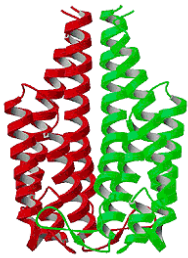




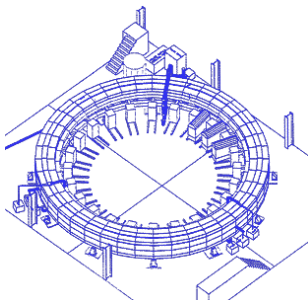
Year End Self-Evaluation

Brookhaven National
Laboratory



Fiscal Year 2002

October 1, 2001
through
September 30, 2002



BROOKHAVEN SCIENCE ASSOCIATES
Under contract with the U. S. Department of Energy

Prime Contract Number AC02-98CH10886
Prepared by: The Office of Management Services
Brookhaven National Laboratory

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Introduction

As part of the implementation of the Performance-Based Contract (DE-AC02 – 98CH10886) between Brookhaven Science Associates (BSA) and the Department of Energy (DOE) for operating Brookhaven National Laboratory (BNL), BSA is required to execute a Performance-Based Management System (Modification # M073). The PBMS is designed to include clear, reasonable, and objective performance measures as standards to assess BSA overall performance of scientific, technical, operational and managerial obligations.

For FY 02, the DOE Office of Science (SC) identified high-level expectations in six critical activities/functional areas that SC would use to guide its regular assessment of Laboratory performance. These critical areas were Science, Environment, Safety & Health (ES&H), Infrastructure, Business Operations, and Stakeholder Relations. DOE Brookhaven Area Office inserted a seventh high-level expectation, Leadership. It was the SC expectation that SC/Headquarters (HQ) program managers, field offices, and laboratories work in partnership to develop laboratory-specific outcomes, objectives, and measures that supported those high-level expectations and to use self-assessment as a tool to achieve desired outcomes and continuous improvement

The performance based management system for FY 2002 was negotiated between DOE and BSA and formed a contract amendment to the Prime Contract (Appendix B). Those high-level performance expectations were divided into three Critical Outcomes and eleven Objectives:

1.0 Excellence in Science & Technology

1.1 Research Quality

1.2 Relevance to DOE Missions and National Needs

1.3 Success in Constructing and Operating Research Facilities

1.4 Effectiveness and Efficiency of Research Program Management

2.0 Environmental Restoration

2.1 Operational Excellence in Environmental Restoration

2.2 Execution of Program Activities

3.0 Laboratory Management and Operations

3.1 Management and Business Processes

3.2 Environment Safety and Health

3.3 Site Infrastructure, Facilities, and Operations

3.4 Information Technology

3.5 Communications and Trust

The results of BSA self-evaluation with respect to these critical outcomes, objectives, and supporting assessments are hereby presented in this report.

Executive Summary

This is the BSA Self Evaluation Report for the Fiscal-Year 2002 for Brookhaven National Laboratory. It reflects Brookhaven Science Associates' (BSA) assessment of how the Laboratory performed against each of the performance measures in the Prime Contract between BSA and the DOE for operating Brookhaven National Laboratory.

BSA has adjectivally rated its FY 2002 performance as *outstanding*. Based on the results of this self-evaluation, BSA calculates an overall performance score of **3.64 out of a possible 4.0 points**. The score breakdown by critical outcome is shown here:

TABLE #1 BSA FY02 SUMMARY EVALUATION				
RATING SCHEMATIC:			<i>Outstanding</i>	
			<i>Excellent</i>	
			<i>Good</i>	
CO #	PM TITLE	WEIGHTING	BSA RATING	BSA SCORE
	Brookhaven Science Associates: Overall	100%	<i>Outstanding</i>	3.64
1.0	Excellence In Science & Technology	60%	<i>Outstanding</i>	3.67
2.0	Environmental Restoration	8%	<i>Outstanding</i>	3.80
3.0	Laboratory Management and Operations	32%	<i>Outstanding</i>	3.56

We are proud to acknowledge that this is the first fiscal year evaluation where the result in each of our critical outcomes has yielded *outstanding performance*. During the last two fiscal years, the DOE has recognized BSA Science and Technology as *outstanding* performance. For FY 2001, DOE recognized BSA Leadership and Management as *outstanding* performance while rating Operational Excellence and Environmental Restoration as *excellent*. Our evaluation of Environmental Restoration against the negotiated measurement criteria yields a marked increase in performance from our self-evaluation and the DOE evaluation.

Executive Summary Performance Map

An executive summary “roadmap” of BSA FY 2002 performance is included at the end of this document. The roadmap includes all of the FY 2002 Critical Outcomes, Objectives, and Performance Measures with the associated prioritization weighting. The roadmap also includes the BSA rating, associated rating color designator, and the BSA score down to the performance metric level. Finally, each performance based management indicator is provided with a section and page reference in order for the reader to easily navigate through the FY 2002 performance attributes that serve as substantiation for the BSA rating and score.

FY 2002 BSA Critical Outcome Performance

Science and Technology: Rating Outstanding, Score 3.67

BSA continues to maintain sustained performance in Science and Technology. The quality of our research is unparalleled. Our rating continues to be *outstanding*. The Laboratory has worked diligently to align its programs and personnel with the strategic mission of our customers. Improving on program relevance is a continuous communication and alignment process that BSA believes is vital to its continued success. BSA believes that it has improved within the outstanding rating of relevance. The Laboratory maintains its outstanding rating in success in operating and maintaining our world-class instruments. BSA also acknowledges that elements of our Research Program Management require attention and is responding to our customer issues and concerns. We will continue to better define and manage to those program management elements and values in order to be in complete alignment and integrated with our customer's technical/quality, risk, cost, and schedule requirements. Although it is our belief that we are improving the elements of research program management, our rating and score should serve to reconcile our evaluation with our customer.

The Science and Technology self-evaluation consists of a summary qualitative assessment (CO #1 Summary) that is supported by a structured composite of supporting information and statistics (CO #1 Detail).

Environmental Restoration: Rating Outstanding, Score 3.80

During FY 2002 the improvement agenda was focused on the thorough and careful completion of the extensive prerequisites necessary to start work in the field, increased cost performance of baseline work scope and timely completion of negotiated restoration milestones. All but one of the designated project start dates were met to the performance schedule. The environmental cost performance index was in excess of the threshold designated as outstanding. The BNL ER team also completed all but one designated milestones on or ahead of schedule. While the one milestone was three weeks late, BSA accelerated six "out-year" milestones into FY 02 also to an outstanding rating.

Although all improvement work could be designated as the higher range of outstanding, BSA believes that the overall environmental restoration performance can improve. Continuing to take an aggressive posture on effective risk reduction and effective baseline management and control that is aligned with customer and stakeholder expectations requires sustained baseline improvement and "out of the box" planning and execution.

The Environmental Restoration self-evaluation consists of an objective assessment (CO #2 Summary) that is supported by the detailed measure and metric performance (CO #2 Detail).

Laboratory Management and Operations: Rating Outstanding, Score 3.56

The improvement initiatives associated with this Critical Outcome include Management and Business Processes, ES&H targeted improvement activities, Site Infrastructure Facilities and Operations, Information Technology, and Communications and Trust. Assessment and Improvement activities included the enhancement of the Laboratory's self-assessment process and required advancement of management systems maturity. The Supporting Assessment Measures served as a vehicle to establish a path to sustained improvement in the BSA Management Systems. The Business Processes were rated

excellent; however, the procurement system that was not part of the FY 02 improvement agenda requires integrated attention. ES&H improvements were rated between outstanding and excellent with the overall rating as lower outstanding. The pursuit of alternative financing for infrastructure projects proceeded ahead of requirements while the infrastructure project management performed at the high range of outstanding. Information Technology performed excellent with Cyber Security implementation and Scientific Computing Infrastructure progressing between ratings of good and excellent. Communication and Trust continues to be evaluated by a third party peer review as outstanding.

The Laboratory Management and Operations self-evaluation consists of an objective assessment (CO #3 Summary) that is supported by the detailed measure and metric performance (CO #3 Detail).

Trends and Areas for Improvement

Although the Critical Outcome Trees have evolved during the past few years, there are commonalities down to the Objective and Measure Level that can be reviewed and compared for trending. Current and past year BSA evaluated performance along the SC critical areas is shown here in Table #2:

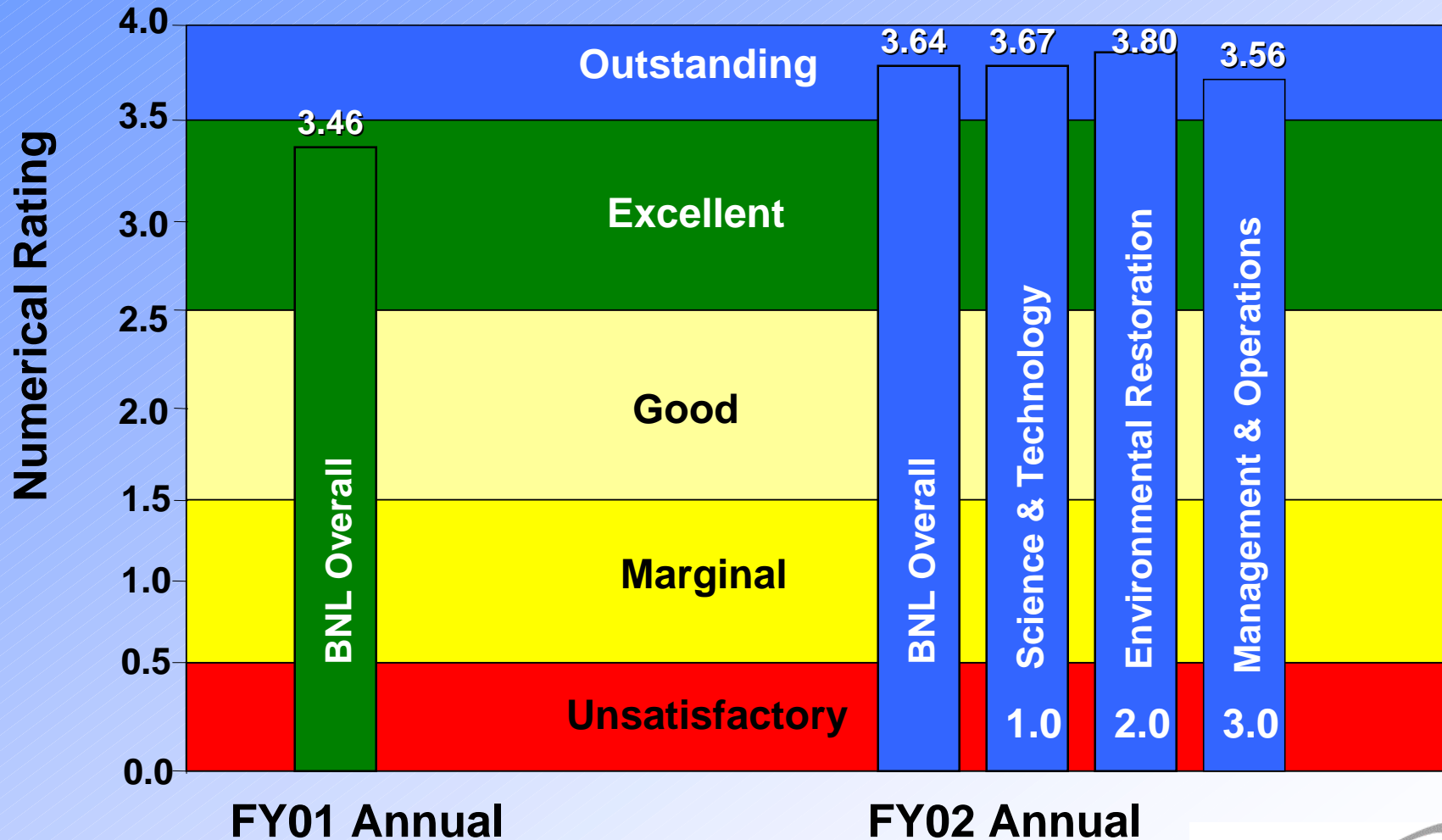
		TABLE #2 BSA SELF EVALUATION SCORES LAST FOUR FISCAL YEARS			
RATING SCHEMATIC:		Outstanding=		Marginal=	
		Excellent=		Unsat=.	
		Good=			
BSA CRITICAL AREAS		FY 99	FY 00	FY 01	FY 02
0.0	BSA OVERALL SELF EVALUATION	3.47	3.61	3.46	3.64
1.0	SCIENCE AND TECHNOLOGY	3.54	3.65	3.62	3.67
	Quality of Research	3.65	3.60	3.70	3.80
	Relevance to DOE Missions and National Needs	3.55	3.70	3.70	3.80
	Success in Constructing and Operating Research Facilities	3.50	3.74	3.60	3.60
	Effectiveness and Efficiency of Research Program Management	3.46	3.42	3.50	3.50
2.0	LEADERSHIP		3.43	3.42	3.62
3.0	ENVIRONMENT SAFETY HEALTH AND QUALITY	3.06	3.88	3.36	3.53
4.0	ENVIRONMENTAL RESTORATION	3.32	3.63	3.10	3.80
5.0	FACILITY OPERATIONS AND INFRASTRUCTURE	3.32	3.95	3.27	4.00
6.0	BUSINESS MANAGEMENT	3.08	2.33	4.00	3.53
7.0	COMMUNICATIONS & TRUST	3.87	3.74	3.88	3.75

Overall, the BSA Self Evaluation Rating recovers back to *outstanding* performance. The non-Science and Technology Critical Outcomes and Objectives that took a downward trend in FY 01 have recovered to consistent outstanding performance.

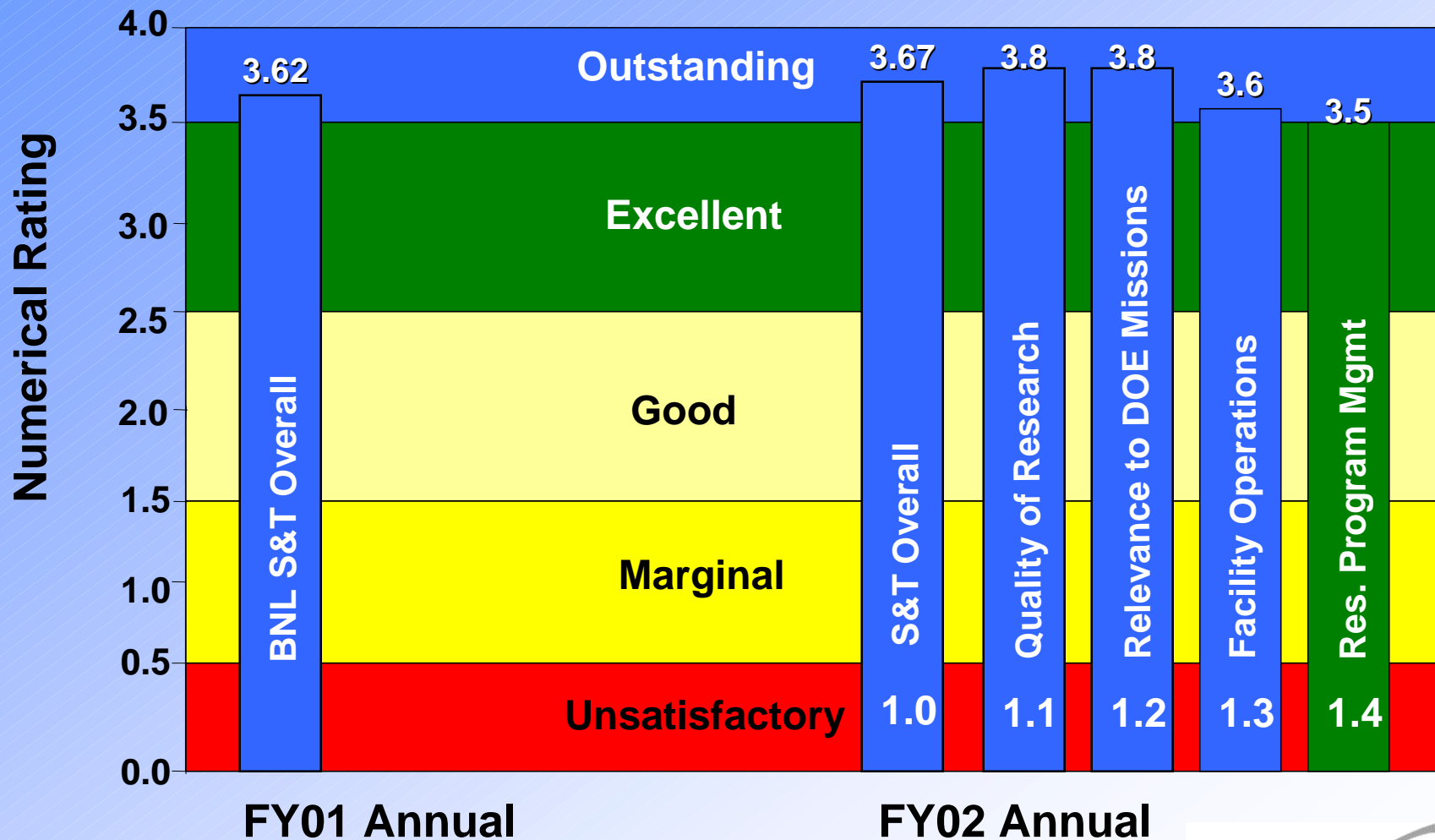
- Science and Technology continues to improve
- Leadership improvement activities are rated outstanding despite the interim Laboratory Director status
- ESH&Q improvements are back to outstanding
- Environmental Restoration has markedly improved
- Facility Operations and Infrastructure achieved perfect ratings
- Business Management continued to perform outstanding; however FY 03 requires noteworthy improvement in the BSA procurement system
- Communications and Trust continues to perform in an outstanding manner.

As requested in the DOE FY 2001 evaluation, we have included an FY 2001 Performance Variance and Issue Status that is located at the end of the self-evaluation. This report includes an assessment of trends, issues, concerns, and current status of BSA corrective actions associated with those items. The emphasis of the FY 2003 performance based management will continue to be on performance of *Outstanding* Science and Technology, Environmental Management, and Laboratory Management and Operations. BSA will continue to drive improvement in integrated assessment and management system maturity and will focus improvement in business processes, with emphasis on procurement.

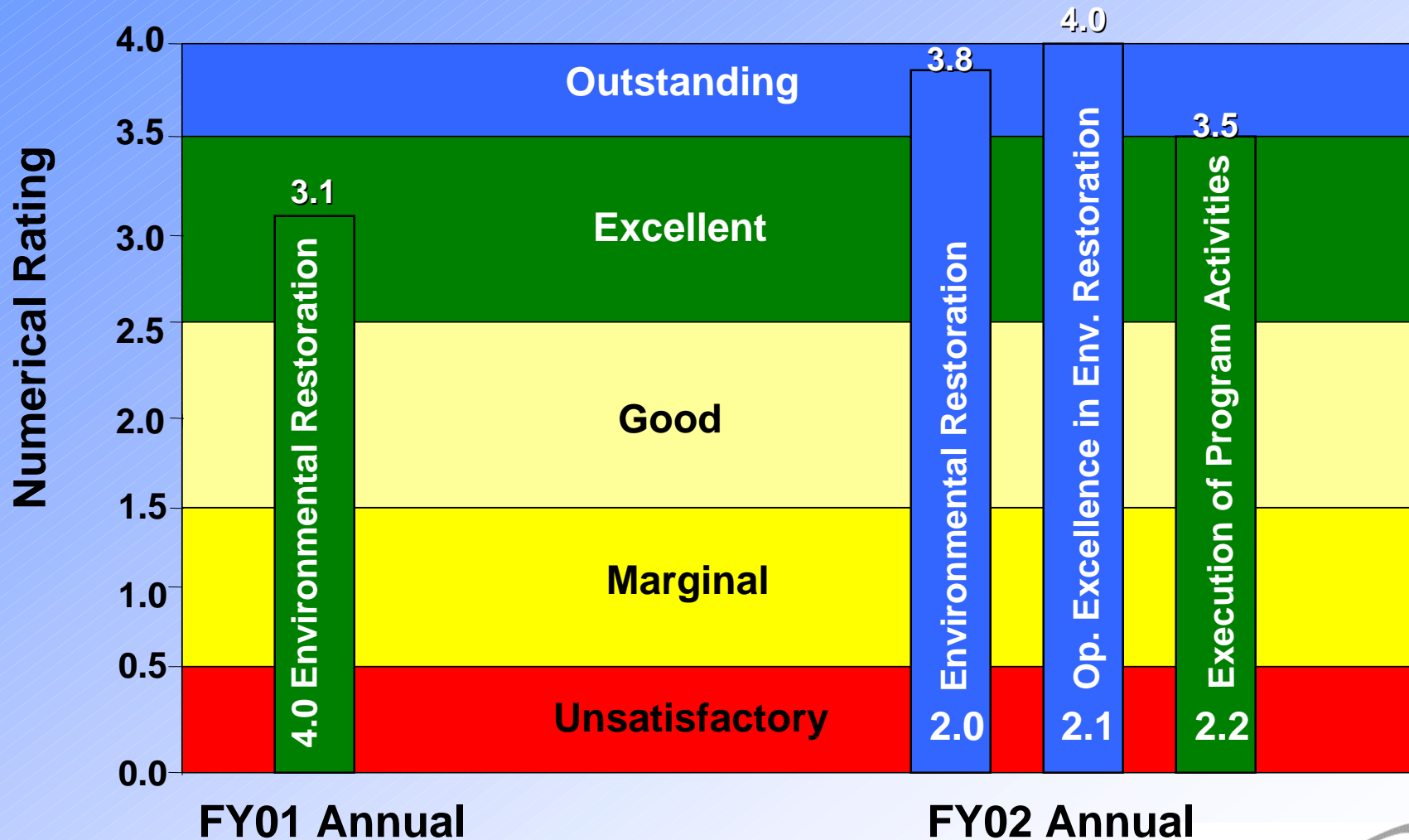
Overall BNL Performance FY 2002 Annual



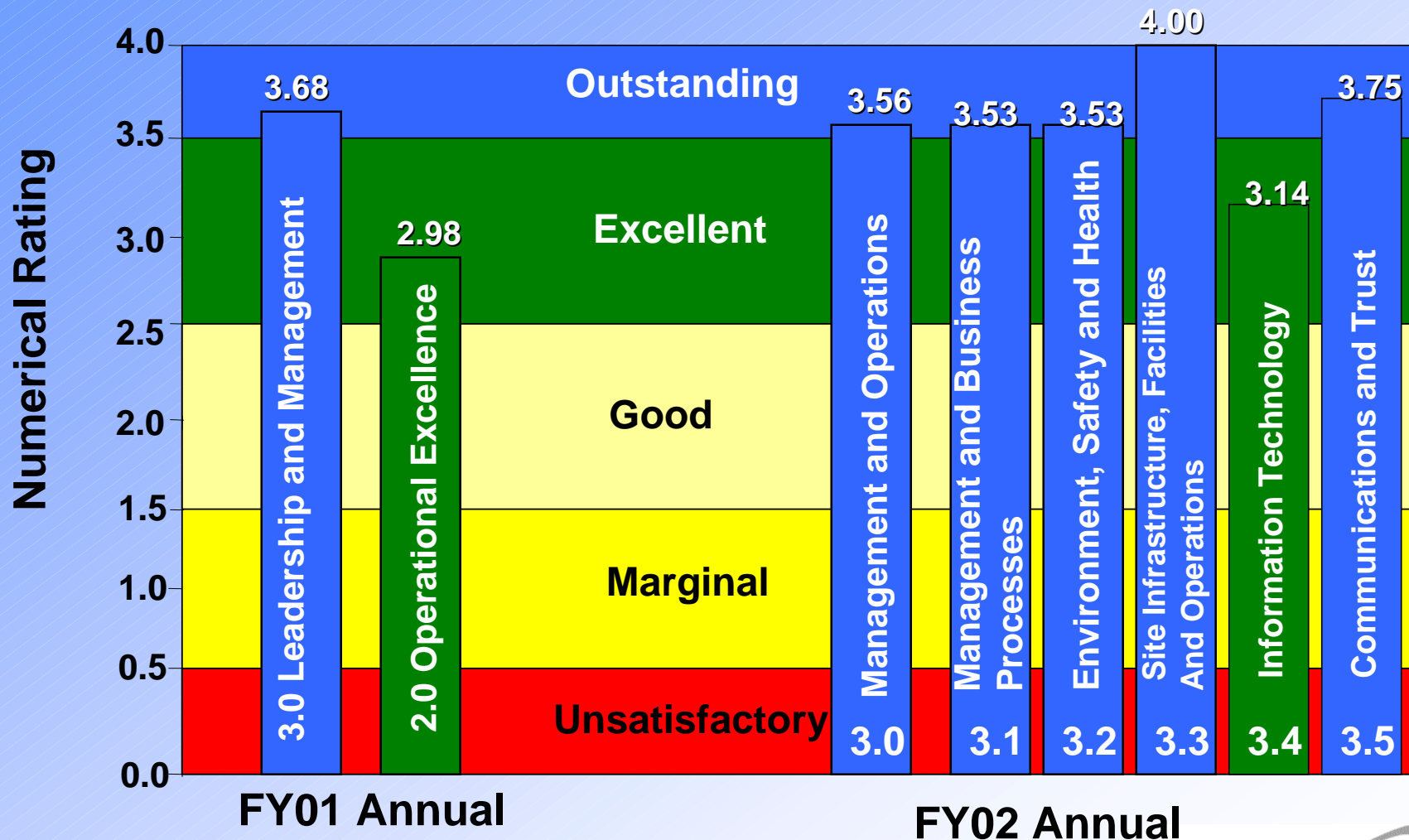
Critical Outcome 1: Science & Technology



Critical Outcome 2: Environmental Restoration



Critical Outcome 3: Management and Operations



BSA FY02 SELF EVALUATION EXECUTIVE SUMMARY PERFORMANCE MAP

RATING SCHEMATIC:		<i>Outstanding</i>		<i>Marginal</i>	
		<i>Excellent</i>		<i>Unsat.</i>	
		<i>Good</i>			
App. B #	PM TITLE	WEIGHTING	BSA RATING	BSA SCORE	PAGE
0	Brookhaven Science Associates: Overall	100%	<i>Outstanding</i>	3.64	
1.0	Excellence In Science & Technology	60%	<i>Outstanding</i>	3.67	CO1-S-3
1.1	Quality of Research	35%	<i>Outstanding</i>	3.80	
	High Energy and Nuclear Physics Biological and Environmental Research Basic Energy Sciences Advanced Scientific Computing Research Energy, Environment & National Security				CO1-S-15 CO1-S-21 CO1-S-28 CO1-S-35 CO1-S-37
1.2	Relevance to DOE Missions and National Needs	10%	<i>Outstanding</i>	3.80	
	High Energy and Nuclear Physics Biological and Environmental Research Basic Energy Sciences Advanced Scientific Computing Research Energy, Environment & National Security				CO1-S-16 CO1-S-23 CO1-S-31 CO1-S-35 CO1-S-37
1.3	Success in Constructing and Operating Research Facilities	30%	<i>Outstanding</i>	3.60	
	High Energy and Nuclear Physics Biological and Environmental Research Basic Energy Sciences Advanced Scientific Computing Research Energy, Environment & National Security				CO1-S-17 CO1-S-25 CO1-S-32 CO1-S-35 CO1-S-43
1.4	Effectiveness and Efficiency of Research Program Management	25%	<i>Excellent</i>	3.50	
	High Energy and Nuclear Physics Biological and Environmental Research Basic Energy Sciences Advanced Scientific Computing Research Energy, Environment & National Security				CO1-S-19 CO1-S-27 CO1-S-33 CO1-S-35 CO1-S-43
	Work For Others and Technology Transfer				CO1-S-45

BSA FY02 SELF EVALUATION EXECUTIVE SUMMARY PERFORMANCE MAP

RATING SCHEMATIC:			<i>Outstanding</i>		<i>Marginal</i>	
			<i>Excellent</i>		<i>Unsat.</i>	
			<i>Good</i>			
App. B #	PM TITLE	WEIGHTING	BSA RATING	BSA SCORE	PAGE	
2.0	Environmental Restoration	8%	<i>Outstanding</i>	3.80	CO2-S-2	
2.1	Operational Excellence in Env. Restoration	60%	<i>Outstanding</i>	4.00	CO2-S-6	
2.1.1	On Time Starts of Major Projects	100%	<i>Outstanding</i>	4.00	CO2-D-3	
2.2	Execution of Program Activities	40%	<i>Excellent</i>	3.50	CO2-S-8	
2.2.1	Cost Performance	50%	<i>Excellent</i>	3.50	CO2-D-6	
2.2.2	Schedule Performance	50%	<i>Excellent</i>	3.50	CO2-D-7	
3.0	Laboratory Management and Operations	32%	<i>Outstanding</i>	3.56	CO3-S- 2	
3.1	Management and Business Processes	55%	<i>Outstanding</i>	3.53	CO3-S- 3	
3.1.1	Assessment and Improvement	70%	<i>Outstanding</i>	3.61	CO3-D- 2	
3.1.1.1	Overall Evaluation of the Lab's Self-Assessment Prgm		<i>Outstanding</i>	3.60	CO3-D-3	
3.1.1.2	Enhance Evaluation of Management Systems		<i>Outstanding</i>	3.70	CO3-D-6	
3.1.2	Business Processes	25%	<i>Excellent</i>	3.25	CO3-D-7	
3.1.2.1	Baseline Study of Laboratory Business Systems		<i>Excellent</i>	3.00	CO3-D-8	
3.1.2.2	Work for Others (WFO) Business Systems		<i>Excellent</i>	3.50	CO3-D-10	
3.1.2.2.1	Improve WFO Billing System		<i>Outstanding</i>	4.00	CO3-D-11	
3.1.2.2.2	Develop WFO Database		<i>Excellent</i>	3.00	CO3-D-11	
3.1.3	Workforce/Diversity	2%	<i>Outstanding</i>	4.00	CO3-D-13	
3.1.4	Corporate Involvement	3%	<i>Outstanding</i>	3.60	CO3-D-13	
3.2	Environment, Safety and Health	15%	<i>Outstanding</i>	3.53	CO3-S-3	
3.2.1	Legacy ES&H Risk Management	30%	<i>Excellent</i>	3.47	CO3-D-22	
3.2.1.1	Site Hazard Footprint Management		<i>Excellent</i>	3.00	CO3-D-23	
3.2.1.2	Chemical Disposition Upon Employee Termination		<i>Outstanding</i>	3.93	CO3-D-23	
3.2.2	On-going ES&H Risk Management	70%	<i>Outstanding</i>	3.55	CO3-D-23	
3.2.2.1	Pollution Prevention		<i>Outstanding</i>	4.00	CO3-D-25	
3.2.2.2	Transportation Safety Implementation		<i>Outstanding</i>	4.00	CO3-D-26	
3.2.2.3	OSHA Reportable Injury Management		<i>Excellent</i>	2.97	CO3-D-30	

BSA FY02 SELF EVALUATION EXECUTIVE SUMMARY PERFORMANCE MAP

RATING SCHEMATIC:			<i>Outstanding</i>		<i>Marginal</i>	
			<i>Excellent</i>		<i>Unsat.</i>	
			<i>Good</i>			
App. B #	PM TITLE	WEIGHTING	BSA RATING	BSA SCORE	PAGE	
3.2.2.4	Chemical Safety Performance		<i>Excellent</i>	3.31	CO3-D-31	
3.2.2.4.1	Chemical Inventories and Accountabilities		<i>Excellent</i>	3.42	CO3-D-32	
3.2.2.4.2	Peroxide Forming Compounds		<i>Excellent</i>	3.20	CO3-D-32	
3.3	Site Infrastructure, Facilities, and Operations	10%	<i>Outstanding</i>	4.00	CO3-S-8	
3.3.1	Pursue Alternative Financing for Infrastructure Projects	30%	<i>Outstanding</i>	4.00	CO3-D-36	
3.3.2	Project Management	70%	<i>Outstanding</i>	4.00	CO3-D-37	
3.4	Information Technology	10%	<i>Excellent</i>	3.14	CO3-S-10	
3.4.1	Cyber Security	55%	<i>Excellent</i>	3.13	CO3-D-44	
3.4.1.1	Cyber Security Program Plan Implementation		<i>Excellent</i>	3.25	CO3-D-46	
3.4.1.2	CSPP Test, Review, and Evaluation Mechanisms		<i>Excellent</i>	3.00	CO3-D-48	
3.4.2	Scientific Computing Infrastructure	45%	<i>Excellent</i>	3.17	CO3-D-49	
3.4.2.1	Visualization Program		<i>Excellent</i>	3.00	CO3-D-50	
3.4.2.2	Computing Resources		<i>Good</i>	2.50	CO3-D-51	
3.4.2.3	New Technology Implementation Assessments		<i>Outstanding</i>	4.00	CO3-D-53	
3.5	Communications and Trust	10%	<i>Outstanding</i>	3.75	CO3-S-13	
3.5.1	Building Regional and National Recognition	50%	<i>Outstanding</i>	3.70	CO3-D-56	
3.5.2	Stakeholder Involvement and Understanding	50%	<i>Outstanding</i>	3.80	CO3-D-60	

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1.0 Basic Science & Technology

FY 2002

Critical Outcome

Objectives

Performance Measures

1.0
BNL will deliver innovative, forefront science and technology aligned with DOE strategic goals in a safe, environmentally sound, and efficient manner and will conceive, design, construct, and operate world-class user facilities.
60% of BNL Score

1.1

Quality of Research

35% of C.O. #1

1.2

Relevance to DOE mission and national needs

10% of C.O. #1

1.3

Success in Constructing and Operating Research Facilities

30% of C.O. #1

1.4

Effectiveness and efficiency of research program management

25% of C.O. #1

1.1.1 High Energy and Nuclear Physics

- Determine the quality of the High Energy and Nuclear Physics Research performed for FY 2002

1.1.2 Basic Energy Sciences

- Determine the quality of the Basic Energy Sciences Research performed for FY 2002

1.1.3 Life Sciences

- Determine the quality of the Life Science Research performed during FY 2002

1.1.4 Energy, Environment & National Security

- Determine the quality of the Energy, Environment, and National Security Research performed during FY 2002

1.2.1 High Energy and Nuclear Physics

- Determine if the High Energy and Nuclear Physics research fits within and advances the missions of DOE; contributes to U.S. leadership in the international scientific and technical communities; contributes to the goals and objectives of the Strategic plans of DOE and other national programs; and the extent of productive interaction with other Science & Technology programs.

1.2.2 Basic Energy Sciences

- Determine if the Basic Energy Science research fits within and advances the missions of DOE; contributes to U.S. leadership in the international scientific and technical communities; contributes to the goals and objectives of the Strategic plans of DOE and other national programs; and the extent of productive interaction with other Science & Technology programs.

1.2.3 Life Sciences

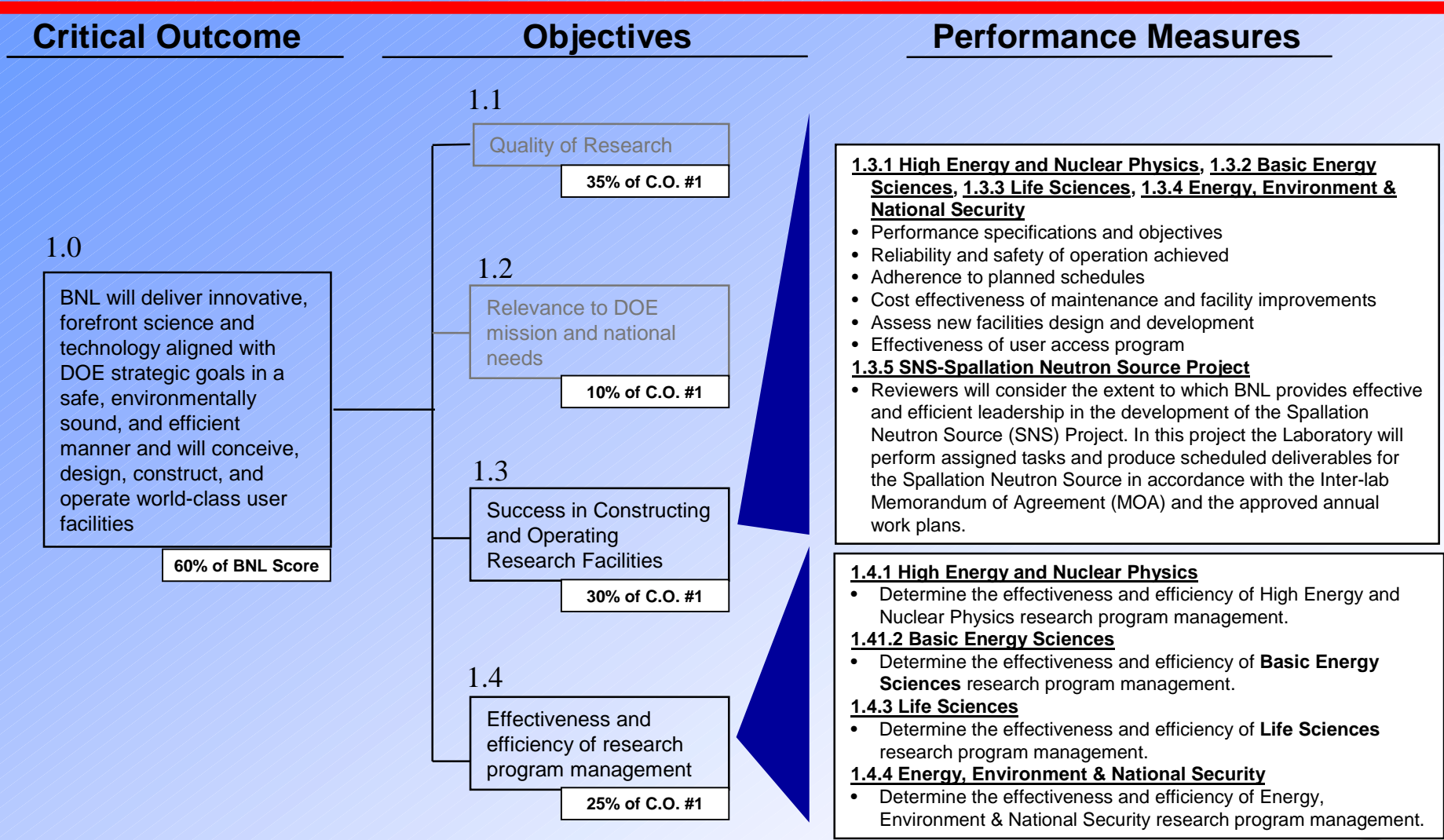
- Determine if the Life Science research fits within and advances the missions of DOE; contributes to U.S. leadership in the international scientific and technical communities; contributes to the goals and objectives of the Strategic plans of DOE and other national programs; and the extent of productive interaction with other Science & Technology programs.

1.2.4 Energy, Environment & National Security

- Determine if the Energy, Environment & National Security research fits within and advances the missions of DOE; contributes to U.S. leadership in the international scientific and technical communities; contributes to the goals and objectives of the Strategic plans of DOE and other national programs; and the extent of productive interaction with other Science & Technology programs.

1.0 Basic Science & Technology

FY 2002



1.0 EXCELLENCE IN SCIENCE & TECHNOLOGY

1.1 INTRODUCTION

Brookhaven Science Associates (BSA) rated its overall Science and Technology (S&T) performance for Fiscal Year (FY) 2002 performance as **Outstanding** with a corresponding score of 3.67. The Laboratory achieved noteworthy accomplishments under each of the four Office of Science S&T Objectives and demonstrated progress in addressing comments raised by the Department of Energy (DOE) in previews, reviews and evaluations.

Individual scores for each of the four Office of Science Objectives are shown in the Table below.

Objective	Weight	Rating	Score
Quality of Research	35%	Outstanding	3.8
Relevance to DOE Mission and National Needs	10%	Outstanding	3.8
Success in Constructing and Operating Research Facilities	30%	Outstanding	3.6
Effectiveness and Efficiency in Research Program Management	25%	Excellent	3.5
Overall	100%	Outstanding	3.67

These scores were assigned by the Deputy Director for Science and Technology based on input from the Associate Laboratory Directors (ALDs) of the four BNL Science Directorates. In determining the evaluation scores, the Deputy Director considered many factors including benchmarks from past experience and DOE evaluations; major successes; peer review input and research program deficiencies; success in addressing issues to improve research program management both within science and technology organizations, as well as those initiatives taken at the institutional level.

In the following sections, highlights of performance are discussed. Detailed supporting information provided by Science Division and Department Chairs is included in Attachment 1 of this report.



Dennis Kovar, Director of DOE's Nuclear Physics Division, congratulates Ray Davis on winning the 2002 Nobel Prize in Physics.

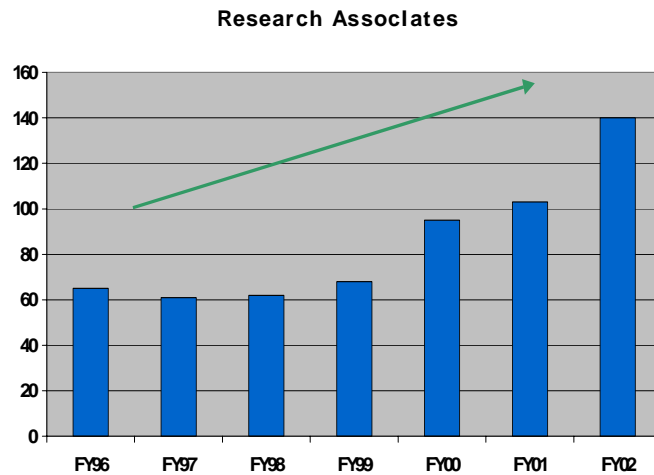
1.2 INSTITUTIONAL LEVEL PERFORMANCE

As BSA approaches the end of its first contractual cycle, it is important to remember the initial focus for this contract period; namely to improve in the areas of Environmental, Safety and Health (ES&H) and Community Relations while maintaining an excellence in science. We believe we have accomplished this goal and more. There has been continuous and sustained improvements in the areas of Environmental Safety and Health (ES&H) and Community Relations during this period. However, it is very important to remember that Brookhaven National Laboratory is here to perform science and technology research. Therefore, we are proud of achieving an *Outstanding* rating in Science and Technology as well as being in alignment with DOE's missions and goals, and building strong collaborations with other national laboratories and universities. The Laboratory's Science and Technology managers have focused on addressing the core areas and major initiatives, in prioritized manner, to achieve and sustain outstanding performance. As reported in previous years, however, many of the management changes are still maturing and will take several more improvement cycles before full benefits are realized. Initiatives adopted to attract and retain key scientific staff, improve strategic planning, and improve LDRD management have matured and we continue to see benefits in committing our resources in this area. Also improved is the integration of BNL capabilities and collaboration to maximize benefits of National Laboratory based research.

1.2.1 Initiatives

1.2.1.1 Scientific Staff

BSA continued its effort to retain and recruit top-level scientific staff at all levels to maintain its core scientific strength. Dr. Ralph James, who joined the Laboratory in June 2001 as the Associate Laboratory Director for Energy, Environment and National Security, played a pivotal role in aligning the Laboratory with DOE's mission for Homeland Security. Dr. Steven Dierker, who joined the Laboratory as the Chairman of NSLS instituted the organizational change in the Department to streamline its user oriented operations.



With an aggressive and focused hiring effort, the S&T sector was able to attract many new scientists, and technical staff. Some of the significant hires were in the Laboratory's strategic areas such as the nanomaterial center development (Dr. Ron Pindak) and biomedical research (Drs. Helene Benveniste and Huilin Li). Taking advantage of the Laboratory's postdoctoral Research Associate subsidies program, the distinguished

Goldhaber Fellowship Program established by BSA and other opportunities, the science and technology sector of the Laboratory has an increased population of young scientists; the number reaching about 140, more than 20% of the total scientific staff. BNL's target is to reach 150. Noting that the salaries of postdoctoral Research Associates at BNL are significantly below the DOE average, measures were taken this year to boost the salaries with a large increase. However, it still stands significantly below the DOE Laboratory average.

Laboratory management established joint appointments with universities such as SUNY at Stony Brook as a viable means to attract key scientific personnel. Joint appointments enable the Laboratory to share resources with the universities, making the cost of top scientists more affordable for both the University and the Lab. Joint appointments also improve program integration, foster broader collaboration and bring graduate students into the Laboratory. Examples of previous successful joint appointments at Stony Brook are listed below together with the DOE program for which the research is focused.

- James Glimm - ASCR (Head Center for Data-Intensive Computing)
- Stanislas Wong - BES (Materials Science)
- Arthur Suits - BES (Chemistry)
- Michael White – BES (Chemistry)

During this reporting period, the following joint appointments were also established:

- Helene Benveniste - OBER (Medical)
- DaXiong FU - OBER (Biology)

Science and Technology Diversity Programs

In 1998 BSA made a commitment to improve the representation of women and under-represented minorities on the scientific staff through a six-year program. Recruitment measures were initiated by utilizing the expertise and experience of a retired African American BNL scientist, Gus Prince to establish a liaison program with Brookhaven National Laboratory and Historically Black Colleges and Universities for the recruitment of minority and women scientists. In addition, partial funding for 13 positions targeting women and under-represented minority postdoctoral Research Associate and Assistant Scientists was provided. To date, the initiative has resulted in one African American Assistant Scientist, three African American and three women postdoctoral Research Associate hires.

1.2.1.2 Planning (Long and Short Term)

Introduction

The Laboratory engages in several aspects of planning, i.e., basic process elements such as Facilities Initiatives Planning, program planning and integration, staff planning, and planning to meet user needs. The Laboratory continues to improve and integrate the

planning processes, although some aspects of the Planning System still need to mature. Those elements of planning that provide a firm basis for the overall planning at BNL continue to be performed in an outstanding manner. These are the 3PBP process for prioritizing short-term infrastructure/ESH projects, major facility and site master planning, and high level Laboratory Initiatives planning conducted by the Director and ALDs. Plans for staff and program realignment and integration are being executed and should be rated as *Excellent*. Bottom to top planning and integration is improving and should be rated *Good to Excellent*. Some organizations are doing an outstanding job of both short- and long-range planning while the planning in other organizations, especially long range planning, needs to improve. However, this tends to be in organizations where the long-range uncertainties in sponsor driven direction and funding makes long range planning difficult at best. It is our evaluation that overall the organizational planning should be rated *Good*. The integration across organizations also needs to improve, but integration of the major directions for programs and initiatives, as determined by senior management, is *Excellent*.

