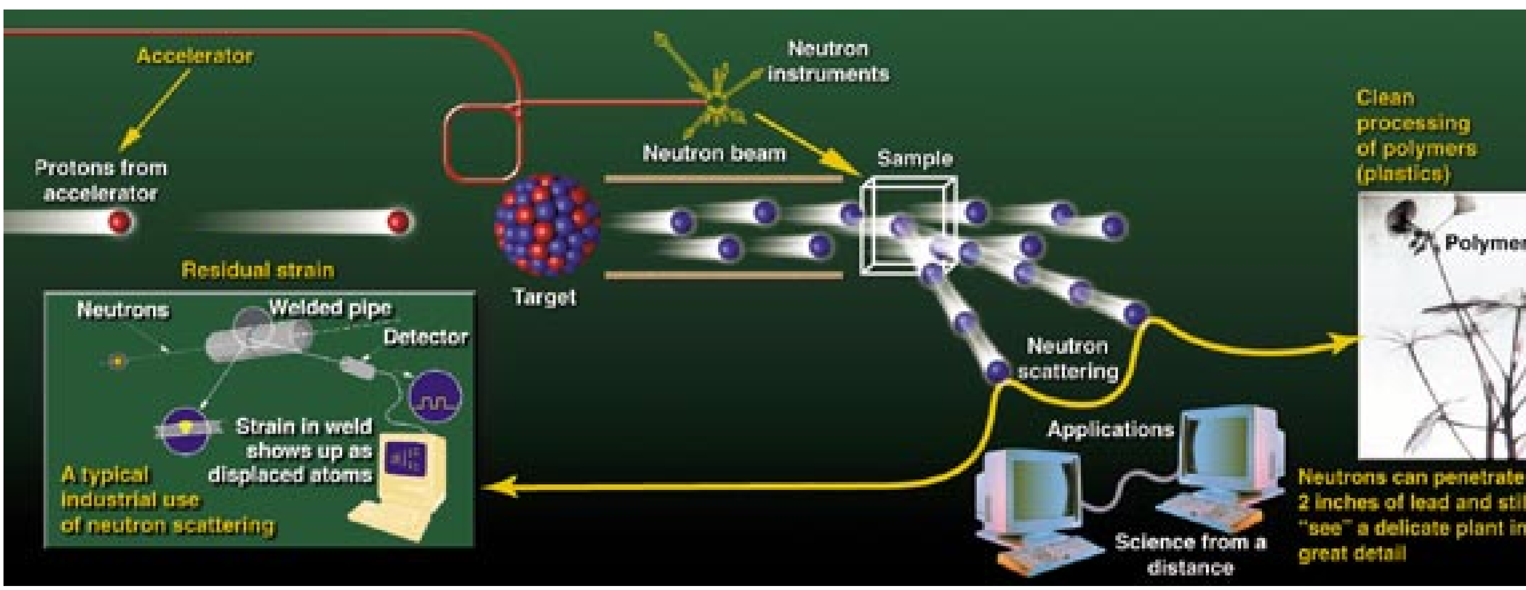


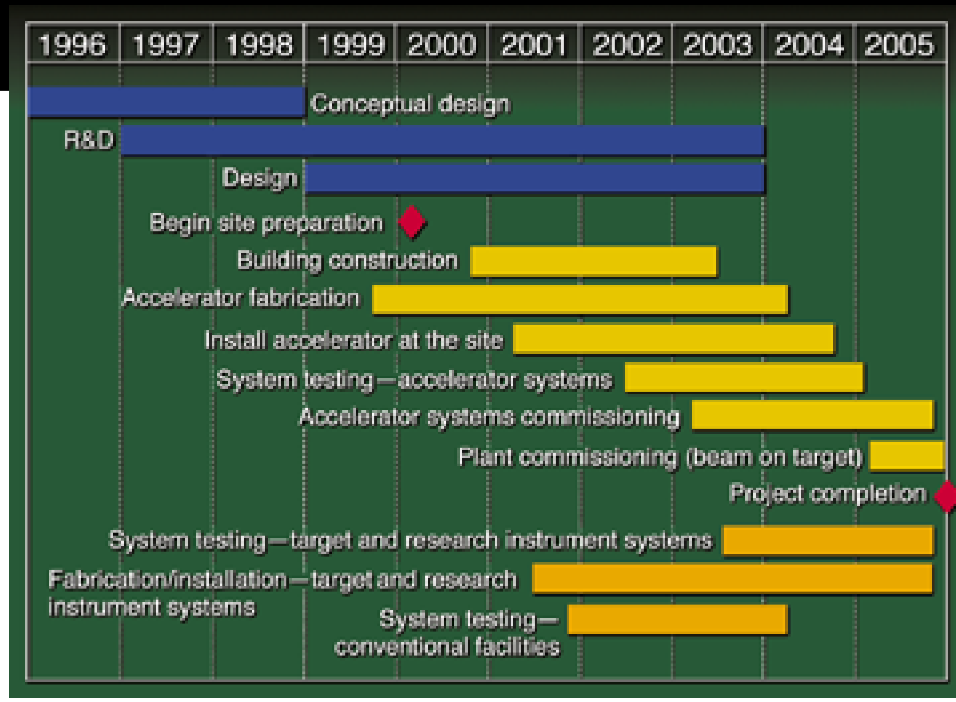
The Spallation Neutron Source: The Nation's Next-Generation Neutron-Scattering Facility

