Chairman's Introduction

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The NSLS remains a viable and productive facility, as can be seen by the rich and diverse science produced in 2004. In one of these exciting research projects published in Nature, researchers detected a rare "hole crystal" in a cuprate superconductor, which may provide insight into high-temperature superconductivity. In another Nature publication, the crystal structure of a segment of RNA was determined, opening a new window of knowledge into that crucial molecule. These are just a couple of the science highlights of 2004, and many others are displayed in the pages of this report. All told, more than 700 publications resulted from NSLS research this year, the facility hosted 2,299 users, and the number of experiments performed rose from 1,145 in 2003 to 1,374—clear indications that the NSLS continues to thrive.

As the NSLS accelerator complex enters its third decade of operations, it continues to perform very well. For 2004, the overall reliability of the VUV-IR ring was excellent at 99 percent. The reliability of the x-ray ring was just shy of 92 percent, primarily due to the need to replace the injection septum vacuum chamber, which developed a leak during the middle of the year. The Operations Division did a tremendous job of installing our spare chamber in minimal time, despite the complexity of the job and the inaccessibility of its location in the ring, as well as keeping downtime to a minimum throughout the rest of the year.

In order to continue to meet the needs of users, several key beamline upgrades took place this year that will enrich our scientific programs, including upgrades to beamlines U12IR, X1A, X13A, and X21. We are very excited about two brand-new beamlines that were commissioned in 2004: X29 and X27A. X29 is the new mini-gap undulator beamline designed for macromolecular crystallography, and it will meet the growing demand of NSLS users who perform research in that area. The establishment of an x-ray microprobe at beamline X27A, optimized for the environmental science community, is also very important, as it will help to satisfy the large over subscription rate for this technique at the NSLS. Two other important upgrades that were initiated this past year are the replacement of the X25 wiggler with an undulator and the construction of the X9 undulator beamline for small-angle scattering, with an emphasis on nanoscience research.

Another key activity that will benefit all users was the restoration of the x-ray ring lattice symmetry, which reduced the horizontal emittance and made the operational lattice more robust. Similarly, all users will benefit from the introduction of the PASS (Proposal Allocation Safety Scheduling) system this past year, which has greatly improved the process of proposal submission, review, allocation, and scheduling. This coming year we will work to add Rapid Access to the capabilities of PASS. Overall, the success of

these and the many other projects that space does not permit listing is a testament to the dedication, hard work, and skill of the NSLS staff.

Safety has always been an important issue at a large, complex scientific facility like the NSLS and in 2004 it received renewed attention. Safety is our highest priority and we spent a great deal of time reviewing and refining our safety practices and procedures. A new "Safety Highlights" web page was created for safety news, and a large number of safety meetings and discussions were held. These reviews and meetings generated many ideas on how the NSLS might improve its safety practices, and we are committed to putting these in place and improving our already very good safety program. We had no lost-time accidents in 2004, which is a notable accomplishment. Our goal is to be best in class and I'm confident that by working together we can achieve that status.

Several activities took place this past year to advance our proposal to replace the NSLS with a new National Synchrotron Light Source-II facility. These included a major workshop in support of the proposed facility in March, a mail review of our proposal outlining the scientific opportunities enabled by NSLS-II, and a technical review of the preconceptual design of the machine. The feedback from the reviews has been positive and indications are promising that NSLS-II will become a reality. The scientific opportunities enabled by NSLS-II are incredibly exciting and it is a critically needed addition to the nation's scientific infrastructure. It will ensure that we remain world leaders in synchrotron science for decades to come.