Justification

Significant efforts were made this year to continue the realignment of programs along the DOE missions and to integrate programs to assure consistency with DOE's current and future needs. The following are examples of institutional planning and execution of that plan.

- Four years ago the Laboratory planned and implemented steps to rejuvenate and expand key capabilities at the Laboratory. BNL now has more than 140 young scientists in the post-doctoral Research Associates and Fellowship program. The Goldhaber Fellowship currently funds 8 top scientists and this year alone more than 100 applications have been received. BNL hired young, highly sought after scientists to reinforce and expand key programs (e.g., theoretical physics, life science, chemical and materials science), and has embarked on a plan for joint university/ Lab appointments to both augment capabilities at the Lab as well as offset the cost of highly recognized senior scientists.
- Planning by senior management has provided a roadmap for new facilities and capabilities and a vision of how the Laboratory will continue to serve the nation and DOE, our international users and partners, and the Northeastern Region of the US. In conjunction with DOE, the Laboratory is pursuing plans to bring to fruition its top priority science facilities, the BNL Nano Center (BES), RHIC II (NP), NSLS Upgrades (BES), and CIRC (NE). Preliminary plans are in place for these projects. BNL Nanocenter received DOE's CD 0 approval. BNL will meet the request of the Director for the Office of Science to provide the appropriate justifications and data needed to move forward with these facility developments.
- NSLS is moving rapidly to a structure that will be more responsive to and accommodate user needs by moving from the PRC concept to the "full service" concept. This concept is key to the Structural Biology Program at the NSLS. This program is an unqualified success and the "Fed Ex" approach is highly responsive to user needs. While the NIH funded this, it demonstrates that careful planning based on

user needs and the unique capabilities of the DOE facilities can attract substantial financial input for other key agencies.

- The NSLS Upgrades will provide the synchrotron light source user community with the cutting edge capabilities well into the future and will better serve the Nano Center, a key resource to the materials science community in the Northeast and a complement to the capabilities of other DOE Nano Centers.
- The Laboratory has planned and is working in conjunction with interested universities to make the NSF RSVP project a reality. This project, and others such as the NASA Radiobiology Program and Facility will make use of cutting edge capabilities of the AGS and provide these unique capabilities to other sponsoring agencies.
- Plans for RHIC II and eRHIC began even before completion of the RHIC facility. These plans will continue to provide cutting edge capabilities in Nuclear Physics well into the future at a cost well below that of a new facility.
- In 1998, the Director of BNL, J. Marburger stated in his message in the Institutional Plan that “rapidly advancing large-scale computing and visualization was necessary to merge the macroscopic and microscopic world”. The Laboratory embarked on plans to make computation serve science. Already, BNL was involved in high-end computing for RHIC in conjunction with RIKEN and the Laboratory embarked on other avenues to strengthen our existing capabilities and to expand the application of advanced computation to other areas. The formation of the CDIC in conjunction with Stony Brook was just one step. Our plans for ATLAS and the transparent integration of capabilities with RHIC computing, and the success of our competition in SiDAC for the Lattice Gauge program demonstrate the soundness of this plan and rigor with which we have pursued our plans. In the recent Genomes to Life proposal, the computation goals were to support the research goals and provide a key tool to the research community for understanding complex microbial communities.
- Program realignment and response to DOE needs has been a major goal of the Laboratory for the past four years. Some of the key elements of the plan included consolidation and integration of material science capabilities, realignment of the Life Science Programs with a focus on the key capabilities of BNL and how they might best serve DOE. A systematic restructuring of the NSLS and long range planning will help to better serve users now and in the future. The newly formed Materials Science Department is only the first step in concentrating our capabilities in materials. It will fully complement and support the programs at the Nano Center. The integration of capabilities in materials and chemical sciences has lead to more success in competing for key funds in nanoscience. The plans for the Life Sciences programs included new staff, focused on DOE issues and more collaborative (both internal and external) approaches to research. The success of these efforts becomes evinced by the success of our competition in bioengineering initiatives and the expansive, highly integrated and collaborative response to the Genomes to Life Call. While BNL did not win funding, the approach has provided a basis on which to move forward and further improve the integration and collaborative nature of its Life Science programs. In the future, plans in Life Sciences will focus on key issues in DOE missions with plans such as that for the Center for Complex Membrane

Proteins. This initiative draws on the facility and core structural biology capabilities of BNL and provides the DOE with a new user capability for understanding the complex biological protein processes involved in cell signaling, so important in human health, in carbon management, and in environmental remediation.

- Site Master Planning continues to focus on providing space appropriate for science in the 21st Century and the Laboratory is actively pursuing Third Party Financing as one measure for implementing its plans. Working with the DOE (SLI) BNL continues to provide sound short and long range plans to maintain and improve the site, including new facilities such as the Research Support Facility in FY 03 and the User Facility in FY 04. The Laboratory also uses the 3PBP process to balance overall infrastructure improvements, ESH improvements, and current and future programmatic improvements (e.g., laboratory upgrades and new space for programs).

Summary

Overall we rate the short and long-term planning as *medium to high Excellent*. Long-range initiatives and large programmatic plans, staff plans and user need plans are high excellent to outstanding. Improvements need to be made in organizational planning and integration (bottom to top) and in long-range integration of programmatic and support planning. Small program planning needs to extend to longer time frames and organizations need to continue to look for opportunities to collaborate and integrate their capabilities to meet sponsors' current and future needs.

1.2.1.3 Overall Integration and Collaborations

Introduction

Integration and collaboration includes both internal to the Laboratory, as well as external with other institutions. The Laboratory has a strong history of collaboration in High Energy and Nuclear Physics and that strength continues. The NSLS has long been a star in laboratory, university and industrial collaborations and it continues to expand its role as a major focal point for collaborations, and will be an integrating element in our New Nano Center programs. Internal collaborations (within the organization and across organizations) continue to grow and small program integration and collaboration with organizations outside the Laboratory are becoming more and more common.

Justification

- Results from the four major detector groups at STAR, PHENIX, PHOBOS and BRAHMS, dominated the Quark 2002 conference, something that could not have occurred if the operations of the facility did not accommodate the users and if the users were not focused and coordinated in their goals. The NSLS continues to be heavily used and in demand. This year's request for beam time is at an all time high, again a feat that could not occur if the operations did not meet the user needs, if the user groups did not work together to assure a strong program, and if the organization did not foster collaboration and integration for efficient and responsive operations.

- The RIKEN-BNL program is an unqualified success in collaboration, as evinced by the signing of another 5-year agreement.
- Advanced computation for HE and NP is moving toward transparent integration. This is a result of the Laboratory's move to make computation serve science and not have computation for computation's sake.
- In HE and NP, BNL and others collaborate to recommend to DOE the long-range directions for the programs and facilities, a National Program. In response to these long-range plans, BNL, in collaboration with several universities and other DOE and foreign Laboratories, is moving to a new concept for RHIC, eRHIC, and will continue to participate in the long range neutrino program plans.
- The Nano Center that will be built at BNL was the result of both internal and external collaborations and the integration of BNL's efforts in nano science. This center will serve the northeastern US, and represents the efforts of several BNL internal department staff as well as external university staff. In conjunction with the Nano Center, BNL also formed the Materials Science Department – pooling the talent and capabilities of researchers from several organizations.
- In several cases, new staff and post-docs have been hired to expand the capabilities of programs and to help integrate aspects of one discipline into another. For example, staff in theoretical physics integrate their capabilities with experimental programs, and new joint BNL/university appointments help integrate programs such as those in catalysis and nanoscience.
- Other indicators include the involvement of the Laboratory in applying computational methods to several focused experimental/programmatic problems such as in imaging, catalysis and bioinformatics. It also involves the Laboratory's recent responses to DOE initiatives that involved interdepartmental, inter-DOE Laboratory and university participation, such as the Genomes to Life proposal.

Summary

Overall, we rate Program Integration and Collaboration *low to medium Outstanding*. Clearly our major program efforts in HE and NP are *high Outstanding*. Efforts in BES are *high Excellent* to *Outstanding* depending on the program and our small program integration and collaboration efforts are moving for *low Excellent* to *high Excellent*.

1.2.1.4 Proposal Process

We break the proposal process into three main categories: the standard FWP process, new proposals for DOE, and proposals for Work for Others. In general DOE sets the FWP process. Since the FWP is primarily a budget vehicle, it is not rated here. However, we note that over the last few years, the Laboratory has attempted to meet DOE program needs by providing early drafts for use in the DOE budget process. As an indicator we evaluate that responsiveness as *Excellent* and intend to be as timely as possible in meeting this need. More advanced guidance from DOE programs could expedite this process. Our proposal response to new initiatives in DOE has depended on the program, the DOE program expectations, and the quality of the reviewers. Overall, we rate the

major proposals we have submitted this year *Excellent*, as evinced by the review comments.

Over this past year the Laboratory has embarked on a more systematic approach to proposals and it will take time to mature before it can be fully evaluated. We believe our process is *high Good to Excellent* and we believe we are evolving a process that should improve both the quality of our proposals and their success. Our model is one that comes from the development of the Nano Center Proposal and the Genomes to Life Proposal, one successful, one not. Both proposals relied on a team concept, the development of a schedule, distribution of responsibilities, and internal and external reviews. For every proposal our goal is to answer the call, to assure that we have the capabilities to meet the stated goals of the request for proposal and to assemble an interdisciplinary team of scientists, administrators and project management specialists, where applicable, to implement the program. We believe that this process produces quality proposals and the success of the proposal then rests on the impartial evaluation and capabilities of the reviewers. We may disagree with the reviewers and their decision, but we believe we have produced proposals that answer the call, and represent cutting edge research for DOE.

In our Work For Others proposal, we have been quite successful with several agencies, most notably NIH. Based on the improved quality and success rate, we rate this as *Excellent*.

1.2.1.5 Laboratory Directed Research and Development

In FY 2002, the LDRD Program continued to improve under the leadership of the newly appointed Scientific Director, Leonard Newman. He came from the ranks of BNL and has a longstanding and broad expertise of the research activities at the Laboratory. In this position he has full responsibility in all aspects of the program, which enabled the program to function more efficiently and effectively. In FY 2002, the program received the results of a formal Baldrige type self-assessment performed on the administration of the program. The assessment highlighted the improvement in the selection process and administration that could be directly attributed to having a dedicated Scientific Director of the LDRD Program. Again in FY 2002, the Scientific Director and a committee, consisting of senior science and technology management of the Laboratory and two senior scientific staff, reviewed all proposals, obtained additional information deemed necessary, and selected the projects to be funded and the amount of each award. Awards were typically funded for two years with the possibility of funding for a third year. The Scientific Director of the LDRD Program performed a mid-year review of all projects. This review was a factor in determining whether a project would continue into the next fiscal year. In addition, The Scientific Director continued the monthly meetings with the DOE Brookhaven Area Office to update the progress of the program and verify that the BNL LDRD Program is meeting the overall LDRD requirements. Significant new requirements were imposed on the LDRD Program in FY 2002 as a result of congressional inquiries on the DOE LDRD Program. BNL supported the new requirements by:

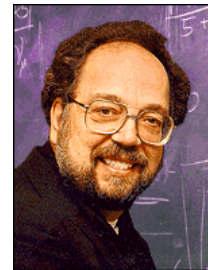
- Participating in the DOE SC LDRD working group to develop new guidelines
- Participating in the development of the new CFO LDRD database
- Ensuring that all projects support the DOE security missions and missions of other federal agencies
- Identifying potential use/benefits to the DOE security missions for all projects
- Submitting data sheets for all projects to the DOE Operations/Site Office for concurrence
- Including the DOE-BAO LDRD Program Manager in all LDRD selection meetings

In FY 2002, BSA increased its expenditure level from \$6 Million to \$7 Million, approximately 1.5 percent of BNL operating funds. There were several success stories in the LDRD Program with projects receiving direct funding from DOE, NIH, and CRADA agreements. In addition, several projects also submitted patents. We are planning to increase the LDRD budget in FY 2003 to \$8.5 Million, approximately 2%.

1.2.2 Scientific Recognition

Awards and Accomplishments: Throughout its history, Brookhaven National Laboratory has received numerous recognitions for its contributions to the Technical and Scientific Community. These are the awards and accomplishments received during fiscal year 2002.

William Marciano, a theoretical physicist, won the J.J. Sakuri Prize for Theoretical Particle Physics for 2002. The award recognizes Marciano for his “pioneering work” on calculations necessary for testing the consistency of the Standard Model, the physics theory that seeks to explain interactions between all known particles.



William Marciano

The American Association for the Advancement of Science has awarded Deputy Chair of the Physics Department, Doon Gibbs, the distinction of Fellow for the Advancement of Science. Gibbs was recognized for his distinguished contributions to condensed matter physics using sophisticated and elegant x-ray scattering techniques.



Doon Gibbs

James Reilly, a retired chemist who continues to participate in groundbreaking research, was awarded a 2002 Design & Engineering Award by Popular Mechanics magazine. Reilly was cited in the science category for his work on developing a new metal alloy that promises to improve the performance of rechargeable batteries.



Garman Harbottle, a senior chemist, was named the 2002 recipient of the Archeological Institute of America's Pomerance Award for his outstanding Scientific Contributions to Archaeology. Harbottle has an international reputation as an expert in dating and authenticating historically important items.



Garman Harbottle

Richard Setlow, a senior biophysicist, was the recipient of the 2002 Environmental Mutagen Society (EMS) Award. He was recognized for his research contributions to the field of environmental mutagenesis, which involves the study of how various agents in the environment, such as chemicals and radiation, lead to DNA damage and how that damage is repaired.



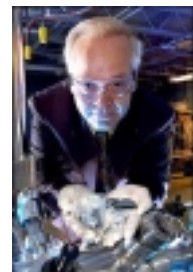
Richard Setlow

The Joint Institute for Nuclear Research has named Nicholas Samios, a senior physicist the 2001 recipient of the prestigious Bruno Pontecorvo Prize in Dubna, Moscow. The award recognizes Samios for his contributions both as a researcher in elementary particle physics, particularly neutrino physics, and as a scientific administrator.



Nicholas Samios

Ralph James, Associate Laboratory Director for Energy Environment & National Security was named a Fellow of The Institute of Electrical and Electronics Engineers (IEEE). James was recognized in the development of wide band gap compound semiconductor devices used for detecting and imaging X- and gamma ray radiation.



Ralph James

Louis DiMauro, a senior chemist, was named a Fellow of the Optical Society of America (OSA). DiMauro was recognized for his work on the development of a new laser technology that generates intense pulses of light over an extremely short time span.



Louis DiMauro

Yonjae Lee, a postdoctoral fellow in the Physics Department, won the 2002 Alvin Van Valkenburg Award for his work on a newly discovered class of materials that expand under pressure.



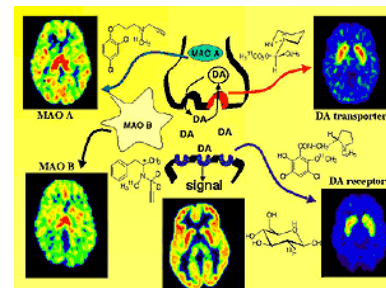
Yonjae Lee

Vasilis Fthenakis, a senior research chemical engineer, was elected a Fellow of the American Institute of Chemical Engineers, in recognition and appreciation of superior attainments, valuable contributions, and service to Chemical Engineering.



Vasilis Fthenakis

Joanna Fowler, a senior chemist, won the American Chemical Society's (ACS) 2002 Glenn T. Seaborg Award for Nuclear Chemistry. Fowler was honored for her pioneering contributions to positron emission tomography [PET], including the development of fluorine-18-fluorodeoxyglucose [FDG], a radiotracer used worldwide for measuring brain function and for diagnosing cancer; and for the development of tracers for monoamine oxidase [MAO] found to be reduced in the brains of smokers.



Raymond Davis Jr., a retired chemist, has won the Nobel Prize in Physics for detecting solar neutrinos, which are ghostlike particles produced in the nuclear power reactions that power the sun. Davis shares the award with two other scientists. In awarding the prize the Royal Swedish Academy of Sciences cited Davis 'for pioneering contributions to astrophysics, in particular for the detection of cosmic neutrinos'.



Raymond Davis

Senior Management

Members of Senior Management continue to participate in international and national laboratory advisory committees, DOE advisory committees, and are involved in organizing major international and national conferences.

1.3 DEPARTMENT OF ENERGY RESEARCH PROGRAMS

1.3.1 High Energy Physics and Nuclear Physics (HEP&NP)

The fields of High Energy and Nuclear Physics are leading areas in the basic research mission of Brookhaven National Laboratory. BNL is the home of DOE's largest and newest nuclear physics research facility, the Relativistic Heavy Ion Collider (RHIC) as well as the world's highest intensity multi-GeV proton accelerator, the Alternating Gradient Synchrotron (AGS). These two large accelerator facilities enable physicists from universities and laboratories around the world to perform cutting edge research at BNL.

In addition to hosting the large accelerator facilities, BNL is also the home of several research groups in high energy and nuclear physics. These research groups both contribute directly to the advance of these two fields of basic research but they also enhance the contributions of the non-BNL researchers by facilitating effective access to the BNL accelerator facilities, usually by collaborating with the outside groups. BNL is also engaged in research on future accelerators and operates the Accelerator Test Facility (ATF) as an exploratory venue for university and outside laboratory scientists interested in advanced accelerator R&D.

Finally, BNL conducts research, development, design and limited production of advanced instrumentation used in all fields of science in the BNL Instrumentation Division and in the BNL Superconducting Magnet Division. Both of these divisions contribute uniquely to advances in their respective areas of science and technology.

1.3.1.1 Quality of Research

BNL research groups in theoretical and experimental high energy and nuclear physics are ranked among the leading groups in the world in the sub-fields in which they perform research work. Annual evaluations by the Office of Science, through the Nuclear and High Energy Physics Divisions frequently award ratings of *Outstanding* to their work. For the period July 1, 2001 – June 30, 2002, achievement highlights of these groups include:

Nuclear Physics

The record of scientific publications and presentations of RHIC research results at national and international conferences and workshops strongly increased its tempo in the current period of evaluation. The four RHIC experimental groups published a total of 25 peer reviewed papers in the period, with another 10 papers submitted. The two larger collaborations, PHENIX and STAR, have published 9 and 8 refereed papers, respectively, most of them in Physical Review Letters, the most prestigious journal in nuclear physics. The BNL Neutrino group under Richard Hahn, collaborated in the very important solar neutrino results from the SNO Collaboration, a path-breaking experiment in neutrino physics that has resolved a three-decade puzzle in measurement of solar neutrino fluxes. The BNL Medium Energy Physics group reported interesting new

results in hypernuclear states that have garnered press attention as well as publication in the peer-reviewed journal, Physical Review D. The complete list of publications is available from the Physics, Chemistry and Collider-Accelerator Departments as needed.

A BNL physicist, Dr. Tim Hallman was elected as the new Spokesperson for the STAR Collaboration in the past year, confirming the leadership strength of the BNL group in STAR. Dr. Les Bland joined the BNL STAR group last summer, bringing new expertise and leadership to the spin physics efforts of STAR at BNL. The nuclear theory group continued building its strength in this period, with the appointment of several new post docs and by continuing the productive collaboration with RBRC (RIKEN-BNL Research Center) theorists on nuclear physics topics. Many contributions at various levels were made by BNL nuclear physicists to the formulation of the latest long range plan for nuclear physics that was released in spring 2002. In the accelerator science area, Steve Peggs was elected to fellowship in the American Physical Society and many C-AD and Superconducting Magnet Division contributions were made to the advance of the field.

High Energy Physics

The AGS-based rare kaon experimental group published the observation of a second event of the very rare but highly important $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ decay, a process of direct importance to the determination of the CP-violation parameters in the Standard Model (SM). New results from the Muon (g-2) measurement was presented to the International HEP Conference to be held in Amsterdam during July 2002. The new (g-2) measurement result will have a major impact on particle physics and on the experimental basis for the SM. BNL physicists continued to contribute to advances in the understanding of particle physics processes in the Standard Model, giving experimental and theoretical talks on expectations for future discoveries that could emerge from the upgraded Tevatron program now underway at Fermilab and, later, from the LHC collider at CERN in 2007 and beyond. Central to these contributions are the topics of search for the elusive higgs boson and evidence of physics beyond the SM. In the pursuit of these subjects, many BNL physicists participated in the assessment work leading up to the Long Range Plan for High Energy Physics, completed in Winter 2002.

Several now and former BNL physicists were awarded prestigious prizes during the last year. Dr. Ray Davis, retired from BNL, received the DOE's 2002 National Medal of Science for his solar neutrino measurements over three decades. Dr. William Marciano, BNL theorist, shared APS's 2002 J.J. Sakurai Prize in theoretical physics with his thesis advisor, William Sirlin of NYU, and Dr. Nick Samios, former BNL director, received the 2002 Bruno Pontecorvo Prize awarded by the Joint Institute for Nuclear Research, Dubna in Russia. Dr. Sara Dawson, BNL theorist, was elected incoming chair of the APS Division of Particles and Fields. Dr. Amarjit Soni was named a fellow of the American Physical Society.

1.3.1.2 Relevance to DOE Missions and National Needs

The HENP research and facilities-operation programs at BNL are commissioned, reviewed and funded annually by DOE program officers and are thereby assured of

conforming closely to the DOE missions in these areas. The relationship to national needs is defined and managed by DOE in the HENP program area through written and oral communications with BNL management as well as by the DOE program review process.

1.3.1.3 Success in Constructing and Operating Research Facilities

Nuclear Physics

BNL's largest user facility is the Relativistic Heavy Ion Collider (RHIC) accelerator used by the worldwide nuclear physics community. During the 2001-2002 reporting period, RHIC first reached its beam-energy design value for heavy ion collisions in June 2001 with all four RHIC experiments taking data in 100 GeV/amu Au-Au collisions. In addition, the PHENIX experiment also attained the Au-Au heavy ion average design luminosity of $2 \times 10^{26} \text{ sec}^{-1} \text{ cm}^{-2}$ in the latter part of the heavy ion run, while the other three RHIC experiments operated at about half this value. Peak Au-Au luminosity exceeded the design average value by about a factor of 2.5, showing that the goal of reaching the average design value on a routine basis can be achieved as the remaining accelerator technical limitations are addressed, one-by-one. During the month of December 2001, polarized proton beams in RHIC were first commissioned with circulating protons at 100 GeV/c, reaching peak polarizations of about 40% and average polarizations of 30%. Due to accelerator system reliability problems, typical of a new facility of this complexity, the availability of the collider was lower than expected for data runs in later years, but the integrated luminosity of the Au-Au run was sufficient for producing a dramatic flow of important new research results at this stage of the physics program. The four RHIC experiments STAR, PHENIX, PHOBOS and BRAHMS, plus the pp2pp elastic-scattering experiment, recorded initial polarized proton data. The speed at which RHIC came into full research-program use was remarkable for a facility of this degree of complexity.

BNL's venerable AGS machine also performed very well for medium energy nuclear physics users in this assessment period. In the fall, three nuclear physics experiments, E930 [Tamura] "High-Resolution γ spectroscopy of Hypernuclei using Large-Acceptance Germanium Detector", E931 [Hungerford], "A Study of the $\Delta I = 1/2$ Rule in the Weak Decay of S-Shell Hypernuclei" and E913 [Nefkens, et al] "Measurement of $\pi^- p \rightarrow$ Neutrals at 200-400 MeV/c" all took data at the AGS and all reported successful data taking outcomes for their experiments.

BNL's Superconducting Magnet Division has continued to design and build innovative superconducting accelerator magnets for the RHIC facility. During the past year, the superconducting spin snake and rotator magnets were completed and installed in the RHIC ring. In the FY 2003 data run, the entire complement of spin magnets will be operational as required for the production and manipulation of polarized proton beams at energies up to the full design energy of 250 GeV.

High Energy Physics

The Alternating Gradient Synchrotron (AGS) was operated for 13 weeks for high energy physics during this evaluation period. In the fall 2002 slow-spill run of the AGS for nuclear physics, high energy physics experiment, E949 [Bryman, Kettell, Sugimoto] “ $K^+ \rightarrow \pi^+ \nu \bar{\nu}$, Rare Kaon Decay”, commissioned their newly upgraded detector from the preceding version of the same experiment, E787, using parasitic beam during the nuclear physics run. E949 then recorded data successfully for 12 weeks in spring 2002. The successful upgrade of the detector enabled the rate of acquiring stopped-kaon triggers to proceed at nearly twice the best rate achieved in earlier years. Although short on running weeks, the 2002 run represented an efficient and very successful start for E949.

BNL also operates the Accelerator Test Facility (ATF), a coupled 71 MeV linear electron accelerator and 5 GW-150 ps, high-power CO₂ laser combination that provides the university community, as well as a BNL research group, with a core user facility for conducting frontier experiments in charged particle acceleration. Last year, 12 groups performed experiments on the machine. ATF also contributed to the education of accelerator science PhD students and publishing research papers on advanced accelerator topics. This facility is now being emulated by similar installations at SLAC and Fermilab.

In the area of facilities construction projects, BNL is a key partner in the joint DOE-NSF sponsored, U.S. participation in the Large Hadron Collider (LHC) construction project. This project, based at the CERN Laboratory in Geneva, Switzerland, is creating the world's highest energy proton-proton collider for the exploration of energy frontier particle physics, together with four large experimental detectors (ATLAS, CMS, ALICE and LHC-B). The LHC will be ready to begin high energy physics operations in 2007. BNL is the host Laboratory for U.S. participation in the ATLAS experiment and manages the U.S. participation in the detector and computing construction projects. The U.S. ATLAS Detector Project has continued performing successfully in the evaluation period, although the international ATLAS partnership is facing some serious budget problems in achieving the “working detector” envisioned by the ATLAS Collaboration. The BNL-managed project is seeking to help mitigate some of the budget problems in international ATLAS without compromising the successful outcome of the BNL-managed U.S. ATLAS Project. BNL will also be the host laboratory for U.S. participation in the ATLAS research program to follow.

BNL is also the home of 40% of the U.S. LHC Accelerator Project. This project is managed by Fermilab as the lead Lab for the U.S. project. The BNL portion of the project work continued in the evaluation period with good performance in cost, schedule and technical progress. Superconducting magnets are being completed at BNL and shipped to CERN and superconducting cable is being tested at BNL, albeit at a slow rate as a result of delayed cable shipments from CERN. This project is slightly behind the U.S. planned schedule but is far ahead of the CERN LHC schedule. BNL performance has been satisfactory as evaluated by DOE project reviews.

1.3.1.4 Effectiveness and Efficiency of Research Program Management

BNL has management responsibility for user facility operations, research programs and construction projects in the national high energy and nuclear physics programs. In addition, the responsibility extends to the safety and environmental aspects of these operations as well as for employee well-being and career advancement. All of these areas operated within successful parameters during the last evaluation period, in spite of continuing budget stress imposed by the flat funding profiles in these research areas. The flat funding contends with real rates of inflation for BNL HENP operations of about 3.5% per year. Maintaining a positive attitude among the staff and providing successful research operations outcomes has taxed the best talents of the BNL managers of the HENP program. The success of the nuclear and the high energy physics programs at BNL stands as a positive testament to the success of this management effort. The safety and environmental records of the HENP departments and divisions were excellent in the period of evaluation as a result of high-level and continuous attention to these crucial areas of management performance.

Nuclear Physics

The nuclear physics program at BNL evolved during the past year with many successes and with no serious shortcomings or failures in the management areas. Routine management challenges imposed by unanticipated problems such as the failure of the main AGS power supply generator and the failure of the AGS to produce the anticipated level of proton beam polarization during the first RHIC spin run were promptly addressed with effective management actions and the impact to the research program was minimized. Staff quality was maintained during the imposed staff reductions that were forced by continuing budget shortfalls in DOE programs. The expectation of future improvement in the RHIC operations budgets, fortified by the FY 2003 President's Budget in this area, provided strong positive incentives to staff morale and continued research productivity. Future funding prospects in the medium energy nuclear physics area did not share this optimism and management vigorously sought to begin re-programming the talents of permanent scientific staff in this area. The outcome of this process is ongoing.

In the area of construction and equipment project management, two, multi-year nuclear physics Additional Experimental Equipment (AEE) projects completed by BNL during the RHIC building era were successfully closed out with DOE during this evaluation period. Likewise, the Accelerator Improvement Projects (AIP) and the smaller scale equipment projects, such as RHIC accelerator upgrades and RHIC detector upgrades have been well managed and are all in good status relative to cost, schedule and technical performance.

High Energy Physics

The surprising news that AGS would be "terminated" in FY 2003 delivered in the President's Budget for FY 2003 presented a very serious management challenge for the second half of the evaluation period. This decision by DOE interrupts, perhaps ends, the high energy physics program in progress at the AGS. The AGS program consists of a

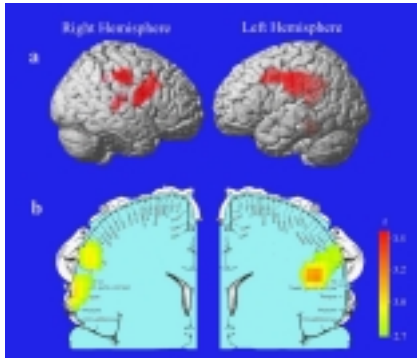
very compelling experiment in rare kaon decays plus the precision muon ($g-2$) measurement. Both experiments had earlier been approved for the AGS by DOE but this approval appears to be rescinded by the new budget decision. This problem comes on top of the very serious flat funding challenge for several years imposed on the HEP research program at BNL, a management challenge that the Laboratory has met with a determination to preserve, as best as possible, the most important research efforts of the program. This has been achieved in terms of BNL's commitment to the D0 experiment at Fermilab, where Jon Kotcher has accepted the role of project manager of the Run 2b upgrade of D0 and other BNL staff physicists have made important contributions across the board to the D0 Run 2 performance. Likewise, the HEP theory group has been maintained at an effective staffing level and has maintained its very high reputation in the national arena. By the time the impact reached the ATLAS physics group, severe gaps in staffing had to be tolerated and the remaining research groups involved with the rare kaon and muon ($g-2$) groups have suffered serious staffing setbacks. BNL's participation in the MINOS neutrino experiment at Fermilab has suffered the most severe staffing problem and has made only a fraction of the contributions intended for the experiment. We believe that BNL has responded as effectively to this management challenge as could be asked and has kept the remaining program going with effective contributions, negligible loss of the best scientific staff and with hopeful attitudes for the future of HEP at BNL.

In the area of management of DOE and NASA construction projects active during the evaluation period [U.S. ATLAS Detector and Computing Projects, LHC Accelerator Project, Spallation Neutron Source (SNS) and Booster Application Facility (BAF)], BNL has performed well and all these projects experience a good status position relative to cost, schedule and technical performance. Funding for these projects has been provided on-schedule by the funding agencies and progress has been as planned. Some delays have been announced by CERN for the LHC Project but the U.S. intends to stay approximately on the original schedule for nearly all its contributions, a management decision that will keep the U.S. part of LHC in good project status for cost and technical performance, even if the schedule doesn't really demand maintenance of the original intent.

1.3.2 Biological and Environmental Research

1.3.2.1 Quality of Research

Medical imaging and addiction studies remain a cornerstone of OBER research at BNL. This research mission creates great opportunities for collaborations and jointly funded initiatives with other agencies, principally the NIH. Specific accomplishments in Radiotracer Chemistry and Neuroimaging using Positron Emissions Tomography (PET) include:



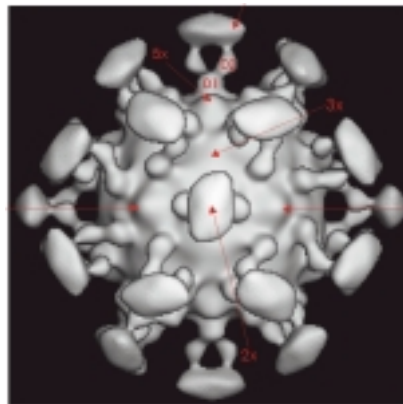
PET images showing the brain regions with metabolic activity (higher in obese subjects).

The lower diagram of the brain identifies hot spots in the areas receiving input from the lips, tongue, and mouth

- BNL's unique expertise and brain imaging capabilities produced new research findings that may help to combat the cause of obesity. Using PET and MRI imaging techniques led to the conclusion that parts of the brain responsible for sensation in the mouth, lips, and tongue are more active in obese people than in normal-weight control subjects. The activation of the brain's dopamine motivation circuits is distinct from the role the brain chemical plays when people actually eat, and may be similar to what addicts experience when craving drugs.
- BNL's brain imaging capabilities (PET, with microdialysis) were used to obtain images of the affects of inhalants in the brain and why solvents (toluene) may be so addictive. This is important work because solvents are the most frequent form of substance abuse in children. These images show that toluene moves into the brain rapidly and initially affects the same brain regions as cocaine and other abused drugs. The study, which was performed in baboons and mice, appears in the April 26 issue of the journal Life Sciences.
- The PET scanner designed for rats and mice (microPET) has completed its first full year of operation as a new scientific tool for preclinical research to measure biochemical transformations and the movement of drugs in the living animal, including the genetically modified animal, over time.
- The use of Bioengineering techniques to advance imaging capabilities has been successful in developing two specialized PET devices to measure radiotracers in blood. One is a beta probe implanted in a blood vessel and the other is a co-incidence detector positioned external to the wrist to measure positron emitter concentration. Both hold the promise of making PET studies simpler and safer. In all these projects the BNL Instrumentation Division played a crucial rule. The program to "Image the

Awake Animal” has advanced due to the combination of unique capabilities that exist at BNL.

- As part of the Macromolecular Crystallography Program, the Laboratory established an Automated Structure Determination Platform for high-throughput in structural genomics and released it to a worldwide crystallography community by studying the bacteria that cause the Black Plague, plant infections, and colds. Researchers have discovered that these three very different microorganisms share a common strategy--- they all prevent the cells they are attacking from calling out for help. All three organisms produce a similar protein to interfere with the infected cells chemical signaling pathways, which are designed to alert the immune system to attack the germs.
- Short-lived positron emitting isotopes have been used to study the effects of environmental stressors on plants. The first images were produced which provided the proof-of – principle of this technique.
- BNL has used its high field Magnetic Resonance Imaging (MRI) capability to identify for the first time that high magnetic fields permit the detection of commonly employed contrast reagents at very low levels. This increased sensitivity may make it possible to detect the passage of contrast agents across the blood-brain-barrier (BBB) in the white matter of the normal human brain. This has tremendous potential for detecting slight perturbations of the BBB in conditions such as HIV infection and severe stress.
- BNL and Psimei Pharmaceuticals Ltd. have worked together under a CRADA to develop Brookhaven-invented boron compounds for use in experimental radiation therapy for cancer, as well as other cancer treatments.
- A method was developed for identifying and qualitatively analyzing genomic DNAs (called Genomic Signature Tags) that provides limited representation of all the DNA molecules in a given population without any prior knowledge of the DNA sequence. This method could potentially be used to detect the presence of biological warfare agents in crude environmental samples. This same method also can be used to support DOE’s Genomes –to- Life (GTL) program to characterize the composition and dynamics of natural populations of microbes in normal and contaminated soil samples.
- Scientists showed that a UV-sensitive rice called Norin 1 (progenitor of many commercial important rice strains) has a mutation in the DNA repair enzyme photolyase, probably a structural mutation. From this information, scientists could introduce the correct gene, thereby significantly increasing the productivity of this crop plant.

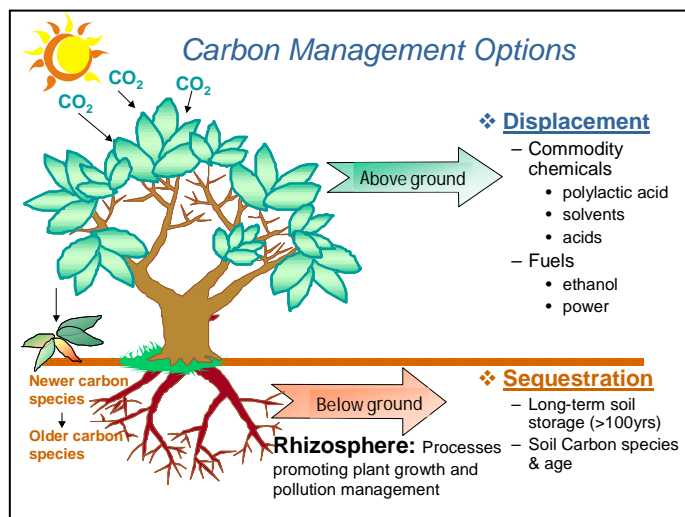


CryoEM Structure of CVB3-CAR Complex

- The Genome Group tested and formulated improved methodologies for sequencing difficult regions of the human genome by using the Nested Deletion Strategy. This is being used to help complete the sequence of the chromosomes being sequenced by the Joint Genome Institute. Nested deletions are being investigated for their possible advantages in sequencing highly repeated DNA, which can cause problems in sequencing human DNA.
- NASA supported collaborators conducted research at BNL this past year (BNL-8) that could help assess the radiation risks faced by astronauts, improve the cancer-killing potential of radiation therapy, and distinguish between DNA damage caused by normal metabolism and that caused by low-level radiation. Scientists at BNL developed a novel ultra-sensitive methodology to quantify varieties of radiation damage that previously could not be measured. Another run at the AGS is planned in the fall of 2002 which will probably be the last before the commissioning of the Booster Applications Facility in 2003.

1.3.1.2 Relevance to DOE Missions and National Needs

A major initiative in FY02 was aligning ourselves to effectively respond to DOE's *Genomes to Life* Initiative. Elements of this alignment revolved around the hiring of key individuals, the procurement of essential equipment, and establishing collaborations with other renowned institutions. The new DOE initiative "Genomes To Life" (GTL) provides an exciting focus for the expertise developed over many years in the Biology Department to understand basic principles of biological interactions both at the molecular level and within ecosystems comprised of microbes and higher forms of life.



In response to the initial call for GTL proposals, a group of scientists from BNL and other National Laboratories and academic institutions submitted a joint proposal to develop cutting-edge, high throughput DNA sequencing methods to identify and quantify microbes in the environment, analyze gene expression profiles in microbes and plant roots within soil communities and track changes in gene expression in response to environmental stimuli and following contamination of soils with radionuclides or heavy metals. The development of these ultra sensitive sequencing methods will allow scientists to monitor microbial species that cannot be propagated as pure cultures in the laboratory and identify coordinately regulated genes that may define novel metabolic pathways responsive to environmental stress. The work is relevant to DOE's efforts to develop renewal resources for carbon management.

Associated with the GTL initiative is the formation of a Center for Complex Protein Structures (CSCP), which will focus on solving the structures of membrane proteins. Membrane proteins are critical elements of biological processes and are directly related to DOE missions in the environmental consequences of energy generation and use and human health. Membrane proteins and protein complexes are important targets in bioremediation, cell signaling, and human function; they function in microbes as transporters and in the brain as receptors for neurotransmitters, yet they account for less than one percent of the known protein structures. Funding for a cryogenic electron microscope was provided by DOE/OBER and will be operational in the fall of 2002.

The PET Imaging Center was expanded in FY 01; the MicroPET and a new PET scanner were delivered to BNL. The focus of the upgrade in FY 02 is on a new cyclotron that will be installed in late 2002 and will greatly increase the efficiency and reliability of isotope production required to support clinical and non-clinical PET studies. The facility expansion and equipment acquisition received joint funding from DOE capital funds, NIH, and the President's Office of National Drug Control Policy. This interagency collaborative support further demonstrates the consensus for the importance of this ongoing research at BNL and its fulfillment of the national needs.

BNL has a long tradition of being the leader in radiochemistry. More recently, efforts were directed toward radiotracers that will target biologic processes and are relevant to important DOE initiatives. For example, components of adenoviral proteins are labeled to monitor the bio-distribution of these proteins for tumor imaging and gene therapy. BNL, through the Radioisotope Research and Production Program, continues to be a major provider of research radionuclides to U.S. investigators and clinical centers.

The NASA Space Biology Program had another successful year supporting the initiative to better understand the biological effects of space radiation. This program has required the coordination of over 80 visiting scientists annually since 1995. The results from the ongoing research will have tremendous implications for future plans of space travel and exploration. Due to this important national need, a partnership with NASA to build a Booster Application Facility at BNL is in progress. The new facility (the Booster Application Facility or BAF) will open in 2003. Additionally, visiting scientists as well as BNL staff will continue to use BNL Laboratories and equipment for experiments on biological materials irradiated at the BAF.

In response to the national need to train clinician scientists, the Medical Department, under the direction of John Gatley, has received a training grant from the National Institute on Drug Abuse/NIH. This will fund up to five two-year post-doctoral fellowships over the next four years.

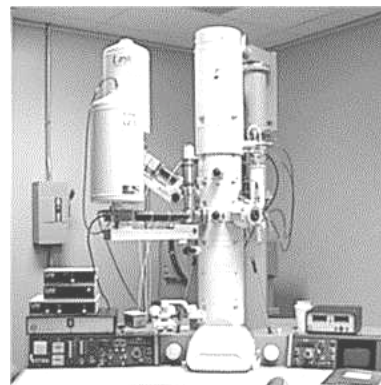
In the wake of the completion of the human genome sequencing project, BNL has joined four New York research institutions in a collaborative effort to turn that knowledge into promising drug targets. The National Institutes of Health awarded the New York Structural Genomics Research Consortium (NYSGRC) \$4.5 million to develop high-

speed methods to decipher the three-dimensional structures of proteins. In addition to BNL, the member institutions of the consortium are Albert Einstein College of Medicine, Mount Sinai School of Medicine, the Rockefeller University and Weill Medical College of Cornell University. This collaboration relies significantly on the capabilities at BNL for sequencing and structural determination.

1.3.2.3 Success in Constructing and Operating Research Facilities

In FY 2002, the BLIP (Brookhaven Linac Isotope Producer) successfully completed its scheduled operating period in support of the production of radioisotopes requested by DOE/NE. A quality program that meets the requirements of the FDA (Food and Drug Administration) was implemented this past year. Issues associated with legacy equipment in the Target Processing Laboratory (Building 801) were problematic.

A new Cryogenic Electron Microscope (CryoEM) was ordered and plans approved for the construction of a facility to house this equipment. This facility will be closely aligned with the STEM facility, which has a large user interest group, and will allow unique experiments to be done in this area. This equipment will be used for the analysis of two-dimensional arrays of membrane proteins, isolated complex particles and frozen tissue sections. It can also support the imaging needs associated with the GTL Program. The instrument is due for delivery in November 2002 and should be operational shortly thereafter.



Cryogenic Electron Microscope

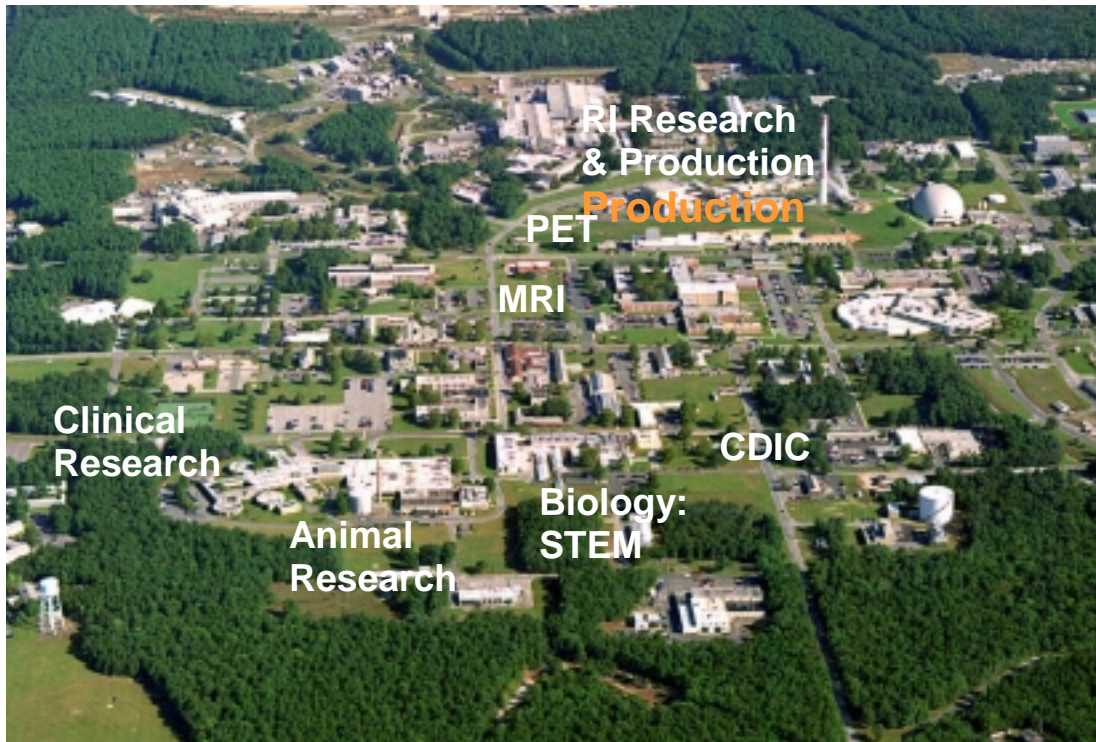


Shown here is part of the hot cell suite in the Medical Department where radioisotopes produced in the BLIP are processed for distribution to medical, industrial, and research users.

The Laboratory continues to upgrade facilities and equipment to advance Laboratory capabilities in biological and environmental research. Examples are noted below. Individually these may not be considered significant initiatives. However, collectively, they represent a substantial upgrade of the capabilities to meet the current and future needs of the DOE and the nation.