The Spallation Neutron Source (SNS) is an accelerator-based, next-generation neutron-scattering facility scheduled to be built on the Oak Ridge Reservation. Because it will produce more neutrons per second for a given area than any other neutron source, the greater brightness of the SNS will enable researchers to "see" never-before-observed details of physical and biological materials, ranging from plastics to proteins. The SNS is the top-priority project of the U.S. Department of Energy's Office of Energy Research (DOE-ER), which already has committed $39 million for its design and preparation. It will produce neutrons by bombarding a mercury target with energetic (1000-million-electron-volt) protons. The protons will excite the mercury nuclei, knocking loose and boiling off neutrons through a nuclear reaction process called spallation. The performance require-



ments and instrumentation needs of SNS are being determined in close collaboration with the scientific user community, and SNS will serve 1000 to 2000 users each year when completed. The project's total cost is estimated at $1.3 billion, and its construction is scheduled for completion in 2005.

The SNS project began in FY 1996, when DOE-ER directed ORNL to initiate research and development (R&D) and conceptual design studies. To carry out these studies in a timely and cost-effective manner, ORNL entered into a collaborative arrangement with four other national laboratories: Argonne, Brookhaven, Lawrence Berkeley, and Los Alamos. This SNS Collaboration, which will continue through the project's construction and operation, uses DOE's best technical expertise and newest technologies, as well as its vast experience with user programs involving scientists and engineers from universities, industry, government laboratories, and foreign institutions.

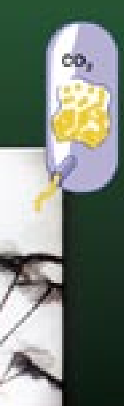


Schedule for the Spallation Neutron Source Project.

The SNS Collaboration completed its conceptual design report (CDR) in May 1997. In June 1997, a team of 65 external reviewers organized by DOE-ER held a week-long, comprehensive analysis of the CDR. The reviewers strongly endorsed the SNS Collaboration, its reference design, technical scope, cost, schedule, and collaborative-management approach. Moreover, the SNS Collaboration's estimate of the total project cost was within 1% of the estimate made by an independent cost-estimation team composed of representatives from industry.

On January 21, 1998, Vice President Al Gore came to ORNL to announce that the Clinton Administration had made a construction line item request of $157 million for the SNS in its FY 1999 budget, which must be approved by Congress. At the announcement ceremony, Gore said, "I'm really delighted to be here at ORNL, the birthplace of neutron-scattering science, to make an announcement that will reclaim America's position as the world leader in a technology that we Americans invented." The SNS Collaboration will provide funds it receives from DOE to instrument 10 beam lines, and the instruments will be selected and built by the scientific community. Neutron scientists and technicians will be on hand to assist the user community once the instruments are completed. Eight more beam lines will be available for special instrumentation and collaborative access teams. The SNS is also designed to be upgraded economically to significantly higher power levels in the future.

The state of Tennessee, through the University of Tennessee, has committed $8 million for the establishment of the Joint Institute for Neutron Sciences (JINS). This new institute will serve as the gateway for the 1000 to 2000 guest scientists and engineers expected to come to East Tennessee each year to use the SNS and the nearby High Flux Isotope Reactor (HFIR), which is being upgraded (see following article). Because the upgraded HFIR will provide the most intense steady-state neutron beams and SNS will produce the most intense pulsed neutron beams for R&D anywhere, and because of the presence of JINS and other neutron-science capabilities at ORNL, Oak Ridge will be the world's leading center for neutron scattering research. *—Bill R. Appleton, ORNL associate director for the Spallation Neutron Source*



What Is Neutron Scattering and Why Is It Useful?

Because neutrons carry no net electrical charge, they interact only with the atomic nuclei of a material and can penetrate to far greater depths than charged particles, light, or even X rays without destroying the material. Thus, neutrons are extremely useful probes of matter in a neutron-scattering experiment. In such an experiment, a well-characterized beam of neutrons is directed onto the material under investigation. Some of the neutrons in the beam pass through the target material while others interact with the material and scatter from its nuclei. By measuring the angles, energies, and other properties of the scattered neutrons, scientists can obtain information about a material's structure and the motions of its atoms. This technique has been used to study fundamental properties of a wide variety of materials and to guide the development of products ranging from cars to computers, paints to plastics, new time-released medicines, and life-saving bulletproof vests. Thus, even though neutron scattering is not a household term, it plays a significant role in our lives by improving many of the products we encounter every day. *Illustration by Allison Baldwin.*