- The Macromolecular Crystallography Facility at the NSLS continues to be over-subscribed and fully utilized. “Fedex” operations have been expanded. This is the process wherein outside users mail specimens to BNL for data collection by our staff. Beamline X26C installed a triple beam diffractometer. Recently, visiting scientists utilized this diffractometer to advance their investigation of the protein-solvent interface on insulin.
- The planning for a high-field MRI (9.4 Tesla microMRI) for animal research has progressed rapidly. Detailed plans for the space and construction necessary for the installation of the microMRI have been completed. The equipment has been ordered and is expected to be delivered to BNL mid 2003.
- A high-performance gradient power supply and a high-performance gradient coil for the BNL 4T MRI instrument was installed and completed performance testing. These are the last components we have required for ultra-fast imaging, and will allow execution of the Echo Planar family of MRI pulse sequences, which can provide human images with sub-second time resolution. This will immeasurably enhance relaxographic imaging projects, functional and physiological imaging efforts, and fast spectroscopic imaging studies.

The microPET scanner received and installed in FY01 is being actively used in preclinical studies in combination with other biochemical and behavioral methods and for imaging genetically modified animals.



Facilities Operated or Used for Life Sciences Research

Several beamlines that comprise the Biology Department's crystallography facilities at the National Synchrotron Light Source underwent major upgrades.

- Beamline X12B was reconfigured to upgrade the optics for high-flux, broad spectral band-pass operation with a multi-layer monochromator (for small-angle scattering and crystallography) and narrow-band-pass operation with a channel-cut crystal monochromator (for multi-wavelength anomalous diffraction crystallography).
- The optics of Beamline X12C were upgraded to provide narrower band-pass, greater reliability, and an increased range of energies.
- A new motor control system was built and installed at Beamline X26C so that the beamlines optical elements could be reliably adjusted and the diffractometer properly aligned.

1.3.2.4 Effectiveness and Efficiency of Research Program Management

A major focus of Life Sciences research program management this past year was to improve our alignment with the DOE and NIH missions, particularly the role that DOE/OBER expects to have in "Bringing Genomes to Life", and the expanding role of NIH in imaging (a new institute was formed) and addiction research. This focus moved us to hire several key scientific staff to establish the capabilities that are consistent with BNL's existing facilities and expertise. Specifically, strategic hires were made to lead the animal MRI facility, the CryoEM facility, and the research associated with complex microbial communities (Genomes to Life). Additionally, 12 research associates were hired to support the Directorate's initiatives.

Regulatory reviews of the Clinical Research Center and the Animal Facility were successfully completed. These facilities and their associated staff continue to support laboratory wide initiatives in pre-clinical and clinical research.

Research was conducted safely and, with several minor exceptions, in a regulatory compliant manner. Where opportunities for improvement exist, measures have been taken to solicit input from external groups to achieve the desired outcome. This is particularly evident in the radiological controls area where the Independent Oversight and Quality Offices have assisted us in evaluating where improvements can be made and in analyzing the effectiveness of actions that have been taken.

Research has been effectively managed to meet the goals of BNL's Environmental Management system. Scientists in Life Sciences identified a significant number of pollution prevention projects, several of which were funded by the Laboratory because of their payback.

OBER research and the pace of discovery have provided frequent opportunities to communicate the positive aspects of DOE's science mission at BNL. The type of research (i.e., addiction, medicine, environmental sciences, etc.) is of a large cross section of the regional population. BSA has been aggressive in communicating the research

initiatives as well as significant results through press releases, presentations at regional meetings, and research institutions. In 2002, thirteen press releases highlighted research in the Life Sciences area.

1.3.3 Basic Energy Sciences (BES)

Basic Energy Sciences encompasses the science of condensed matter physics, materials sciences, chemical sciences, and nanoscience. The related facilities that are included here are the National Synchrotron Light Source, the Laser Electron Accelerator Facility, the Transmission Electron Microscope Facility, and the Deep Ultraviolet Free Electron Laser.

1.3.3.1 Quality of Research

Condensed Matter Physics, Materials and Engineering Sciences

Electron Microscopy

New advances were made in techniques of electron microscopy, which permit the observation and quantification of magnetic dynamics on the nanoscale. A new method of non-interferometric phase retrieval complimented by interferometric off-axis electron holography was used to reveal important new features of vortex domain structures in arrays of nanoscale cobalt islands.

New Complex Metal Oxides

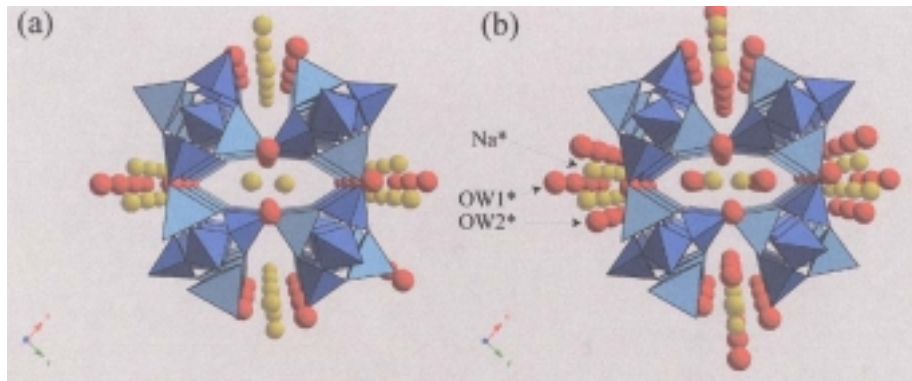
A new method for growing thin films of metal oxides was developed, which promises to make the manufacturing of conducting and memory devices more efficient and of higher quality. Called epitaxial liquid-assisted growth (eLAG), this technique consists of using a precursor-formed liquid to deposit a crystalline substance on another, such that the deposited substance mimics the orientation of the substrate.

Research in complex functional metal oxides has generated new insight into their properties. For example, transport measurements of the cubic perovskite-related material calcium copper titanium oxide ($\text{CaCu}_3\text{Ti}_4\text{O}_{12}$) show that it has one of the highest known values of the static dielectric constant, $\sim 100,000$, at room temperature. However, it drops by a factor of 1000 below 100 K without any change in the long-range crystallographic structure. Optical measurements provided the first clues both to its high value, and to the mechanism behind this sudden decrease at low temperature [Science 293, 673 (2001)].

Ferroelectric relaxor compounds, the basis for actuators and transducers with superior piezoelectric properties, have been shown to be characterized by nanoscale domains that have a randomly oriented dielectric polarization. Inelastic neutron-scattering measurements demonstrated that the polar nanodomains very strongly dampen transverse optical phonons with wavelengths longer than the characteristic size of the nanodomains [Phys. Rev. Lett. 87, 277601 (2001)].

The high conductivity of the high-temperature superconductor $\text{La}_{2-x}\text{Sr}_x\text{CuO}$ has been shown to be achieved by doping holes into an antiferromagnetic parent compound. Neutron-diffraction studies of a series of single crystals established that in the doping regime between the antiferromagnetic and superconducting phases, the magnetic moments on copper atoms become ordered within local antiferromagnetic domains with the antiphase domain walls oriented diagonally with the Cu-O planes. On doping into the superconducting phase, the domain walls rotate to become parallel with one of the directions of the Cu-O bonds [Phys. Rev. B 65, 064505 (2002)]. Inelastic x-ray scattering studies of the electronic excitation spectrum of the 2D cuprate $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$ showed that the gap excitation consists of two modes, both of which are two-dimensional. In the doped, $x=0.17$, compound, the gap was “filled in” and the lower energy excitation washed out, indicative of the “bad” metallic state (submitted to Physical Review Letters).

Finally, we have investigated superhydration, in advanced zeolites (aluminosilicates), namely the selective absorption of excess water under pressure into a fully hydrated zeolite. Reversible superhydration allows the immobilization of commonly occurring radioisotopes such as ^{90}Sr , ^{137}Cs , and ^{60}Co via a “trap-door mechanism,” i.e., exchanging ions in aqueous solutions at pressures of a few hundred bars will expand the pore of the zeolites due to the excess water entering the zeolite cages. Subsequently, larger cations can enter the nanopores (Journal of American Chemical Society, in press).



The hydrated zeolite is shown in figure (a) while the superhydrated structure is shown in (b).

Soft Matter

Initial research in soft matter has shown x-ray reflectivity of liquid wetting phenomena on nanopatterned substrates. We found that as the temperature difference between the liquid film and its vapor decreased, the film’s thickness increased from ~ 1 to ~ 10 nm. Interestingly, the rate of growth initially was much smaller than expected for van der Waals interactions, but then crossed over to a much faster rate. The crossover thickness was comparable to the depth of the etch pit.

Theory

Correlation profiles of several complex networks were calculated, and shown to be similar; they include the correlation profiles of interacting proteins in yeast, and of the autonomous system connectivity of the internet. The general technique derived in this work can distinguish between designed (or evolved) and random features in a given network (Science, in press). A fast, stable algorithm was elaborated that solves the long-standing problem of “phase unwrapping” inherent in holography and many other interferometric techniques (Phys. Rev. Lett, submitted).

The Origin of Metallic Corrosion

It has been observed that aluminum and stainless steel corrode in different ways, a discovery that may lead to better corrosion-resistant aluminum alloys. Corrosion of stainless steel usually begins in localized spots on the corrosion-resistant film on the surface of the material. The scientists discovered that aluminum corrosion starts like stainless steel, but when the pits form, they are not as readily covered by the surface film as in stainless steel. Understanding these chemical processes will help the scientists devise ways to counter them and develop better anti-corrosion treatments for aluminum and possibly other metals and alloys (Electrochem and Solidstate Letters, accepted).

Chemical Sciences

Catalysis

The activation of gold on titania was achieved; this nanoscience success is related to the adsorption and reaction of SO_2 on $\text{Au/TiO}_2(110)$. Bulk metallic Au and TiO_2 exhibit a low reactivity for the dissociation of SO_2 than are commercial catalysts for SO_2 oxidation. Interactions with titania electronically perturb gold, making it chemically more active. Gold, in turn, enhances Titania's reactivity by facilitating the migration of O vacancies from the bulk of the oxide to its surface (Journal of American Chemical Society, in press).

Chemical Dynamics

A combination of nonresonant laser photoionization of hydrocarbon radicals and ion imaging in a crossed molecular beam apparatus has led to the first global measurements of differential cross sections for the abstraction of H atoms from hydrocarbons by energetic triplet oxygen atoms.

Measurement of the duration and coherence of time of high harmonic light has been achieved using a scaled interaction. This can lead to the formation of attosecond pulses, which can open a new frontier in optical physics.

Charge Transfer

Molecular engineering of synthetic porphyrins yielded new classes of chromophores and catalysts with tunable, controllable, and predictable physico-chemical properties with potential applications to artificial photosynthesis and biometric catalysis.

Using LEAF's pulse-probe capabilities, the very fast dissociation of aryl halide anions was easily and accurately measured for molecules previously immeasurable, or where published data was in error by factors of 10-100. This has enabled the spectrum of the solvated electron in an ionic liquid to be measured for the first time.

Theoretical work on the thermal-, photo-, and radiation-induced reactions in the Condensed Media program has enabled us to model charge transport through molecular assemblies over tens of nanometers (nm) by using combined classical and semi-classical kinetic models, and all-electron quantum chemical computational techniques.

1.3.3.2 Relevance to DOE Missions and National Needs

BNL has been very responsive to the DOE nanoscience initiative: six NSET proposals have been submitted (with 3 successes), as well as a successful Nanocenter proposal. These efforts were highly collaborative and involved the participation of the Chemistry-, Materials Science-, Physics-, Instrumentation-, and NSLS- organizations as well as collaborators from universities.

The NSLS continues to be one of the most heavily used of the DOE synchrotron light sources. The number of users continues to expand as does their disciplines. More than 2500 users from over 400 national and international institutions come to the NSLS annually.

Work at the NSLS, DUV-FEL, and the ATF contribute significantly to DOE's program for short wavelength Free Electron Laser technology development.

A plan has been developed to form a DOE Center for Catalysis Science. BNL has external collaborators from other national laboratories and universities.

The Center for Neutron Science (CNS) is designing neutron hybrid spectrometer for the SNS in Oak Ridge, Tennessee. The CNS is also modifying and installing at the ORNL HFIR reactor, the Japan-U.S. sponsored triple axis spectrometer.

The DOE Office of Basic Energy Sciences conducted peer reviews of three program areas during the fiscal year: Chemical Sciences, Condensed Matter Physics and Materials Chemistry, and Materials and Engineering Physics. There were no comments or concerns regarding alignment with DOE missions and relevance to national needs.

1.3.3.3 Success in Constructing and Operating Research Facilities

The Laser Electron Accelerator Facility (LEAF) significantly enhances Brookhaven's instrumental capability for research in both radiation chemistry and photochemistry. LEAF delivers synchronized picosecond electron and photon pulses, and provides a way to study the fundamentals of ionization in condensed media on fast time scales. Two operational detection systems obtain transient absorption data either rapidly with ~ 1 nanosecond time resolution or, in more time-consuming "pulse-probe" experiments, with 7 picosecond time resolution. Both modes were used this year in measurements of fast molecular dissociation reactions of great interest to organic chemists. Projects on ionic liquids, molecular wires, ion recombination and supercritical fluids are ongoing. An early version of a new ultrafast single shot detection method was demonstrated.

As mentioned in 1.3.3.2, the NSLS continues to be one of the most heavily used of the DOE's synchrotron light sources. The laboratory is committed to enhancing the facility's role as a national resource for materials-, chemical-, and biological-research. To enhance the capability of the NSLS to meet the increasing and changing user demands, major upgrades have been completed or are in progress: two new RF cavities for the X-ray ring, a new digital orbit feedback system for the X-ray ring, and the new NIST-funded X6A beamline. A major initiative has begun to upgrade all the insertion device beamlines on the X-ray ring to meet the demand of new scientific programs. A vigorous effort is underway to explore methods of supporting users by improving access to a full range of synchrotron-based experimental techniques for specific programs in the materials- and chemical-sciences. The first example is a pilot program in catalytic chemistry, to be followed by others, possibly including soft matter, high-pressure studies and high magnetic fields. The NSLS is pursuing two initiatives to develop the next generation synchrotron radiation source. The first initiative involves a staged upgrade beginning with a new state-of-the-art 3-4 GeV electron storage ring coupled with a superconducting linear accelerator. The second initiative, the Laser Seeded Free Electron Laser, seeks to develop a high peak power, short wavelength free-electron laser with excellent temporal and spatial coherence, capable of producing femtosecond pulses.

The BNL Nanocenter, which will be a center for functional nanomaterials, has received approval by the DOE of mission need (CD-0) via a formal announcement by the Secretary of Energy. The Nanocenter will integrate BNL'S unique capabilities in a broad range of synchrotron characterization techniques with new capabilities in nanomaterials synthesis and nanofabrication. Our focus of tailoring the chemical and physical response of functional materials complements those of other planned Centers. The centerpiece of the BNL Nanocenter is a new building located contiguous to the existing NSLS facility. The building will house clean rooms, general laboratories, and wet and dry laboratories, as well as office space for BNL staff, other university and industrial users, and space for seminars and conferences. The Nanocenter will have seven major laboratory clusters: nanopatterning, proximal probes, electron microscopy, materials synthesis, ultrafast optical sources, and theory and computation. The seventh cluster takes advantage of the capabilities of the NSLS; the Nanocenter will have dedicated beamlines at the NSLS, including a new small angle scattering beamline.



Artist's Rendering of the Nanocenter Building.

The Nanocenter is to the right of the NSLS.

In February of 2002, the BNL Deep Ultra-violet Free Electron Laser (DUV-FEL) facility reached an important milestone on the way to its ultimate goal, the production of 100 nm laser light by the process of high gain harmonic generation (HG). The DUV-FEL produced laser light at 400 nm at unexpected levels by the process of self-amplified spontaneous emission (SASE). The performance of the DUV-FEL gives researchers confidence that the goal of 100 nm is indeed attainable.

The BNL Transmission Electron Microscopy Facility has had a very successful year. It continues to implement its mission to develop and apply advanced techniques of quantitative electron microscopy to fundamental problems in materials science. In recognition of outstanding scientific contributions, the DOE program office has doubled its funding and encouraged the acquisition of another TEM. A new omega filter microscope with a monochromator has been ordered. This new TEM is partially funded by New York State. The new instrument will provide <0.2 eV energy resolution that will boost our research on nanoprobe electron energy-loss spectroscopy.

1.3.3.4 Effectiveness and Efficiency of Research Program Management

Brookhaven was very active this year in establishing a major nanoscience program. The theme for this program is "tailoring" the physical and chemical responses of nanoscale functional materials. The scientific goals of our nanoscience research are to establish an understanding of the chemical and physical response of functional nanomaterials and to develop new nanoscale materials probes, particularly involving the NSLS and the emerging high resolution TEM facility. As a result of two successful proposals, scientific work started on two new programs: Catalytic Nanomaterials and Charge Transfer at the Nanoscale. Additionally, a proposal for nanotemplate-directed assembly of soft matter and biomaterial was awarded and will begin later this year. It is intended that this research will be carried out under the auspices of the Nanocenter.

A workshop was held in March at BNL for the Center for Functional Nanomaterials (“Nanocenter”). It was an unqualified success, attracting over 400 attendees, representing 80 or more U.S. institutions from 21 states and three international visitors. In addition to presenting a strong technical program, the goal was to bring together representatives from academia, industry, and government to discuss the role of the Nanocenter in the Northeast region and to solicit advice and comments on instrumentation, operational principles, and science. The initial feedback was very positive and we were impressed with the strong showing of interest in a BNL Nanocenter. The input from the workshop participants is greatly appreciated and will be used during the conceptual design phase of the Center.

The revitalization of materials science programs at BNL has made extensive progress this year. Several actions were taken to integrate more closely the programs in materials physics, metallurgy, and materials chemistry with those in condensed matter physics and several areas of chemistry. Our goal is to strengthen traditional core programs and compete more effectively with interdisciplinary responses to DOE initiatives. A new Materials Science Department (MSD) has been formed within the Basic Energy Science Directorate with David Welch as the interim Chair. In addition, the programs in materials science were linked with those in condensed matter physics by establishing a Materials Center. The Materials Center is headed by Doon Gibbs and is intended to coordinate internal programs in materials science at the NSLS, the new Materials Science Department, the Condensed Matter Physics Section of the Physics Department, and the Chemistry Department. Thus far, this program has arranged for better access by Center members to all of the experimental resources on the site and begun to coordinate seminars and research initiatives. There are now strong collaborations within BNL between Condensed Matter Physics and the MSD, i.e., work on high T_C superconductivity and the new superconductor MgB_2 and various areas of nanoscience, such as nanoscale magnets, correlated electron systems, and transition metal oxides.

The Center for Neutron Science is progressing toward its goal of developing a comprehensive neutron research program to sustain the world-class neutron science capabilities at BNL. While BNL’S current neutron research is conducted at the NIST reactor and ISIS, we are developing a test facility beamline at the AGS to support research and development of spallation neutron instrumentation, and we are also developing state-of-the-art instrumentation for neutron sources in the U.S., primarily for the SNS.

A plan has been developed to establish a Catalysis Institute at BNL. The plan is aligned with the new DOE interest in centers of excellence in catalysis science. BNL has, at present, several initiatives in catalytic science, which are important and converging with the plan for this institute: a major program in nanocatalysis, a program to develop a suite of catalysis beamlines at the NSLS, and a major scientific research program in electrocatalysis. The institute is a major component of BNL’s strategic plan, and space will be allocated for the institute.

1.3.4 Advanced Scientific Computing Research (ASCR)

1.3.4.1 Center for Data Intensive Computing

The Center for Data Intensive Computing (CDIC) was formed to provide a focus for advanced scientific computing at the Laboratory and to contribute to the research mission of BNL's and DOE's programs.

The Center is headed by J. Glimm, Chair of the Department of Applied Mathematics and Statistics at Stony Brook. There is one joint appointment (with Stony Brook) at the Assistant Scientist level and four graduate students in Applied Mathematics, Computer Science, and Physics. In addition there are three Postdoctoral Research Associates, and several summer faculty were supported, along with two summer students.

Examples of recent projects include:

- Magnetohydrodynamics, with application to fluid instabilities in accelerator targets such as the Spallation Neutron Source and the proposed Muon Collider.
- Fluid dynamics of droplet formation in jets, with application to diesel fuel injectors as studied at the Advanced Photon Source.
- Magnetic properties of nanocrystalline wires adsorbed on solid surfaces.
- Electronic and atomic structure of uranium.
- Models of cardiac electrophysiology, in collaboration with Beth Israel Medical Center.
- Parallel algorithms for global aerosol transport in the atmosphere.
- Application of the new special purpose computer designed for elementary particle physics to classical molecular dynamics.
- Visualization and statistical analysis of very large data sets produced by brain imaging and by mass spectroscopic measurements on atmospheric aerosols.

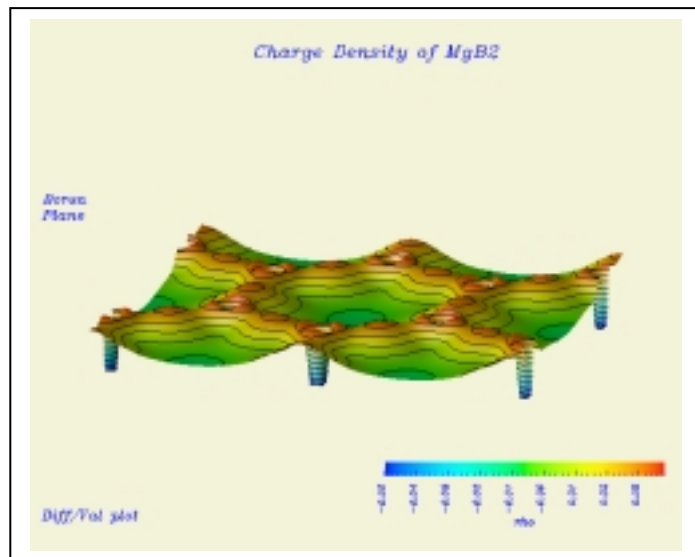
The Center Director leads a multi lab project which is part of The Office of Science's - Scientific Discovery through Advanced Computing Program (SciDAC). The goal of this project, The Terascale Simulation Tools and Technologies Center (TSTT) is, to eliminate the technical and human barriers preventing the effective use of powerful adaptive, composite, and hybrid methods in large scale scientific simulations. Work at Brookhaven is focussed on the diesel jet breakup problem. A separate SciDAC project is concerned with numerical methods and new software for the study of particle beams in accelerators including wake fields. This work is important for the national effort in accelerator simulation as well as to the needs of BNL's Alternating Gradient Synchrotron and a proposed next generation synchrotron light source.

The Center will play an important role in the recently announced Brookhaven NanoCenter serving as lead for the Theory and Modeling Group within the NanoCenter and focussing significant resources on computational nanoscience.

CDIC has acquired a 150 processor Linux cluster which is used to perform parallel calculations using the message passing interface (MPI). The cluster is managed by staff in BNL's Information Technology Division.

A primary goal of CDIC is to participate in the Department of Energy's long range research programs in scientific computing. Funding this year has been obtained from ASCR for the work in magnetohydrodynamics, for TSTT, and for the Accelerator Project in SciDAC. In addition, many projects which have benefited other program areas at the Laboratory have been started and several have been successfully completed. However it is clear that for lasting success in this area a larger funding base needs to be secured including funding from other programs within The Office of Science.

Charge density contours in magnesium diboride superconductor



1.3.5 Energy, Environment, and National Security

1.3.5.1 Energy Resource Mission (EE/FE/NE)

The Laboratory's role in the DOE Energy Resource mission is performed primarily under the auspices of DOE Offices of Energy, Efficiency, Fossil Energy, and Nuclear Energy Science and Technology, with some funding from other offices within DOE, such as the Office of Policy. In addition, the DOE Basic Energy Science Program described previously sponsors much of the underlying basic research supporting the DOE's Energy Resource mission. BNL is actively involved in three areas: reliable and diverse energy supply, clean and affordable power and efficiency and productive energy use. Highlights of accomplishments and focus areas are discussed below.

The Energy Sciences and Technology (ES&T) Department has diverse capabilities and expertise which supports DOE's Energy Resource mission. The ES&T portfolio includes programs and projects that range from fundamental studies of combustion to computer simulations of advanced nuclear reactors to advanced modeling to development and demonstration of energy-related technology. In addition, ES&T has specialized know-how and unique technology platforms that, through collaboration with its sponsors, enable it to deploy and establish energy projects that benefit the economy.

BNL continues to have local, national and international energy R&D partnerships that help to keep the laboratory in a position of US leadership in the energy field. Work in this area supports DOE as well as NRC, EPA, New York State, and private industry. Energy research programs continue to be recognized for outstanding contributions such as the 2002 R&D 100 Award (joint with NREL) for a Smart, High Performance Polyphenyenesulfide Coating System.

Advanced Nuclear Applications – ES&T's research addresses two significant program areas: proliferation-resistant reactor designs and advanced accelerator applications. ES&T staff are members of multi-laboratory teams that analyze waste transmutation studies utilizing accelerators and reactors, and also provide support to the Spallation Neutron Source (SNS). ES&T leads an international team, including industry, developing a new fuel cycle that will use thorium-based fuels in existing light-water reactors with minimal modifications.

Nuclear Safety – ES&T provides support to the NRC, DOE, and international organizations on nuclear safety and regulatory matters. Current international nuclear safety activities support the NRC's efforts to strengthen nuclear regulators in nations of the former Soviet Union and Eastern Europe and provide support to the International Atomic Energy Agency (IAEA). Analytic support is provided to the NRC and others in areas such as reactivity transients, life extension, and reactor pressure vessel safety. DOE's Integrated Safety Management (ISM) activities are supported in the areas of ISM safety guides and standards, and assisting DOE in audits and evaluations. ES&T also provides in-depth support to the NRC to help ensure that operating U.S. nuclear power plants provide electricity safely and reliably. Current programs are focused on aging of structures and components and environmental qualification of power cables. This work

includes both engineering and analytical support, and results support development of NRC regulatory guidelines. New programs have also been started in risk assessment for Nuclear Materials Safeguards and Security (NMSS) and in electric grid infrastructure modeling.

Economic/Environment/Economic Assessment- This program is centered on the MARKAL-MACRO computer code developed at BNL over the last two decades. The model is used in more than 60 countries to inform energy planning, including implementation of new energy technology, environmental and economic impacts, and issues related to climate change. MARKAL has been selected by the Energy Information Administration to be the main tool for the preparation of the next World Energy Outlook. MARKAL is also used by the DOE's EERE and the EPA. ES&T is currently working on projects that provide crucial information required to resolve issues in the national debate on climate change.

Liquid Fuels Research- ES&T's program on liquid fuels concentrates on developing alternative fuels that significantly reduce harmful emissions when burned. Projects under this program include testing blends of biofuels and oil, and ultra-deep removal of sulphur from fuel oil. ES&T led a team of government and industry participants that developed an initial "roadmap" for research, development and commercialization of new products, including alternative fuels.



Advanced Burner Testing

Materials for Energy Applications – ES&T is developing and testing materials for use by the geothermal industry that help combat the problems of corrosion and erosion. These include testing geothermal well cements and developing coatings to extend the life of carbon steel heat exchanger tubes. Special grouts developed in the department have been recognized by the industry as a key technology in the successful deployment of geothermal heat pumps in the Northeast. A method for non-destructive testing of erosion and corrosion in geothermal piping is also under development. The department is continuing to increase its support for its sponsors. We completed several tests of Building Combined Heat and Power (BCHP) equipment for EE, we have initiated the Significance Determination of Risk Process (SDRP) notebooks for NRC, and we have taken on management of Ukraine assistance activities.

1.3.5.2 Environmental Research

Significant achievements were also attained during this past year in BNL's Environmental Sciences Department for DOE's Atmospheric Chemistry, Atmospheric

Radiation Measurements (ARM), Free Air CO₂ Enrichment (FACE), Terrestrial Carbon Cycle, Water Cycle, Environmental Science, Environmental Remediation and Environmental Management programs.

Vasilis Fthenakis (Environmental Research & Technology Division) was honored as a Fellow of the American Institute of Chemical Engineers. Terry Sullivan was presented a Certificate of Appreciation by Jim Wright, Manager of SCFA, DOE in recognition of outstanding contributions to the Subsurface Contaminants Focus Area, DOE. Dr. A. J. Francis was awarded tenure at BNL for his pioneering contributions on the fundamental mechanism of the biotransformation of actinides and toxic metals by microbes. His findings of the speciation and localization of uranium ion is a particularly valuable original contribution to this field of understanding bioremediation mechanisms.

US Patent No. 6,399,849 was awarded to BNL for the Treatment of Mercury Containing Waste, twenty peer-reviewed publications were entered into the literature, and the staff was represented on seven major technical committees.

Continued operation of the North Carolina FACE Facility and the ARM External Data Center.



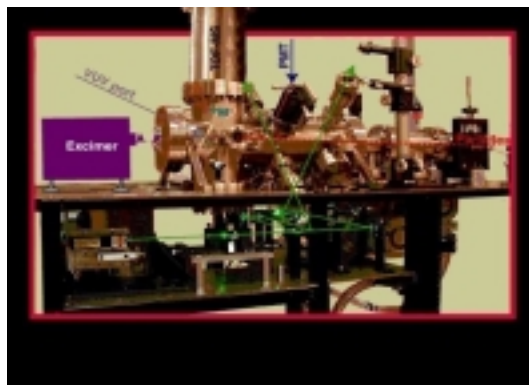
FACE Facility

TexAQS 2000, held in Houston, published scientific results showing a large industrial component of the ozone generation rate.

BNL Scientists used satellite measurements and chemical transport modeling to show the influence of anthropogenic aerosol on cloud optical depth. Their results were consistent with the Twomey mechanism of indirect radiative forcing of climate by aerosols.

BNL Scientists continued developing and reporting new algorithms for the retrieval of aerosol properties from moments of the particle size distribution.

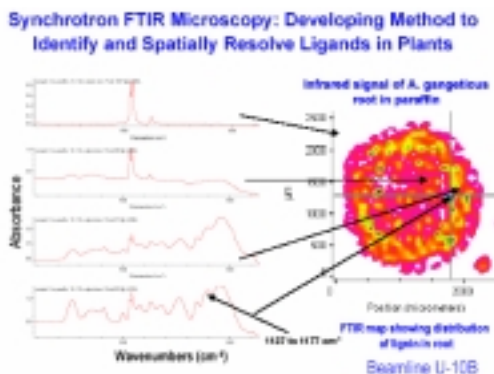
The first results and initial description of a particle-into-liquid collector for rapid measurement of aerosol bulk chemical composition were published. Ambient particles are mixed with saturated water vapor to produce droplets that are collected and analyzed by traditional ion chromatography techniques.



Single Particle Laser Mass Spectrometer
CO1-S-39

Environmental Scientists demonstrated that perfluorocarbon tracers are a cost-effective method to verify and monitor long-term performance of walls, floors, caps and cover systems.

A collaborative effort between the Environmental Sciences Department and the NSLS at Brookhaven along with the Earth Sciences Department at SUNY Stony Brook proposed to create a new Environmental Molecular Sciences Institute. This NSF/DOE institute would provide end station upgrades to environmental beam lines and the development of new environmental applications.



Perfluorocarbon tracers, typically used in atmospheric studies, were successfully used to characterize the subsurface fan ducts at the Brookhaven Graphite Research Reactor. The novel project, an Accelerated Site Technology Deployment, provided a preliminary characterization that was then used to direct more traditional sampling and characterization.

1.3.5.3 National Security (NNSA/EM)

Brookhaven National Laboratory's Nonproliferation and National Security (NNS) Department has the capabilities to assist the nation in the areas of nonproliferation and security (both national and global). As a National Laboratory, Brookhaven has advanced capabilities and expertise that put it in a unique position to contribute to counterterrorism efforts in the U.S. and abroad.

NNS's national security initiatives have expanded as a result of the heightened awareness of the possibility of terrorist activities continuing in our country. We would like to elaborate on the initiatives we have put in place to address this very important issue.

In response to multiple requests from the Secretary of Energy, Office of Science, NNSA and others, BNL has established a Nonproliferation and Counterterrorism Division under the Department of Nonproliferation and National Security. The Division will serve as a

focal point for the BNL efforts in counterterrorism including advanced technologies for the detection of nuclear, biological and chemical agents, safeguarding and interdicting weapons of mass destruction and related materials, improved protection against attacks, consequence management, and medical counter measures.

On a local level, BNL organized and co-hosted a NNSA/DOE counterterrorism workshop, “New York Metropolitan Region: Counterterrorism and Infrastructure Assurance Technology Needs,” in April. The workshop included 160 representatives from DOT, DOE, DOJ, FAA, NYC office of emergency management, other NYS organizations and industry. Recently, BNL provided a briefing in Albany on the security of radioactive materials at non-reactor sites in New York; this is leading to additional cooperative efforts between NY State organizations and BNL.



New York Region: Counterterrorism and Infrastructure Assurance Technology Needs Workshop

BNL developed an Emergency Response Planning Guideline (ERPG) for mercury vapor. This is the 100th ERPG developed with BNL participation. A BNL staff member was elected to Chairmanship of ERPG.

BNL continues to manage the U.S. Support Program of Technical Assistance to IAEA Safeguards. Under this program, BNL supports the decision making process for the interagency Subgroup on Safeguards Technical Support. In October 2001, BNL hosted the "Workshop on Design and Testing for High Reliability," which provided a forum for industry experts to discuss issues impacting the reliability of safeguards instrumentation.

BNL has developed absorption characteristics for Tera Hertz radiation in selected plastic materials as part of underground infrastructure imaging system project.

BNL developed a high precision, local survey system providing two-dimensional positioning to an accuracy of 1 cm.

BNL continued to support the joint DOD/DOE Integrated Technology Implementation Plan that develops and evaluates methods for monitoring international arms control and non-proliferation agreements. This multi-lab effort involves participation in a number of studies and working groups, such as the Radiation Technology Working Group and the Authentication Working Group. BNL hosted a workshop, with participants from five other DOE laboratories and from the Defense Threat Reduction Agency, to discuss the

applications of template methods for confirming the identity of controlled items, such as nuclear warheads or special nuclear material components.

Also under the same program, BNL defined, contracted, and monitored a program with the Russian Research Institute of Automatics (VNIIA) to build and improve the BNL-developed CIVET information-barrier technology. The problem is to build a simple, computerized measurement system that can be fully authenticated by both parties so that it can be relied upon by both sides to make classified measurements without revealing sensitive information while providing high-confidence in unclassified outputs. A program review was held at BNL to exchange ideas between BNL and VNIIA technical experts.

BNL continues to play a major role in the Nuclear Materials Conversion and Consolidation (MCC) project, which is an important component of the MPC&A program. Current MCC activities are underway at the Luch and Dmitrovgrad facilities in Russia. A critical goal of the MCC project is to reduce the number of sites and buildings that contain weapons-usable nuclear material, as well as to reduce the attractiveness of existing highly enriched uranium by downblending it to low enriched uranium.



Nuclear Materials Protection and Control Programs

Under the MPC&A program, technologies and assistance provided to Russian institutes included the development and implementation of comprehensive physical inventory-taking statistical sampling plans, measurement requirements, measurement procedures, and measurement control techniques. The transfer of these technologies has provided unprecedented access to several Russian nuclear sites. Our activities involve direct interaction and collaboration with Russian technical specialists.

A BNL staff member continues to lead the MPC&A Operational Monitoring Project. Under this activity, a system was designed, constructed and installed at the Moscow State Engineering Physics Institute to monitor MPC&A system upgrades at this institute to ensure that they continue to detect, delay, and respond to attempts to divert nuclear materials.

BNL made substantial contributions under the MPC&A Regulatory Project in assisting Russia's MINATOM and Gosatomnadzor in the development of a regulatory framework for implementing and monitoring the improved and more comprehensive safeguards for nuclear materials.

BNL is assisting the DOE Office of International Safeguards and the Department of State in evaluating and suggesting improvements in IAEA safeguards for light-water reactors, both as currently applied and under the new Integrated Safeguards regime. BNL is also evaluating and proposing improvements in IAEA safeguards for gas centrifuge enrichment plants located in non-nuclear weapons states.

1.3.5.4 Success in Constructing and Operating Research Facilities

In terms of constructing and operating research facilities, EENS has not constructed any new research facilities during the past several years, but plans have been developed for a new Energy Sciences Building and DOE approval (CD-O) has been obtained for the new building. Finding authorization continues to be a major concern and discussions are ongoing with DOE to develop a viable funding strategy which will allow this critical construction project to move forward.

EENS operates laboratories, offices, and other facilities that are located in 12 buildings. During FY02, EENS has continued its space consolidation initiative and has nearly completed its efforts to vacate buildings that were underutilized and no longer compatible with current research programs. In FY02, EENS vacated Buildings 938, 939, and 490D, and will soon be vacating building 801. In addition, due to the reorganization of the Material Science Department, EENS is no longer occupants of buildings 555 and 480. Over the past two years, EENS has consolidated its staff and equipment from 21 buildings to 12, which has resulted in a very significant reduction in Directorate space charges. Further consolidation is not anticipated. In terms of facility upgrades, EENS has an ongoing program to renovate laboratories in building 815. It is expected that lab renovations to laboratory C-4 will begin next year to provide a state-of-the-art Laboratory for BNL's expanding research program in methane hydrates. Further lab renovations in building 815 will be proposed for subsequent years, as this facility will become the focal point for BNL's environmental research programs.

EENS manages its safety and environmental aspects of its activities through the Research Operations group. Research Operations provides support to the EENS science departments in Facilities management, Environmental Management Systems, Integrated Safety Management Programs, and property management. EENS Environmental and Safety Management consistently meet or exceed BNL's goals for waste generation, pollution prevention, Tier 1 inspections, and work planning and controls. EENS' performance in the areas of worker training and safety have also been exemplary.

1.3.5.5 Effectiveness and Efficiency of Research Program Management

EENS has made significant improvement in the area of research program management. The Directorate has dedicated a great deal of effort to the establishment of a comprehensive strategic plan, which will guide the future research initiatives of EENS. EENS management (ALD and Chairs), as well as Departmental Strategic Planning Committees, jointly contributed to the development of strategic planning and to the identification of future research initiatives.

Strategic research initiatives were developed after a careful examination of Directorate capabilities and research strengths, coupled with a thorough analysis of the future

research needs and priorities of DOE and other potential sponsors. These were several research initiatives that were identified through this process which have been recognized as high-priority BNL initiatives and EENS opportunities for significant future growth.

- Counterterrorism and Homeland Security
- Advanced Sensors
- Advanced Fuels
- Nuclear Energy Revival
- Climate Change
- Carbon Cycle
- EnviroSuite
- Renewable Energy

For each of the identified research initiatives, a written plan was developed to outline specific objectives, marketing strategies, and political considerations, and to identify EENS Managers who are responsible for implementing the plan. EENS' strategic initiatives were endorsed by Laboratory Management, and the initiatives have been communicated to the entire EENS staff.

EENS has been proactive in fostering progress in its new strategic initiatives. EENS and BNL have committed resources for lab renovations needed to support the Advanced Fuels initiative, a strategic hire will be supported for the Advanced Sensors initiative, capital equipment investments have been made for Advanced Fuels, Nuclear Energy, and EnviroSuite initiatives, and significant investments have been made to support the Counterterrorism/Homeland Security initiative.

Perhaps the most impressive measure of progress in developing new research programs which are aligned to the EENS initiatives, was the quantity and quality of LDRD proposals generated by EENS staff. EENS staff developed 70 LDRD proposals, 62 of which were relevant to the Directorate's strategic initiatives. After an extremely competitive evaluation process, BNL has committed to funding for 15 of EENS' proposals. This represents a significant increase in LDRD funds for the Directorate as compared to previous years, and will provide much-needed seed funding for exciting new research programs.

1.4 WORK FOR OTHERS AND TECHNOLOGY TRANSFER

The Laboratory's Work for Others program has two components, work for other federal agencies and work for non-federal sponsors. Since 1998, the BNL Budget Office has had responsibility for work for other federal agencies while the Office of Intellectual Property and Industrial Partnerships ("OIP") has had responsibility for work for non-federal sponsors. In July 2002 the Laboratory undertook a consolidation of the work for others program under which OIP will have responsibility for the complete program. Implementation of this change is underway and should be effective at the start of FY03.

The work for others program permits the Laboratory to conduct research that is of scientific interest, that complements its DOE mission work, and that contributes to sustaining its core research capabilities. As part of the consolidated work for others program, OIP staff will serve as relationship managers to build productive and informed relationships with program managers at other federal agencies where the Laboratory's research capabilities complement the agencies' technology interests and needs. The relationship managers will play three distinct roles--identify funding opportunities from other federal agencies, work with the BNL research team in the preparation of a high quality, responsive proposal, and champion the proposal with the program manager after submission.

1.4.1 WFO - Other Federal Agencies

1.4.1.1 National Institutes of Health (NIH)

Several of our biomedical programs and facilities operate with joint funding from DOE and NIH. These programs/facilities include our Imaging and Neuroscience Center which encompasses the PET and MR programs in the Medical and Chemistry Departments, the Scanning Transmission Electron Microscope in the Biology Department, and the Structural Biology beamlines at the NSLS.

More than 800 biologists from Brookhaven, other national laboratories, universities, and pharmaceutical companies use nine of the NSLS experimental stations to study biological structures by crystallography. Four of these are involved directly in a cooperative effort, funded roughly equally by DOE OBER and the National Center for Research Resources (NCRR) of NIH. The total annual budget of approximately \$4M supports the activities of 20 workers who provide support to users, maintain the facilities, engage in R&D programs to improve them, and carry out fundamental research on experimental methods and structural biological subjects. Several important innovations have been made possible by the NCRR funding: to provide an on-site technical specialist to support users, 20 hours per day, seven days per week; to provide personnel and facilities for a mail-in data collection service ("FedEx Data"); and to provide web-based observation of the experiment and the possibility for remote control. NIH also provides substantial support for biomedical research through grants to individual investigators. Such grants support work at the Imaging and Neuroscience Center, investigations on DNA damage

and repair, protein structure and folding, viral proteases and receptors, and the Lyme disease bacterium.

1.4.1.2 National Aeronautics and Space Administration (NASA)

The construction and operation of the Booster Applications Facility (BAF) in the Collider Accelerator Department represents DOE's ongoing partnership with NASA to provide extraordinary facilities and capabilities for research on issues related to the NASA mission. The BAF will be a new experimental facility and accelerator that takes advantage of heavy-ion beams from the Alternating Gradient Synchrotron Booster for studies on radiation effects related to the space program. BAF will provide protons and heavy ions (Fe, Si, C, Ni, Ar, Au, etc) for space radiobiology studies and radiation effects on microelectronics. The BAF construction is on time and the facility is slated to be fully operational in 2003. The facility will have laboratories to meet the specific needs of NASA's Space Radiation Health Program (SRHP) and National Space Biomedical Research Institute (NSBRI) research programs. BAF will include laboratories for *in vitro* and *in vivo* experiments, as well as for physics experiments.

1.4.1.3 Environmental Protection Agency (EPA)

Brookhaven's capabilities have been applied to international work supporting DOE and other federal agencies in transferring technology to friendly nations. The near-term focus of these programs is the States of the Former Soviet Union, specifically in the areas of reactor safety and decommissioning the nuclear navy. BNL participates in several environmental cleanup projects in Kazakstan funded by EPA's Office of International Affairs and DOD.

1.4.2 WFO - Non-Federal Sponsors

BNL has many unique capabilities and facilities not available in the private sector that offer opportunities for sponsored research in environmental sciences, energy technologies, materials sciences and biotechnology. The Laboratory's work for non-federal sponsors program encompasses the research the Laboratory conducts under funding from state and local government, industry, non-profit foundations, universities, medical centers, and foreign sponsors.

1.4.2.1 Private Firms

BNL scientists perform research for a number of private firms often taking advantage of BNL's unique facilities. Currently the majority of work for private firms is in the energy sciences area and includes the following:

- Insight Technologies: (funding from the New York State Energy Research and Development Authority)
 - "Development of a Two-Stage Oil Burner with Wide Hand Tracking Control"
 - "Field Tests of the Flame Quality Monitor"

- KeySpan Energy Corporation
 - "Determination of Gas Flow Rates at LILCO Gas-Fired Power Stations (PFTs)"
 - "Development and Demonstration of an Asbestos-Spray Treatment in a Utility Environment"
 - "Polymer Grouts and Polymer Composite Liners for Retaining Excavated Wall Foundations"
 - "Recycled Waste-based Cement Composite Materials for Rapid Permanent Road Restoration and Grout for Soil Stabilization"
- Aerodyne Research Corporation (funding from DOE SBIR)
 - "Developing a Versatile Aerosol Mass Spectrometer for Organic Aerosol Analysis"
- Energy Research Center, Inc. (funding from the New York State Energy Research and Development Authority)
 - "New York State Premium Low-Sulfur Fuel Marketplace Demonstration"
- ITT Industries (funding from DOD)
 - "Ultraviolet Raman Spectral Signature Acquisition"

1.4.2.2 Non-Profit Organizations/Institutions

The largest segment of our work for non-profit organizations/institutions is in our biomedical research programs, utilizing BNL's capabilities in Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI) extensively. Currently work for non-profit organizations/institutions includes the following:

- New England Medical Center Hospitals, Inc. (funding from NIH)
 - "In Vivo Proton MRS Studies of Cerebral Injury in HIV Infection"
- St. Luke's-Roosevelt Hospital Center (funding from NIH)
 - "Medical Application Accuracy of Neutron Activation"
- The Scripps Research Institute (funding from NIH)
 - "Methamphetamine and AIDS: Toxic Interactions in Animals"
- National Multiple Sclerosis Society
 - "Quantitation of Blood-Brain Barrier Permeability in MS Lesion Development"

1.4.2.3 Universities

BNL's atmospheric chemistry and oceanography programs are extensively involved in sponsored research programs for educational institutions; several leverage DOE's investments in atmospheric chemistry. Educational institutions also extensively utilize our capabilities in biomedical research, and PET studies funded by universities have been extremely effective in monitoring the brain's metabolic functions and providing new insight into treatments for schizophrenia and Alzheimer's disease. Current work for educational institutions includes the following:

- Georgia Institute of Technology (funding from NASA)
 - "Measurement of Particle Chemical Composition During NASA Trace-P"
- Pennsylvania State University (funding from DOE)
 - "Development of Cloud Property Retrieval Algorithms at Boundary Facilities"
- State University of New York System
 - "Regulation of Tissue Repair" (funding from NIH)
 - "PM2.5 Technology and Characterization Study in N.Y." (funding from EPA)
 - "A Study of the Outer Shelf, Shelf Break, Front and Slope From Long Term ADCP and Hydrographic Observations from the MV Oleander" (funding from the NSF)
- Rockefeller University (funding from NIH)
 - "Center for Structural Genomics"
- University of California at San Diego (funding from NSF)
 - "The Collection of Shipboard Acoustic Doppler Current Profiler Data During the Shelf Basin Interaction Program"
- University of Colorado at Boulder (funding from DOD)
 - "Single Molecule Field-Effect Transistor"
- University of Rochester (funding from NSF)
 - "U.S. Atlas Barrel Cryostat Design and Procurement"
- Woods Hole Oceanographic Institution
 - "GLOBEC: Long-Term ADCP Moored and Lagrangian Measurement and Analysis as Part of a Georges Bank Study" (funding from NSF)
 - "GLOBEC: Frontal Exchange Processes for Eastern Georges Bank" (funding from NSF)
 - "Analysis of Acoustic Backscatter Data from the Japan/East Sea" (funding from DOD)

1.4.2.4 State Agencies

The majority of funding from state agencies comes from the New York State Energy Research and Development Authority (NYSERDA). Current work from state agencies includes the following:

- NYSERDA
 - "Improved Electric Power Efficiency in Heating Equipment"
 - "The Use of Biodiesel Fuel Blends in Space Heating Equipment"
 - "High Efficiency, Condensing Heating Appliance Firing Low Sulfur Oil"
 - "Variable Firing Rate Oil Burner Using Pulsed Fuel Flow Control"
- Texas Natural Resource Conservation Commission
 - "Analysis of TexAQS 2000 Data"

1.4.2.5 Foreign Sponsors

BNL's expertise in conducting risk-assessment studies and other work for the Nuclear Regulatory Commission has resulted in a significant amount of foreign sponsored research, for which we perform similar studies at foreign nuclear power plants. Current work for foreign sponsors includes the following:

- ENCONET Consulting (Austria)
 - "Risk-Informed Applications for Nuclear Power Plants"
- Japan Nuclear Cycle Development Institute
 - "A Joint Study of No-Notice Randomized Inspection for Reactors with MOX Fuels"
- Korea Atomic Energy Research Institute
 - "BNL Safety for the KALIMER Project"
- Swedish Nuclear Power Inspectorate
 - "Assistance in Nuclear Power Plant Control Room Modernization"
- Tokyo Electric Power Company
 - "AC Losses in Conductors Based on High-TC Superconductors"
- Union Fenosa Group (Spain)
 - "Review of CNJC Design Documentation for Proposed Control Room Modification"

1.4.3 Technology Transfer

BNL's technology transfer program has two primary objectives, to complement our DOE research mission through involvement in technology transfer projects that enhance our research capabilities, and to be a resource to U.S. industry, thereby enhancing the competitiveness of U.S. companies in domestic and international markets. Key components of BNL's technology transfer program are collaborative research projects under Cooperative Research and Development Agreements (CRADAs) and intellectual property protection and licensing.

1.4.3.1 Intellectual Property Program

The Laboratory's intellectual property protection program continues to be effective. OIP received 38 invention disclosures in FY01 and 18 through June 2002; OIP filed 28 U.S. patent applications in FY01 and 13 through June 2002, and BSA received 16 U.S. patents in FY01 and 13 through June 2002.

Inventions arising from BNL's biotechnology research programs continue to be of particular licensing interest to industry. Technologies related to medical imaging, radiopharmaceuticals, nuclear medicine, molecular genetics, genomics, structural biology, and protein engineering are licensed to industry. Technology based on our T7

gene expression system continues to evolve with new patents issued and new commercial licenses granted. In FY01 over 60 new licenses were granted covering the T7 technology and through June 2002 47 new T7 licenses were executed. In all the Laboratory entered into 77 new licenses in FY01 and over 50 new licenses through June 2002. There are over 150 technologies in BSA's Patent Licensing Portfolio; close to half these technologies are licensed to industry; and a dozen new products are on the market based upon technologies licensed by the Laboratory. The net revenue generated by the licensing program which is re-invested in the Laboratory's research programs, has been over \$1.5M for the last three years. The licensing program continues to be very cost effective, with the costs of patent prosecution, patent maintenance, and licensing being 23% of the gross revenue in FY99, 29% in FY00 and 27% in FY01.

1.4.3.2 CRADA Program

CRADAs are a valuable component of BNL's research portfolio. These programs enhance BNL's research capabilities and provide access to industrial expertise and capabilities. CRADA projects have generated new technologies and numerous patents, created new commercial products and processes, and demonstrated the societal relevance and public benefit of DOE funded research. BNL's participation in CRADAs has been funded primarily from the following three sources:

- DOE's Office of Science Laboratory Technology Research (LTR) Program that in the mid-90's supported most of BNL's CRADA programs, but over the last several years has experienced severe cuts in funding.
- DOE's Initiative for Proliferation Prevention Program for the Newly Independent States of the former Soviet Union (IPP-NIS), and,
- industrial partners who fully fund BNL's CRADA research activities.

The LTR program supports high-risk, multidisciplinary research partnerships to investigate challenging scientific problems whose solutions have promising commercial potential. BNL's strengths in research on electronics/instrumentation, energy, the environment, and biotechnology underpin our participation in this enterprise. Examples of these projects include work with two Long Island Companies. In the first, we are working with Advanced Energy Systems to design, fabricate, and test a high duty factor, high-brightness, all niobium superconducting RF gun. The second project, with Brookhaven Technology Group, is to generate a compact, cost-effective, high-brightness 5 MeV electron gun. Such high-brightness electron beams are needed for high-luminosity electron colliders and efficient short-wavelength free electron lasers.

The IPP-NIS program supports research partnerships at BNL conducted under CRADAs which take advantage of the research capabilities of established scientific institutions in the NIS and the commercialization expertise of U.S. industry. DOE supports the research conducted by BNL and the NIS institute, while the industrial partner supports its own work. BNL is currently a participant in nine IPP-NIS CRADAs. Examples of these projects include the BNL/Radkowsky Thorium Power Corp. CRADA under which we are working with the Kurchatov Institute to develop a new type of fuel for nuclear reactors,

and the BNL/MIT CRADA under which we are working with GE's Global Nuclear Fuels and Kaz Atom to develop fuel processing technologies.

The Laboratory has successfully attracted research funding from industry to support research collaborations. BNL is working with Dow Chemical Company to create environmentally beneficial agricultural plants with novel applications for human health and nutrition. BNL is working with Psimei Pharmaceuticals to develop new boron containing drugs for neutron capture therapy of different malignant tumors and with GlaxoSmithKline to evaluate the addiction potential of a new drug to treat depression.

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2.0 Environmental Restoration

FY 2002

Critical Outcome

2.0

BNL Will Deliver “Best-In-Class” Solutions In Conducting The Environmental Restoration Program. Focused Upon Completion, The Results Will Be Protective Of The Environment, Cost Effective, And Performed In An Open Exchange With The Community, Our Regulators, And Other Stakeholders. BNL Will Continue To Keep The Commitments Agreed To In The Memorandum Of Understanding Signed By Dr. Marburger And Mr Holland On May 4, 2001.

8% of BNL Score

Objectives

2.1

Operational Excellence in Environmental Restoration

60% of C.O. #2

2.2

Execution of Program Activities

40% of C.O. #2

Performance Measures

2.1.1 On Time Starts of Major Projects (100% of 2.1)

BSA will be evaluated on the quality of work planning and schedule management via the achievement of schedule start dates for major projects. The identification and start dates are mutually agreed to with BAO.

2.2.1 Cost Performance (50% of 2.2)

BSA will be evaluated on its cost effective performance management of the baseline for FY 2002.

Cost Performance Index = (Budgeted Cost of Work Performed)/(Actual Cost of Work Performed)

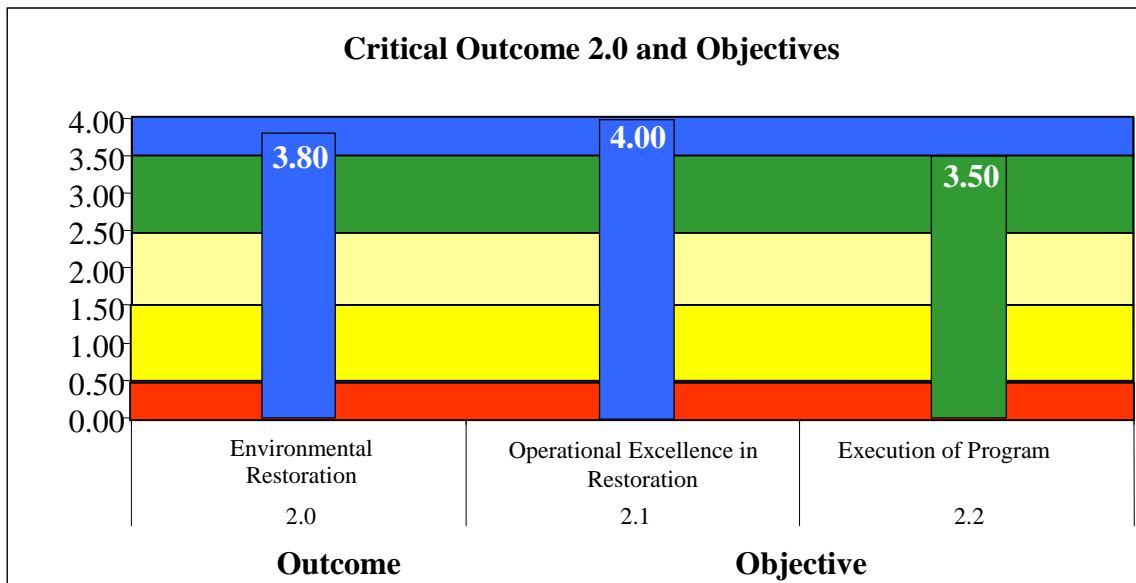
2.2.2 Schedule Performance (50% of 2.2)

BSA will meet and accelerate all primary, secondary and removal action milestones scheduled under the Interagency Agreement (IAG) as agreed upon with the U.S. EPA and NYSDEC and all Level 1, 2A, and 2B Milestones. These are listed in Table 1. Additionally, BSA will accelerate out-year milestones to demonstrate superior schedule performance.

2.0 Environmental Restoration

The weight of this Outcome is 8% of total.

BNL Will Deliver “Best-In-Class” Solutions In Conducting The Environmental Restoration Program. Focused Upon Completion, The Results Will Be Protective Of The Environment, Cost Effective, And Performed In An Open Exchange With The Community, Our Regulators, And Other Stakeholders. BNL Will Continue To Keep The Commitments Agreed To In The Memorandum Of Understanding Signed By Dr. Marburger And Mr Holland On May 4, 2001.



This assessment is organized and presented as follows:

1. Performance Overview
2. Performance Measure Results
3. Issues

Performance Overview

During FY02, the BNL EM made substantial progress in completing the cleanup of the Laboratory. The favorable impacts of FY01 restructuring activities are reflected in the improvement of performance with almost every aspect of BNL's Environmental Restoration (ER) Program.

First and foremost, the ER worked throughout FY02 with a single lost time injury. The ER team performed a thorough analysis of this and worked other BNL subject matter experts and responsible units/divisions on several initiatives that will benefit ER as well as the balance of the Laboratory. The ER team is not willing to accept any work place

injury. ER's FY02 performance indicates that the ER team is effectively implementing the BNL work management requirements.

During FY02, BNL's raw (i.e. unadjusted), overall fiscal year Cost Performance Index (CPI) was 1.03. BNL recognizes that this raw CPI value does not reflect previous year adjustments for earned value and cost accruals that straddle the fiscal year. However, this raw, overall CPI reflects substantial improvement in comparison to the same raw CPI values for the previous two fiscal years: 0.925 and 0.845 for FY00 and FY01, respectively. In relative, non-absolute terms, this trend clearly indicates substantial improvement in the area of cost performance.

The ER team's composite earned value during FY02 was \$35.3 Million. This represents a substantial increase in the rate of progress in comparison to the two previous fiscal years: a 20% increase over the \$29.3 Million of earned value during FY01, and a 35% increase over the \$26.1 Million of earned value during FY00. The FY02 Schedule Performance index was 1.26. This too represents substantial improvement: the SPI for FY00 and FY01 were both substantially less than unity (1.0). By performing at this level, the BNL ER team made substantial progress in reducing the unfavorable program-to-date schedule variance: the end of FY01 schedule variance of \$4.7 Million was reduced to \$2.1 Million, or a \$2.6 Million net improvement.

In summary, during FY02, BNL delivered safe environmental restoration, with a substantial increase in quantity (i.e. earned value) that is in line with the FY05 completion objective, and delivered substantial overall improvements to both cost and schedule performance. BNL's overall rating against the FY02 Appendix B performance measures is 3.8, or **Outstanding**. BNL does acknowledge a number of issues and opportunities to improve performance, and also recognizes the enormous challenges to successfully complete the ER Program. But as evidenced by many examples expressed in this self-assessment, BNL has demonstrated the willingness, flexibility, and determination to make the necessary adjustments that will ensure ultimate ER Program success. As discussed elsewhere in this self-assessment, BNL reduced its rating under Objective 2.2 by one-half point because of missed opportunities and improvements which are still needed. BNL believes that ER performance is **Outstanding**, but not at the "4.0" level.

Performance Measure Results Summary

Critical Outcome 2.0 is comprised of two Objectives: 2.1, Operational Excellence in Environmental Restoration and 2.2, Execution of Program activities. These objectives are weighted 60% and 40%, respectively.

Objective 2.1 was monitored by a single performance measure: 2.1.1, On Time Starts of Major Projects. This measure was established to focus needed attention on the thorough and careful completion of the extensive prerequisites necessary to start work in the field. During FY02, the ER team started all but one project on or ahead of schedule. The single project that was not started ahead of schedule was started within the two-week window

established in Appendix B. These results correspond to a rating of 4.0, *Outstanding*. BNL's rating of ER performance for this objective is 4.0, *Outstanding*.

Objective 2.2, Program Execution, is evaluated by two performance measures: 2.2.1, Cost Performance and 2.2.2, Schedule Performance.

- For Performance Measure 2.2.1: the fiscal year adjusted CPI, excluding the BGRR, is in excess of the "1.02" Outstanding threshold established in Appendix B. Efforts are well underway to finalize the adjusted CPI and it appears likely that the final adjusted CPI will be in the 1.03 to 1.05 range. This performance numerically equates to a rating of 4.0.
- With one exception, BNL's ER team completed all milestones on or ahead of schedule. One milestone was three weeks late. As described elsewhere in this assessment, the ER team successfully accelerated six "out year" milestones into FY02. This performance also numerically equates to a rating of 4.0 when evaluated against the criteria described in Performance measure 2.2.2, Schedule performance.

Numerically evaluating ER performance against Performance Measures 2.2.1 and 2.2.2 yields a rating of 4.0. However, BNL believes that there were issues that justify a reduced rating for these measures. In the cost management areas, BNL acknowledges opportunities and benefits that may accrue from re-examining and challenging previous decisions and conclusions made jointly by BNL and the DOE. For example, the evaluation of the Building 650 Outfall Project may have yielded cost savings by eliminating some scope that may not have been cost effective in reducing risk at the Laboratory. Based on the foregoing, BNL believes that an assessment rating of 3.5 is more reflective of BNL's performance ie the 4.0 numerical rating resulting from a clinical review of Performance measure 2.2.1. For Performance Measure 2.2.2, BNL similarly believes that a 4.0 rating would overstate BNL's performance even though a numerical analysis would support a higher rating. For example, schedule delays during earlier phases of the Peconic River and Building 650 projects compressed the available durations for "back end" activities. Schedule compression resulted in unfavorable impacts to these successor activities. For this Performance Measure, BNL believes that a rating of 3.5 is appropriate.

Issues

BNL acknowledges several issues where additional attention and improvements are needed. These are more fully described elsewhere in this self-assessment but are highlighted at the summary level as follows:

- The Peconic River remedy risk assessment and remedy review identified needed improvements in ensuring that actions and proposals are more clearly focused on risk reduction. This lesson is being applied to other sectors of the ER Program

with the objective of recovering unfavorable cost variances and over runs that occurred during previous years.

- The working relationship with Suffolk County on matters related to the Peconic River requires additional attention. The Suffolk County regulatory officials require extensive information and interaction because of their roles and responsibilities. The ER team was not timely in taking sufficient actions to address these needs. Recent changes and improvement were put in place by BNL and appear to be thorough. However, additional attention and close monitoring are prudent.
- Access to off-site property to allow the installation and operation of several groundwater treatment systems remains unresolved. Substantial progress was made during FY02, however, this matter will require constant attention until such time the required systems are constructed and placed into operation.
- The ER team needs to focus on critical path and cost position improvements to provide additional levels of confidence that the ER Program will be completed with the Baseline schedule and cost windows. The team needs to proactively identify and exploit upside opportunities. BNL needs to make full use of its new project management tools to extend its forecasting horizon to include the entire ER Program.
- The ER team needs to closely examine the underlying fundamentals of HFBR decommissioning. The cost



In April 2002, worker frees sediment leaving wetland vegetation undisturbed during Peconic River pilot-study project



In June 2002, Peconic River pilot-study project shows great promise following sediment removal in March and replanting in April

estimates, all well in excess of \$100 Million, do not appear to be commensurate with the HFBR related risks. Current efforts to conceptually develop a risk reduction alternative are should serve to address this issue.

- BNL needs to remain focused on the BGRR improvement initiatives. Substantial performance improvements have been recognized. The ER team needs to deliberately execute its plan to narrow the cost variance gap that has accrued since the beginning of the project. The tem needs to follow though on preliminary plans to remove what appears to be unnecessary work from the approved Baseline. Central to this cost recovery plan is leaving the BGRR below grade structures in place. BNL's cost recovery plan was recently presented to the DOE.

The year end score for Critical Outcome 2, Environmental Restoration is 3.8 correlating to a rating of ***Outstanding***

2.1 Operational Excellence in Env. Restoration

The weight of this Objective is 60%.

BSA will incorporate operational excellence into work planning, authorization and implementation. Hazards are identified and mitigations developed during work planning. Work authorization includes levels of coordination and management review appropriate to risks and impacts. Incidents are reported promptly and timely actions are taken to resolve the problem and prevent recurrence. Trends are analyzed and feedback provided to improve performance. Management systems in use are effective tools in minimizing or avoiding events that could compromise safety or impact project costs and schedule.

Accomplishments

BNL has made substantial improvements throughout FY02. Many of these improvement initiatives were fueled by the analysis of performance and operational events, and BNL's identification of prudent and necessary changes. Highlights of these improvements include:

- 1) The BGRR D&D project has historically been a performance challenge. As BNL continued to make progress from FY01 into FY02, BNL recognized the need to perform a comprehensive top to bottom review of the project; the assessment was performed during the second quarter of FY02 and a new path forward was developed, communicated to the DOE, regulators and the community, and has been fully institutionalized. BGRR facility characterization and the engineering studies that will lead to a well supported end state determination are now progressing ahead of schedule. All of the IAG commitments have been rescheduled and the project team is now working on critical path and near critical path activities. Detailed planning work for the challenging below grade duct filter and liner work is nearing completion. There is now a comprehensive project strategy in which all of the BGRR work packages are logically connected, as appropriate. BNL has consistently demonstrated an improved ability to develop a plan, execute and then deliver at the BGRR. Noteworthy examples include the cooler removal work package and the below grade duct characterization project which were completed during FY02. More recent

examples include the full BGRR facility characterization project and the BGRR engineering studies which are progressing ahead of schedule, on budget. This trend represents a substantial turn around in BGRR D&D performance.

- 2) The management of wastes generated in connection with the BNL EM program has been a long standing performance issue. Again, relying on performance observations and feedback through the use of the BNL EMS (Environmental Management System) several initiatives have been implemented which have substantially improved performance in this key area. During FY02, BNL developed and promulgated an EM waste policy document which specifies the fundamental expectations for managing EM waste. Most importantly, the policy appropriately places ownership of waste management with the generator, and BNL is now preparing and working to detailed, "waste stream-specific" waste management plans. BNL can point to several examples of improved performance. The below grade duct coolers were volume reduced and shipped for off-site processing and disposal a short period of time after the cooler project was complete. In addition, relying on a newly generated waste management plan, the Surface Projects Group recently completed the shipping and disposal of the Building 650 outfall waste immediately upon completion of the cleanup project. This same disciplined approach was instrumental in turning around BNL's performance in executing the above grade duct shipment campaign and the disposal of the canal debris. In every instance, BNL is now working to documented and detailed waste management plans. As BNL applies lessons learned and becomes increasingly consistent with the use of these waste management plans, additional performance improvement is anticipated.
- 3) BNL successfully started to sort two of the chemical holes stockpiles during FY01. Continuing the process into FY02, using lessons learned, BNL worked closely with a sub-tier contractor to qualify and deploy equipment to sort this material at an improved rate of productivity by eliminating unnecessary and costly mobilization/demobilization steps. In addition, the EM team integrated talent from elsewhere in the Laboratory and successfully deployed a technology that enabled the real time screening of the stockpiled waste. As a result of these efforts, BNL will substantially under run the estimated cost identified in the EM Baseline and finish ahead of schedule. As a result, BNL was able to accelerate the shipment of some stockpiled soil for off-site disposal. The technology deployment yields an enormous database which will prove vital to sending this waste to a Subtitle D landfill (this is yet another BNL initiative that will offer substantial financial benefits to the EM program).

Analysis

The EM team worked throughout FY02 with one lost time accident. The EM activities throughout FY02 involved work involving a wide range and extent of hazards and risks. This has largely been attributable to detailed work planning and teamwork, particularly with BGRR project. One of the benefits of restructuring the BGRR project is that additional and necessary time is now being provided for work planning. Work planning is now much more effective because BNL's ES&H professionals and specialists are now being integrated into the project during the earliest phases of work package/project

development and planning. As a result, the project team is now problem solving on a much more proactive basis.

There are some BGRR lessons learned which need to be used elsewhere in the EM program. For example, most of the work packages classified as "Surface Projects" rely on RI data, risk analyses and RODs that were developed and published several years ago. BNL is implementing a strategy to perform a holistic review of this work as part of the planning process. BNL's objective is to re-visit these decisions to ensure that cleanup actions are prudent and necessary and to ensure that decisions made years ago are accurately reflected in work plans and implementation tools that are developed in the present. BNL recognizes the need to learn from the BGRR experience and institutionalize a proactive problem-solving environment that is more consistent across the EM program.

The year end score for Objective 2.1, Operational Excellence in Environmental Restoration is 4.00; correlating to a rating of *Outstanding*.

2.2 Execution of Program Activities

The weight of this Objective is 40%.

BSA will expertly, expeditiously, and economically plan, conduct, and complete decontamination and decommissioning of surplus facilities; removal and disposal of wastes; and remediation of soils and groundwater contaminated by past practices. These projects will be safely but aggressively undertaken, closely controlled, and focused on completion. BSA will aggressively manage cost and schedule performance within acceptable performance measures and achieve all major Interagency Agreement milestones on or before their commitment date with the regulatory agencies.

Accomplishments

BNL continued to launch a wide range of EM program improvement initiatives throughout FY02. Virtually every aspect of the BNL cleanup program has been reached by these initiatives, and the favorable impact is now being reflected by BNL's improving performance in executing the cleanup of the Laboratory. The improvement program including the complete restructuring of the EM program during the second half of FY01.

BNL's accomplishments are summarized as follows:

- Project Management Infrastructure

During FY02, BNL developed and deployed the remaining project management procedures necessary to establish a complete project management infrastructure. For example, procedures covering Baseline changes/management, cost estimating and long range end of project forecasting are now being routinely used. BNL, working closely with the DOE, has streamlined and improved the quality of project reporting. BNL has recruited and deployed additional experienced and qualified project controls specialists; these new resources have been oriented and are now productive members of the EM team. BNL needs to focus on driving general EM staff familiarity with the new procedures beyond the "power users" down into the general EM staff. BNL also needs to make full use of its new end of

project forecasting tools such that BNL is more proactive in identifying and resolving cost and schedule issues.

- Waste Management Infrastructure

During FY02, BNL developed and deployed new overarching waste management policy requirements for conducting the BNL cleanup. Most importantly, the policy establishes clear responsibilities for the management and disposal of EM generated waste. Under the policy, the actual waste generators are responsible for the timely, safe and efficient disposal of their cleanup wastes. The policy also establishes the requirements for the development of waste stream specific waste management plans prior to the generation of EM wastes. Waste management plans have already been instrumental to the safe and timely disposal of the below grade duct coolers and the Building 650 outfall waste. BNL is also back fitting these new requirements for EM wastes generated during previous fiscal years. Additionally, BNL launched an EM-wide initiative to evaluate, and if possible effectuate, the disposal of a number of EM waste streams at a Subtitle D disposal facility. The maturity of this initiative continues to increase, and BNL plans to have the first of several packages for DOE review and approval early during FY03. BNL will continue to drive the consistent use and adherence to its new waste management requirements. BNL also has initiated the development of a simple IS infrastructure to manage and integrate the numerous domains of waste management data; this initiative was launched during FY02 and will be completed during early FY03.

- Subcontractor Management

During FY02, BNL resolved the long standing URS claim; the claim was settled at approximately 25% of the value of the submitted claim. More importantly, BNL has been proactive in developing and implementing strategies that have fostered the successful completion of work while avoiding unnecessary and costly claims and disputes. BNL has let numerous and substantial sub-tier contacts and task orders that have facilitated the timely and successful completion of EM work. The ATG recovery contract and chemical holes sorting contract are success stories that reflect the improvements that BNL has made in specifying and contracting EM related work.

- BGRR Project Execution

BNL conducted a top to bottom review of the BGRR D&D project. BNL developed and implemented sweeping changes to the project with the object of improving overall project performance. BNL re-established a Baseline schedule that appropriately integrates the various work packages that comprise the project; a corresponding overarching regulatory strategy was also developed. Necessary changes to the Baseline and IAG commitments were also made. BNL is now well into full BGRR characterization and end state determination to a logical and well thought out plan. Work under the new path forward is proceeding ahead of schedule and is tracking closely to the new budget. Detailed planning work for the filter and liner work is now underway, and BNL is enthusiastic about taking on

these extraordinary challenges during FY03; the BGRR path forward strategy was instrumental in providing additional planning time for these crucial work activities. Having improved BGRR performance, BNL is now focused on opportunities to re-shape some of the remaining work packages with the objective of recovering some of the previous cost over runs. For example, BNL is reviewing the necessity of the substantial D&D scope in one of BGRR work packages.

- High Flux Beam Reactor (HFBR)

During FY02, BNL developed the necessary scope documents and cost estimates to define the HFBR Decommissioning Project. This included bottoms up cost estimates for D&D alternatives ranging from "No Action" to Greenfield. BNL's analyses included the assessment of HFBR re-use and involved the development of rough order of magnitude cost estimates which will facilitate an end state determination during FY03. In addition, the documents necessary to support the DOE's decision making process (i.e. Mission Needs Statement and Acquisition Strategy) were drafted and submitted for DOE input; BNL acknowledges that the Acquisition Strategy is in need of some additional work.

- Operable Unit V

During the Summer of FY01, BNL restructured the Peconic River cleanup project to address several substantial regulator and community issues and concerns. Noteworthy issues included substantial data gaps, the need for an assessment of off-site risks and wide-spread concern regarding cleanup methodology and possible damage to the Peconic River eco-system. The original schedule called for the submittal of the proposed remedy to the regulators on August 22. Throughout FY02, BNL worked to this plan. The data gaps were filled. Pilot studies were carried out which resolved most of the issues and concerns regarding cleanup methodology and in doing so, resulted in the cleanup of over one acre of the Peconic River. All of this involved the permitting and installation of a sediment trap; as expressed during a meeting dating back to FY01, this resolved a long standing regulator issue. During FY02, the Peconic River risk assessment was performed and various remedies were evaluated. BNL offered a recommendation to the DOE during July. All of these activities were performed with bilateral participation on the part of the regulators and the community. By the end of the fiscal year, because of some additional DOE remedy reviews, and because BNL needed to perform additional refinement of its cost estimates, the August 22 Baseline date which was established during May of 2002 was late by three or four weeks. Owing to the complex Peconic River work environment, this still represents substantial Peconic River progress attributable to substantial efforts by the BNL/DOE team. BNL acknowledges the DOE's concerns about the cleanup costs in comparison to the Baseline and what may be viewed as marginal human health risks. As discussed with several DOE officials, BNL looks forward to participating in a thorough critique of this project with the objective of identifying lessons learned which can be deployed to other BNL EM projects. Notwithstanding this issue, substantial progress was made with the Peconic River

project during FY02; this represents a dramatic turn around for a project that was in a complete stall, lacked an overarching strategy and direction and was in a state of regulatory dispute as recent as the middle of FY01. BNL acknowledges that a great deal of work needs to be done to improve the working relationship with Suffolk County. Planned improvement initiatives to address this matter include periodic and documented meetings to ensure that County issues and concerns are addressed in a thorough and timely maner. BNL is also re-assigning its Regulatory Affairs Manager to serve as the BNL point of contact for all matters flowing between the County and the program. In addition to the Peconic River accomplishments, BNL initiated and is well along with the cleanup of the STP. BNL needs to work closely with the DOE in developing a strategy to close out this work package.

- Surface Projects

BNL completed the cleanup of the Building 650 outfall; the project was completed on schedule and the wastes were shipped for off-site disposal promptly following the completion of the field work. BNL has yet to perform a top to bottom critique of this project; a substantial thrust of this critique will include an analysis of the cost over run that was experienced during the conduct of this work. During FY02, BNL successfully completed the sorting and characterization of all of the chemical holes stockpiled waste; this work was completed ahead of schedule and under budget. Because of BNL's innovativeness on deploying some mercury field screening technology, BNL is well positioned to ship waste that was previously assumed to be mixed



In November 2002, workers at the Sewage Treatment Plant remove sediment containing elevated levels of mercury

waste as LLRW; this will result in substantial cost savings to the EM program during FY02.

BNL, having acquired hundreds of data points, is also well positioned to ship hundreds of yards of this waste to a Subtitle D landfill as an alternative to disposal as LLRW; this offers substantial and further FY03 cost savings. Because several RA work plans were accelerated into FY02, BNL is well positioned to accelerate field cleanup activities should funding become available. This operational flexibility may prove to be extremely valuable to BNL and the DOE during FY03. During FY02, BNL successfully launched a campaign to recover from the bankruptcy of ATG, one of BNL's key sub-tier contractors. By the end of the fiscal year, over one million pounds of waste that was previously stranded at ATG's Richland facility had been process,

and over two-thirds had been shipped for disposal at Envirocare. Because of extraordinary diligence BNL's part, this waste was disposed of at "soils" contact rates resulting in substantial cost savings to the EM program. The total cost of ATG's services, including pre and post bankruptcy costs, remained below the proposed cost of the "next low bidder" that submitted a proposal for this same work. In short, the recovery campaign was executed at a fair and reasonable cost to the program. Concurrent with the stranded LLRW, BNL successfully shipped four sources for off-site disposal and/or re-use; this work was work that was initially awarded to ATG and also fell under BNL's ATG recovery plan. BNL is well positioned to complete the removal of the waste in the former hazardous waste storage facility by the end of the calendar year such that the facility can be immediately downgraded from its classification as a nuclear facility. With the objective of reducing project management costs, the remainder of this work was restructured and is being assigned to the BNL WMD.

- Groundwater Projects

During FY02, BNL focused considerable attention on the off-site groundwater treatment systems. Plume characterization and engineering/design was completed for six treatment systems. This involved the resolution of several community concerns regarding the siting, construction and operation of these systems. Throughout FY02, BNL worked closely with a real estate developer to minimize potential land use impacts on a substantial parcel of undeveloped land adjacent to the Laboratory. As a result of BNL's actions, BNL and DOE are well positioned to secure the required access to off-site property during FY03. In addition to these accomplishments, BNL accelerated the development and submittal of the related remedial action work plans to the IAG during FY02. Lastly, BNL successfully amended a number of technical requirements to its groundwater monitoring program; these changes resulted in a substantial cost underrun during FY02.

Analysis

The analysis and rating of BNL's performance for this objective is provided in NBL's assessment of Performance Measures 2.2.1 and 2.2.2.

The year end score for Objective 2.2, is 3.50, correlating to a rating of *Excellent*.

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3.0 Laboratory Management and Operations

FY 2002

Critical Outcome

Objectives

Performance Measures

3.0

BNL Will Manage And Enhance Operations And Management Processes To Provide An Effective And Efficient Work Environment That Enables The Execution Of The BNL Mission In A Manner Responsive To Customer And Stakeholder Expectations.

32% of BNL Score

3.1

Management and Business Processes

55% of C.O. #2

3.2

Environment, Safety and Health

15% of C.O. #2

3.3

Site Infrastructure, Facilities and Operations

10% of C.O. #2

3.4

Information Technology

10% of C.O. #2

3.5

Communications and Trust

10% of C.O. #2

3.1.1 Assessment and Improvement (70% of 3.1)

3.1.1.1 Overall Evaluation of the Laboratory Self-Assessment Program

BSA will coordinate and conduct an overall evaluation of the Laboratory's Assessment Program. The evaluation team will include DOE representatives (BAO and others selected by BAO), BSA Representatives and "peer reviewers" from other Laboratories.

3.1.1.2 Enhance Evaluation of Management Systems

A Management System Evaluation consists of the following:

- Establishment of an evaluation team.
- Development of an Information Package about the performance and operation of the management system
- Conducting an Evaluation Workshop to score the maturity of the MS.
- Generation of a report documenting the evaluation process and results.

3.1.2 Business Processes (25% of 3.1)

3.1.2.1 Baseline Study of Laboratory Business Systems

This measure is focused on an effort to baseline/benchmark management processes and systems to identify the set of indicators that collectively can be used to evaluate the ongoing effectiveness and efficiency of the Laboratory business related management systems.

3.1.2.2 Work-for-Others Business Systems

These measures are focused on improving the billing system and the development of a database that will be shared between the DOE/BAO and the Laboratory in accordance with the Office of Science's 2001 Report and in accordance with BNL's FY 2001 Self-Evaluation of WFO-Federal.

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Information Technology

10% of C.O. #2

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Communications and Trust

10% of C.O. #2

3.1.3 Workforce/Diversity (2% of 3.1)

This measure serves to ensure the Workforce Diversity initiatives are effective in ensuring the availability of viable diversity candidates in the pool of individuals applying for managerial and professional positions.

3.1.4 Corporate Involvement (3% of 3.1)

Brookhaven Science Associates believes that active corporate involvement is a critical success factor in the management of BNL. To implement this, BSA is committed to the following types of activities at BNL:

- Providing highly skilled candidates for senior management positions at the Laboratory.
- Providing proven management systems and processes for enhancing business operations.
- Facilitating the implementation of these with long-term assignments of key leaders and short-term assignments of subject matter experts.
- Conducting management assessments in various areas of Laboratory operations.
- Providing strategic guidance to the science, technology and cleanup missions of the Laboratory.
- Facilitating the exchange of ideas and practices between other organizations affiliated with BSA corporate partners that bring benefits to DOE and/or BNL.

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FY 2002

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3.2.1 Legacy ES&H Risk Management (30% of 3.2)

3.2.1.1 Site Hazard Footprint Management

This measure is intended to begin establishing a "hazard footprint" for conditions that are not directly related to achieving the Laboratory mission and have not been transitioned to EM for disposition/ resolution. The focus will be on establishing the footprint for radiological hazards.

3.2.1.2 Chemical Disposition Upon Employee Termination

This measure is focused on evaluating the adequacy and effectiveness of termination processes which contain checks to ensure transfer of responsibilities for the management of chemicals when employees are terminated.

3.2.2 On-going ES&H Risk Management (70% of 3.2)

3.2.2.1 Pollution Prevention

Each organizational unit must demonstrate active involvement in the BNL Pollution Prevention Program. "Demonstrating involvement" is evidenced by submitting at least two pollution prevention project proposals to the P2 Council and/or two success stories and/or lessons learned stories.

3.2.2.2 Transportation Safety Implementation

The purpose of this measure is to satisfactorily complete key milestones associated with field deployment/implementation which are scheduled for FY02, and prepare the Laboratory for a DOE independent assessment of the Transportation Safety Program required by DOE Order 460.2.

3.2.2.3 OSHA Reportable Injury Management

BNL will seek to improve the following reportable rates: Total Recordable Case Rate (OSHA Recordables) TRCR, Lost Workday Case Rate (LWCR) and Lost Work Day Rate (LWDR)

3.2.2.4 Chemical Safety Performance

This measure is intended to evaluate the effectiveness of those processes and tools in managing chemical risks

3.0 Laboratory Management and Operations

FY 2002

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Communications and Trust

10% of C.O. #2

3.3.1 Pursue Alternative Financing for Infrastructure Projects (30% of 3.3)

BSA will continue to evaluate whether "third-party" (non-DOE) project funding is available, feasible and should be used to meet selected infrastructure needs.

3.3.2 Project Management (70% of 3.3)

BSA will manage its construction and construction-like projects to ensure scope, schedule and cost objectives are readily met.

This performance measure is for all capital-funded construction projects, excluding Strategic Systems (formerly Major Projects and Major Systems Acquisitions) and EM Projects. It is measured as a composite that accounts for the percent of capital funds committed and costed per fiscal year, the percent of projects on schedule, and the number of capital construction projects with scope completed within the Total Estimated Cost (TEC). The formula for calculating the performance is:

PROJECT RATING (PM): $(PM) = 0.2 (a^1 + a^2) + 0.2 (b^1 + b^2) + 0.2 (c)$

3.3.2.1 Funds Committed(a1)

3.3.2.2 Funds Costed (a2)

3.3.2.3 Project Schedule Compliance (GPP and IHEM) b1

3.3.2.4 Project Schedule Compliance (Line Item) b2

3.3.2.5 Scope Completed Within Approved Baseline (Line Item, GPP and IHEM) (c)

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3.4.1 Cyber Security (55% of 3.4)

BNL will maintain/improve a Cyber Security program that is designed to protect the unclassified portion of the computing and networking infrastructure from attacks originating from inside or outside the Laboratory, based on: social engineering, physical destruction of network components, or electronic attacks utilizing the network and the Internet. The program must balance the need for openness and the science mission against the security required to reduce the threats to acceptable levels. Two elements of this measure are:

- Completion of the Laboratory's computer security program according to DOE guidelines and directives, and as documented in BNL's Cyber Security Program Plan (CSPP).
- Establishing mechanisms to test, review and evaluate the CSPP to ensure it's value as a "living document;" as such, it will continue to meet the rapidly evolving cyber security risks, with response to external/internal threats balanced appropriately against the needs of the Laboratory science mission.

3.4.2 Scientific Computing Infrastructure (45% of 3.3)

BNL will continue to develop and maintain a scientific computing infrastructure that is fully supportive of the Laboratory's scientific mission, focusing on those areas where leveraging existing expertise and local/regional collaborations can produce significant improvement over the current status. This includes:

- Strengthening and upgrading the existing Visualization Program to address the visualization and data analysis requirements for the major BNL scientific initiatives--in particular, for RHIC and ATLAS.
- Strengthening and upgrading the scientific computing resources present in the BNL Computing Facility (BCF), to provide strategic value to the major scientific programs at the Laboratory, as well as to local/regional collaborations.
- Inaugurating a program of New Technology Implementation Assessments (NTIAs). Within this program, a specific new information technology will be investigated for a given Laboratory program/application, by mutual agreement with program/application owner.

3.0 Laboratory Management and Operations

FY 2002

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Information Technology

10% of C.O. #2

3.5

Communications and Trust

10% of C.O. #2

The Laboratory will enhance the foundation of trust and confidence it has built by: strengthening existing relationships and building new relationships with key stakeholders, elected and appointed officials, civic leaders, and other important constituencies; effectively communicating the Laboratory's scientific initiatives and accomplishments; generating community enthusiasm for Laboratory research programs; and working to fulfill the education mission shared with DOE.

3.5.1 Building Regional and National Recognition (50% of 3.5)

The objective of this measure is to increase regional and national recognition of the Laboratory and the Department of Energy. Strategic issues include enhancing the effectiveness of Laboratory communications with internal and external publics, showcasing the results of Lab research with special emphasis on RHIC and other high profile initiatives that produce exciting and scientifically interesting new information, building relationships with the press, and developing and improving the Laboratory's use of electronic media.

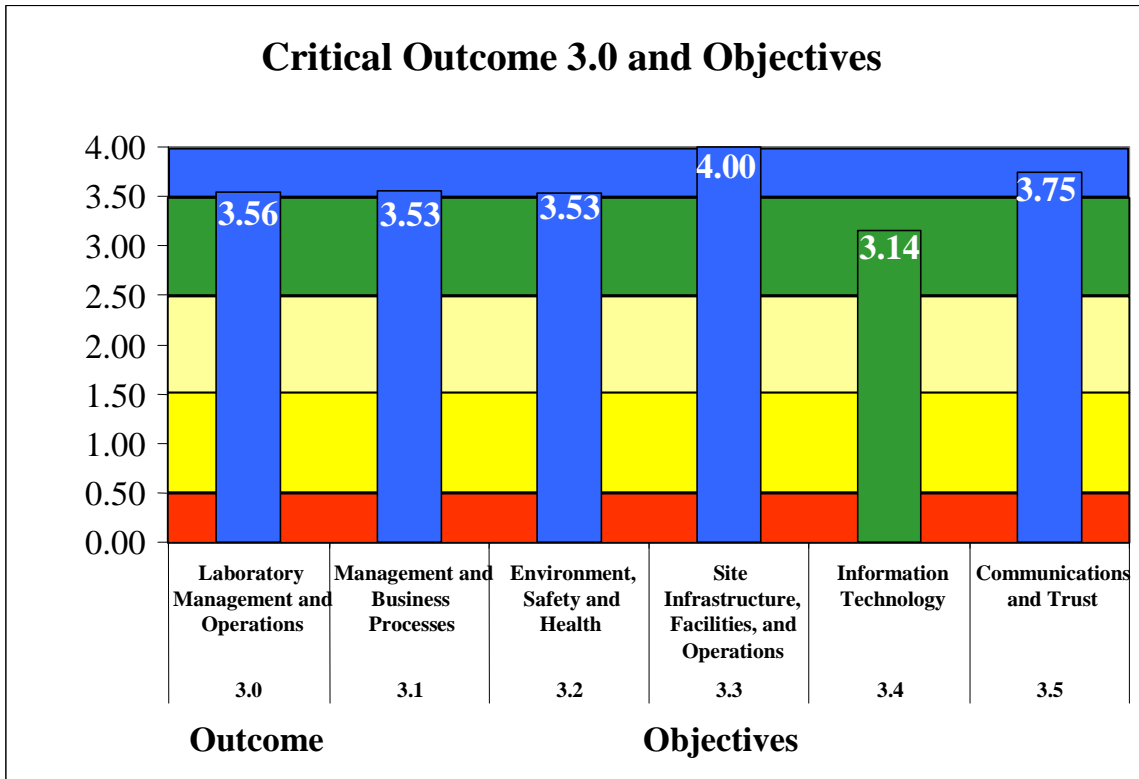
3.5.2 Stakeholder Involvement and Understanding (50% of 3.3)

The Laboratory is committed to ensuring that internal and external stakeholders have access to information about issues of interest and concern, and to providing two-way channels of communication so that stakeholders feel there is a frank and open dialogue with Laboratory management on issues of importance. Responsibility for stakeholder involvement on specific projects rests primarily with the project line manager with strong support from the Laboratory in terms of issues identification, community involvement training programs, information materials development, communications activities such as meetings and roundtables, collection and evaluation of community input, and feedback to the community.

3.0 Laboratory Management and Operations

The weight of this Outcome is 32% of total.

BNL Will Manage And Enhance Operations And Management Processes To Provide An Effective And Efficient Work Environment That Enables The Execution Of The BNL Mission In A Manner Responsive To Customer And Stakeholder Expectations.



In partnership with the DOE, this Critical Outcome was established to ensure that an effective and efficient work environment would be established, sustained and that supports the execution of the BNL mission in a manner responsive to customer and stakeholder expectations. Objectives were established in 1) Management and Business Processes, 2) Environment, Safety and Health, 3) Site Infrastructure, Facilities and Operations, 4) Information Technology, and 5) Communications and Trust.

Based on the self-evaluations performed in support of this Critical Outcome the annual score for Critical Outcome 3 is 3.56 which correlates to a rating of **Outstanding**. Scores for the underlying Objectives are provided in the graph above. An executive level summary of accomplishments follows. The detailed results of the self-evaluations of the Objectives and Measures, supporting this Critical Outcome are provided in Attachment 2 of this document.

The year end score for Critical Outcome 3.0 is 3.56, correlating to a rating of **Outstanding**.

3.1 Management and Business Processes

The weight of this Objective is 55% of total.

BSA will develop, implement, evaluate, and improve management tools and processes to attract, hire and retain a highly qualified and diverse workforce and enable the workforce to effectively and efficiently support the Laboratory scientific and cleanup missions.

- The Overall performance for the Management and Business Practices objective is rated **Outstanding** with a score of 3.53.

Performance relative to each of the Objectives is briefly described below and described in detail in Attachment 3, Laboratory Management and Operations Performance Detail of this document.

Assessment and Improvement: Two initiatives were undertaken 1) the performance of 29 Supporting Assessment Measures and 2) continuation of the successful Enhance Evaluation Management Systems that were initiated in FY01. The results of these activities yielded a rating of **Outstanding**.

Business Processes: This is a rollup of two sub measures, 3.1.2.1 Baseline study of Laboratory Business Systems and 3.1.2.2 Work-for-Others (WFO) Business Systems. The results of these activities yielded a rating of **Excellent**.

Workforce/Diversity: From October 1, 2001 83 of 117 requisitions filled or 70.9% had at least one diversity candidate. This represents a raw increase of 9.8% or a relative increase of 16.0% over the 61.1% average for the two base reference years of 1998 and 1999 for this measure. This exceeds the 10% improvement required to achieve a performance level of **Outstanding**.

Corporate Involvement: Brookhaven Science Associates continues to be committed to active corporate involvement in the management of BNL. BNL realizes that metric #1 in this area “*Providing highly skilled candidates for senior management positions at the Laboratory*” is a key factor in this measure. Pursuant to this, BNL recognizes the delay in permanently filling the position for the Laboratory Director and other science and technology managerial positions and is actively pursuing top candidates to fill then positions. Overall, performance for corporate involvement is rated at the lower end of **Outstanding**.

The year end score for Objective 3.1, is 3.53, correlating to a rating of **Outstanding**.

3.2 Environment, Safety and Health

The weight of this Objective is 15%.

BNL will develop, implement, and continuously improve management systems, processes, and services to effectively and efficiently manage environment, safety, and health risks

associated with the legacy vulnerabilities and work associated with support of ongoing Laboratory mission activities.

The Overall performance for the ES&H objective is rated **Outstanding** with a score of 3.53. Specific performance measures under this objective were associated with site hazard footprint management, chemical disposition on employee terminations, pollution prevention, transportation safety, OSHA reportable injury management, and chemical safety performance. Performance relative to each of these is briefly described below.

Site Hazard Footprint Management: Radiological footprints were completed for nine of eleven (~80%) facilities scheduled which corresponds to an **Excellent** rating. Information necessary for baselining was gathered through interviews, walkthroughs, records review, and limited characterization data. The data was collated in tables for ease of use, or abstracted where on-going activities for characterization exist (e.g. AGS lead, steel, and block yard). The baseline documents will be updated as additional information is updated. Progress for FY02 was less than initially planned primarily because of a late start and also because there was significantly more archival material needing review than had been anticipated.

Chemical disposition on employee terminations: Performance for the measure for chemical disposition for employee terminations is rated as **Outstanding** with a score of 3.93. A total of 54 employees, who had chemical containers assigned, terminated their employment from BNL in FY02; 53 (98.1 %) of these employees reconciled their chemicals within one month of their termination date as required by the measure. The remaining termination was dispositioned within 90 days. The success of BNL's performance on this measure is primarily attributed to improved communication and follow-up.

Pollution prevention: Performance measures related to Pollution Prevention (P2) are rated as **Outstanding** with a score of 4.0. All Laboratory organizations participated at or above the prescribed pollution prevention requirements. Success of, and interest in, the P2 program is particularly evident in the continuing increase of P2 proposals from the Science and Technology organizations over the last 5 years. In FY02 \$119K was invested and the annual cost savings from these

investments is estimated to be \$268K. Each year there is un-met demand for funds to be utilized for innovative P2 proposals.



Newly poured rollup door apron for radioactive storage Bldg. 974

Transportation safety: Performance against the measures for Transportation Safety Implementation is rated as **Outstanding** with a score of 4.00. Documentation of all Safety Assessment Methodologies and all supporting milestones were completed either on, or ahead, of schedule. A detailed methodical process was used to determine the appropriate set of transportation activities requiring review. The thorough process

provides laboratory management with high confidence that transportation activities are being identified and appropriate controls are established. The approach also enabled identification of operational enhancements that lowers the level of risk for on-site transportation activities.

OSHA reportable injury management: Performance for this measure is rated as *Excellent* with a score of 2.97. This measure is rated as a composite of three injury management rates, Total Recordable Case Rate (TRCR), Lost Workday Rate (LWDR), and Lost Work Case Rate (LWCR). Each rate is equally weighted (1/3) for evaluation of the measure composite. Performance for the LWDR and TRCR is rated as *Outstanding* and *Excellent* respectively. However, the LWCR is rated as *Good*. The strong performance for the LWDR is primarily attributed to improvement in case management initiatives. The *Good* rating for the LWCR is a factor of several elements including (1) OSHA Reporting Rules change, (2) an increase in reported ergonomic cases, and (3) an increase in reported hearing loss cases. Actions taken in FY02 to reverse undesirable trends in occupational injuries included presentations to the senior management team focused on responsibility and accountability for management in the prevention of workplace injuries and the management of employee lost time when injuries occur. Articles from the Interim Laboratory Director in the Monday Memo augmented these communication initiatives. Additionally, a Safety Awareness Day was held on July 8, 2002. This day, sponsored and endorsed by the Interim Laboratory Director, included two sessions in Berkner Hall with outside speakers, followed by department/division all-hands meetings focused on improving safety in the workplace.

Chemical Safety Performance: Overall performance for chemical safety is rated as *Excellent* with a score of 3.31. This rating is an average of two measures: (1) Chemical Inventory Management, and (2) Management of Peroxide Forming Chemicals. For chemical inventory management, seven rooms were randomly inspected for conformance to general chemical management requirements (bar code and correct owners) resulting in a score of 3.42. For management of peroxide forming chemicals, five additional randomly selected rooms were inspected for conformance to requirements for management of peroxide forming chemicals (labeling, storage, and testing), resulting in a rating of 3.20.

In addition to the specific measures discussed above, implementation of Supporting Assessment Measures (SAMs), other planned self-assessment activities, corporate oversight, regulatory assessments (e.g. DOE, EPA, DEC etc), and evaluation of events, conditions, or issues (e.g. occurrence reports, lessons learned, regulatory changes etc) provide additional performance information relative to contractual obligations and laboratory management expectations.

Collectively, performance against the specific performance measures under this objective and other ES&H performance information indicate that the BNL ES&H program continues to improve. For Example:

- In June 2002, independent auditors re-certified BNL's Environmental Management System (EMS) declaring it to be in conformance with the ISO 14001 standard and BNL's own requirements. The audit results clearly indicated that organizations have implemented the ISO 14001 system and are beginning to realize some benefits. Areas for improvement were primarily associated with documentation control.
- Environmental compliance status continues to improve. The laboratory conducted focused self-assessments on air emissions (radioactive and non-radioactive) and PCB management. The results indicated that these programs are being effectively managed. The air emission assessment identified a potential non-compliance at the Brookhaven LINAC Isotope Producing (BLIP) related to NESHAPS requirements for radioactive airborne emissions. Other findings from both the air emissions assessment and the PCB assessment were related primarily to minor regulatory issues. The laboratory was over 99% compliant with SPDES permit requirements. Progress continues to be made on achieving conformance to Suffolk County Article 12. The project plan for upgrading all site storage tanks is approximately 50% complete with \$1.3M committed through FY03. All regulatory reports were submitted on or ahead of schedule.
- Overall radiological control performance is considered *Excellent*. The laboratory has maintained a rate of improvement that caused performance to increase from last year's overall rating of *Good*. This improvement was a continuation of the trend established in 1999. The rate of improvement in FY 2002 was not as significant as in previous years, but was particularly noteworthy in that several setbacks had to be overcome to continue the improvement.
- During FY02 the second cycle of triennial assessments was completed and the third cycle was initiated. Several of the assessments performed during FY02 confirmed significant improvement in the functional elements from the results of earlier assessments, e.g. training, sealed source accountability. In addition, very positive feedback of performance was presented in the report in functional element "Organization and Administration. The follow-up assessment from the DOELAP external dosimetry team confirmed significant improvements over the previous visit.
- Continued strong performance is evident in the management of regulated waste generation rates and industrial waste recycling rates. Since 1992 routine operations waste streams are down 81%, 73%, and 88% for radioactive waste, mixed waste, and hazardous waste respectively. BNL has sustained excellence in achieving high rates of recycling since the mid 90's. Over the last several years performance of recycling has been included as a DOE/BSA Critical outcome and has consistently achieved a high *Excellent* to *Outstanding* rating. In FY02 action was taken to rekindle interest and participation in the recycling program by the Laboratory population.
- The laboratory continues to meet energy management objectives. BNL has sustained excellence in reducing the laboratories energy use, which is currently 28% (BTU/FT²) below the 1985 base line year. To continue the success new projects are on going to

replace energy wasteful equipment, expand our system capability and re-commission the operation of the existing systems.

- A major focus for Work Planning and Control was the creation of a new SBMS Subject Area that eliminates the issue of integration between former legacy standards 1.3.5 (experiments) and 1.3.6 (other “routine” work). This issue had been cited in past assessment findings. The new Subject Area reflects the maturity of the WP&C process to date and provides an updated tool for how the Laboratory expects work and experiments to be evaluated, approved, and performed.
- 71% of workers responding to a work planning involvement survey indicated they felt involved with the work planning processes. Virtually all responders felt they understood the hazards associated with their work and they were aware of their authority to stop work. It’s important to note however, that the average response rate per department or division was approximately 42%. With the highest being 100% and the lowest 7%. While the survey results were positive, and the response rate was fairly strong given that it was voluntary involvement, a higher and more consistent response rate would have provided more confidence in the results.
- Progress towards accelerator authorization basis upgrades is evident with the majority of active work on or ahead of schedule. The BLIP upgrade remains behind schedule primarily due to the issue regarding monitoring of radioactive air emissions cited above. Negotiations with the EPA to determine the best path forward are in progress.

Although no deficiencies representing substantial vulnerabilities to the Laboratory were identified, analysis of collective assessment results (i.e. self-assessment, external assessments, trends of occurrence reports etc) have indicated the need for management attention in several areas. Actions will be taken in FY03 to address the following concerns:

- Line organizations need to have input on the impact analysis of changes in regulations. Management System Stewards need to ensure organizations impacted by upcoming regulatory changes become adequately engaged in the evaluation of the impacts and in determining/agreeing to approaches to conformance (either through implementation or variances) with the requirements.
- Progress on subject area development and publication has slowed. The SBMS Steering Committee has begun to take a more active and directive role in setting strategic direction for SBMS deployment, setting priorities, and monitoring progress of subject area development and revision.
- Awareness of the status of implementation and deployment of Subject Areas at the Management System Steward level needs to be improved to ensure progress in system implementation is consistent with balanced priorities.

- Senior line management involvement in assessing field performance and the adequacy, effectiveness, and efficiency of Lab-wide procedures needs to be improved.
- Although ES&H self-assessment activities, particularly those at the management system level, are maturing, greater emphasis needs to be placed on analysis of assessment results (both on a routine basis and at year end) to ensure that planned actions and schedules are consistent with the balanced priorities established by Laboratory management and the Critical Outcomes, Objectives, and Measures (contract Appendix B).

Several ongoing or impending DOE initiatives and changes in regulatory climate [i.e. transition of direct EM funding for waste disposal to program funding, the potential for external regulation, implementation of 10CFR830 Part B (which significantly impacts the management of site nuclear facilities), and changes to OSHA reporting for occupational injuries] have consumed substantial management attention in FY02 and will continue to do so in FY03.

The year end score for Objective 3.2, is 3.53, correlating to a rating of *Outstanding*.

3.3 Site Infrastructure, Facilities, and Operations

The weight of this Objective is 10%.

BNL will maintain and improve the efficiency and reliability of the site infrastructure and manage projects to upgrade site facilities to meet the objectives of the Strategic Facility Plan and Master Site Plan. Site operations will be managed to ensure effective protection of personnel, property, the general public, national security interests, proprietary information, classified matter, and sensitive unclassified information.

Performance measures for the F&O Directorate were organized into four Malcolm Baldrige-based categories: Customers, Operations, Resources, and People. Seventy-five separate measures were tracked this year and received an overall rating of Excellent.

A highlight of noteworthy accomplishments for the Directorate is as follows:

- Negotiated an electric load curtailment agreement with LIPA/NYPA for the summer of 2002 that resulted in BNL receiving bill credits in excess of \$1M. Agreement capitalized on the fact that RHIC was planning to be down over the summer period, so minimal research interruption was necessary.

- Obtained \$1.3M in incremental operating funding from DOE-SC for the demolition of several BNL excess buildings. Agreement included DOE's approval to meet the "Matching funds" requirement with Plant Engineering contributed services, thereby minimizing the impact on the Laboratory's G&A budget. The project was completed without a lost time injury, on time and within budget.



Building 318 being demolished

- Led a 10 person team in the development of the first-ever, "bottoms-up" required maintenance estimate for the BNL conventional physical plant. Authored a white paper on the subject, which positively influenced DOE maintenance policy formulation.
- Performed a Lab wide threat assessment in light of 911 and subsequently implemented recommendations which were over and above DOE requirements.
- Served as Conventional Facilities Team Leader for a review of the neutrino project at Fermilab.
- Supported Williams Floyd High School in the FIRST robotic competition. The robot was designed and fabricated by students and Central Shops employees at BNL.
- Prepared white paper to request that DOE/BSA modify the BSA contract to allow BNL employees to perform Davis-Bacon covered work for small construction projects. The paper is now with the Policy Council.

- Development of a Master Assessment Schedule to assure that all-key areas of its operations are assessed over a multi-year period. The assessments identified in this schedule are a combination of contractually required assessments, and Specific Assessments, which include SBMS requirements.



New Dosing Chamber at Sewage Treatment Plant
(Sanitary Modification Phase II)

- Development and implementation of a Management System Project Plan. The plan provides the framework to assist the ALD for

F&O in meeting his responsibilities as a Management System

Steward by assessing the current Management System and its subsystems and providing the planning details and processes for full Management System deployment. The following Management Systems are addressed in the aforementioned plan:

- Emergency Preparedness and Off-Normal Event Reporting
- Emergency Response Services
- Facility Operations
- Life Cycle Asset Management
- Safeguards and Security

The year end score for Objective 3.3, is 4.00, correlating to a rating of ***Outstanding***.

3.4 Information Technology

The weight of this Objective is 10% of total.

BNL will provide a cost effective, reliable, and secure computing/communications infrastructure for administrative computing, and support to scientific programs for unique computing problems.

Performance Level Metrics

Note: All the measures within this objective are date driven milestones. The following metrics apply:

Metric: Each milestone will be awarded points as follows based on accomplishment of that milestone:

Outstanding	Bettering a milestone date by >30 days	4 Points
Excellent	Meeting a milestone date	3 Points
Good	Missing a milestone date by <45 days	2 Points
Marginal	Missing a milestone date by >45 days	1 Point
Unsatisfactory	Missing a milestone date by >90 days	0 Points

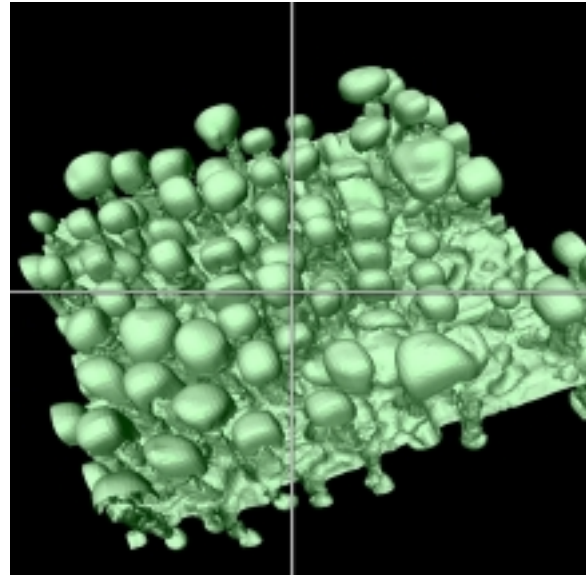
The evaluation of the Performance Measure will be the numerical average of the scores of the supporting milestones.

Accomplishments

BNL has continued to improve its Information Technology infrastructure by continuing emphasis on Cyber Security and by strengthening the Scientific Computing infrastructure. Achievements in each of these major areas are indicated under the respective performance measures, 3.4.1 and 3.4.2 in section 3.

Analysis

The beginning of FY02 saw a major shift in approach, as the Information Technology Division (ITD) focused on developing and establishing those initiatives and services that add strategic value to the Laboratory, e.g. in the area of scientific computing. One key example is the use of the Visualization Program as a model for the development of new Centers of Excellence, which will provide support for the Laboratory's scientific mission. This new focus represents a distinct departure from the past and is being funded/resourced through a major internal restructuring of ITD. This was enabled by the Division's extensive internal improvement program that has been implemented over the last several years.



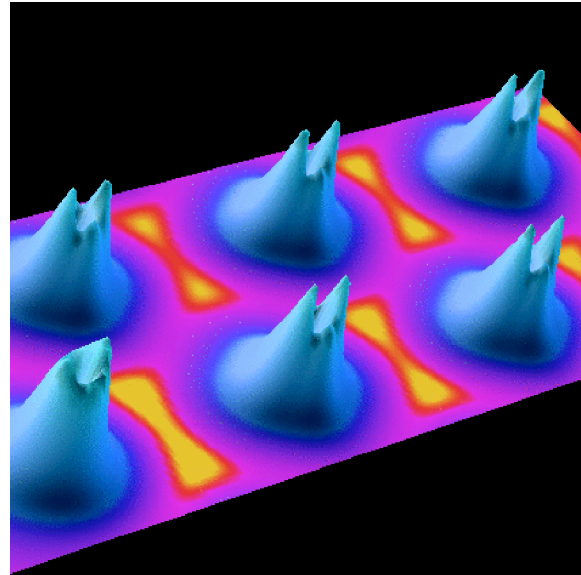
Computer rendered image of an isosurface defined by the interface boundary of two fluids

During FY02, most milestones in Scientific Computing and Cyber Security were met as projected. In the second half of FY02, impacts on some of the milestones occurred due to resource issues, and, in the case of Scientific Computing, one milestone was not met as

anticipated due to external factors. Details are provided in sections of Performance Measures 3.4.1 and 3.4.2 in section 3. BNL will continue to work toward resolving any remaining open issues and/or issues raised related to these performance measure milestones, in order to achieve/sustain an Information Technology infrastructure that most effectively protects and enables its scientific mission and resources.

Management Focus for the Coming Quarter

Management will remain focused on ensuring that the problems that caused lower-than-anticipated ratings for certain ITD performance measure milestones during FY02 will not recur in the future. To this end, ITD has already taken steps to address the issue of failing to meet certain of its original performance measure targets, namely those defined for milestone #1 of Scientific Computing submeasure 3.4.2.1 and milestone #2 of submeasure 3.4.2.2. In both cases, failure to achieve the expected performance for these milestones was due to external events beyond ITD's direct control. These issues have already been discussed in



The interface boundary of two fluids mixing using Chromium software

detail with DOE/BAO during the ITD and DOE/BAO Quarterly Review Meetings held during the last half of FY02. It was agreed that, for any truly strategic measure, there would almost always be aspects that are beyond the control of the owner organization. Such aspects can not, and should not, be eliminated from the measure, hence the solution proposed was to improve the writing of the performance measure(s), and in particular, the rating criteria to be used. In both of the FY02 cases noted above, the rating criteria stressed only one element, namely time, as the parameter for measurement. This set up the potential to achieve a low score on the milestone, even though the associated work performed by ITD achieved or surpassed expectations. It was determined that in the future, grading criteria for ITD performance measures/milestones will be multi-dimensional, and will be developed specifically for each measure and/or milestone. This approach has already been implemented by ITD and was used in the development of the performance measure for FY03. As FY03 progresses, ongoing evaluation of the new performance measure(s) will determine if the new approach to construction of performance measures has had the intended effect.

The year end score for Objective 3.4, is 3.14, correlating to a rating of *Excellent*.

Notes, Issues, Trends and Assumptions

The major challenge remains that of developing a secure computing/communications infrastructure that enables, rather than negatively impacts, BNL's science mission. This includes the appropriate design, implementation and maintenance of BNL's Cyber

Security Program Plan as well as the design, growth and maintenance of computing services that support and attract scientific programs to the Laboratory. The issue of acquiring appropriate resources to initiate programs in both of these major areas as well as maintain a high-level of ongoing support has been an ongoing problem that has not yet been completely solved.

3.5 Communications and Trust

The weight of this Objective is 10%.

The Laboratory will enhance the foundation of trust and confidence it has built by: strengthening existing relationships and building new relationships with key stakeholders, elected and appointed officials, civic leaders, and other important constituencies; effectively communicating the Laboratory's scientific initiatives and accomplishments; generating community enthusiasm for Laboratory research programs; and working to fulfill the education mission shared with DOE.

Purpose and Supporting Information

The Laboratory's Communications, Community Involvement, and Education Program plans serve as a guide to the many activities and initiatives that will be pursued in FY02 to fulfill this objective and to help meet the expectations and performance measures of science and operational departments and divisions across the Laboratory.

Each element of the plan will include associated self-assessment activities for the appropriate organization (e.g. CIGPA, Departments, and Divisions). Stakeholder feedback will be collected and research and self-assessments will be conducted throughout the year to determine program effectiveness, to evaluate program utility, and to make mid-course corrections as necessary.

Performance towards this objective will be based on accomplishment of the goals set forth in the Communications, Community Involvement and Education plans. BNL and BAO will conduct an independent peer review process or other selected process that both parties agree is necessary and appropriate to evaluate the Laboratory's communications, community involvement, and education programs. The peer review or other process selected will focus primarily on the measures below.

Accomplishments

Over the past four years, BSA has focused on building a foundation of trust and confidence with the community and key stakeholders. In FY 02, the Laboratory was successful in strengthening this trust and confidence and, furthermore, was able to capitalize on this success and build new opportunities for the future. These new opportunities have come about as a result of a unified, and cooperative approach by senior management to focus on Laboratory strategic priorities. Among these have been

the award by DOE of a new nanoscience center and cooperative efforts with Senator Charles Schumer for counterterrorism activities related to Laboratory research. A coordinated approach that involved science and operational departments, CEGPA, and others, was key to these successful initiatives. With the Media and Communications Office working with scientific staff to increase the visibility of the Laboratory's forefront science, coupled with the Community Involvement Office and operational staff efforts to maintain community trust and minimize inappropriate attention to environmental issues, Brookhaven has created an environment where positive initiatives can be successfully pursued.



BNL's Ralph James and Senator Charles Schumer at a Port Security Event held in NY City



Debut issue of BNL's Science Magazine

Communications plans were developed and served as guides to ensure consistent and effective communications of scientific initiatives and accomplishments, as well as complex environmental issues, to the many stakeholders interested in the Laboratory. Examples of plans that were utilized this year include those for the nanoscience center, the National Synchrotron Light Source, and the Peconic River. Stakeholder feedback was collected throughout the year, opportunities for improvement were identified and many changes were implemented as mid-course corrections. Significant enhancements to the Laboratory's communications capabilities were made in FY 02 through major improvement to both content and structure of the BNL website.

Brookhaven high-profile science. Evidence of success in this objective is observed through articles in periodicals such as Discover Magazine, Popular Science and The New York Times. The Public Relations Society of America selected the Lab for its Big Apple award in recognition of the media accomplishments associated with addiction research at BNL.

Support for the now established procedures and policies related to community involvement was reinforced through the training of level 1, level 2, and project managers.

National and regional recognition continue to grow through strategic placement and pitching of

Over 80% of the level 1 and 2 managers have now been trained and have become part of the network contributing to identifying, trending, tracking, and managing issues important to the Laboratory. This contribution is now supported by a trending and tracking system that is maintained to inform managers about both internal and external issues that may have impact on their operations.

Fiscal year 2002 was also marked by the creation of the Volunteers in Partnership program. The program supports employees and retirees who volunteer within their community by making funds and resources available for approved requests. An advisory committee was formed to support this program and it meets routinely.

This fiscal year also saw significant improvements to the Laboratory's educational programs. Several key activities were undertaken to strengthen the visibility and effectiveness in this area. The Laboratory's elementary school programs were transitioned over to CEGPA's Office of Educational Programs. This increased the effectiveness and flexibility of the group, creating opportunities that previously were difficult to capitalize on. A strategic plan was developed for the educational programs, and implementation has already started. Part of this plan includes expanding on the relationships that already exist and building new relationships through initiatives that take advantage of the unique scientific capabilities of Brookhaven. Finally, the website for the educational programs was redesigned to match the Laboratory main page format and to target key audiences likely to participate in BNL educational activities.

Details of the accomplishments for the year and how they relate to the two performance measures, "Building Regional and National Recognition" and "Stakeholder Involvement and Understanding," are provided in their respective accomplishment summary sections.

In accordance with the requirements of this objective, a peer-review process was conducted at the end of the fiscal year on September 23 and 24, 2002. After a series of presentations, a review of the documentation, and deliberation, a rating of 3.7 out of 4.0 was awarded for the Laboratory's performance on this objective. The peer review team noted that the high level of performance of CEGPA, and the Laboratory as a whole, has continued throughout FY02.

Based upon the accomplishments achieved by the Laboratory in this area during FY02 and the peer review rating awarded, the performance for this objective is considered to be ***Outstanding***.

Analysis

The ***Outstanding*** rating provided is based upon the overall achievement of the performance objective. This rating is supported by the accomplishments detailed in each performance measure and has been substantiated through a peer review process. The 3.75 rating is based upon the 50% weight applied to each measure. In this year end self evaluation, a rating of 3.7 for National and Regional Recognition, and a rating of 3.8 for Stakeholder Involvement and Understanding, have been assigned.

Management Focus for the Coming Quarter

The focus in the upcoming quarter will be to maintain the core Laboratory communications, community involvement and education programs and to establish communications activities that are supportive of the Laboratory's FY 03 strategic priorities.

The year end score for Objective 3.5, is 3.75, correlating to a rating of *Outstanding*.

Notes, Issues, Trends and Assumptions

Issues and Trends

For the third year in a row, the peer-review team has noted that the high quality and caliber of the communications programs at BNL have strained the available resources, and any new initiatives must be carefully assessed for the cost versus value to the Laboratory. Accordingly, the Laboratory as a whole, and CEGPA in particular, will need to carefully consider the value of each program/initiative, and determine where to set priorities for communications resources and efforts in the coming years.

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1.0 Excellence In Science & Technology

1.1 Quality of Research

Supporting information for BSA Quality of Research performance for Fiscal Year 2002 has been organized into the following data categories.

- Significant Accomplishments
- Significant Awards
- Peer-Reviewed Publications
- Number of Patents, Disclosures, Licenses and Royalties
- Significant New Hires
- Proposals
- LDRD Initiatives
- Editorial Activity and Major Book Articles
- Technical Committees

Each Department within each BSA Scientific Directorate has provided supporting performance information within the above format. The following is a compilation of that performance data.

1.1.1 High Energy and Nuclear Physics

1.1.1.1 Collider Accelerator Department

Significant Accomplishments

Significant Achievements

- RHIC is operational at full collision energy; all experiments collecting data and publishing
- RHIC operating at average luminosity equal to 33% of design
- Fifth RHIC experiment, PP2PP, installed and taking data
- AGS proton slow-beam intensity delivered 5.7×10^{19} on target for E949, Rare Kaon Decay experiment
- ISO 14001 Registration recertified in FY 2002
- First regular operation of AGS for fixed target experiments concurrent with RHIC operation. Context switching time as planned.
- KOPI0 AGS beam target tests continued (NSF-HEPHEP)
- Radiobiology experiments continued (NASA)
- RHIC II collaboration began (NOVOSIBIRSK, DUBNA, Bates, TJNAF)
- Five AGS Nuclear Physics experiments were operational concurrent with HEP

Significant Instrumentation Developments

- Incremental developments leading to superior RHIC performance
- EBIS R&D successfully completed and ready for construction

Significant computer/software developments

- Accelerator mode switching under program control

Significant Awards

- S. Peggs – APS Fellowship
- A. Herscovitch – Acceleron Grant Winner

Peer-Reviewed Publications

- For FY 2002, C-A has a total of 89 publications in refereed journals, major reports and proceedings. List is available upon request.

Number of Patents, Disclosures, Licenses and Royalties

Total: two

- US Patent: Wide tracking range, auto ranging, low jitter phase lock loop for swept and fixed frequency systems, T. Kerner, October 23, 2001
- Record of invention: Plasm shielding for in-air and under-water beam processes, A. Herscovitch, March 27, 2002

Significant New Hires

- Twenty-six new hires and transfers into C-A from other BNL Departments
- Six temporary to support BAF construction
- Five temporary positions for studies
- Fifteen replacements for staff lost through attrition

Proposals

- RHIC - Collider-Accelerator Operation
- RHIC Experimental Operations (partial)
- Accelerator Operation for HEP
- Experimental Facility Operation for HEP
- Accelerator Operation for Medium Energy Physics
- Spallation Neutron Source Project
- NASA - Booster Application Facility Project
- NASA - Genetic and Epigenetic Effects - E960
- Proton Radiography - E955

Technical Committees

Review of BNL

- DOE SNS Review, November 2001, W.T. Weng, Y.Y. Lee, J. Wei, M. Nekulak, J. Sandberg, J. Tuozzolo
- DOE/NASA BAF Project Review, December 2001, A. McNerney, J. Becker, K. Brown, J. Feldman, D. Lowenstein, D. Phillips, R. Prigl, B. Sutherland, M. Vasquez
- SNS ASAC Review, February 2002, J. Wei, Y.Y. Lee, P. Cameron, D. Davino
- DOE RHIC Operations Review, February 2002, D. Lowenstein, A. McNerney, E. Lessard, T. Roser, P. Pile, J. Sandberg, J. Tuozzolo, M. Brennan
- DOE/NASA BAF Project Review, February 2002, D. Lowenstein, A. McNerney, P. Pile, A. Rusek, B. Sutherland
- DOE RHIC Program Review, July 2002, D. Lowenstein, T. Roser, Y. Makdisi

Service Activity for DOE Program and/or Nat'l/Regional level

- AHF B-Tag Review, October 2001, D. Lowenstein
- NLC MAC, October 2001, S. Peggs
- BOGSNS, October 2001, W.T. Weng, D.I. Lowenstein
- JLab HKS Readiness Review, November 2001, P. Pile
- SNS HEBT Vacuum System Review, November 2001, H.C. Hseuh
- CERN LHC Vacuum System Review, November 2001, H.C. Hseuh
- NLC MAC, January 2002, S. Peggs
- RCMS Collaboration Internal Review, January 2002, S. Peggs, D. Lowenstein
- SNS DOE Review, February 2002, S. Peggs
- NuMi DOE Review at FNAL, February 2002, S. Peggs
- Peer Review Panel for Muon Ionization Cooling Experiment Proposal at Rutherford Appleton Laboratory, March 2002, D. Lowenstein
- NuMi DOE Review at FNAL, May 2002, D. Lowenstein
- HRIBF Operations Review, ORNL, June 2002, D. Lowenstein
- DOE SNS Review - ORNL - May 2002, T. Roser
- Accelerator Advisory Committee - Batavia, IL - May 2002, T. Roser
- DPB Nominating Meeting - Albuquerque, New Mexico- April 2002, T. Roser
- Review of the Kopio Application to the 'Canadian Foundation of Innovation' - Ottawa,
- US Particle Accelerator School Board of Overseers, Yale, June 2002, D. Lowenstein - Canada - March 2002, T. Roser
- Muon Collaboration TECh. Board Meeting - Chicago, IL - Feb 2002, T. Roser
- FNAL Accelerator Advisory Committee Mtg. - Chicago, IL - Dec 2002, T. Roser
- SNS Review - ORNL - Nov 2001, T. Roser
- Review of GSI Upgrade by the German Science Council - Darmstadt, GM - Nov. 2001, T. Roser
- US/Japan HENP Committee, FNAL, June 2002, D. Lowenstein
- US/Russia Joint Coordinating Committee on Fundamental Properties of Matter, D. Lowenstein
- SNS Accelerator Safety Review Committee, Jan 2002, E. Lessard

BNL Committees

- OPSEC, D. Lowenstein, P. Pile
- SBMS Steering Committee, D. Lowenstein
- Employment Benefit Committee, D. Lowenstein
- PAAA Working Group, D. Lowenstein
- BNL Institutional Review Board, E. Lessard
- BNL Radioactive Drug Research Committee, E. Lessard
- BNL Environment, Health and Safety Committee, E. Lessard
- BNL Radiation Protection Work Group, E. Lessard
- SNS SAD Review, E. Lessard
- BNL Fire Alarm Committee, R. Karol, E. Lessard
- C-AD Radiation Safety Committee, E. Lessard

- C-AD ALARA Committee, E. Lessard
- C-AD Experimental Safety Review Committee, E. Lessard
- C-AD Accelerator Systems Safety Review Committee, E. Lessard

1.1.1.2 Physics Department

Significant Accomplishments

Nuclear Physics (NP) Summary. RHIC experiments have now had a significant second run, collecting an order of magnitude more data than in the first run and at the full energy of the machine. Analyses are in progress and many preliminary results will be presented at Quark Matter 2002 later this month. Meanwhile the analyses of the first run are nearly complete and more than 20 papers have appeared in the published literature or are currently in press. Results on the suppression of hadron production at high transverse momentum, on elliptic flow, on interferometry and on correlations are new to RHIC and extremely interesting. RCF performed according to expectations and had made the processing of the large new data set possible. RCF is now in the process of getting ready for the even larger data set expected from run 3. LEGS commissioned the new polarized target and had an encouraging first run at NSLS. The Theory Group had an extremely active year, with many visitors and workshops. The RHIC spin group is in place and growing, with the expectation of being able to grow on the PHENIX side in the coming fiscal year. BNL's NP programs, including RHIC, RHIC II, EIC and Spin Physics all are well represented in the final Long Range Plan.

- RHIC Experiments:

BRAHMS: Detector operational. Successful data taking run completed in January. Early results from the full energy run already submitted for publication. BRAHMS explores kinematic regions not accessible to the other experiments.

PHENIX: The detector, minus one muon spectrometer, is operational and completed a very successful run in January. High-level triggers were implemented, allowing PHENIX to measure rare events. Some interesting studies were limited by the available machine luminosity, which will be improved in subsequent runs. Many papers were published, including the first publication on the suppression of high-pT hadrons; a number more are in press. The Group continues to play a major role in the data analysis and preparation of physics results. It is a strong young group with excellent leadership. Need to continue to make sure Physics Department maintains a real physics role and not just a detector support role. Looks very promising right now. New post-docs have been added.

STAR: The detector is operational and completed a very successful run in January. Many physics papers were produced from the first year's data and a number more are in press. The detector performed extremely well in the 2001 running. The Physics Department group continues to do an excellent job in running the operations. A number of post-docs

were added and the local group's physics visibility is increasing under the direction of the senior physicist hired last year.

- Theory: Tenure was granted to a young nuclear theorist in the group, adding to a very solid core of senior people. The group continues to attract excellent young theorists and to work synergistically with the RIKEN/BNL Research Center theorists. The combination has made the department a world-class center for strong interaction theory. Progress is being made in right-sizing the base budget of this group.
- RCF: Continued to perform well during and after the second run, providing the needed resources to process and analyze the data. After the run RCF convened a working group from among the experiments to consider how the next hardware and software acquisitions should be optimized in response to expectations of the third run.
- LEGS: This project had a successful first run with the new frozen spin target and a successful review by the DOE in the spring.
- RHIC Spin: RHIC Spin Group development is continuing, especially the recruitment of scientific personnel to work on the STAR spin program at Brookhaven. However, the development is currently funding-limited and efforts are underway to increase the funding and to focus the group's activities more exclusively on RHIC Spin. This group, together with RBRC was active and productive in making PHENIX and STAR ready for the first RHIC polarized proton run in FY 2001. Although the delivered polarization was less than hoped for, the spin program made some important first measurements of polarization and of asymmetry in hadron production.
- Hypernuclear Physics: This effort is being wound down in the Physics Department as we concentrate the Medium Energy research more on Spin physics at RHIC. We are in the process of redirecting the staff working in this area to other activities, both ongoing and new.

High Energy Physics (HEP) Summary. Very strong program in diverse areas. Very well reviewed by DOE this year. Need to maintain strengths in theory, D0, ATLAS and Kaons while trying to expand in a reasonable way in MINOS, MECO and muon collider related efforts.

- Theory: Lattice gauge theory is a major effort of the HET group and this year saw physics results for ϵ'/ϵ , g_V/g_A , and theoretical studies of the accuracy of domain wall fermions. Next-to-next-to-leading order QCD corrections to Higgs boson production at the Tevatron and the LHC were completed, leading to significant enhancements in the rates over the next-to-leading order predictions. Studies of the theoretical implications of the $(g-2)_\mu$ measurement in both the Standard Model and supersymmetric models showed that the $(g-2)_\mu$ measurement was consistent with low scale supersymmetry. There was also participation in the HEPAP Subpanel for Long Range Planning.
- D0: Very strong team – Excellent rating from D0 spokespersons. Jon Kotcher named Run 2b Project Manager. Leading efforts on software algorithms and DAQ.

- Muon (g-2): Result published in February 2001 received over 130 citations. The analysis of all the μ^+ data will be presented at the International Conference on High Energy Physics in Amsterdam, July 2002.
- E787/E949: A second event was found in the final analysis of E787 and published in January 2002 leading to a branching ratio $B(K^+ \rightarrow \pi^+ \nu \bar{\nu}) = 1.57^{+1.75}_{-0.82} \times 10^{-10}$. This result prompted many publications and real constraints on the unitarity triangle. The E949 experiment collected a significant number of K^+ decays with sensitivity comparable to that of E787. More AGS running is required to achieve the goal of 5-10 events and this is in jeopardy due to the FY 2003 Presidential Budget.
- MINOS: Leading study of $\nu_\mu \rightarrow \nu_e$ feasibility – important physics goal. Heavily involved in beam studies and beam instrumentation groups.
- MECO: W. Morse is in charge of the muon beam, which includes the muon stopping target, the absorber for the p_s^{-1} , the muon beam stop. Peter Yamin is calculating the neutron flux in the anti-counters surrounding the solenoid. Funding in FY03 is expected from the NSF.
- Muon Collider/Storage Ring: The simulation efforts of the Advanced Accelerator Group have focused on changes to the neutrino factory design that will reduce costs. There has been much progress in the design of muon cooling rings, which could also play a vital role for muon colliders. The simulations show significant 6D cooling for the first time.
- Accelerator Test Facility (ATF):
 - Measurement of the effect of Rough-Surface Wake Field: This wake field is important in high performance machines such as linear colliders and X-ray FELs as it affects the energy spread of short-pulse, high-current electron pulses. The interaction is due to the surface roughness and it is a relatively new phenomenon. There are a few theories, not always in agreement, and until recently no experiment. An ATF group and a DESY group reported results nearly at the same time. A paper has been submitted to PRL.
 - ATF Experiment AE28 concluded successfully. Detectors designed to monitor beam quality via muons and tolerate the high radiation environment of the MINOS/NuMI beam line at Fermilab were tested at the ATF facility for linearity, stability and saturation effects. The data show that the detectors will be an adequate solution for the beam monitoring of the MINOS neutrino beam line. A paper has been submitted to NIM-A.
 - The 11th Annual BNL Accelerator Test Facility Program Committee and Users Meeting took place on January 31 to February 1, 2002. The ATF and its experiment were reviewed and drew complementary remarks from the committee headed by Professor C. Joshi of UCLA. One new experiment was approved, "Optical

Diffraction-Transition Radiation Interferometry Diagnostics for Low Emittance Beams".

- The effect of laser non-uniformity on the emittance of a photoinjector has been characterized. This is a fundamental issue for the performance of high-brightness electron guns and this is the first systematic experimental investigation of the effect. The results have been accepted for publication in Phys. Rev. ST-AB.
- The Fast Optical Detector of Charged Particles, AE23, succeeded in observing the effect of a short electron bunch passing close to an electro-optic crystal using a streak-camera.
- Experiment AE22 obtained a first-of-its-kind result relevant to the generation of polarized electrons for a linear collider. A high-energy CO₂ laser was channeled in a capillary discharge. Plasma dynamic simulations confirm occurrence of laser guiding conditions at the relatively low axial plasma density $1.4 \times 10^{17} \text{ cm}^{-3}$. A relativistic electron beam transmitted through the capillary changes its properties depending upon the plasma density. The experiment observed focusing, defocusing or steering of the e-beam. Counter-propagation of the electron and laser beams inside the plasma channel generated intense picosecond x-ray pulses. This is the first time a laser beam and an electron beam have interacted in a plasma channel which is used to guide the laser and electron beams.
- NLC: BNL had a major theory role in preparing case for NLC. Efforts in silicon tracking and hadron calorimetry are proceeding at a modest level.

Condensed Matter Physics (CMP) Summary. The quality of the science remains "*Outstanding*" in Condensed Matter Physics at BNL. Among the most prominent scientific achievements so far this year are included:

- Development of theoretical techniques to distinguish evolved and random features in complex networks (such as interacting proteins in yeast),
- New insights into the electronic structure of calcium copper titanate, one of the highest dielectric constant materials known, on the basis of infrared studies,
- Demonstration that polar nanodomains result in the damping of optical phonons in ferroelectric thin films,
- Development of high pressure superhydration techniques in zeolite nanopores to trap radioisotopes, and
- Novel inelastic x-ray scattering studies of the double-mode gap excitation in La(2-x)Sr(x)CuO₄.

Several prestigious Awards were given to scientists within CMP this year, including the BNL R&D Award to Ben Ocko, a member of the X-ray Scattering group, and the Van Valkenburg Award for High Pressure Studies to Yongjae Lee, a post doc in the Powder Diffraction Group. All senior staff but one have been elected as Fellows of the American Physical Society--that person was nominated for the first time this year.

Condensed Matter Physicists have submitted nearly 200 publications to refereed journals and Conference Proceedings since October 2001. BNL Physicists continue to give prominent invited talks at major national and international meetings with members from all of the research groups contributing. They also serve on many important national and international committees, including a Review Committee for Physical Review Letters, Editorial Boards for the Journal of Physics and The Physical Review, The Main User Group for the SNS, the Award Committee for the Adler Prize of the American Physical Society, and many others including program committees for numerous conferences.

The relevance of CMP's programs to the DOE mission remains "Outstanding."

New programs have been initiated in materials synthesis and in soft condensed matter physics. Concerning the former, BNL has recruited an expert in oxide single crystal growth, successfully commissioned a new facility for Pulsed Laser Deposition, and hired an Assistant Physicist to focus on nanofabrication and characterization of self-assembled block copolymer systems. Each of these efforts has in its first year of operation already grown important new materials, which are presently being studied by groups within CMP. More recently, we hired an Assistant Physicist to set up a more general growth and characterization lab in direct response to comments made in earlier DOE Reviews. Concerning the latter, a successful NSET proposal was submitted to the DOE last year to start a new group within CMP, working collaboratively with a group at the NSLS, in the general area of nanotemplate directed assembly of soft matter and biomaterials. New funding is anticipated in August to initiate this effort. Both of these efforts involve cross-departmental collaborations at BNL, and are part of BNL's response to the DOE Initiatives in Nanoscience and Complex Materials.

Referring to the BNL Nanocenter, now planned for construction in FY 2004, CMP physicists have been instrumental in helping to plan both the Laboratory Clusters, as well as the Science Thrusts, which will comprise the Center's central mission.

Significant Awards

Total: 15 (HEP 6, NP 4, CM 5)

- W. Marciano - Sakurai Prize, Humboldt Senior Scientist Award
- F. Paige - BNL R & D Award
- S. Prelovsek-Komelj - The Jozef Stefan Golden Emblem prize Awards - Awarded for doctoral thesis in Solvenia
- A. Soni - APS Fellow
- L. Littenberg - DOE outstanding Mentor Award
- S. Kahana - Alexander von Humboldt prize Winner
- L. McLerran - Alexander von Humboldt Prize Winner, American Physical Society Fellow
- Foreign Member of the Finnish Academy of Arts and Sciences
- P. D. Johnson - Fellow, American Physical Society, Fellow, Institute of Physics, UK, BNL Science and Technology Award
- M. Strongin - Fellow, American Physical Society
- B. Ocko - Brookhaven Award

Peer-Reviewed Publications

- Total: 746 (HEP 299, NP 279, CM 168)
- Total referred journals - 458
- Total unreferred journals - 70
- Total conference proceedings – 218

Number of Patents, Disclosures, Licenses and Royalties

- Total: 2 (HEP 0, NP 0, CM 2)

Significant New Hires

- B. Surrow (Goldhaber Fellow) into the RHIC Spin Group
- F. Essler into the Condensed Matter Theory Group

Proposals

- FWP's – 23

LDRD Initiatives

- Total: 10 (HEP 2, NP 1, CM 7)

Editorial Activity and Major Book Articles

- Total: 5 (HEP 0, NP 0, CM 5)

Technical Committees

- Total: 137 (HEP 49, NP 73, CM 15)

Notes, Issues, Trends and Assumptions

- Nuclear Physics: The long-term future of the RHIC Spin Group's activities in hypernuclear physics and elastic scattering remains unclear. The main concern for the LEGS Group is the completion of the TPC as we run up against the likely conclusion of this program at the NSLS in FY 2006. So far, RCF is keeping pace with the expected growth of data volume. However there are still concerns. The staffing is still marginal and despite efforts to hire more staff the net gains are slow, though somewhat less difficult in the post dot-com era. This fiscal year has seen a net gain of 2. The leanness of the staff is likely to be a problem as data rates and volumes continue to increase in the future.
- High Energy Physics: The sharp decline in support for FY 2002 and FY 2003 for HEP has led to many RIFs and this trend will continue.
- Condensed Matter Physics: The major concern facing condensed matter physics remains flat funding of the core programs. Another is the role of core programs relative to facilities like the NSLS and BNL Nanocenter.

1.1.1.3 Instrumentation Division

Significant Accomplishments

Silicon Detectors

- Followed up on the new concept developed for pixel detectors with position resolution in the range of 1-5 microns with the simulation, design, and processing of the first batch prototype detectors. Initial tests on the test structures have shown good results and the proof of the principle of the new concept. A patent application regarding this new concept is now put forward by BNL with a filing date in Sept. 2002.

Developed and processed a number of novel Si strip/pixel detectors for various experiments:

- Produced 12 planes of large area Si strip detectors with novel ion implantation bias resistors for the RHIC PP2PP experiment with successful beam run in last December (12/01) at RHIC;
- Fabricated 16 planes of novel segmented Si strip detectors with double metal technology for the CERN NA60 experiment with successful beam run in June,2002 at CERN;
- Made pixel array pad detectors for NSLS with extremely good testing results;
- Made the first batch prototype Active Matrix Si detectors for protein crystallography;
- Made the first batch prototype submicron resolution Si stripixel detector for NASA human tissue ion radiation studies.

Gas Detectors

- A curved, 1D, position-sensitive detector, with fast encoding electronics has been constructed for the NSLS.
- New, ionization mode, neutron detectors are in the development stage as the next generation, high rate devices for new Spallation Neutron Sources.

Microelectronics

- Pendulum Titlmeter for Electric Dipole Moment of the muon experiment(EDM)with 100 nrad resolution.

Monolithic circuits.

- Photon-counting ASIC for high-rate EXAFS with Si pad detector.
- Amplitude-and time-measuring ASIC with derandomization.
- Active-pixel linear array ASIC with 512 elements.
- Requirements study of readout electronics for MECO calorimeter and tracker.
- Microelectronics group: readout software system for EXAFS detector, test software for ATLAS preamp/shaper ASIC.

Micro/Nano Fabrication

- Determination of the exposure and process parameters for SU-8 (a novel e-beam resist with a sensitivity over 100 times that of PMMA) has been completed using the SEM/electron beam lithography attachment.
- Development of a BioMEMS sensor using high aspect ratio fabrication methods for the Dept. of Biomedical Engineering, SUNYSB.
- Fabrication of a hybrid semiconductor-superconducting device using e-beam lithography in collaboration with the Dept. of Physics, SUNYSB.
- Use of SEM for research in LDRD project 01-85: Carbon Nanotube Chemical Probes for Biological Membrane Attachment Quantification.

Laser and Optics

- Femtosecond electron bunches have been generated and beam profiles measured.
- Multiphoton-assisted laser micromachining to sub-micro dimension structures.
- A 5 mega volt pulse generator with 1 nanosecond pulse width has been tested for photo cathode studies and high brightness electron gun development.

Optical Metrology

- Measurement of the complete 3-D surface topography on a cylinder mirror was achieved with a special Long Trace Profiler instrument installed on an ultra-precision grinding machine at RIKEN in Tokyo.

- Development of a portable Long Trace Profiler was completed. The entire system, including optical head, translation stage, and computer, can be transported in a single suitcase to remote locations.

Significant Awards

Awards and other Recognition

- Science and Technology Award, T. Srinivasan-Rao, Jan. 2002
- Brookhaven Award, R. DiNardo
- 1 Life Fellow of IEEE
- 1 Adjunct Professor at SUNY
- 1 Dual professor in Xiangtan University, China,
- Visiting professor in Beijing Institute of Semiconductors, China.

Peer-Reviewed Publications

- Total: 28

Most publications have been in Nuclear Instruments and Methods, and in IEEE Transactions on Nuclear Science.

Number of Patents, Disclosures, Licenses and Royalties

Patents: 3

- Beam Splitter and Method for Generating Equia; Optical Path Length Beams.
- Novel Stripixel Detector configuration.
- Offset-Free Rail-to-Rail Derandomizing Peak Detect and Hold Circuit.

LDRD Initiatives

- Carbon Nanotube Chemical Probes for Biological Membrane attachment Quantification.
Principal Investigator: J. Warren

Editorial Activity and Major Book Articles

- G. Smith completed book chapter for Wiley's 'Encyclopedia of Imaging Science and Technology'
- Z. Li was one of the editors for the Proceedings of the International Symposium of Young Scholars on Mechanics and Material Engineering for Science and Experiments.

Technical Committees

- V. Radeka served as a reviewer for the following journals: Nuclear Instruments and Methods, Review of Scientific Instruments, IEEE Trans. on Nuclear Science.
- V. Radeka served as reviewer for LHC Experiments: ATLAS, CMS and LHCb.
- P. O'Connor, G. DeGeronimo and A. Kandasamy served as journal reviewers.
- P. O'Connor served as review for the ATLAS TRT front-end chip.
- Z. Li reviewed for IEEE Trans., Nucl. Sci. and Nucl. Instr. & Meth. A., and for DOE SBIR and Advanced Detector Program.

1.1.1.4 Superconducting Magnet Division

Significant Accomplishments

- Delivered the final four helical dipole magnets to RHIC for spin physics program.

- Delivered the final spare magnet to DESY for HERA luminosity upgrade.
- Completed testing on all five D1 dipole magnets for LHC at CERN; preparation for shipping underway.
- Completed assembly on eight D2 dipole magnets for LHC at CERN; testing underway.
- Tested 325 samples of superconducting cable for LHC at CERN.
- Completed magnetic measurements for six first article SNS magnets and the entire production run of 32 ring dipoles and 39 21cm diameter quadrupoles.
- Tested several coils made with brittle high-field superconductors. Test magnet made with two Nb₃Sn coils using 'react & wind technology' reached short sample in first quench. Also, successfully tested coils made with HTS.

Peer-Reviewed Publications

- Test Results for Initial Production of LHC Insertion Region Dipole Magnets
- The SNS Ring Dipole Magnetic Field Quality
- Magnet Engineering and Test Results of the High Field Magnet R&D Program at BNL
- Next Generation IR Magnets for Hadron Colliders
- Interstrand Resistance Measurements in Cored Rutherford Cables

Significant New Hires

- Post Doc appointment - Rainer Soika

LDRD Initiatives

- Neutrino factory storage ring magnet R&D
- High field NMR
- GSI rapid cycling magnet R&D

Technical Committees

- U.S. LHC Accelerator Steering Committee
- U.S. ATLAS Project Advisory Panel
- LHC Machine Advisory Committee
- Muon Collider Technical Advisory Committee
- Cornell CESR/CLEO PAC
- DPF Wilson Prize Committee
- SNS Accelerator Systems Advisory Committee
- 2003 Particle Accelerator Conference Program Committee
- 2004 Magnet Technology Conference Program Committee
- Cornell CESR Review Committee - Superconducting Undulator Magnet
- Cornell CESR Review Committee - NSF Grant Renewal
- Fermilab Review Committee for Internal Review of Superconducting Magnet R&D
- BEPC-II Review Committee at IHEP

1.1.2 Basic Energy Sciences

1.1.2.1 Chemistry Department

Significant Accomplishments

BES Programs

Gas Phase Molecular Dynamics

- New theoretical approaches have been developed for the rovibronic problem of large amplitude motion in combination with the Renner effect, using substituted carbenes as a test case.
- A combination of nonresonant laser photoionization of hydrocarbon radicals and ion imaging in a crossed molecular beam apparatus has led to the first global measurements of differential cross sections for the abstraction of H atoms from hydrocarbons by energetic triplet oxygen atoms.
- The rate of the reaction of triplet CH₂ with methyl radicals was measured using laser photolysis and a continuous sampling TOF mass spectrometer. The source of disagreement of our directly measured rate with previous estimates was traced to a problem with the methyl recombination rate in He, which has now been remedied.
- We have developed a general and efficient method to calculate vibrational energy levels of tetra-atomic molecules without any dynamical approximation. The computer code implementing this algorithm is being made freely available to the scientific community.

Photoinduced Molecular Dynamics

- The formation of attosecond (10⁻¹⁸ s) light pulses will open a new frontier in optical physics providing a dynamical probe on the electronic time-scale. Understanding how to form such pulses is intimately linked to novel techniques in ultra-fast metrology. We have been able to measure the duration and coherence time of high harmonic light using a scaled interaction. High harmonic radiation is one route to the formation of attosecond pulses.

Catalysis: Reactivity and Structure

- Neither bulk metallic gold nor TiO₂ react to dissociate SO₂, yet gold nanoparticles supported on TiO₂ makes a superior catalyst for SO₂ oxidation. Interactions with titania electronically perturb gold, making it chemically more active. Gold in turn enhances the reactivity of titania by facilitating the migration of O vacancies from the bulk to the surface of the oxide.
- The photodesorption of neutral atoms and molecules from cold metal surfaces has been characterized by the measurement of angular distributions strongly peaked along the surface normal, using a novel ion imaging spectrometer recently designed and constructed in our laboratory. The results support a non-thermal photo-desorption mechanism proposed in earlier studies.
- The first state-resolved product measurements of a surface reaction under steady state conditions have been achieved for the ammonia oxidation reaction on an oxygenated polycrystalline Ag surface. The velocity and rotational distributions of the NO product are not in equilibrium with the surface temperature, and thus give a direct probe of the reaction dynamics.
- The product-forming step in catalytic ionic hydrogenations is a hydride transfer reaction from a metal hydride. Kinetics measurements show that the ruthenium hydride (C₅Me₅)(CO)₂RuH has much higher reactivity as a hydride donor than either the Fe or Os analogues, and the different reaction products formed from the different metals demonstrate that the ruthenium complex also exhibits reactivity as a strong nucleophile.

Thermal, Photo- and Radiation-Induced Reactions in Condensed Media

- Using LEAF's pulse-probe capabilities, the very fast dissociation of aryl halide anions was easily and accurately measured for molecules previously unmeasurable, or where published data was in error by factors of 10-100.

- The spectrum of the solvated electron in an ionic liquid was measured for the first time.
- Long-lived, photo-induced, multiple charge separation was observed in a dendrimeric system consisting of a viologen core and peripheral naphthalene groups. Pulse radiolysis studies showed that the charge-separated state is stabilized against recombination by the formation of naphthalene dimer cations.
- Quantum chemical calculations estimated the sensitivity of electronic tunneling through molecular assemblies extending over tens of nanometers to several variables including chemical substitution, molecular conformation, electronic spacer type and length, and charge carrier injection gaps.
- Photo-activated Re-based catalysts are being investigated for the reduction of CO₂. Reactions of CO₂ with photochemically produced Re-ligand radicals, as well as excited state properties of the Re dimer have been studied. A CO₂ bridged bimetallic structure has been identified as an intermediate leading to CO.

Charge Transfer on the Nano-scale

- Prospective materials for molecular wire studies have been obtained through collaboration and charges were injected chemically and/or using the LEAF accelerator. Two materials displayed intense visible and near infrared optical absorption spectra, a key indicator for charge transport in molecular wires.

NanoCatalysis

- A laser-ablation source has been developed for generating neutral gas-phase clusters of molybdenum atoms alloyed with carbon, nitrogen and sulfur, i.e., $M_nC_mN_nS_n$. These materials are $M_nC_mN_nS_n$, with sizes in the range of (m, n) $M_nC_mN_nS_n$ (X at the center of the BNL-Chemistry nanocatalysis effort and this source will be used in deposition and spectroscopy experiments for characterization and reactivity studies.
- Parallel theoretical studies have also been performed on the analogous, first-row Ti_nC_n clusters including the well-known met-car, Ti_8C_{12} . High level ab initio methods have been applied to the latter system resulting in a detailed description of the electronic structure and a new prediction of the ground state geometry. High-level ab initio calculations of met-car “building blocks” such as TiC_2 and MoC_2 are also being carried out.
- Recent STM experiments have shown a novel growth mode for Mo nanoparticles on Au(111). Using first-principles density functional calculations, the interactions between Mo clusters and Au(111) are being studied, and the chemical reactivity of this system towards CO, O₂, S and C₂H₄ is being explored.

BER Programs

Radiotracer Chemistry and Neuroimaging

- PET Imaging Studies of Inhalant Abuse: Toluene, the most widely abused solvent was labeled with carbon-11 and the first imaging studies were carried out in the baboon, showing a very high uptake and rapid clearance in brain regions involved in reward and reinforcement. This sets the stage for a comprehensive study of the neurobiology of solvent abuse.
- New PET tracers have been developed for future studies on the effects of smoking on organs other than the brain, and carbon-11 labeled amino acids have been prepared for the assessment of amino acid transport and metabolism by tumors.

Magnetic Resonance Imaging

- We have developed a quantifiable concept – the MR 'Shutter-Speed' – to account for variations in the rate of water exchange between distinct biological compartments contained within a MR resolution volume element. Failure to account for this variation usually leads to significant errors in pathophysiological properties extracted from an MRI study. Clinical imaging for stroke, cancer, heart attack, and multiple sclerosis could all be affected by such errors.

HENP Programs

Solar Neutrino Research

- The SNO (Sudbury Neutrino Observatory) has announced the solution of the solar neutrino problem. The total neutrino flux was found to agree closely with the prediction of the Standard Solar Model, while the flux of electron-flavor neutrinos, measured by SNO via the charge-current interaction, was only about one third of the total flux. The observations are consistent with transformation among neutrino flavors as they travel from the sun to the earth, a process which requires neutrinos to have mass. The massive neutrino is “New Physics,” not contained within the current theory of elementary particles.
- A metal-loaded liquid scintillator is under development at BNL for the LENS low-energy neutrino collaboration to measure the flux and energy distribution of the lowest energy solar neutrinos. Several promising candidates have been identified for an indium-loaded liquid scintillator.

Phobos Heavy Ion Collaboration

- Collected data from the latest RHIC run - the highest energy heavy ion collisions ever achieved, along with some pp data at the same energy.
- Convinced RHIC to run collisions for one day at injection energy for easy comparison to CERN-SPS experiments.
- Published the first full-energy RHIC paper that rules out an important particle production mechanism (gluon radiation from jet quenching) in one of the leading heavy ion collision models (HIJING).

Significant Awards

- October 2001, Garman Harbottle, 2002 Recipient of the Pomerance Award of the Archaeological Institute of America for Scientific Contributions to Archaeology
- 2001, Joanna Fowler, Keynote Speaker, Marie Curie Exhibit, SUNY at Farmingdale
- November 2001, Louis DiMauro, Fellow of the Optical Society of America
- November 2001, D. Cabelli, US DOE National Award for Pollution Prevention, Outstanding Leadership - ISO 14001 EMS Project
- January 2002, Morris Bullock Science & Technology Award
- April 7, 2002, Joanna Fowler, Glen T. Seaborg Award
- March 2002, Richard Ferrieri, DOE Outstanding Mentor Award – ERULF Program
- May 9, 2002, Ray Davis named recipient of the National Medal of Science Award for his lifetime achievement in science for his solar neutrino work. The announcement was made by the White House. At press time BNL was notified that Ray Davis has received the Nobel Prize for his lifetime achievements in solar neutrino science. This award is acknowledged in section 1.2.2 Scientific Recognition of Critical Outcome 1.
- July 2002, James Lightstone, a graduate student at USB working with Michael White in the Chemistry Department, has been chosen by the Department of Energy as one of twenty-six

graduate students nationwide to participate in the 52nd Meeting of Nobel Laureates to be held in Lindau, Germany.

- 2002, Joanna Fowler, Keynote Speaker, Marie Curie Exhibit, Georgia Tech, Atlanta

Peer-Reviewed Publications

BES - 72

BER - 17

HENP - 4

Total: 93

Selected Papers Published in Top Journals: Science, J Amer Chem Soc, Phys Rev Let, Phys Rev B, Synapse

Direct Evidence for Neutrino Flavor Transformation from Neutral-Current Interactions in the Sudbury Neutrino Observatory

Q. R. Ahmad, R. C. Allen, T. C. Andersen, J. D. Anglin, J. C. Barton, E. W. Beier, M. Bercovitch, J. Bigu, S. D. Biller, R. A. Black, I. Blevis, R. J. Boardman, J. Boger, E. Bonvin, M. G. Boulay, M. G. Bowler, T. J. Bowles, S. J. Brice, M. C. Browne, T. V. Bullard, G. Buhler, J. Cameron, Y. D. Chan, H. H. Chen, M. Chen, X. Chen, B. T. Cleveland, E. T. H. Clifford, J. H. M. Cowan, D. F. Cowen, G. A. Cox, X. Dai, F. Dalnoki-Veress, W. F. Davison, P. J. Doe, G. Doucas, M. R. Dragowsky, C. A. Duba, F. A. Duncan, M. Dunford, J. A. Dumore, E. D. Earle, S. R. Elliott, H. C. Evans, G. T. Ewan, J. Farine, H. Fergani, A. P. Ferraris, R. J. Ford, J. A. Formaggio, M. M. Fowler, K. Frame, E. D. Frank, W. Frati, N. Gagnon, J. V. Germani, S. Gil, K. Graham, D. R. Grant, R. L. Hahn, A. L. Hallin, E. D. Hallman, A. S. Hamer, A. A. Hamain, W. B. Handler, R. U. Haq, C. K. Hargrove, P. J. Harvey, R. Hazama, K. M. Heeger, W. J. Heintzelman, J. Heise, R. L. Helmer, J. D. Hepburn, H. Heron, J. Hewett, A. Hime, J. G. Hykawy, M. C. P. Isaac, P. Jagam, N. A. Jelley, C. Jillings, G. Jonkmans, K. Kazkas, P. T. Keener, J. R. Klein, A. B. Knox, R. J. Komar, R. Kouzes, T. Kutter, C. C. M. Kyba, J. Law, I. T. Lawson, M. Lay, H. W. Lee, K. T. Lesko, J. R. Leslie, I. Levine, W. Locke, S. Luoma, et al. Phys. Rev. Lett. (submitted)

Measurement of Rate of $\bar{\nu}_e + d \rightarrow \bar{\nu}_e + p + p + e^-$ Interactions Produced by 8B Solar Neutrinos at the Sudbury Neutrino Observatory

Q. R. Ahmad, R. C. Allen, T. C. Andersen, J. D. Algin, G. Bühler, J. C. Barton, E. W. Beirer, M. Bercovitch, J. Bigu, S. Biller, R. A. Black, I. Belvis, R. J. Boardman, J. Boger, E. Bonvin, M. G. Boulay, M. G. Bowler, T. J. Bowles, S. J. Brice, M. C. Browne, T. V. Bullard, T. H. Burritt, K. Cameron, J. Cameron, Y. D. Chan, M. Chen, H. H. Chen, X. Chen, M. C. Chon, B. T. Cleveland, E. T. H. Clifford, J. H. M. Cowan, D. F. Cowen, G. A. Cox, Y. Dai, X. Dai, F. Dalnoki-Veress, W. F. Davidson, P. J. Doe, G. Doucas, M. R. Dragowsky, C. A. Duba, F. A. Duncan, J. Dunmore, E. D. Earle, S. R. Elliott, H. C. Evans, G. T. Ewan, J. Farine, H. Fergani, A. P. Ferraris, R. J. Ford, M. M. Fowler, K. Frame, E. D. Frank, W. Frati, J. V. Germani, S. Gil, A. Goldschmidt, D. R. Grant, R. L. Hahn, A. L. Hallin, E. D. Hallman, A. Hamer, A. A. Hamian, R. U. Haq, C. K. Hargrove, P. J. Harvey, R. Hazama, R. Heaton, K. M. Heeger, W. J. Heintzelman, J. Heise, R. L. Helmer, J. D. Hepbur, H. Heron, J. Hewett, A. Hime, M. Howe, J. G. Hykawy, M. C. P. Isaac, P. Jagam, N. A. Jelley, C. Jillings, G. Jonkmans, J. Karn, P. T.

Keener, K. Kirch, J. R. Klein, A. B. Knox, R. J. Komar, R. Kouzes, T. Kutter, C. C. M. Kyba, J. Law, I. T. Lawson, M. Lay, H. W. Lee, K. T. Lesko, J. R. Leslie, et al.
Phys. Rev. Lett. 87, 071301-1-071301-6 (2001)

Measurement of Day and Night Neutrino Energy Spectra at SNO and Constraints on Neutrino Mixing Parameters

Q. R. Ahmad, R. C. Allen, T. C. Andersen, J. D. Anglin, J. C. Barton, E. W. Beier, M. Bercovitch, J. Bigu, S. D. Biller, R. A. Black, I. Blevis, R. J. Boardman, J. Boger, E. Bonvin, M. G. Boulay, M. G. Bowler, T. J. Bowles, S. J. Brice, M. C. Browne, T. V. Bullard, G. Buhler, J. Cameron, Y. D. Chan, H. H. Chen, M. Chen, X. Chen, B. T. Cleveland, E. T. H. Clifford, J. H. M. Cowan, D. F. Cowen, G. A. Cox, X. Dai, F. Dalnoki-Veress, W. F. Davison, P. J. Doe, G. Doucas, M. R. Dragowsky, C. A. Duba, F. A. Duncan, M. Dunford, J. A. Dumore, E. D. Earle, S. R. Elliott, H. C. Evans, G. T. Ewan, J. Farine, H. Fergani, A. P. Ferraris, R. J. Ford, J. A. Formaggio, M. M. Fowler, K. Frame, E. D. Frank, W. Frati, N. Gagnon, J. V. Germani, S. Gil, K. Graham, D. R. Grant, R. L. Hahn, A. L. Hallin, E. D. Hallman, A. S. Hamer, A. A. Hamain, W. B. Handler, R. U. Haq, C. K. Hargrove, P. J. Harvey, R. Hazama, K. M. Heeger, W. J. Heintzelman, J. Heise, R. L. Helmer, J. D. Hepburn, H. Heron, J. Hewett, A. Hime, J. G. Hykawy, M. C. P. Isaac, P. Jagam, N. A. Jelley, C. Jillings, G. Jonkmans, K. Kazkas, P. T. Keener, J. R. Klein, A. B. Knox, R. J. Komar, R. Kouzes, T. Kutter, C. C. M. Kyba, J. Law, I. T. Lawson, M. Lay, H. W. Lee, K. T. Lesko, J. R. Leslie, I. Levine, W. Locke, S. Luoma, et al.
Phys. Rev. Lett. (submitted)

Baryon Rapidity Loss in Relativistic Au + Au Collisions

B. B. Back, R. R. Betts, J. Chang, W. C. Chang, C. Y. Chi, Y. Y. Chu, J. B. Cumming, J. C. Dunlop, W. Eldredge, S. Y. Fung, R. Ganz, E. Garcia, A. Gillitzer, G. Heintzelman, W. F. Henning, D. J. Hofmann, B. Holzman, J. H. Kang, E. J. Kim, S. Y. Kim, Y. Kwon, D. McLeod, A. C. Mignerey, M. Moulson, V. Nanal, C. A. Ogilvie, R. Pak, A. Ruangma, D. E. Russ, R. K. Seto, P. J. Stankas, G. S. F. Stephans, H. Q. Wang, F. L. H. Wolfs, A. H. Wuosmaa, H. Xiang, G. H. Xu, H. B. Yao and C. M. Zou
Phys. Rev. Lett. 86, 1970-1973 (2001)

Distance-Dependent Activation Energies for Hole Injection from Protonated 9-Amino-6-chloro-2-methoxyacridine into Duplex DNA

W. B. Davis, S. Hess, I. Naydenova, R. Haselsberger, A. Ogrodnik, M. D. Newton and M.-E. Michel-Beyerle
J. Am. Chem. Soc. (in press)

Self-referencing, Spatially Encoded Spectral Interferometry for the characterization of Attosecond Electromagnetic Pulses

C. Dorrer, E. Cormier, I. A. Walmsley and L. F. DiMauro
Phys. Rev. Lett. (submitted)

New Mode of Coordination for the Dinitrogen Ligand: Formation, Bonding, and Reactivity of a Tantalum Complex with a Bridging N₂ Unit That is Both Side-On and End-On

M. D. Fryzuk, S. A. Johnson, B. O. Patrick, A. Albinati, S. A. Mason and T. K. Koetzle
J. Am. Chem. Soc. 123, 3960-3973 (2001)

Pulse Radiolysis Studies of Dendritic Macromolecules with Biphenyl Peripheral Groups and a Ruthenium Tris-bipyridine Core

T. H. Ghaddar, J. F. Wishart, J. P. Kirby, J. K. Whitesell and M. A. Fox
J. Am. Chem. Soc. 123, 12832-12836 (2001)

A Dendrimer-Based Electron Antenna: Multiple Electron Transfer Reactions in Dendrimers with a 4,4'-Bipyridine Core and Naphthalene Peripheral Groups

T. H. Ghaddar, J. F. Wishart, D. W. Thompson, J. K. Whiteshell and M. A. Fox
J. Am. Chem. Soc. (submitted)

Identification of Intermediate Rhenium(I) Species in CO₂ Reduction with fac-Re(η^5 -diimine)CO)₃X

Y. Hayashi, S. Kita, B. S. Brunshwig and E. Fujita
J. Am. Chem. Soc. (Commun.) (submitted)

Kinetics and Mechanism of the η^5 - to η^4 -CuA1C14 Phase Transition: A Time-Resolved ⁶³Cu MAS NMR and Powder X-ray Diffraction Study

H. Liu, R. M. Sullivan, J. C. Hanson, C. P. Grey and J. D. Martin
J. Am. Chem. Soc. 123, 7564-7573 (2001)

"Heavy Electron" Photoelectron Spectroscopy: Rotationally-Resolved Ion Pair Imaging of CH₃⁺

X.-H. Liu, R. Gross and A. G. Suits
Science 294, 2527-2529 (2001)

Observation of Benzene Radical Ion in Equilibrium with Solvated Electrons

R. A. Marasas, T. Iyoda and J. R. Miller
J. Am. Chem. Soc. (submitted)

Chemistry of NO₂ on Oxide Surfaces: Formation of NO₃ on TiO₂(110) and NO₂ O Vacancy Interactions

J. A. Rodriguez, T. Jirsak, G. Liu, J. Hrbek, J. Dvorak and A. Maiti
J. Am. Chem. Soc. 123, 9597-9605 (2001)

Experimental and Theoretical Studies on the Reaction of H₂ with NiO: Role of O Vacancies and Mechanism for Oxide Reduction

J. A. Rodriguez, J. C. Hanson, A. I. Frenkel, J.-Y. Kim and M. Pérez
J. Am. Chem. Soc. 124, 346-354 (2002)

Importance of O Vacancies in the Behavior of Oxide Surfaces: Adsorption of Sulfur on TiO₂(110)

J. A. Rodriguez, J. Hrbek, Z. Chang, J. Dvorak, T. Jirsak and A. Maiti
Phys. Rev. B (in press)

Topiramate Selectively Attenuates Nicotine-Induced Increases in Monoamine Release

W. K. Schiffer, M. R. Gerasimov, D. A. Marsteller, J. Geiger, C. Barnett, D. L. Alexoff and S. L. Dewey
Synapse 42, 196-198 (2001)

Rapid Electron Tunneling Through Oligophenylenevinylene Bridges
H. D. Sikes, J. F. Smalley, S. P. Dudek, A. R. Cook, M. D. Newton, C. E. D. Chidsey and S. W. Feldberg
Science 291, 1519-1523 (2001)

Relationship Between Blockade of Dopamine Transporters by Oral Methylphenidate and the Increases in Extracellular Dopamine: Therapeutic Implications
N. D. Volkow, G.-J. Wang, J. S. Fowler, J. Logan, D. Franceschi, L. Maynard, Y.-S. Ding, S. J. Gatley, A. Gifford, W. Zhu and J. M. Swanson
Synapse 43, 181-187 (2002)

A First-Principles Study of the Adsorption of Sulfur on Pt(111): S Core-Level Shifts and the Nature of the Pt-S Bond
Z. Yang, R. Wu and J. A. Rodriguez
Phys. Rev. B. 65, 155409-1 - 155409-9 (2002)

Number of Patents, Disclosures, Licenses and Royalties

Patents Filed: 5

- Stephen L. Dewey, Charles R. Ashby, Jonathan Brodie, "Treatment of PCP Addiction and PCP Addiction - Related Behavior"
- Stephen L. Dewey, Charles R. Ashby, Jonathan D. Brodie, "Novel treatment for Obsessive-Compulsive Disorders (OCD) and OCD-related disorders using GVG"
- Stephen L. Dewey, Charles R. Ashby, Jonathan D. Brodie, "Prevention of Addiction in Pain Management"
- Stephen L. Dewey, Charles R. Ashby, Jonathan D. Brodie, "Treatment of Addiction and Addiction Related Behavior"
- Stephen L. Dewey, Charles R. Ashby, Jonathan D. Brodie, "Treatment of Addiction and Addiction-Related Behavior"

Disclosure Submitted:

BNL 01-26, Morris R. Bullock and Jeong-Su Song, "Preparation of Alcohol Complexes of Tungsten"

Significant New Hires

- Michael White, Sr. Chemist and Arthur Suits, Chemist - First Joint Appointments with the State University of New York at Stony Brook and Brookhaven National Laboratory.
- Mingfang Yeh - Promoted from Research Associate to Assistant Scientist under supervision of Richard Hahn, Solar Neutrino Research Group.

Proposals

New & Significant Proposals:

- "PET Investigations of Abused Inhalants", Madina R. Gerasimov, NIH NIDA Funding: \$389K per year.

- Nanocatalysis \$550K yearly. P.I. Michael White, Jan Hrbek, James Muckerman
- Nanocharge Transfer \$650K yearly. P.I. Carol Creutz

Ten Proposals Submitted on Counter Terrorism:

- Chemical and Biochemical Toxin Remediation by Modified TiO₂ Nanoparticles, Bruce Brunschwig, Etsuko Fujita
- New Routes to Sensors By Imprinting of Receptors in Non-Polar Polymers, R. Morris Bullock, Vladimir K. Dioumaev and Bruce S. Brunschwig
- Understanding Radioprotection in *Deinococcus radiodurans*, Diane Cabelli
- Surface-Enhanced Raman Spectroscopy on Optically-Confined Particles for Characterization of CBW Agents, Christopher Fockenberg and Trevor J. Sears
- Chemical Warfare Remediation by TiO₂-Containing Zeolites, Etsuko Fujita, Bruce Brunschwig, Jonathan Hanson and Clare Grey (SUNY, SB)
- Destruction of Chemical Weapons: Chemical bond activation of models for toxic compounds on gold/oxide catalysts, J. Hrbek and J.A. Rodriguez
- Molecular Basis for Microbicidal Action of Inorganic Oxidants: Implications for Improving Sterilization by Radiation, Sergei V. Lyamar
- Molecular Wiring for Remediation and Detection, John R. Miller and Andrew Cook
- Radiation Chemistry and Chemical Kinetics Studies in Ionic Liquids: Applications for Treatment of Radioactive Contamination, James F. Wishart
- Imaging Tandem Mass Spectrometry for High-Throughput “Fingerprint” Detection of Complex Molecules, Arthur G. Suits and Gregory E. Hall
- Photodynamic Necrosis Using Porphyrin Photosensitizers (Catalytic destruction of bio and chemical threats), Jack Fajer
- Wide range pH solutions with peroxides for surface decontamination, Hugh S. Isaacs
- Magnetic MFM BioSensors, L. H. Lewis

LDRD Initiatives

Fourteen LDRD Initiatives submitted:

1. New Development of Norepinephrine Transporter Radioligands for PET Studies of Substance Abuse, Depression and ADHD, Yu-Shin Ding, Nora Volkow, Joanna Fowler
2. Supercritical Extraction of Radioisotopes from Production Targets, David Schlyer, Richard Ferrieri, Michel Schueller
3. Infrared Spectroscopic Probes of Mass-Independent Isotope Effects in Reactions of Atmospheric Significance, J. Preses, Ralph Weston
4. Infrared Diode Laser Absorption of Studies of Adsorbed Metal Carbonyls and Chemical Agents, J. Preses, Jan Hrbek
5. Development of Polarization-Dependent Detection Schemes for Noise Reduction and High-Pressure Catalysis Applications of Surface at the U41R Beam Line at the NSLS, M. White, M. Wu
6. Chemical Warfare Remediation by Modified TiO₂ and TiO₂-Containing Zeolites/Silicates, E. Fujita, J. Hanson, and B. Brunschwig
7. Condition: Green Chemistry Radiolytic Studies of Ionic Liquids in Service of Security and the Environment, J. Wishart
8. Hydrogen Atom Transfer from Carbon to Metal – Relevance of a Novel Reaction to Catalyzed Hydrocarbon Conversions, R. M. Bullock, B. Brunschwig

9. New Routes to Sensors by Imprinting of Receptors in Non-Polar Polymers, V. Dioumaev, R. M. Bullock
10. Large Scale Collaborative Computing for RHIC Experiments, P. Steinberg, Burt Holzman
11. Scientific Program for the DUV-FEL , L. DiMauro, A. Suits, M. White
12. Optical Fiber Bundles for Ultrafast Single Shot Detection at LEAF, A. Cook, J. Miller
13. Imaging Tandem Mass Spectrometry, A. Suits, G. Hall
14. Radioprotection in D. radiodurans, a radiation resistant bacterium , D. Cabelli

Fifteen LDRD Projects Awarded in October (FY02):

A. Cook, C. Creutz, J. Miller, J. Hrbek, T. Sears, M. White, D. Schlyer, M. Newton, B. Brunshwig, N. Camillone, R. Ferrieri, C. Fockenberg, M. Merasimov, R. Hahn, A. Suits.

Editorial Activity and Major Book Articles

Editorial Activity and Major Book Articles

BES - 4

BER - 4

Technical Committees

BNL Committees:

- BNL Council - G. Hall, R. M. Bullock
- BNL Institutional Review Board - D. Schlyer, R. Ferrieri
- BNL Radioactive Drug Research Committee - D. Schlyer
- BNL-USB Relations Committee - C. Springer, J. Muckerman, R. Holroyd
- Brookhaven Lecture Committee - T. Koetzle, G. Hall
- BSA Cultural Outreach: Concert Committee - J. Muckerman
- Central Shops Users Group - C. Koehler, Jr.
- Computer Security Representative - M. Kahanda
- Cyber Security Advisory Council - J. Muckerman
- Institutional Animal Care and Use Committee - D. Cabelli
- Laser Safety Advisory Committee - G. Hall
- Lectureship Committee - C. S. Springer
- OPSEC Working Group - R. Hahn
- Research Library Advisory Committee - C. S. Springer, Jr.
- Technology Transfer Coordinating Committee - M. Bullock

Meetings Chaired:

Total: 15

- Chemical Sciences Workshop
- O.,S.A. Annual Meeting
- 35th Winter Conference on Brain Research
- Sudbury Neutrino Observatory Collaboration Meeting
- Dynamics of Molecular Collisions
- American Chem. Society National Meeting
- DOE/Nano Workshop
- NIST Seminar
- Symposium on High Resolution IR Spectroscopy

- Combustion Contractors Meeting
- Gordon Research Conference on Photoionization
- Conference on Dynamics of Molecular Collisions,
- O S A I L A - XVII,
- Gordon Research Conf. Photoions,
- Photionization & Dev. International Conf on Neutron Physics and Astrophysics

1.1.2.2 National Synchrotron Light Source

Significant Accomplishments

- Source Development Laboratory lases at 400 nm. The BNL Deep Ultra-Violet Free Electron Laser (DUV-FEL) facility marked an important milestone, generating laser light at 400 nm by the process of Self Amplified Spontaneous Emission (SASE). Achieving intensity 20,000 times higher than the spontaneous emission, the result showed that the electron beam and the undulator system can support lasing down to 88 nm where there is strong user interest in the chemical physics community.
- Digital orbit feedback systems improved. Already in regular operation for some time in the VUV ring, a sophisticated correction algorithm has been implemented which has all but eliminated 60 Hz residual beam motion. The IR science program derives the most benefit from this improvement. Hardware for implementation of digital feedback on the X-ray ring has been installed and tested during studies. Full implementation including local feedbacks around insertion devices is under development.
- East Coast NIH-NIGMS Structural Biology Facility is fully operational. The X6A beamline will provide rapid access to beam time for a community of life scientists interested in the 3-dimensional molecular structure of biomolecules. Together with the adjoining biochemistry laboratory, this facility addresses problems from purification and crystallization to the 3-D structural modeling of biomolecules.
- A new end-station for spin-polarized photoemission. The new end-station for beamline U5UA hosts an Omicron EM125 hemispherical electron analyzer. Compared to the old analyzer, this new analyzer operates with better energy resolution as well as an improved signal-to-noise level. The analyzer is coupled to a mini-Mott (Rice University design) for spin-resolved photoemission spectroscopy. Additionally, the new end-station is equipped with a load-lock chamber for fast sample transfer. This will diminish the down time between different experiments, avoiding long bake-out procedures.
- Soft x-ray undulator beamline monochromator upgrade. A new water-cooled, 6-position interferometrically-controlled grating chamber was installed at beamline X1B. At present, four new gratings (300, 600, 1200, and 1600 lines/mm), covering the soft x-ray photon energy range from 100eV to 1600eV, were outfitted. Resolving power of more than 10,000 was achieved. The high energy resolution and extended energy range provided by the new monochromator will benefit greatly all the experimental programs using the beamline, including soft x-ray resonant scattering, emission, and imaging.

- Ultra-high vacuum compatible soft x-ray scattering end station operational. A novel resonant soft x-ray scattering instrument has become operational at the X1B undulator beamline at the NSLS. The instrument combines the element and electronic state specificity of soft x-ray spectroscopy with x-ray diffraction, which enables the direct probing of intrinsic inhomogeneities in strongly correlated electron systems and nanoscale magnetic systems. For example, the spatial distribution of the doped holes in an epitaxial film of oxygen-doped La₂CuO_{4+d} was determined recently using this instrument for the first time.

Peer-Reviewed Publications

Users:

- 1 book chapter
- 264 journal articles, of which 78 are premier

NSLS Staff:

- 6 journal articles, of which 1 is premier
- A complete list will not be available until year end.

Number of Patents, Disclosures, Licenses and Royalties

- 1 patent granted (6,353,232: Holder assembly system and method in an emitted energy system for photolithography), 2 patents pending
- A complete list will not be available until year end.

Significant New Hires

- A senior hire was made to lead the development of soft condensed matter research at the NSLS and assist the development BNL Nanoscience Center.
- A junior hire was made to lead the development of magnetism research at the NSLS.
- One half time science writer and a full time web master were hired to improve the information and outreach to the users community.

Proposals

- 1: Laser Seeded Free Electron Lasers and High Gain Harmonic Generation Experiments at the Source Development Laboratory of the National Synchrotron Light Source, submitted to The Office of Naval Research

LDRD Initiatives

- NSLS has actively sought LDRD support for developing initiatives important to its programs. We have 13 LDRDs that were funded in FY02, with 11 continued for funding in FY03. In addition, three new LDRDs were approved for funding start in FY03.

Editorial Activity and Major Book Articles

- 1- Editorial Board of "Physical Review E"
- 1- Editorial Board of "Liquid Crystals"
- 1- Referee for Review of Science Instruments
- 1 - Co-editor of Journal of Synchrotron Radiation
- Please note that this is not a complete list, which will not be available until year end.

Technical Committees

4 people participated in the following:

- National Institute of General Medical Sciences
- National Cancer Institute Synchrotron Advisory Board and Technical Advisory Committee

- SNS Ring HEBT & Injection Vacuum Design Review of Diamond, Third generation Light Source, BNL
- Member: Review Oversight Committee for the Canadian Light Source

1.1.2.3 Material Science Department

Significant Accomplishments

- Molecular engineering of synthetic porphyrins yielded new classes of chromophores and catalysts with tuneable, controllable, and predictable physico-chemical properties with potential applications to artificial photosynthesis, biomimetic catalysis, photonic devices, and photodynamic therapy (a photochemical cancer treatment).
- New advances were made in techniques of electron microscopy which permit the observation and quantification of magnetic dynamics on the nanoscale. A new method of non-interferometric phase retrieval complimented by interferometric off-axis electron holography was used to reveal important new features of vortex domain structures in arrays of nanoscale cobalt islands, as well as to quantify the dynamics of magnetic induction in the nanoscale structure of advanced Nd₂Fe₁₄B permanent magnets.
- The development and application of new in situ techniques of imaging, visualization, and electrochemical noise measurements have resulted in an important new understanding of the relationship of localized corrosion ("pitting") of aluminum surfaces and the electrochemistry of the aluminum oxide passive film. The new studies show that electrochemical noise reveals valuable information about pit growth, rather than the conventional interpretation which is based on breakdown and repair of the passive oxide.

Significant Awards

- Masaki Suenaga was elected to fellowship in the American Physical Society, based on his achievements in the understanding of factors which control critical current densities in superconductors, both conventional and high-T_c.
- Robert Klie was awarded a Goldhaber fellowship based on his achievements in transmission electron microscopy.
- J. McBreen, Fellow of The Electrochemical Society, September 3, 2001.

Peer-Reviewed Publications

CONTRIBUTED PAPERS:

- X. Sun, H. S. Lee, X. Q. Yang and J. McBreen, Improved Elevated Temperature Cycling of LiMn₂O₄ Spinel Through the Use of a Composite LiF Based Electrolyte, *Electrochem. Solid-State Lett.*, 4, A184 (2001).
- M. Balasubramanian, J. McBreen, I. J. Davidson, P. S. Whitfield and I. Kargina, In Situ X-ray Absorption Study of a Layered Manganese-Chromium Oxide Based Cathode Material, *J. Electrochem. Soc.*, 149, A176 (2002)
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- X.-Q. Yang, J. McBreen, W.-S. Yoon, and C. Grey, Crystal Structure Changes of $\text{LiMn}_{0.5}\text{Ni}_{0.5}\text{O}_2$ Cathode Materials During Charge and Discharge Studied by Synchrotron Based In Situ XRD, *Electrochem Commun.* accepted.
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INVITED PAPERS:

- J. McBreen and M. Balasubramanian, Rechargeable Lithium-Ion Battery Cathodes, JOM 54(3), 25 (2002)(Invited paper).
- M. W. Renner and J. Fajer “Oxidative chemistry of nickel porphyrins.” J. Biol. Inorg. Chem. 6, 915 (2001) (Invited paper).
- M.W. Renner, K.M. Barkigia, D. Melamed, J.-P. Gisselbrecht, N.Y. Nelson, K.M. Smith, and J. Fajer “Conformational Control of Oxidation Sites, Spin States and Orbital Occupancy in Nickel Porphyrins” Research on Chemical Intermediates (Invited Paper) in press.
- M. J. Kramer, L. H. Lewis, Y. Tang, K. W. Dennis and R. W. McCallum, “Microstructural refinement in melt-spun Nd₂Fe₁₄B”, (Invited paper), Scripta Materialia, in press.
- Laura Henderson Lewis, “The New Future of Magnetism”, The World & I Magazine, a publication of the Washington Times, p. 146, Sept. 2001 (Invited paper).
- Brankovic, S.R., Wang, J.X. and Adzic, R.R., New methods of controlled monolayer-to-multilayer deposition of Pt for designing electrocatalysts at an atomic level (Invited paper), J. Serb. Chem. Soc. 66, 887-898 (2001).
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- S.R. Brankovic, N.S. Marinkovic, J.X. Wang, R.R. Adzic, Carbon monoxide oxidation on bare and Pt-modified Ru(1010) single crystal electrodes, J. Electroanal. Chem. (Invited paper) in press.
- Daniel Haskel, Edward A. Stern, Fatih Dogan, and A. R. Moodenbaugh, "Dopant Structural Distortions in High Temperature Superconductors: Active or Passive Role", J. Synchrotron Rad. 8, 186-190, 2001 (Invited paper).
- Y. Zhu, L. Wu and J. Tafto, “Accurate measurements of valence electrons distribution and interfacial lattice displacement using quantitative electron diffraction”, review article for the special issue of Quantitative Electron Diffraction, J. Spence Ed., Microscopy & Microanalysis, (Invited paper) in press.
- M.A. Schofield, Y. Zhu, L. Wu, V.V. Volkov and M. Malac, “Performance and capabilities of JEM-3000F to advanced materials characterization at Brookhaven National Laboratory”, JEOL News: Electron Optics Instrumentation, 36E 2-9 (2001)(Invited paper).

CONFERENCE PROCEEDINGS:

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- Scanning Volta Potentials Measurements of Metals in Irradiated Air. H. S. Isaacs, G. Adzic, C. S. Jeffcoate, and M. P. Ryan, in Scanning Probe Techniques for Materials Characterization at Nanometer Scale, D. C. Hansen, H. S. Isaacs, and K. Sieradzki, Editors, Proc. Vol. 2000-35, pp. 94-101, (Conference Proceedings) The Electrochemical Society, Inc., Pennington, NJ, 2001.
- Pits and Pores II: Formation Properties and Significance for Advanced Materials, P. Schumki, D. J. Lockwood, Y. H. Ogata, H. S. Isaacs, Editors. PV 2000-25. (Conference Proceedings) The Electrochemical Society, Inc., Pennington, NJ, 2001.
- Kinetics of Pitting Corrosion in Jells, H. S. Isaacs and G. Adzic in Second International Symposium on Pits and Pores: P. Schmuki, D. J. Lockwood, Y. H. Ogata, and H. S. Isaacs,

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- In situ studies of corrosion using x-ray absorption near spectroscopy (XANES) H.S. Isaacs , P. Schmuki, and S. Virtanen, State-of-the-Art Application of Surface and Interface Analysis, D. R. Baer, C. R. Clayton, G. P. Halada, G. D. Davis, Editors, PV 2001-5, pp. 271-281, (Conference Proceedings) The Electrochemical Society, Inc., Pennington, NJ, 2001.
- Characterization of salt particle-induced corrosion processes by synchrotron-generated x-ray fluorescence and complementary surface analysis tools, Aaron K. Neufeld, Ivan S. Cole, Alan M. Bond, Hugh S. Isaacs, and Scott A. Furman, State-of-the-Art Application of Surface and Interface Analysis, D. R. Baer, C. R. Clayton, G. P. Halada, G. D. Davis, Editors, PV 2001-5, pp. 187-196, (Conference Proceedings) The Electrochemical Society, Inc., Pennington, NJ, 2001.
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- Insights into Electrochemical Noise of Aluminum in Chloride Environments - K. Sasaki, H. Isaacs, and P. Levy, in Corrosion and corrosion control, J. D. Sinclair, E. Kalman, M. W. Kendig, W. Plieth, W. H. Smyrl, Editors PV 2001- 22, (Conference Proceedings) The Electrochemical Society, Inc., Pennington, NJ, in press.
- The Role of Chromate in the Mechanisms of Passivation and Repassivation of Undermining Coatings on Hot-Dip Galvanized Steel Surfaces, N. Le Bozec, A. Nazarov, D. Thierry, and H. Isaacs, in Corrosion and corrosion control, J. D. Sinclair, E. Kalman, M. W. Kendig, W. Plieth, W. H. Smyrl, Editors PV 2001- 22, (Conference Proceedings) The Electrochemical Society, Inc., Pennington, NJ, in press.
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- In-situ XANES Study of Formation of Chromate Conversion Coatings on Aluminum and Its Alloys - K. Sasaki, H. Isaacs , C. Jeffcoate, H. Lee, and V. Srinivasamurthi, in Corrosion and corrosion control, J. D. Sinclair, E. Kalman, M. W. Kendig, W. Plieth, W. H. Smyrl, Editors PV 2001- 22, (Conference Proceedings) The Electrochemical Society, Inc., Pennington, NJ, in press.
- Effects of Anion, pH, and Temperature on Dissolution Behavior of Aluminum Oxide Films, H. Lee and H. Isaacs, in Corrosion and corrosion control, J. D. Sinclair, E. Kalman, M. W. Kendig, W. Plieth, W. H. Smyrl, Editors PV 2001- 22, (Conference Proceedings) The Electrochemical Society, Inc., Pennington, NJ, in press.

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- L. Wu, Y. Zhu and J. Tafto, "An interferometric electron ruler with picometer accuracy in gauging lattice displacement", (Conference Proceedings) Microscopy and Microanalysis, 7(2), 282-283 (2001).

Number of Patents, Disclosures, Licenses and Royalties

FY 01

- BNL No.01-14: Adzic, Radoslav; Brankovic, Stanko; Wang, Jia; CO-tolerant Fuel Cell Electrocatalyst with a very Low Pt Loading and a Process for its Preparation.
- BNL No. 01-15: Lewis, Laura J. Henderson; Double Magnetocaloric Effect Nanocomposites.
- BNL No. 01-28: Sun, Xuehui; Lee, Hung Sui; Yang, X. Q.; McBreen, James; Composite Electrolytes Containing LiF Salt which Improve the Elevated Temperature Cycling of Spinel LiMn₂O₄ Electrode.

Patent Applications Filed:

- BSA No. 01-07: Adzic, Radoslav; Brankovic, Stanko; Wang, Jia; CO-tolerant Fuel Cell Electrocatalyst with a very Low Pt Loading and a Process for its Preparation.
- BSA No. 00-28: Wiesmann, Harold; Solovyov, Vyacheslav; Synthesis of Y Ba₂Cu₃O₇ Using Sub-atmospheric Processing.
- Patents Issued:
- BSA No. 98-17: Lee, Hung Sui; Yang, X. Q.; McBreen, James; Patent 6,120,941; 9/19/2000; Anion Receptor Compounds for Non-Aqueous Electrolytes.
- BSA No. 99-05: Adzic, Radoslav; Marinkovic, Nebojsa; Patent 6,183,894; 2/6/2001; Electrocatalysts for Alcohol Oxidation in Fuel Cells.
- BSA No. 98-24: Reilly, James J.; Adzic, Gordana D.; Johnson, John; Vogt, Thomas; McBreen, James Q.; Patent 6,238,823; 5/29/2001; Non-Stoichiometric AB₅ Alloys for Metal Hydride Electrodes.

New Licenses in FY 01: 0

Gross Royalties in FY01: \$0

FY02

- BNL No. 02-07: Wiesmann, Harold; Solovyov, Vyacheslav; Method for Fluorinating Films Containing Rare Earths, Barium and Copper.

- BNL No. 02-08: Sun, Xuehui; Lee, Hung Sui; McBreen, James; Yang, X. Q.; Using Boron-Based Anion Receptors to Improve the Thermal Stability of the Commercial LiPF₆-based Electrolyte for Lithium Batteries.
- BNL No. 02-13: Lewis, Laura J. Henderson; Simple Magnetic Field Amplification for Functional Magnetic Materials.
- BNL No. 02-14: Isaacs, Hugh S.; Observing Changes in Video Images.

Patent Applications Filed: NONE

Patents Issued:

- BSA No. 00-11: Lee, Hung Sui; Yang, X. Q.; McBreen, James; Xiang, Caili; Patent 6,352,798; 3/5/2002; Phenyl Boron-Based Compounds as Anion Receptors for Non-Aqueous Battery Electrolytes.

New Licenses in FY 02: 0

Gross Royalties in FY02: \$0

H. S. Isaacs, A. Shipley and E. Karplus, Observing Changes in Video Images, BSA.

Proposals

- Three-year CRADA, total funding \$750K:
- K. Barkigia and M. Renner, P.I.'s, "Synchrotron-based Structural Studies of Hydroporphyrin Sensitizers for Photodynamic Therapy," with Miravant Medical Technologies.
- The funding of the BES program, "Studies of Nanoscale Structure and Structural Defects of Advanced Materials," (KC0201010), Y. Zhu, P.I., was increased by \$1000K per year.
- M. Suenaga, P.I., "Use of Transmission Electronic Microscopy and New Developed Precursor-Deposition Method to Improve Fabrication of High Current Superconducting," with Oxford Superconducting Technology.
- H. Isaacs, P.I., "Non-Invasive Techniques to Study Local Passivity Breakdown of Metal Alloys in Aqueous Media," with Applicable Electronics, Inc.
- H. Isaacs, P.I., "Inhibition of Magnesium Corrosion for Automobile Coolant Applications," with Honeywell.

LDRD Initiatives

- S. Wong: "Size Dependence of Catalytic Reactivity of Iron Oxide Nanocrystals," \$85K
- M. Renner: "Immobilization of Organometallic Complexes into Sol-Gel Matrices," \$82K
- L. Lewis: "Magnetic Nanodispersions (NANO IV)," \$73K
- K. Barkigia, "Mapping Electron Densities in Porphyrin Radical Crystals Using the NSLS," \$70K
- Q. Li, "High Resolution Magneto-Optical Study of Magnetic Nanostructures, Nanocomposite Functions & Superconducting Materials (NANO IV)," \$46K

Editorial Activity and Major Book Articles

- R. Adzic, Editorial Board: Journal of the Serbian Chemical Society.

- R.R. Adzic, J.W. Wang, B.M. Ocko, J. McBreen, Surface X-ray scattering and X-ray Absorption spectroscopy techniques, Handbook of Fuel Cells Technology, W. Vielstich, D. Lamm, H. Geistarg (Eds.), J. Wiley & Sons, New York, in press.
- R.R. Adzic, Electrocatalysis on surfaces modified by metal monolayers deposited at underpotent "Encyclopedia of Electrochemistry", Vol 1, A. Bard, M. Stratmann, eds., Wiley-VCH, New York, in press.
- Y. Zhu, Q. Li, L. Wu, V. Volkov, G. Gu, and A. R. Moodenbaugh, "Microstructure of Superconducting MgB₂", in: Studies of High Temperature Superconductors: Advances in Research and Applications V. 38, A. V. Narlikar, Ed., (Nova, Huntington, NY, 2002). In press.
- M. Suenaga, "BaF₂ Post-deposition Reaction Processing for Thick YBCO Films", in: Next Generation High Temperature Superconducting Wires, A. Goyal, Ed., (Plenum Publishing Corp., New York, NY 2002). In press.
- D.O. Welch, "Normal State vs. Superconductor," in Handbook of Superconducting Materials, D. Ginley and D. Cardwell, Eds., (Institute of Physics Publishing, Bristol), in press.
- Y. Zhu and V.V. Volkov, "Magnetic structure and magnetic imaging of RE₂Fe₁₄B (RE=Nd, Pr) permanent magnets", in Magnetic imaging and its applications in materials, Eds. M. De Graef and Y. Zhu, Academic Press, 2001, p227-270.
- Jack Fajer is on the editorial board of the journal, Spectrochimica Acta.
- J. McBreen, Invited Guest Editor of a Special Issue of Electrochimica Acta on X-Rays in Electrochemistry, Issue will be published July 27, 2002.

Technical Committees

- David Welch was elected Chairman of the Superconducting and Magnetic Materials Committee of the Minerals, Metals and Materials Society (TMS).
- L.H. Lewis: Program Committee, 46th Annual Conference on Magnetism and Magnetic Materials; Program Chair, InterMag 2003; Internal Advisory Board, International Training Institute for Materials Science, Hanoi, Vietnam; Executive Committee, BNL Nanoscience Center: "Center for Functional Nanomaterials;" Scientific Thrust Leader & Spokesperson, "Magnetic Nanoassemblies," BNL Nanoscience Center: "Center for Functional Nanomaterials;" Organizer & core member, DOE CESP Annual meeting: "Magnetic Nanocomposites" (meeting to be held 10/02); National Advisory Board, 17th Annual International Workshop on Rare Earth Magnets and their Applications (Aug. 18-22, 2002, Newark, Delaware); Search committees: Chair, BNL MSD; Director, BNL Nanoscience Center.
- R. Adzic, International Society for Electrochemistry, Co-Chairman, Division 1, Fundamental Interfacial Electrochemistry (1987-1989); Society, Member, Executive Committee, Physical Electrochemistry Division (1995-1998); Advisory Board, International Conference on Electrocatalysis, Como, Italy (2001-present).
- G.S. Frankel, J.R. Scully, H.S. Isaacs and J.D. Sinclair, Organizers. Corrosion Science: A Retrospective and Current Status, The Electrochemical Society, 201st Meeting. Philadelphia, PA, May 12-17, 2002.
- H. Isaacs: Corrosion Division Uhlig Award Committee for 2002 and 2003, The Electrochemical Society Inc. Pennington NJ. Whitney Award Committee for 2003, NACE International, Houston, TX.

Notes, Issues, Trends and Assumptions

Note this is the first year of Departmental status for the Materials Science Department. [↑](#)

1.1.3 Life Sciences

1.1.3.1 Biology Department

Significant Accomplishments

The new DOE initiative "Genomes To Life" (GTL) provides an exciting focus for the expertise developed over many years in the Biology Department to understand basic principles of biological interactions both at the molecular level and within ecosystems comprised of microbes and higher forms of life. In response to the initial call for GTL proposals, a group of scientists from BNL and other National Laboratories and academic institutions both US and abroad, submitted a joint proposal to develop cutting-edge, high throughput DNA sequencing methods to analyze gene expression profiles in microbes and plant roots within soil communities and to track changes in gene expression following contamination of soils with radionuclides or heavy metals. The development of these ultra sensitive sequencing methods will allow scientists to monitor microbial species that cannot be propagated as pure cultures in the laboratory and identify coordinately regulated genes that may define novel metabolic pathways responsive to environmental stress. While this proposal was unsuccessful in its initial attempt this was mainly due to the lack of pilot data. LDRD funds will be used to generate pilot data for this initiative.

Subsequent calls for GTL proposals will focus on the major goal of characterizing interactions that enable proteins to function together as cooperative "molecular machines". This goal is strongly supported by Biology Department strengths in structural biology and protein expression and its long experience with characterizing the biochemistry of protein complexes derived from bacterial, plant and mammalian cells. The Biology Department STEM and new CryoEM microscopy facilities also are well matched to the GTL objective of developing methods for imaging protein complexes in living cells or in fixed sectioned cells. Therefore, several areas of Biology Department expertise have excellent prospects to flourish under the GTL program. Incorporated into the GTL initiative is a technique we recently developed for identifying and qualitatively analyzing genomic DNAs (called Genomic Signature Tags) that provides limited representation of all the DNA molecules in a given population without any prior knowledge of the DNA sequence. This method could potentially be used to detect the presence of biological warfare agents in crude environmental samples. This same method also will be used in the GTL project to characterize the composition and dynamics of natural populations of microbes in normal and contaminated soil samples.

Other major accomplishments in basic research and technology development include:

- As part of an ongoing effort to understand how viruses infect cells, Biology Department scientists deciphered the molecular-level interaction between coxsackie virus, which infects the heart, brain, pancreas, and other organs, and the human cell protein to which it attaches.
- We have found a way to make a plant enzyme that is 100 times more efficient than similar enzymes found in nature. The research offers insight into how enzymes evolve, and may one day lead to methods to boost production of other useful plant products.

- Several beamlines that comprise the Biology Department's crystallography facilities at the National Synchrotron Light Source underwent major upgrades:
- Beamline X12B was reconfigured to upgrade the optics for high-flux, broad spectral band-pass operation with a multi-layer monochromator (for small-angle scattering and crystallography) and narrow-band-pass operation with a channel-cut crystal monochromator (for multi-wavelength anomalous diffraction crystallography).
- The optics of Beamline X12C were upgraded to provide narrower band-pass, greater reliability, and an increased range of energies.
- A new motor control system was built and installed at Beamline X26C so that the beamline's optical elements could be reliably adjusted and the diffractometer properly aligned.

Significant Awards

- Richard Setlow, recipient of the Environmental Mutagen Society (EMS) Award for 2002 in recognition of outstanding research contributions in the area of environmental mutagenesis.
- The Biology Department had two SUNY Stony Brook graduate students receive PhDs this year; Mark Brown received his from the School of Pharmacology and Brenda Daniels from Biochemistry and Structural Biology.

Peer-Reviewed Publications

The Department had two cover articles worth noting:

1. A collaboration between our Proteomics group and SUNY SB led to a cover of *Journal of Biological Chemistry*, Vol. 277(22), May 31, 2002. The cover shows a DNA repair enzyme "caught in the act." A Schiff base intermediate of *Escherichia coli* formamidopyrimidine-DNA glycosylase (Fpg), an enzyme responsible for excising oxidatively damaged purines from DNA, has been chemically reduced, and the resulting trapped complex was structurally determined. The structure reveals for the first time the mode of Fpg interactions with damaged DNA. For details see the article by Gilboa et al., pages 19811-19816.
2. An international collaboration led to a cover of *Environmental Science & Technology*, Vol. 35(21), November 1, 2001. The redroot pigweed plant (*Amaranthus retroflexus*), shown in artist Loel Barr's cover illustration, has until now been mainly known as a highly toxic, nuisance plant commonly found in pastures. Plant ingestion by cattle, swine, sheep and goats can cause breathing problems, trembling, weakness, abortions, coma, and ultimately death. The leaves, stems, and roots of the plant are all dangerous to these and other animals. Why then, you might ask, would anyone want to cultivate such a plant? In their assessment of phytoremediation's progress in the United States and Europe, researchers Daniel van der Lelie, Jean-Paul Schwitzgubel, David Glass, Jaco Vangronsveld, and Alan Baker provide an answer. The redroot pigweed plant is particularly useful for phytoremediating radionuclide-contaminated sites. In field trials it was successfully used to accumulate significant amounts of radioactive cesium (Cs-137) in its leaf and stem biomass. In a growing market on both sides of the Atlantic Ocean, this and other plants are increasingly being used to phytoremediate site contamination.

Peer-Reviewed Publications

Total: 24

- Baniecki, M. L., McGrath, W. J., McWhirter, S. M., Li, C., Toledo, D. L., Pellicena, P., Barnard, D. L., Thorn, K. S., and Mangel, W. F. Interaction of the human adenovirus proteinase with its 11-amino acid cofactor pVIc. *Biochemistry* 40(41), 12349-12356 (October, 2001).
- Bewley, M. C., Marohnic, C. C., and Barber, M. J. The structure and biochemistry of NADH-dependent cytochrome b5 reductase are now consistent. *Biochemistry* 40(45), 13574-13582 (November, 2001).
- Bonanno, J. B., Edo, C., Eswar, N., Pieper, U., Romanowski, M. J., Ilyin, V., Gerchman, S. E., Kycia, H., Studier, F. W., Sali, A., and Burley, S. K. Structural genomics of enzymes involved in sterol/isoprenoid biosynthesis. *Proceedings of the National Academy of Sciences USA* 98(23), 12896-12901 (November, 2001).
- Eswaramoorthy, S., Kumaran, D., and Swaminathan, S. Crystallographic evidence for doxorubicin binding to the receptor-binding site in *Clostridium botulinum* neurotoxin B. *Acta Crystallographica*, D57 (Pt. 11), 1743-1746 (November, 2001).
- Hainfeld, J. F., Furuya, F. R., Powell, R. D., and Liu, W. DNA nanowires. *Microscopy and Microanalysis* 7 (Suppl 2: Proceedings), 1034-1035 (2001).
- He, Y., Chipman, P. R., Howitt, J., Bator, C. M., Whitt, M. A., Baker, T. S., Kuhn, R. J., Anderson, C. W., Freimuth, P., and Rossmann, M. G. Interaction of coxsackievirus B3 with the full length coxsackievirus-adenovirus receptor. *Nature Structural Biology* 8(10), 874-878 (October, 2001).
- Lacks, S. A., and Greenberg, B. Constitutive competence for genetic transformation in *Streptococcus pneumoniae* caused by mutation of a transmembrane histidine kinase. *Molecular Microbiology* 42(4), 1035-1045 (November, 2001).
- McGrath, W. J., Baniecki, M. L., Li, C., McWhirter, S. M., Brown, M. T., Toledo, D. L., and Mangel, W. F. Human adenovirus proteinase: DNA binding and stimulation of proteinase activity by DNA. *Biochemistry* 40(44), 13237-13245 (November, 2001).
- McGrath, W. J., Baniecki, M. L., Peters, E., Green, D. T., and Mangel, W. F. Roles of two conserved cysteine residues in the activation of human adenovirus proteinase. *Biochemistry* 40(48), 14468-14474 (December, 2001).
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- Cover of *Environmental Science & Technology*, Vol. 35(21), November 1, 2001. The redroot pigweed plant (*Amaranthus retroflexus*), shown in artist Loel Barr's cover illustration, has until now been mainly known as a highly toxic, nuisance plant commonly found in pastures. Plant ingestion by cattle, swine, sheep and goats can cause breathing problems, trembling, weakness, abortions, coma, and ultimately death. The leaves, stems, and roots of the plant are all dangerous to these and other animals. Why then, you might ask, would anyone want to cultivate such a plant? In their assessment of phytoremediation's progress in the United States and Europe, researchers Daniel van der Lelie, Jean-Paul Schwitzguebel, David Glass, Jaco Vangronsveld, and Alan Baker provide an answer. The redroot pigweed plant is particularly useful for phytoremediating radionuclide-contaminated sites. In field trials it was successfully used to accumulate significant amounts of radioactive cesium (Cs-137) in its leaf and stem biomass. In a growing market on both sides of the Atlantic Ocean, this and other plants are increasingly being used to phytoremediate site contamination.
- Special Issue of *Environmental and Molecular Mutagenesis* (Journal of the Environmental Mutagen Society), Vol. 38, No. 2/3, pp. 87-260 (2001) published "A Richard B. Setlow Festschrift" (volume of writings by different authors presented as a tribute to a scholar). This festschrift was dedicated to the "Father of DNA Repair," Richard B. Setlow, in the year of his 80th birthday. They include contributions from many of his former students and colleagues who welcome the opportunity to say "Thank you, Dick!" The website where the table of contents and abstracts for the issue are located is <http://www3.interscience.wiley.com/cgi-bin/issuetoc?ID=86511335>
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Number of Patents, Disclosures, Licenses and Royalties

- Biology's Gross Licensing Revenue for FY01 was \$1,682,811.00
- New Licenses in FY 01: 75

Disclosures Submitted in FY 01:

- 01-06 Dunn, John, J. Studier, William F. Luft, B. J. "Nucleotide Sequences Encoding Borrelia sp. LMP1 and Uses Thereof"
- 01-07 Shanklin, J. Whittle, Edward J. "Isoform of Castor Oleate Hydroxylase"
- 01-08 Shanklin, J. Blewitt, Michael G., Warikoo, Veena "Bacterial Oleic Acid Hydratase"
- 01-12 Freimuth, Paul I., Zhang, Yian-Biao, Howitt, Jason "Cis-acting Peptide Chaperone"
- 01-27, Subrahmanyam, Satyam, Shanklin, J., "Inhibition of desaturase activity by the co-expression of a mutant acyl-ACP desaturase"
- 01-29, Mendelman, Victoria Lynn, "Chip-Based Species Identification from Environmental Samples"
- 01-38, Shanklin, John Broadwater, John A., "Improved Lesquerella Oleate Hydroxylase"

Patent Applications Filed in FY 01:

- 01-01 Dunn, John J. Luft, B. J. "Recombinant Constructs of Borrelia burgdorferi"
- 01-02 Anderson, Carl W. Connelly, Margery A. "DNA-PK Assay"
- 00-22 Sutherland, Betsy M. "Method for Assaying Clustered DNA Damages"
- 01-05 Shanklin, J. Whittle, Edward J. "Isoform of Castor Oleate Hydroxylase"

U.S. Patents Issued in FY01:

- 99-13 6,248,569 6/19/2001 Dunn, John J. Randesi, Matthew, Quesada, Mark A. "Method for Introducing Unidirectional Nested Deletions"
- 94-14 6,248,562 6/19/2001 Dunn, John J. Luft, B. J. "Novel Chimeric Proteins Comprising Borrelia Polypeptides and Uses Therefor"

US Patents Issued FY02:

Anderson, C. W., Appella, E., and Sakaguchi, K., Inventors. Methods for generating phosphorylation site-specific immunological reagents. U.S. Patent No. 6,309,863 B1, October 30, 2001.

Significant New Hires

During this reporting period the Biology Department successfully recruited and hired two soil microbiologists as well as five research associates. We also have an offer out to a CryoElectron Microscopist. These scientists will enhance the Laboratory's research portfolio and, coupled with

the staff we already had, put us in better alignment with DOE missions for not only the Genomes to Life Initiative but for bioremediation and counterbioterrorism research.

The Department also hired a crystallographer to manage the operation of beamline X26C, a collaborative crystallography beamline (BNL, Cold Spring Harbor Lab, SUNY SB, and Georgia Universities).

Proposals

The following four significant proposals have been submitted to funding agencies:

- 'An Integrated Functional Genomics Consortium to Increase Carbon Sequestration in Poplars: The Poplar-Mycorrhizal Symbiosis as a System to Improve Carbon Sequestration (Submitted 5/30/02 by J. Dunn/N. van der Lelie. Response to DOE's call on 'Terrestrial Carbon Sequestration Using the Poplar').
- 'Structural Studies on C. botulinum progenitor toxin B' (Submitted 2/02 to NIH by S. Swaminathan).
- 'STEM Mass Mapping and Heavy Atom Labeling of Biomolecules' (Submitted 2/02 to NIH by J. Wall).
- The Biology Department was awarded three Seed Grant by SUNYSB. While the funding levels are not significant the program is worth noting as it was set up to strengthen the programmatic links between BNL and SUNYSB. Proposal titles are as follows:
 - 'Gene Expression Profiles Following in-Vivo Exposure to Ionizing Radiation' (J. Dunn)
 - 'Toxin Knowledge Base Management using Artificial Intelligence and Database Technologies' (S. Swaminathan)
 - 'Development of Transgenic Fish Model for use in vivo Exposure to Ionizing Radiation' (R. Setlow)

LDRD Initiatives

Total: 11

- Understanding the Pathways of Ubiquitin Dependent Proteolysis-Bewley, M.
- New Protein Expression Tools for Proteomics-Freimuth, P.I.
- Cryo-EM for Solving Membrane Proteins-Hainfeld, J.F.
- Human DNA Damage Responses: DNA-PK and p53-Anderson, C.W.
- Molecular Mechanisms Underlying Structural Changes in the Adult Brain: A Genetic Analyses-Dunn, J. J.
- DNA-Nano Wires that AutoConnect in 3 Dimensions (NANO III)-Hainfeld, J.
- Crystallization and X-ray Analysis of Membrane Proteins-Fu, D.
- In Vitro Investigation of the DNA Double Strand Break Repair Mechanism by Non-Homologous End-Joining in the context of Chromatin-Lymar, E.
- Genomic Selex to study Protein DNA/RNA Interactions in Ralstonia metallidurans CH34 Regulating Heavy Metal Homeostasis and Resistance-van der Lelie, D.
- Lead Resistance in Ralstonia metallidurans CH34-van der Lelie D.
- Design of a Ralstonia mettallidurans Two-Hybrid Protein System for Studying Signaling Pathways Regulating Heavy Metal Homeostatis and Resistance-Taghavi, S.

Editorial Activity and Major Book Articles

Total: 13

- Anderson, C. W. and Appella, E. Signaling to the p53 tumor suppressor through pathways activated by genotoxic and non-genotoxic stresses. *Handbook of Cell Signaling*, R. A. Bradshaw and E. Dennis, Editors, Academic Press (in press, 2002).
- Flanagan, J. M. and Bewley, M. C. Protein quality control in bacterial cells: Integrated networks of chaperones and ATP-dependent proteases. *Genetic Engineering, Principles and Methods*, Vol. 24, J. K. Setlow, Editor, Kluwer Academic/Plenum Publishers, NY (in press, 2002).
- Becker, M. and Berman, L. NSLS 2001 Annual Users' Meeting Workshops: Frontiers in Structural Biology at High-Brightness X-Ray Sources. *Synchrotron Radiation News* 14(6), 7-9 (November/December, 2001).
- Lacks, S. Cotransformation. *Encyclopedia of Genetics*, S. Brenner and J. H. Miller, editors, Academic Press, pp. 471-472, San Diego, CA (October, 2001).
- Lacks, S. Pneumonia bacteria. *Encyclopedia of Genetics*, S. Brenner and J. H. Miller, editors, pp. 1491-1494, Academic Press, San Diego, CA (October, 2001).
- Lacks, S. Repair mechanisms. *Encyclopedia of Genetics*, S. Brenner and J. H. Miller, editors, pp. 1661-1669, Academic Press, San Diego, CA (October, 2001).
- Fu, D., Libson, A., and Stroud, R. The structure of GlpF, a glycerol conducting channel. *Ion Channels: From Atomic Resolution Physiology to Functional Genomics*, Novartis Foundation Symposium No. 245, pp. 51-61; discussion pp. 61-65 and 165-168. John Wiley & Sons Ltd., Chichester, UK (2002).
- Hainfeld, J. F. and Powell, R. D. Silver- and gold-based utometallography of nanogold. *Advances in Pathology, Microscopy & Molecular Morphology Series: Gold and Silver Staining: Techniques in Molecular Morphology*, G. W. Hacker and J. Gu, Editors, Chapter 3, pp. 29-46, CRC Press LLC, Boca Raton, FL (2002).
- Hainfeld, J. F., Powell, R. D., and Furuya, F. R. Microscopic uses of nanogold. *Advances in Pathology, Microscopy & Molecular Morphology Series: Gold and Silver Staining: Techniques in Molecular Morphology*, G. W. Hacker and J. Gu, Editors, Chapter 6, pp. 85-106, CRC Press LLC, Boca Raton, FL (2002).
- Powell, R. D. and Hainfeld, J. F. Combined fluorescent and gold probes for microscopic and morphological investigators. *Advances in Pathology, Microscopy & Molecular Morphology Series: Gold and Silver Staining: Techniques in Molecular Morphology*, G. W. Hacker and J. Gu, Editors, Chapter 7, pp. 107-118, CRC Press LLC, Boca Raton, FL (2002).
- Sutherland, J. C. Simultaneous measurement of circular dichroism and fluorescence polarization anisotropy. *Clinical Diagnostic Systems: Technology and Instrumentation*, G. E. Cohn, Editor, *Proceedings of SPIE*, Vol. 4625, pp. 126-136 (June, 2002).
- Swaminathan, S. and Eswaramoorthy, S. Crystal structure of Clostridium botulinum neurotoxin serotype B. *Scientific and Therapeutic Aspects of Botulinum Toxin*, International Conference 1999: Basic and Therapeutic Aspects of Botulinum and Tetanus Toxins, Orlando, FL, November 16-18, 1999, M. F. Brin, J. Jankovic, and M. Hallett, Editors, Chapter 3, pp. 29-39, Lippincott Williams & Wilkins, Philadelphia, PA (June, 2002).
- Tubbs, R. R., Pettay, J., Grogan, T., Cheung, A. L. M., Powell, R. D., Hainfeld, J., Hauser-Kronberger, C., and Hacker, G. W. Supersensitive in situ hybridization by tyramide signal amplification and nanogold® silver staining: The contribution of autometallography and

catalyzed reporter deposition to the rejuvenation of in situ hybridization. *Advances in Pathology, Microscopy & Molecular Morphology Series: Gold and Silver Staining: Techniques in Molecular Morphology*, G. W. Hacker and J. Gu, Editors, Chapter 9, pp. 127-144, CRC Press LLC, Boca Raton, FL (2002).

Technical Committees

Members of the scientific staff serve on the editorial boards and as reviewers for many journals such as *Proceedings of the National Academy of Science*, *Photochemistry and Photobiology*, *Biochemistry*, *Cancer Research*, *Mutation Research*, *Acta Crystallography D*, *Biochimica Biophysica Acta*, *J. Biological Chemistry*, and *Molecular and Cell Biology*.

21 of the Department's 24 scientific staff are members of graduate programs at SUNY Stony Brook (Genetics, Biochemistry and Structural Biology, and Molecular Microbiology, and the Medical Scientist Training Program).

Many of the scientific staff also participate in review panels for funding agencies (i.e. J. Flanagan BES, Carl Anderson DOE "Genomes to Life" for universities)

In addition, the staff participates as members on advisory boards such as:

- Scientific Advisory Board of the Institute for Molecular Biotechnology, Jena Germany
- Scientific Advisory Board of Structural GenomiX, California
- National Scientific Advisory Panel For American Foundation for Aging Research
- Advisory Committee for MacCHESS
- NASA Iterative Biological Crystallization Project
- Battelle Technical Council
- Member, Board of Directors National Space Biomedical Research Institute.
- Advisory committee, Wyeth Pharmaceuticals

The staff also participates in workshops and meetings which lead to the development of funded programs such as:

- The steering committee for the DOE's GTL Imaging workshop to formulate the call for proposals (<http://gtlimaging.emsl.pnl.gov/proj/gtlimaging/index.html>).
- Co-organized and participated in a NIH Workshop on Protein Posttranslational Modifications and Cancer Prevention that will advise NCI on funding opportunities.
- Organized a p53 workshop in Rome, Italy that lead to an application to NIH for development of mouse models for cancer research by a team of international scientists.

1.1.3.2 Medical Department

Significant Accomplishments

Medical imaging and addiction studies remain the cornerstone of OBER research at The Laboratory. This research mission creates great opportunities for collaborations and jointly funded initiatives with other agencies, principally the NIH. The following describes specific accomplishments in Radiotracer Chemistry and Neuroimaging using Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI):

- PET and microdialysis were used to continue the first comprehensive study of solvent abuse (the most frequent form of abuse in children) in living systems, beginning with the pharmacokinetic and pharmacodynamic effects of toluene, the solvent most widely abused.
- The experimental medication, gamma vinyl GABA (GVG), which has shown great promise in diminishing addictive behaviors in animals, was labeled with carbon-11 for the first imaging studies of its distribution and pharmacokinetics in primates.
- Drug abusers frequently relapse when they again encounter an environment where they formerly used the drug. We showed that exposure to environmental cues produces similar neurochemical changes to the drug itself, illustrating the powerful role that the environment plays on drug-related behavior.
- Aromatic amino-acids, which may accumulate in rapidly growing tumors, were labeled with carbon-11 for PET studies in primates to determine their utility as tracers for detecting cancer. D- and L-boronphenylalanine also were labeled with carbon-11 for investigations of amino-acid transport, melanoma imaging, and BNCT therapy for brain tumors.
- The PET scanner designed for rats and mice (microPET), which was commissioned in FY 2001, was used by Brookhaven's scientists and outside collaborators as a new scientific tool for pre-clinical research to measure biochemical transformations and the movement of drugs in living animals. Two specialized PET devices were developed in FY 2002 to measure radiotracers in blood. One is a beta probe implanted in a blood vessel, and the other is a coincidence detector positioned external to the wrist to measure the concentration of positron emitters. Both promise to make PET studies simpler and safer.
- A collaboration was established to use the short-lived positron-emitting isotopes to study environmental stressors on plants.
- Progress continues on functional MRI studies using the BNL 4 Tesla scanner. The increased sensitivity resulting from last year's upgrade allow us to detect the passage of contrast agents across the blood-brain-barrier (BBB) in the white matter of the normal human brain.
- Brookhaven and Psimei Pharmaceuticals Ltd. continue to work together under a CRADA to develop Brookhaven-invented boron compounds for experimental radiation therapy for cancer, as well as other cancer treatments. In March 2002, our progress was measured in experiments at MIT.

Significant Awards

- Linda Chang, Brookhaven Town Award for contributions in science.
- Gene-Jack Wang, 2001, Man of the Year in Medicine – The Village Beacon-Record (UPS 001-056), Setauket, New York.
- Nora Volkow, NYS Senate's 'Woman of Distinction' Award, 2001
- Nora Volkow, Council member NARSAD, 2001
- Nora Volkow, Recognition Award, Suffolk Coalition to Prevent Alcohol and Drug Dependencies, Inc., 2002

Peer-Reviewed Publications

Total: 77

1. Benczik J., Hopewell J.W., Snellman M., Morris G.M., Tenhunen M., Seppala T., Joensuu R. and Joensuu H. Normal dog brain tolerance to irradiation with photons. Radiation Research. (In press).

2. Chang L, Ernst T, Speck O, Patel H, DeSilva M, Leonido-Yee M, Miller E. Perfusion MRI Abnormalities and Computerized Cognitive Deficits in Abstinent Methamphetamine Users. *Psychiatry Research: Neuroimaging* 2002 Jun 15;114(2):65-79.
3. Chang L, Speck O, Miller E, Braun A, Jovicich J, Itti L, Ernst T. Neural Correlates Of Attention And Working Memory Deficits In Patients With HIV-1. *Neurology* 2001; 57:1001-1007.
4. Ernst T, Chang L, Cooray D, Salvador C, Jovicich J, Walot I, Boone K, Chlebowski R. The Effects of Tamoxifen and Estrogen on Brain Metabolism in Elderly Women, *Journal of the National Cancer Institute* 2002;94(8):592-597.
5. F.A. Dilmanian, T.M. Button, G. Le Duc, N. Zhong, L.A. Peña, J.A.L. Smith, S.R. Martinez, T. Bacarian, J. Tammam, B. Ren, P.M. Farmer, J. Kalef-Ezra, P.L. Micca, M.M. Nawrocky, J.A. Niederer, F.P. Recksiek, A. Fuchs, and E.M. Rosen. Response of rat intracranial 9L gliosarcoma microbeam radiation therapy. *Neuro-Oncology* 4: 26-38, 2002.
6. Fowler J.S., Volkow, N.D., Logan, J. Franceschi, D., Wang, G.-J., MacGregor, R., Shea, C., Garza, V., Pappas, N., Carter, P., Netusil, N., Bridge, P., Liederman, D., Elkashef, A., Rotrosen, J., Hitzemann R. Evidence that l-deprenyl treatment for 1 week does not inhibit MAO A or the dopamine transporter in the human brain. *Life Sciences* 68, 2759-2768 2001.
7. Fowler JS, Ding Y-S, Logan J, Franceschi D, Wang G-J, Volkow ND, Pappas NR, Schlyer D, Gatley SJ, Alexoff D, Felder C, Zhu W: "Non-MAO A Binding of Clorgyline in White Matter in Human Brain". *Journal of Neurochemistry* 2001; 79: 1039-1046.
8. Fowler JS, Ding YS, Logan J, MacGregor R, Shea C, Garza V, Gimi R, Volkow ND, Wang GJ, Schlyer D, Ferrieri R, Gatley SJ, Alexoff D, Carter P, King P, Pappas N, Arnett CD. Species differences in [¹¹C]clorgyline binding in brain. *Nuclear Medicine and Biology* 28, 779-785, 2001.
9. Fowler JS, Logan J, Wang G-J, Volkow ND, Zhu W, Franceschi D, Pappas NR, Ferrieri R, Shea C, Garza V, Xu Y, MacGregor R, Schlyer DJ, Gatley SJ, Ding Y-S, Alexoff D: "PET Imaging of MAO B in Peripheral Organs in Humans". *Journal of Nuclear Medicine* (in press).
10. Fowler JS, Volkow ND, Logan J, Franceschi D, Wang G-J, MacGregor R, Shea C, Garza V, Pappas NR, Carter P, Netusil N, Bridge P, Liederman D, Elkashef A, Rotrosen J, Hitzemann RJ: "Evidence That L-Deprenyl Treatment for One Week Does Not Inhibit MAO A or the Dopamine Transporter in the Human Brain". *Life Sciences* 2001; 68: 2759-2768.
11. Fowler JS, Volkow ND, Wang GJ, Gatley SJ, Logan J. [(11)C]Cocaine: PET studies of cocaine pharmacokinetics, dopamine transporter availability and dopamine transporter occupancy. *Nucl Med Biol* 28, 561-572, 2001.
12. Fowler JS, Volkow ND. 18FDG for the study of central nervous system drugs. *J Clin Pharmacol Suppl*:9S-10S 2001.
13. Fowler, J.S., Logan, J., Ding, Y.S., Franceschi, D., Wang, G.J., Volkow, N.D., Pappas, N., Schlyer, D., Biegon, A., Zhu, W. Non-MAO A binding of clorgyline in white matter in human brain. *J Neurochem* 79, 1039-1046 2001.
14. Gifford, A.N., Makriyannis, A., Volkow, N.D. Gatley, S.J. (2002) In vivo imaging of the brain cannabinoid receptor. *Chem. Phys. Lipids*. In press

15. Goldstein R, Harvey AS, Duchowny M, Jayakar P, Altman N, Resnick T, Levin B, Dean P, Alvarez L. (1996). Preoperative clinical, EEG, and imaging findings do not predict seizure outcome following temporal lobectomy in childhood. *Journal of Child Neurology*, 1(6), 445-450.
16. Goldstein RZ, Volkow ND, Wang G-J, Fowler JS, Rajaram S. (2001). Addiction changes orbitofrontal gyrus function: involvement in response inhibition. *NeuroReport*, 12(11), 2595-2599.
17. Goldstein RZ, Hurwitz BE, Llabre MM, Schneiderman N, Gutt M, Skyler JS, Prineas RJ, Donahue RP. (2001). Modeling preclinical cardiovascular risk for use in epidemiologic studies: Miami community health study. *American Journal of Epidemiology*, 154(8), 765-76.
18. Goldstein RZ, Giovannetti T, Schullery TM, Zuffante P, Lieberman JA, Robinson DG, Barr WB, Bilder RM. (2002). Neurocognitive correlates of response to treatment in formal thought disorder in first-episode schizophrenia. *Neuropsychiatry, Neuropsychology, and Behavioral Neurology*, 15(2), 88-98.
19. Giovannetti T, Goldstein RZ, Schullery TM, Barr WB & Bilder RM. (2002). Semantic knowledge degradation does not explain reduced category fluency in first episode schizophrenia patients. *Journal of the International Neuropsychological Society*, in press.
20. Goldstein RZ, Volkow ND. (2002). Drug Addiction and its Underlying Neurobiological Basis: Neuroimaging Evidence for the Involvement of the Frontal Cortex. *American Journal of Psychiatry*, in press.
21. Goldstein RZ, Volkow ND, Chang L, Wang G-J, Fowler JS, Depue RA, Gur RC. The Orbitofrontal Cortex in Methamphetamine Addiction: Involvement in Fear. *NeuroReport*, under revision.
22. Goldstein RZ, Volkow ND, Khalsa SS, Leskovjan A, Wang G-J, Fowler JS. Severity of neuropsychological impairment in drug addiction: validation with glucose metabolism in the reward circuit. *Drug and Alcohol Dependence*, under review.
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Number of Patents, Disclosures, Licenses and Royalties

- New Licenses in FY 01: 1
- Gross Royalties in FY01: \$426,480.00

Disclosures Received in FY01:

- 01-18 Srivastava, Suresh C., Meinken, George E., Li, Zizhong "A New Formulation of Tin-117m DTPA for Therapy of Cancer in Bone"
- 01-19 Srivastava, Suresh C., Li, Zizhong, Meinken, George E. "A New Method for Direct Synthesis of Sn-117m(4+) DTPA Chelate"

Patent Applications Filed in FY 01:

- 01-13 Srivastava, Suresh C., Li, Zizhong, Meinken, George E "A New Method for Direct Synthesis of Sn-117m(4+) DTPA Chelate"
- 01-10 Miura, Michiko, Slatkin, Daniel N. "Novel Metalloporphyrins and their Uses as Imageable Tumor-Targeting Agents for Ionizing and/or Non-Ionizing Radiation Therapy"

Patents Issued in FY 01:

- 97-19 Srivastava, Suresh C., Meinken, George E. 6,231,832, 5/15/2001 "Radiopharmaceutical Compositions"

Significant New Hires

- BNL's MR Imaging Program has been growing. In the beginning of this reporting period, Helene Benveniste, an MR scientist joined BNL's Medical Department. She has a joint appointment with SUNY Stony Brook. She will be responsible for the new Animal MR machine and research program.
- Linda Chang's MR group has expanded to include three new post docs as well as a new medical associate.
- A research associate was also hired as part of a project to target Tin-117m to estrogen receptors for breast cancer therapy.

Proposals

Total: 17 Proposals

- NIH, Beneviste, Helene. "Imaging Illicit Drug Abuse: Development of a New Test Bed Using MRI..."
- NIH, Chang, Linda. "Project 5: Proton Magnetic Resonance Spectroscopy (1h MRS) in Schizophrenia"
- NI Drug Abuse, Chang Linda. "Neuroimaging and Mentoring in Drug Abuse Research"
- NIH, Chang, Linda. "GCRC Supplement to the SUNY Stony Brook GCRC Site"
- NI Neurological Disorders and Stroke, Dilmanian, F. Avraham. "Microbeam Radiation Therapy for Gliomas"
- US Department of Defense, Dimanian, F. Avraham. "Comparing X-Ray Microbeams and Broad Beams at Optimal configurations..."
- US Department of Energy, Dimanian, F. Avraham. "Bystander Effects and Adaptive Responses Elicited in Low Doses of Low..."
- NIH, Dimanian, F. Avraham. "Effects and Techniques in Microbeam Radiation Therapy"
- NIH, Gatley, Samuel John. "Feto-Maternal Pharmacokinetics of Abused Inhalants"
- NI Drug Abuse, Goldstein, Rita Z. "Behavioral Correlates of fMRI Response in Cocaine Users (K23)"
- NIH, Pena, Louis. "Synthetic FGF Analog for Medical Devise Applications"
- US Department of Energy, Srivastava, Suresh. "Radiolabeled Progenitor Stem Cells for InVivo PET Imaging and..."
- NIH, Thanos, Panayotis (Peter) K. "microPET Imaging and Rodent Models of Drug Abuse"
- NIH, Volkow, Nora. "PET Studies of Brain DA in Stimulent Abusers"
- NI Drug Abuse, Volkow, Nora. "Studies in Cocaine Abuse"
- NIH, Wang, Gene-Jack. "Brain Dopamine Pathology in Obese Individuals"
- NIH, Wang, Gene-Jack. "Brain Dopamine Pathology in Obese Individuals"
- NIH. Gatley, S. John 'PET Studies of Alcohol Distribution and Metabolism'

LDRD Initiatives

Total: Six Initiatives

- Creating a MicroMRI Facility for Research and Development-Benveniste H.
- Microvascular Endothelial Cells as Targets for Ionizing Radiation: In Vitro and In Vivo Models-Pena L.

- Combination of Magnetic Fields and 20 keV Synchrotron X-rays to produce Microbeams for Cell Culture Experiments-Pena L.
- Gene Expression Profiling of Methamphetamine-induced Toxicity in Neurons in Culture using DNA Microassays-Vazquez M.
- 'Functional Spectral Signature' (FSS) Method for Signal to Noise-Enhancement of Brain Patterns in PET Images-Felder C.
- Targeting Tin-117m to Estrogen Receptors for Breast Cancer Therapy-Kolsky K.

Editorial Activity and Major Book Articles

Total: Eight

- Alia-Klein N, O'Rourke T, Malaspina D, Goldstein RZ, Amador X. Reliability and validity of the Violence Assessment Scale. (*American Journal of Psychiatry*).
- Dilmanian, G.M. Morris, N. Zhong, T. Bacarian, J. Tamman, M. Miura, P.L. Micca, L. Rigon, B. Scharf, D.N. Slatkin, R. Yakupov, and E.M. Rosen. Response of subcutaneous murine mammary carcinoma EMT-6 to synchrotron-generated segmented X-ray microbeams", *Proceedings of the Joint Symposium on Bio?Sensing and Bio?Imaging'*, August 27-31, 2001, Yamagata, Japan, pp 118-122, A. Akatsuka, Ed., The Japan Society for Analytical Chemistry, 2002 Tokyo (CD ROM).
- Hurwitz BE, Goldstein R, Massie CA, Llabre MM, Schneiderman N. (2000). Low-flow circulatory state and the pathophysiological development of cardiovascular disease: A model of autonomic mediation of cardiovascular regulation. In P.M. McCabe, N. Schneiderman, T. Field, & A. R. Wellens (Eds.), *Stress, Coping, and Cardiovascular Disease*. Lawrence Erlbaum Associates. Mahwah, NJ, pp 85-122.
- Mausner, L.F., S. Mirzadeh, *Reactor Production of Radionuclides*, in: *Handbook of Radiopharmaceuticals: Radiochemistry and Applications*, M.J. Welch and C.Redvanly eds. John Wiley & Sons Ltd., NY (in press).
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- Trojaborg W and Chang L. Drug Induced Myasthenic Syndromes. In: Gilman S, Goldstein GW, Waxman SG, editors. *Neurobase*. San Diego: Arbor Publishing, first 2002 edition.
- Volkow ND, Wang GJ, Fowler JS, Chang L. Imaging Studies of Stimulant Abuse: Linking findings from non-human primates to those in human studies. *College of Problems in Drug Dependence (CPDD) Symposium: NIDA Monograph 2002* (in press)

Technical Committees

The Scientific staff of the Medical Department participate on the following types of technical committees (list is not all inclusive):

Journal Article Peer Review:

- Synapse
- Nuclear Medicine and Biology
- Journal of Pharmacology and Experimental Therapeutics
- Neuropharmacology
- Journal of Medicinal Chemistry

Grant Proposal Peer Review

- NIDA
- NIAAA
- DOE
- VA
- MRC (Canada)
- Wellcome Trust (UK)

Board Membership/Advisory/Visiting Committees:

- NIAA Board
- Design Review Committee, LANL
- National Space Biomedical Research Institute (NSBRI) Board

Professional Society Officerships:

- SNM Board of Directors

Graduate Program Participation:

- SUNY Stony Brook (Biomedical Engineering, Neurology and the Medical Scientist Training Program)

1.1.4 Energy, Environment and National Security

1.1.4.1 Environmental Sciences

Significant Accomplishments

BNL continues to work for DOE's Atmospheric Chemistry, ARM, FACE, Terrestrial Carbon Cycle, Water Cycle, Environmental Science, Environmental Remediation and Environmental Management programs.

Achievements include:

- Continued operation of the North Carolina Face facility and the ARM External Data Center.
- Houston 2000 scientific results showing a large industrial component of the ozone generation rate were published.
- Scientists used satellite measurements and chemical transport modeling to show the influence of anthropogenic aerosol on cloud optical depth. Their results were consistent with the Twomey mechanism of indirect radiative forcing of climate by aerosols.
- Scientists continued developing and reporting new algorithms for the retrieval of aerosol properties from moments of the particle size distribution.
- The first results and initial description of a particle-into - liquid collector for rapid measurement of aerosol bulk chemical composition were published. Ambient particles are mixed with saturated water vapor to produce droplets that are collected and analyzed by traditional ion chromatography techniques.

- Environmental scientists demonstrated that perfluorocarbon tracers are a cost-effective method to verify integrity and monitor long-term performance of walls, floors, caps and cover systems.
- In response to the DOE BER Environmental Management Science Program, three interdisciplinary research efforts were proposed. These interdisciplinary efforts build on the scientific strengths of current programs and include extensive use of the NSLS.
- The Environmental Science Department, the NSLS and the Earth Sciences Department at SUNY Stony Brook proposed to create a new Environmental Molecular Sciences Institute. This NSF/DOE institute would provide end station upgrades to environmental beam lines and the development of new environmental applications.
- Perfluorocarbon tracers, typically used in atmospheric studies, were used to characterize the subsurface fan ducts at the Brookhaven Graphite Research Reactor. The novel project, an Accelerated Site Technology Deployment, provided a preliminary characterization that was then used to direct further more traditional sampling and characterization.
- A BNL scientist was appointed Chairman of the ARM Cloud Properties Working Group. The Group oversees all cloud sensing and cloud science activities in the ARM program. It consists of 50 members worldwide and is the largest working group within the ARM program.
- A BNL scientist was nominated to serve as a member of the USGCPR Water Cycle Science Steering Committee. This committee reviews and makes recommendations concerning Global Water Cycle Science.

Significant Awards

- Vasilis Fthenakis, Environmental Research & Technology Division, was honored as a Fellow of the American Institute of Chemical Engineers. The AIChE, founded in 1908, is a professional organization with more than 50,000 members. Dr. Fthenakis is one of eight Fellows chosen in 2002.
- Dr. A. J. Francis, Environmental Research & Technology Division, was awarded Tenure at BNL for his for tenure on May 13, 2002.
- Memo of appreciation by Jim Wright, Manager of SCFA, DOE, awarded to Terry Sullivan - Certificate of Appreciation presented to Terry Sullivan in recognition of outstanding contributions to the Subsurface Contaminants Focus Area, DOE.

Peer-Reviewed Publications

- Bardos, R., Mariotti, C., Marot, F., Sullivan, T. Framework for decision support used in contaminated land management in Europe and North America. *Land Contamination & Reclamation* 36, 2094-2100 (2002).
- Dodge, C. J., Francis, A. J. Photodegradation of a ternary iron(III)–Uranium(VI)–Citric acid complex. *Environmental Science Technology* 36, 2094-2100 (2002)
- Fthenakis, V. Multilayer protection analysis for photovoltaic manufacturing facilities. *Process Safety Progress* 20(2), 87-94 (2001).
- Fuhrmann, M., Zhou, H., Neiheisel, J., Dyer, R. Sorption of radioactive contaminants by sediment from the Kara Sea. *Marine Pollution Bulletin* 43(1-6), 102-110 (2001).
- Fuhrmann, M., Lasat, M., Ebbs, S., Kochian, L., and Cornish, J. Uptake of ¹³⁷Cs and ⁹⁰Sr from contaminated soil by three plant species; Application to phytoremediation. *J. Environ. Qual.* 31, 904-909, May-June 2002.

- Fuhrmann, M., Melamed, D., Kalb, P. D., Adams, J. W., Milian, L. W. Sulfur polymer solidification/stabilization of elemental mercury waste. *Waste Management* 22, 327-333 (June 2002).
- Harshvardhan, Schwartz, S. E., Benkovitz, C. M., Guo, G. Aerosol influence on cloud microphysics examined by satellite measurements and chemical transport modeling. *J. of the Atmospheric Sciences* 59, 714-725 (2002).
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- Kalb, P. Polyethylene Encapsulation. In *Hazardous and Radioactive Waste Treatment Technologies Handbook*, Dr. Chang H. Oh, Editor, CRC Press, LLC, 2001.
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- Rogers, A., Ellsworth, D. S., Humphries, S. W. Possible explanation of the disparity between the in vitro and in vivo measurements of Rubisco activity: a study in loblolly pine grown in elevated pCO₂. *J. Experimental Botany* 52(360), 1555-1561 (2001).
- Schwartz, S. E., Harshvardhan, Benkovitz, C. M. Influence of anthropogenic aerosol on cloud optical depth and albedo shown by satellite measurements and chemical transport modeling. *Proc. of the National Academy of Sciences* 99(4), 1784-1789 (2002).
- Song, S-R., Jones, K. W., Lindquist, W. B., Dowd, B. A., Sahagian, D. L. Synchrotron x-ray computed microtomography: studies on vesiculated basaltic rocks. *Bulletin of Volcanology* 63, 252-263 (2001).
- Weber, R. J., Orsini, D., Daun, Y., Lee, Y-N., Klotz, P. J., Brechtel, F. A particle-into-liquid collector for rapid measurement of aerosol bulk chemical composition. *Aerosol Science and Technology* 35, 718-727 (2001).
- Wright, D. L., Shaocai Yu, Kasibhatla, P. S., McGraw, R., Schwartz, S. E., Saxena, V. K., Yue, G. K. Retrieval of aerosol properties from moments of the particle size distribution for kernels involving the step function: cloud droplet activation. *J. Aerosol Science* 33, 319-337 (2002).

Number of Patents, Disclosures, Licenses and Royalties

- Kalb, P., Melamed, D., Patel, B., Fuhrmann, M. Treatment of Mercury Containing Waste, U.S. Patent No. 6,399,849 (June 2002).

Significant New Hires

- Alla Zelenyuk, Associate Scientist, Atmospheric Sciences Division
- Yangang Liu, Associate Scientist, Atmospheric Sciences Division
- Alistair Rogers, Associate Scientist, Earth Systems Science Division

Significant New Proposals

- 'Real Time Tailpipe Emission Measurements.' - DOE B&R EE0602000.
- 'A Field Program to Identify TRI Chemicals and Determine Emission Factors from DOD Munitions Activities.' - Non-Federal Work for Others.
- 'Innovative Waste Segregation and Near Real-Time Field Characterization for RCRA Metals in Stockpiled Soil' Accelerated Site Technology Deployment- ASTD project, CH32SS30.

LDRD Initiatives

Total: Three Initiatives

- Simulated Observatory of Atmospheric Processes (SOAP)- P. Daum, PI
- Biomineralization of Actinides: A Mechanistic Study of the Microbial Genesis of Novel and Stable Compounds - A. J. Francis, PI
- Using Mini-CO₂-DIAL for Verification and Long-Term Monitoring of Cover Systems - J. Heiser, PI

Editorial Activity and Major Book Articles

- Kalb, P. Sulfur Polymer Encapsulation. In 'Hazardous and Radioactive Waste Treatment Technologies Handbook,' Chapter 6.6, Dr. Chang H. Oh, Editor, CRC Press, LLC, 2001.
- Kalb, P. Polyethylene Encapsulation. In 'Hazardous and Radioactive Waste Treatment Technologies Handbook,' Dr. Chang H. Oh, Editor, CRC Press, LLC, 2001.

Technical Committees

- Member National Research Council Committee on Air Quality Management- C.Benkovitz
- Member DOE EM-50 Strategic Laboratory Council- C. Wirick
- Member Rocky Flats Advisory Committee- A. J. Francis
- Member DOE EM Subsurface Lead Laboratory Committee- T. Sullivan
- Member DOE EM Long term capping Committee- J. Heiser
- Chairman ARM Cloud Properties Working Group (CPWG)- M. Miller
- Member USGCRP Water Cycle Science Steering Committee- M. Miller

1.1.4.2 Energy Sciences and Technology

Significant Accomplishments

The department is continuing to increase its support for its sponsors. We completed several tests of BHP equipment for EE, we have initiated the SDRP notebooks for NRC, and have taken on

management of Ukraine assistance activities. New programs have started in risk assessment for NMSS and we have started work on electric grid infrastructure modeling.

The thorium fuel cycle project started irradiations in Russia and non-fuel flow testing was completed. We continued our support of accelerator based projects, including the SNS.

Significant Awards

2002 R&D 100 Award (joint with NREL) for Smart, High Performance Polyphenyenesulfide Coating System

Peer-Reviewed Publications

62

Number of Patents, Disclosures, Licenses and Royalties

In FY-02, there were 3 disclosure statement, 3 patent applications and six patend awarded as of June 30, 2002.

Proposals

The department submitted eleven proposals to the NERI program and two proposal for NEPO. One NEPO proposal was funded.

We have also submitted proposals for work in methae hydrates and deep sulfur removal to DOE.

LDRD Initiatives

Total: Four Initiatives

- Catalytic Microcombustion Systems
- Electrical Systems Reliability
- Liquid Fuel Gasifier for Combustion and Fuel Cells
- Study of a Power Source for Nano-Devices

Editorial Activity and Major Book Articles

Eleven

Technical Committees

Twenty one

Notes, Issues, Trends and Assumptions

We have increasing activity for the NRC as their research budget has started to increase. New programs are being started in methane hydrates. Our thorium work is maturing, but may be poised for growth next year.

1.1.4.3 Nonproliferation and National Security

Significant Accomplishments

- Organized and co-hosted for DOE and International Atomic Energy Agency - Contact Expert Group "Workshop on Spent Nuclear Fuel and Radioactive Waste Management at Andreeva Bay, Russia."
- Organized and co-hosted for NNSA/DOE workshop on "New York Metropolitan Region: Counterterrorism and Infrastructure Assurance Technology Needs", April 9-11, 2002. This workshop included 160 representatives from DOT, DOE, DOJ, FAA, NYC Office of Emergency Management, other NYS organizations, and industry.

- Supported BNL efforts to respond to multiple requests from the Secretary of DOE, Office of Science, NNSA and elsewhere regarding BNL capabilities in Counterterrorism research, development, demonstration, testing and evaluation.
- The International Safeguards Project Office initiated a program of one-year internships with the International Atomic Energy Agency for recent graduates in the field of software development. Four interns were given assignments for the period June 2002 to May 2003.
- Developed an Emergency Response Planning Guideline (ERPG) for mercury vapor, in cooperation with ORNL Spallation Neutron Source project, estimated to save them over \$20 million in project costs. BNL staff member was elected to Chairmanship of Emergency Response Planning Guidelines (ERPG) Committee; published 100th ERPG.
- Developed absorption characteristics for Terra Hertz radiation in selected plastic materials as part of underground infrastructure imaging system project.
- Developed an accurate global survey system providing two-dimensional positioning to an accuracy of 1cm. Prototype called "Lighthouse" was developed under a DOE CRADA program.
- Conducted high-level, annual progress reviews of 46 MPC&A Program Projects, analyzing the information obtained in these reviews and providing the DOE Program Director with both summary and comprehensive reports on each project.
- BNL has maintained a key technical role in transferring technologies and methods for upgrading materials protection, control and accounting (MPC&A) of weapons-usable nuclear materials at Russian facilities.
- BNL continues to play a major role in the Nuclear Materials Conversion and Consolidation (MCC) project, which is an important component of the MPC&A program. A critical goal of the MCC project is to reduce the number of sites and buildings that contain weapons-usable nuclear material, as well as to reduce the attractiveness of existing highly enriched uranium by downblending it to low enriched uranium.
- A BNL staff member was appointed lead of the MPC&A Education and Awareness Project. Under this project, a two-hour MPC&A Culture module was developed as the front-end to technical and administrative courses conducted by Atomenergo, ISTC, RMTC, MEPhI, Kurchatov Institute, and Navy.
- A BNL staff member continues as lead of the MPC&A Operations Monitoring Project. Under this activity as system was designed, construct and installed at the Moscow State Engineering Physics Institute to monitor MPC&A system upgrades at this sites in order to ensure that they continue to detect, delay, and respond to attempts to divert nuclear material.

Peer-Reviewed Publications

Approximately: 21

- Rawool-Sullivan, M. Moskowitz, P.D. and Shelenkova, L.M., "Technical and Proliferation-Related Aspects of the Dismantlement of Russian Alfa-Class Nuclear Submarines," The Nonproliferation Review/Spring 2002, pages 161-171.
- Moskowitz, P.D. et al., Technical Editor, "Russian Federation Reports on Conditions, Priorities and Response Options for Spent Nuclear Fuel and Radioactive Waste Management at Andreeva Bay," Published by the US Department of Energy, Washington, DC.
- S. Pepper, 'INMM Panel Discussion in Recognition of Twenty-Five Years of MSSP,' Journal of Nuclear Materials Management, Volume XXX, Number 2, Winter 2002.

- Hansen, DJ and DK Craig, eds., Handbook: DOE SCAPA TEELs Rev18 January 31, 2002, Brookhaven National Laboratory, January 31, 434 pp.
- Hansen, DJ, ed., "The American Industrial Hygiene Association 2002 Emergency Response Planning Guidelines and Workplace Environmental Exposure Level Guides Handbook," AIHA 2002.
- AIHA ERP Committee, "Emergency Response Planning Guideline: Carbon Disulfide (Update)," AIHA, 2002.
- AIHA ERP Committee, "Emergency Response Planning Guideline: Chlorine Dioxide," AIHA, 2002.
- AIHA ERP Committee, "Emergency Response Planning Guideline: Chlorosulfonic Acid (Update)," AIHA, 2002.
- AIHA ERP Committee, "Emergency Response Planning Guideline: Chlorotrifluoroethane (Update)," AIHA, 2002.
- AIHA ERP Committee, "Emergency Response Planning Guideline: Hydrazine," AIHA, 2002.
- AIHA ERP Committee, "Emergency Response Planning Guideline: Hydrogen Selenide," AIHA, 2002.
- AIHA ERP Committee, "Emergency Response Planning Guideline: Mercury," AIHA, 2002.
- AIHA ERP Committee, "Emergency Response Planning Guideline: n-Butyl Acetate," AIHA, 2002.
- AIHA ERP Committee, "Emergency Response Planning Guideline: 1,2 Dichloroethane," AIHA, 2002.
- AIHA ERP Committee, "Emergency Response Planning Guideline: Phosgene (Update)," AIHA, 2002.
- AIHA ERP Committee, "Emergency Response Planning Guideline: Toluene Diisocyanate," AIHA, 2002.
- AIHA ERP Committee, "Emergency Response Planning Guideline: Thionyl Chloride," AIHA, 2002. Sabelnikov, A.S., "Bioaugmenting Grease Traps: a Model Study," submitted for publication.
- Impact of the Nuclear Option on Environment and Economy', Nuclear Technology, March, 2002
- Neutronics Design and Fuel Cycle Analysis of a High Conversion BWR with Pu-Th Fuel', International Congress on Advanced Nuclear Power Plants, (ICAPP), Hollywood, Florida, June 9-13 2002
- Steam Line Break and Station Blackout transients for Proliferation Resistant Hexagonal Tight Lattice BWR ' International Congress on Advanced Nuclear Power Plants, (ICAPP), Hollywood, Florida, June 9-13 2002
- Construction of Complex Images by an adaptive Neuron-Like research System' Singapore, 2002

Significant New Hires

Two Significant Hires:

- Barbara Hoffheins, MS, BS Electrical Engineer
- Alex Sabelnikov, Ph.D, Sci.D, Biology

Proposals

Approximately: 24

- MeHg Health Risks to DOE FE – Accepted and funded by DOE FE.
- CT and Infrastructure Needs in the NY Metropolitan Region - Accepted and funded by NNSA.
- Pipeline Coating Facility – Accepted and funded by NNSA Nuclear Cities Initiative.
- Pb-Bi Alfa-Class Reactors – Under review by NNSA NN.
- Safeguards of SNF at the Andreeva Bay Site – Under review by NNSA NN.
- Multiple proposals under review by NNSA and DOE, DoD on counterterrorism (» 10).
- U.S. DOE Field Work Proposal B&R DP0909112 resulting in FY2002 \$500,000.
- Two funded NERI projects in collaboration with Purdue University
- DEPSCor Proposal," Modeling of Multiphase Flow in The agitated Mixer, with University of Wyoming
- NERI Proposals, " Risk Informed Approach to Evaluate Effectiveness of Passive Safety Systems Against External Events", with General Electric
- NERI Proposal," Development of the In-vessel Technology Basis for a Natural Circulation Boiling Water Reactor with University of Florida
- NERI Proposal," Technology Basis and Licensing Methods for Advanced Plants using Passive Safety Features", University of California and GE
- NERI," DEEP UNDERGROUND REACTOR PROTECTED FROM TERRORIST ATTACK" with University of California
- NERI," Novel Modular Natural Circulation BWR Design", with Purdue University

LDRD Initiatives

LDRD Proposals Submitted: 17

Editorial Activity and Major Book Articles

- INMM Associate Editor
- Journal of Environmental Systems Associate Editor

Technical Committees

- DOE Task Force on Energy Assurance for Deputy Secretary Frank Blake.
- Department of Energy Subcommittee on Consequence Assessment & Protective Actions (SCAPA)
- Department of Energy Hazardous Material Risk Quantification Project Team
- American Industrial Hygiene Association Emergency Response Planning Guidelines Committee, Chairman
- National Academy of Sciences/Environmental Protection Agency National Advisory Committee on Acute Exposure Guideline Levels
- Centers for Disease Control Anthrax Remediation Working Group
- AIHA Emergency Response Planning Guideline (ERPG) Committee
- EPA Federal Advisory Committee (FACA) for Acute Exposure Guideline Limits (AEGL)
- ASME Special Committee on Standard Planning
- NYC / WTC Buildings Code Task Force
- NYC Green Building Technologies

- SUSB/BNL Calverton High Technology Incubator
- INMM Technical Program Committee
- INMM Executive Committee
- INMM Government Industry Liaison Committee, a Standing INMM Committee
- Associate Technical Editor, Journal of Nuclear Materials Management
- Organized and chaired the Closing Plenary - Combating Nuclear Terrorism, 43rd INMM Annual Meeting, Orlando, FL, 23-27 June 2002.
- Technical Center program at the State Department, Member of IPP Inter-Laboratory Board, Chair of IPP Support Institute Committee.
- Health Physics Society Committee on Homeland Security
- BNL Community Advisory Council
- BNL Advocacy Panel
- Vice Chair of the ANS Technical Journal Committee
- Chair of the ANS Committee on Standards for Reactor Design

1.2 Relevance to DOE Missions and National Needs

The Department/Division Chairs were given the following tables to review for accuracy of content. All changes received were made and are shown in the following tables.

DOE Office of Science - Program Title: Nuclear Physics (KB)	
Approximate Dollar Value: \$140.7M	
Sub Program (\$K)	Mission Alignment
KB01 (\$5,100) Medium Energy Nuclear Physics	National Trust Science – Exploration of the atomic nucleus as a laboratory to determine the origin of nuclear spin and to create new kinds of nuclei where a nucleus has one or more “strange” quarks.
KB02 (\$121,000) Heavy-Ion Nuclear Physics	National Trust Science - Supports the operation of the Relativistic Heavy Ion Collider (RHIC) complex, including 4 accelerators, 4 large experiments and halls and the experimental research that is carried out. The focus is on creation of new states of matter. Also provides support for the waste management operations at the site.
KB02 (\$15,500) Landlord function	Infrastructure Support – The Nuclear Physics Office provides the “landlord” function at BNL. This category includes ongoing waste management issues, general plant projects for major modifications to site facilities and utilities and site general equipment
KB03 (\$4,400) Theoretical Nuclear Physics	National Trust Science – this area provides the nuclear theory basis and support for all of the nuclear physics programs and also the support for the National Nuclear Data Center that DOE maintains
KB04 (\$710) Low Energy Nuclear Physics	National Trust Science – Investigation of the neutrino, an elusive particle that is emitted from the sun in its process of energy generation. Its study leads not only to an understanding of the sun but also of the neutrino itself

DOE Office of Science - Program Title: High Energy Physics (KA)	
Approximate Dollar Value: \$38.3M	
Sub Program (\$K)	Mission Alignment
KA04 (\$16,500) Research and Technology	National Trust Science – High energy particle physics which includes experimental and theoretical research into the fundamental nature of matter as well as development of new accelerator techniques including superconducting magnet R&D
KA05 (\$21,800) Facility Operations	National Trust Science – about 25% of the funds are for operation of the AGS accelerator to carry out very specialized experiments and the remainder of the funds is support for construction of the Large Hadron Collider (LHC) accelerator at CERN in Switzerland and part of one LHC experiment, ATLAS. BNL’s roles are as the lead U.S. lab for the ATLAS experiment, computing and construction of accelerator magnets

DOE Office of Science - Program Title: Basic Energy Sciences (KC)	
Approximate Dollar Value: \$75.9M	
Sub Program (\$K)	Mission Alignment
KC0201-01/02/03 (\$3230) Structure and Physical Properties of Materials	New Energy Sources, Presidential Energy Plan, and National Trust Science: Studies of nanoscale structural defects with TEM and other instruments, metal-environment interactions and superconducting materials leads to advancing understanding of structural and physical properties of materials.
KC020201 (\$4516) Neutron & X-Ray Scattering	New Energy Sources, Presidential Energy Plan, and National Trust Science: The Center for Neutron Science, the Physics & Chemistry Departments plan neutron instrumentation at SNS and provide operational & technical support in their research at other facilities. X-ray scattering studies help reveal underlying physics contributing to properties of materials.
KC0202-022/03 (\$3983) Condensed Matter Physics: Theory & Experimental	New Energy Sources, Presidential Energy Plan, National Trust Science: Programs involve combination of experimental probes coupled with theory support to understand properties of highly correlated electron systems; and materials synthesis, including PLD thin film and crystal oxide growth.
KC020301 (\$1111) Materials Chemistry	New Energy Sources, Presidential Energy Plan, and National Trust Science: Program develops an understanding of electroresponsive conducting polymers and uses this information in the synthesis of improved materials.
KC0204011, KC0301045 (\$33,200) National Synchrotron Light Source	New Energy Sources, Presidential Energy Plan, Climate Change Initiative, and National Trust Science: Program is for operation and development of the NSLS, which is part of DOE's theme of "extraordinary tools for extraordinary science" and is a national asset for multidisciplinary research.
KC0204012 (\$17130) High Flux Beam Reactor Transition Project	Environmental Cleanup: Project transitioning to EM.
KC03010 (\$4615) Photochemical and Radiation Sciences	New Energy Sources, Climate Change Initiative, And Environmental Cleanup: Program explores the temporal properties of electron-transfer processes associated with chemical, solar and electrochemical energy conversion. The Laser Electron Accelerator Facility is used for this work. Porphyrin materials studies are included in this program.
KC030102 (\$2952) Chemical Physics	New Energy Sources and Presidential Energy Plan: Gas phase molecular dynamics, imaging and characterization studies, dynamic properties of catalytic materials
KC030201 (\$2184) Chemical Energy	New Energy Sources and Presidential Energy Plan: Catalysis studies of the reactivity and structure of surfaces and the growth of overlayers.
KC030202 (\$352) Separations and Analysis	Presidential Energy Plan, Climate Change Initiative, and Homeland Defense: Program supports the development of experimental tools for investigating the rates of gas phase chemical reactions and growth of aerosol particles, which have environmental impacts, related to fossil fuel combustion.
KC030204 (\$1386) Chemical Engineering Sciences	New Energy Sources and Presidential Energy Plan Program: explores the structure and function of materials and interfaces of importance related to batteries and fuel cells, as well as in electrochemical corrosion of metals and alloys.
KCO4 (\$333) Geosciences	New Energy Sources and Presidential Energy Plan: Program explores understanding of rock characterization, energy exploration and recovery.

DOE Office of Science - Program Title: Basic Energy Sciences (KC)	
Approximate Dollar Value: \$75.9M	
Sub Program (\$K)	Mission Alignment
KC06 (\$1225) Energy Biosciences	New Energy Sources, Presidential Energy Plan, and Climate Change Initiative: Program includes studies of mechanistic and molecular based photosynthesis, lipid metabolism and genetic systems leading to engineering synthesis of alternative fuels and petroleum-replacing chemicals.

DOE Office of Science - Program Title: Biological and Environmental Research (KP)	
Approximate Dollar Value: \$23.6M	
Sub-Program (\$K)	Missions Alignment
KP-11-01-01 (\$4590) NSLS Structural Biology Facility Operation and Analysis of Proteins.	National Trust Science, Environmental Cleanup, and the Climate Change Initiative. This funding supports the operation, maintenance, and continuing development of x-ray crystallography used to probe the structure of biological systems. The x-radiation from the NSLS is used for diffraction studies of crystals of macromolecules, macromolecular complexes, and viruses. Funds also support operation of the STEM and development of biophysical instruments.
KP-11-02-02 (\$550) DNA Damage Clusters in Low Level Radiation Responses of Human Cells	Environmental Cleanup and National Trust Science. This research is essential among DOE's strategic goals in Science and Technology, seeking to understand biological impacts of energy by-products, and to protect human health and the environment.
KP-11-03-01 (\$940) Genome Sequencing and Analysis	Climate Change Initiative and New Energy Sources. The research objective is to provide a basic understanding of the biomolecular building blocks of all matter and life as well as the effects of radiation and chemicals on organisms at the level of biological molecules as a means to protect human health and the environment. Genome scale tools and resources developed as part of this research are needed for developing new biological strategies for greenhouse gas control and for technology breakthroughs in fuel development.
KP-12 (\$6,061) Environmental Research	National Trust Science and Climate Change Initiative: BNL's Atmospheric Science program acquires data to understand the atmospheric processes that control the transport, transformation, and fate of energy-related chemicals and particulate matter. The emphasis is on processes and models related to new air quality standards for tropospheric ozone and particulate matter, and the relationships between air quality and climate change. Research, is being conducted, to understand and identify the sources, destinations, and impacts of carbon dioxide in our global environment.
KP-13 (\$585) Research for Environmental Restoration	National Trust Science and Climate Change Initiative: BNL's fundamental understanding of complex phenomena to reduce or prevent pollution in order to protect human health and the environment. Knowledge gained through this research provides the fundamental scientific understanding needed to make bioremediation a viable option for dealing with DOE's most challenging clean-up problems.
KP-14-01-02 (\$2810) Radiotracer Chemistry and Neuroimaging	National Trust Science. The PET Program and the radiotracer research associated with it supports the "Protect Our Living Planet" theme of the DOE's research mission. This program advances our knowledge in the areas of radioisotope research, radiotracer synthesis with short-lived isotopes, and basic neuroscience such as the interactions between chemical compounds and biological systems.

DOE Office of Science - Program Title: Biological and Environmental Research (KP)	
Approximate Dollar Value: \$23.6M	
Sub-Program (\$K)	Missions Alignment
KP-14-01-03 (\$1310) High Field Magnetic Resonance Imaging)	National Trust Science. The MRI Program and the functional magnetic resonance research associated with it supports the "Protect Our Living Planet" theme of the DOE's research mission as well as providing "extraordinary tools for extraordinary science". As part of BNL's Center for Imaging and Neurosciences, the MRI Program investigates the synergistic uses of multiple imaging modalities in studies of the human and animal brain, and other organs. As part of DOE's AMI Program, nuclear medicine imaging systems that can image animals and humans in real time without anesthesia are being developed (<i>Imaging the Awake Animal Brain</i> project)
KP-14-01-04 (\$824) Physiological Imaging	National Trust Science. This project takes advantage of the combination of imaging technologies available at BNL to investigate physiological and neurochemical mechanisms underlying addictive behaviors and aging. It provides "extraordinary tools for extraordinary science" while also being aligned to the Protect Our Living Planet theme of DOE's science mission.
KP-14-01-05 (\$2420) BNCT Research & Med. Reactor Ops.	National Trust Science: These projects focus on developing Boron Neutron Capture Therapy for the treatment of cancers.
KP-14-01-06 (\$1080) Imaging Gene Expressions and Neuroreceptor Radioligands	National Trust Science. These projects support the conduct of experiments to evaluate receptor selectivity essential for understanding the therapeutic effects of drugs and the ability to image tumors in the development stages.

DOE Office of Science: Miscellaneous Programs	
Program Title: Computation and Technology (KJ) and University and Science Education (KX)	
Approximate Dollar Value: \$2.6M	
Sub Program (\$K)	Mission Alignment
KJ02 (\$1856) Computational and Technology Research	National Trust Science and Environmental Cleanup: BNL's program supports high-risk, multidisciplinary research partnerships to investigate challenging scientific problems whose solutions have promising commercial potential..
KJ01 (\$342) Computational and Technology Research	National Trust Science: Support the emerging high-priority scientific programs with advanced computing modalities, such as accelerator science, medical imaging, material science, and aerosol transport. Funds also support the particle physics data grid.
KX (\$400) University and Science Education	National Trust Science: Supports the DOE education objectives by building the capacity of undergraduate institution in support of DOE's scientific mission, by providing educational a career pathways in math, science and engineering for a diverse population of undergraduate students and precollege institutions, and by increasing science literacy of precollge math, science and engineering teachers.

DOE - NNSA

Program Title: Non Proliferation and National Security

Approximate Dollar Value: \$31M

Sub Program (\$K)	Mission Alignment
NN-50 (\$27,800) Nonproliferation and National Security Program	<p>Nuclear Non-Proliferation and Homeland Security: BNL is playing a lead or supporting role in the following areas of the MPC&A Program:</p> <p style="padding-left: 40px;">Introduction of technologies for very precise measurements of bulk nuclear materials.</p> <p style="padding-left: 40px;">Development and implementation of comprehensive physical inventory statistical sampling plans, measurement requirements and performance procedures</p> <p style="padding-left: 40px;">Downblending of HEU to LEU.</p> <p>Support the development of regulatory documents pertaining to nuclear materials protection, control and accounting in Russian facilities.</p>
NN40 (\$1800) Nonproliferation and National Security Program	<p>Nuclear Proliferation and Homeland Security: BNL's program incorporates environmentally oriented components into nuclear, chemical, and biological safeguards, nonproliferation and weapons dismantlement programs. We also work to ensure that the knowledge and skills possessed by former Russian weapons scientists are refocused on civilian activities with non-defense environmental orientation.</p>
NN31, NN20, and NN10 (\$462) Nonproliferation and National Security Program –	<p>Nuclear Proliferation; Homeland Security: BNL perform analyses, conducts research and development, provides technical support to US programs and policymakers, and builds prototype instruments and systems (hardware and software). These activities further US interests in nuclear materials safeguards and security, verification and transparency, nonproliferation of weapons of mass destruction and nuclear security-related infrastructure protection. A BNL technical staff member serves as a "transparency monitor" under the US/Russian Federation Highly-Enriched Uranium Purchase Agreement.</p>

DOE – Conservation and Renewable Energy, Fossil Energy, Energy Information Administration

Program Title: Energy Efficiency, Fossil Fuels, National Energy Information Systems

Approximate Dollar Value: \$6.4M

Sub Program (\$K)	Mission Alignment
TA01 (\$170) National Energy Information System (NEIS)	<p>President's Energy Plan and Climate Change Initiative: MARKAL-MACRO is a technology specific, data-rich optimization model that provides least-cost energy system solutions under specified constraints to support policy and planning decisions. BNL is utilizing MARKAL-MACRO and its associated databases and methods to evaluate energy source uses on both environmental and micro/macro economic scales.</p>

DOE – Conservation and Renewable Energy, Fossil Energy, Energy Information Administration

Program Title: Energy Efficiency, Fossil Fuels, National Energy Information Systems

Approximate Dollar Value: \$6.4M

Sub Program (\$K)	Mission Alignment
EE05 and EE06 (\$2646) Transportation Sector	Energy Infrastructure, Energy Sources and President’s Energy Plan: BNL’s programs on Natural Gas Storage Systems work with US industry to demonstrate systems that will lead to significantly reduced costs for production and storage of liquefied natural gas. This includes assessing the production of Liquid Natural Gas from landfills, developing state-of-the-art storage tanks and refueling facilities, designing novel cryogenic fuel delivery systems, and developing strategies for market end-use. BNL also works on the structure and characterization of new battery materials
EC09 (\$1400) Building System Design	President’s Energy Plan and Energy Infrastructure: BNL develops more efficient and nonpolluting heating systems as well as improvements to the distribution and use of energy in buildings. Researchers are developing advanced low NO _x oil burner technologies for use in homes and commercial buildings.
EB40 (\$1040) Solar and Renewable Resource Technologies	Energy Infrastructure and President’s Energy Plan: BNL continues research on corrosion resistant materials and cements for reducing costs associated with the use of geothermal energy. Researchers are focusing on corrosion testing of NiCrMo alloys, evaluation of coatings and mortars for resistance to sulfur oxidizing bacteria, numerical modeling of remediated wells, and field testing.
EB50 (\$550): Solar and Renewable Resource Technologies	Energy Sources: BNL continues work on the development of practical conductor for Electric Power Systems.
EB22 (\$330) Solar and Renewable Resource Technologies –	Energy Infrastructure, Energy Sources and President’s Energy Plan: BNL is conducting our assessment of the health and environmental efforts of photovoltaic (PV) energy, which will play an important role in planning for increased utilization of PV as an energy source.
EH (\$100) Policy and Management for EERE	Energy Infrastructure: BNL provides assistance to DOE in area of policy and management of energy.
AC10, AA20 (\$200) Fossil Energy	Energy Infrastructure, Energy Sources and President’s Energy Plan: BNL continues to participate in the Natural Gas and Oil Technologies Partnership, which includes DOE, its National Laboratories, and the domestic petroleum industry. The partnership seeks to develop and apply new technologies, which meet the evolving industry needs.

DOE – Environmental Management

Program Title: EW

Approximate Dollar Value: \$1.5M

Sub Program (\$K)	Mission Alignment
EW40 (\$1540) Environmental and Waste Management	Environmental Cleanup: BNL continues to use its expertise to develop new or improved technologies for environmental clean up including is using an innovative tracer technology and 3D-visualization techniques to accelerate the characterization of structures, and elucidation of contaminate transport.

DOE – Office of Nuclear Energy, Science and Technology

Program Title: Isotope Production and Distribution (ST) and Nuclear Energy Research and Development (AF)

Approximate Dollar Value: \$3M

Sub Program (\$K)	Mission Alignment
ST-01-01-02 (\$2400) Radioisotope Production at BLIP	National Trust Science: The work at BNL supports the DOE’s Medical Isotope Program which provides radioactive and stable isotope products to a wide and varied domestic and international market. Ultimate applications of isotope products include medical research and health care, industrial research and manufacturing, education, and national defense. The Medical Isotope program is related to DOE’s theme of “Protecting our Living Planet”.
AF (\$600) Nuclear Energy Research and Development	Environmental Cleanup and Homeland Defense: BNL provides technical support (analysis and small scale experiments) the Advanced Accelerator Applications program whose primary focus is RD&D related to accelerator driven systems from transmutation of radioactive nuclear waste.

Work For Others - Non DOE

Approximate Dollar Value: \$44M

Sub Program (\$K)	Missions Alignment
DOD (\$600)	Environmental Cleanup and Nuclear Proliferation: BNL continues to provide programmatic support for the Artic Military Environmental Cooperation (AMEC). BNL’s involvement includes several programs dealing with radiation monitoring and containment from Russian nuclear submarines, which are awaiting dismantlement.

Work For Others - Non DOE

Approximate Dollar Value: \$44M

Sub Program (\$K)	Missions Alignment
DHHS (NIH); (\$8900)	New Energy Sources, Climate Change, and National Trust Science. Several NIH projects are directly supportive of the upgrade and further development of the beamlines at the NSLS which are used in a broad range of research in the general area of structural biology, and is supportive of DOE's research theme of "extraordinary tools for extraordinary science". These enhancements relate to beam stability and advancing molecular crystallography capabilities. Several NIH funded projects are related to DOE's "Protecting our Living Planet" research theme by supporting basic and applied research in the Imaging Sciences at BNL. This includes studies of diseases of addiction, vaccine intervention for Lyme disease, and studies of HIV progression as it relates to brain function. Radiotracer development for nuclear medicine applications is also funded through these projects
DOS (\$6,700)	Nuclear Proliferation and Homeland Defense: BNL's International Safeguards Project Office provides technical and administrative management support to the International Atomic Energy Agency (IAEA) in transferring U.S. technology for the increased effectiveness and efficiency in the implementation of IAEA safeguards.
EPA (\$1,800)	Environmental Cleanup: BNL is working with the EPA and DOE to stimulate development and commercialization of environmental treatment technologies for dredged material from the Port of New York/New Jersey that are environmentally effective and economically affordable.
NASA (\$8300)	National Trust Science. The design and construction of the Booster Applications Facility is part of DOE's theme of "extraordinary tools for extraordinary science" and is a national asset for multidisciplinary research.
NASA & NSBRI (\$1500)	National Trust Science. As part of DOE's research theme for protecting our living planet, researchers at BNL are funded by NASA and its research arm, NSBRI, to perform basic and applied research related to the effects of ionizing radiation on animals and humans. This research makes use of BNL's accelerator facilities.
NRC (\$7,400)	Energy Infrastructure, Homeland Defense and President's Energy Plan: BNL continues to provide technical support to a wide range of programmatic needs pertaining to the domestic and international nuclear power industry, including: aging, analysis, component and structural life extension, seismic engineering, human factors, and safety analysis.
Other Federal Agencies (\$1,000)	National Trust Science, Energy Infrastructure and Homeland Defense: BNL undertakes specific tasks for other federal agencies such as DOC where BNL is completing neutronic and thermal-hydraulic calculations in order to demonstrate that the NIST Research Reactor meets safety requirements for normal operations and review of airport infrastructure for FAA and clean coal technologies.
Work for Others Non-Federal (\$6,000): State, local gov't., non-profits, utilities and universities	National Trust Science, New Energy Sources, and Presidential Energy Plan, Energy Infrastructure, Homeland Defense; Environmental Cleanup; and Climate Change: Projects in diverse areas that rely on the core capabilities of the Laboratory and/or the unique facilities available at BNL. Several projects are related to our capabilities in advanced instrumentation, imaging of well and diseased brains, genetic engineering of plants, development of new battery materials, recycled waste based cement composites,, risk informed applications for nuclear power and spectroscopic imaging of multiple sclerosis.
CRADAs (\$1,800): industry	National Trust Science, New Energy Sources, Nuclear Non - Proliferation, Presidential Energy Plan: These projects range from materials development for battery technology and superconducting materials, development of radiotracer technologies, development of a non-proliferative fuel, to engineering plants as a renewable energy source. Industries involved include DuPont, Dow, Chevron, GRI and Con Edison.

Work For Others – Other DOE Labs/Field Offices	
Approximate Dollar Value: \$32.2M	
Sub-Program (\$K)	Missions Alignment
Battelle-PNL, Oakland, Idaho, Sandia (\$800)	Nuclear Proliferation and Energy Infrastructure: BNL is conducting research for the development and optimization of proliferation resistant reactor designs and provide collection of MC&A information. BNL also continues to participate in a program, which addresses various safety issues related to the operation of Russian nuclear power stations.
Battelle, ANL, ORNL, (\$2470)	Climate Change and National Trust Science: BNL continues to provide scientific support for the DOE - ARM infrastructure, including ARM Web Server, planning for ARM aircraft measurements, ocean environmental engineering, instrument development/deployment, and data interpretation. In addition to assisting in the planning of a Ecosystem Research Facility
Sandia, Rocky Flats, Nevada, Battelle-PNL, ORNL (\$480)	Environmental Cleanup: BNL work includes technical and experimental support to WIPP for the examination of the role of microorganisms in colloidal transport of actinides under relevant test conditions., support to ORNL in managing mercury wastes and the PNL in management of Double walled tanks.
Oakland Ops, Midwest Research Institute, NREL and LLNL (\$230)	Energy Sources: BNL projects include Nuclear Energy Research Initiatives, development of biodiesel fuels for space applications and Generation IV technology roadmaps.
Albuquerque Ops, Sandia, Oakland Ops, Battelle, LBNL, ORNL, LANL, SLAC, Fermi (\$1380)	National Trust Science: BNL executes specific projects that are consistent with our core capabilities in basic sciences such as accelerator and detector design, advanced instrumentation and materials. In addition, work for other DOE includes projects at our unique facilities, such as the Alternating Gradient Synchrotron Accelerator Complex.
Spallation Neutron Source (\$26,900)	National Trust Science: To aid other DOE laboratories in achieving their missions by providing unique expertise for construction of an accelerator to be moved to ORNL as an integral part of the Spallation Neutron Source.

DOE – Miscellaneous: Laboratory Support Programs and Programs in Support of DOE	
Approximate Dollar Value: \$55.4M	
Sub Program (\$K)	Mission Alignment
KG – Multipurpose Energy Laboratory Facility Support (\$6400)	Landlord Infrastructure: Maintain infrastructure of the Laboratory
SO, GD, FS, ND – Office of Security and Emergency Operations (\$9,600)	Homeland Defense: Provide site safeguards and security
EW – Environmental Management (\$37,400)	Environmental Clean-up: Remediate contamination from past practices. Provides for program management and remediation and decontamination/decommissioning activities
CN – Office of Counter-Intelligence (\$1,000)	Homeland Defense: Supports the CI activities at the site.

DOE – Miscellaneous: Laboratory Support Programs and Programs in Support of DOE

Approximate Dollar Value: \$55.4M

Sub Program (\$K)	Mission Alignment
HC-10 (\$127) Environment, Safety and Health (Non-Defense)	Energy Infrastructure and President's Energy Plan: BNL assists the DOE in evaluating the technical background needed for the development of policy and standards applicable to the design, construction, operation, maintenance and decommissioning of nuclear facilities.
WB (\$900) In House Energy Management	Energy Infrastructure: Doe provides funds to the site to implement projects for the more efficient use of energy at the site.

1.3 Success in Constructing and Operating Research Facilities

Supporting information for BSA Constructing and Operating Research Facilities performance for Fiscal Year 2002 has been organized into the following data categories.

- Budget and Schedule Performance
- Facility Performance Assessment
- Facility Availability
- User Survey Results
-

Each Department within each BSA Scientific Directorate has provided supporting performance information within the above format. The following is a compilation of that performance data.

1.3.1 High Energy and Nuclear Physics

1.3.1.1 Collider Accelerator Department

Budget and Schedule Performance

C-A performance was outstanding.

Financial performance was outstanding; all budgets were controlled and adhered to. Cost plans were on target.

Facility Performance Assessment

C-A performance was outstanding.

RHIC technical goals for FY 2002 were all either achieved or exceeded.

Performance:

- RHIC operational with gold and polarized proton beams at full collision energy, all experiments collecting data and publishing
- Peak luminosity approx. $5 \times 10^{26} \text{cm}^{-2} \text{sec}^{-1}$ (Au-Au), $2 \times 10^{30} \text{cm}^{-2} \text{sec}^{-1}$ (p-p)
- Average store luminosity approx. $1-1.5 \times 10^{26} \text{cm}^{-2} \text{sec}^{-1}$ (Au-Au), $\sim 1 \times 10^{30} \text{cm}^{-2} \text{sec}^{-1}$ (p-p)
- First acceleration of polarized protons to 100 GeV with approx. 25% polarization
- Storage times up to 12 hours
- Refill time of 45 minutes between stores
- RHIC operating with Au x Au at 40 TeV
- AGS slow beam averages 6.4×10^{13} protons/pulse with world record peak at 7.4×10^{13}
- FY 2002 protons delivered (5.7×10^{19})

Facility Availability

HEP = 87.7%

NP (RHIC) = 82.5%

1.3.1.2 Physics Department

Budget and Schedule Performance

Success in Constructing and Operating Research Facilities

Nuclear Physics (NP) Summary: A major RHIC shutdown is presently under way, preceding the third run scheduled to start in the fall of 2002. Major new capabilities have been added to the detectors, including PHENIX's second muon arm and a large piece of STAR's electromagnetic calorimeter. The RHIC Computing Facility (RCF) followed a successful data processing and analysis performance after the 2000 run with a significant increase in capability to handle the data expected in 2001. These efforts are on schedule and within budget.

- RHIC Experiments

PHENIX: The second muon spectrometer, the last major piece of the baseline detector is being installed in the current shutdown. All mechanical and electronic installation is complete; the detector is being turned on and run in.

STAR: During the present shutdown a large portion of the detector's electromagnetic calorimeter is being installed. This will increase STAR's capabilities for the next run, especially in polarized proton physics.

- LEGS: Very productive efforts to complete the TPC, especially its electronics, have started in concert with the Instrumentation Division.

High Energy Physics (HEP) Summary: The major construction efforts in HEP are the ATLAS Project and preparations for the KOPIO Project. A significant new ATF experiment is also complete and in operation.

- ATLAS Project Management - Good Lehman review. Developing Research Program, which includes Pre-Operations (commissioning and integration), Maintenance and Operations, R&D for Upgrades and Computing.

Technical Coordination – David Lissauer continues to lead both the BNL and ATLAS Technical Coordination. This is having a major constructive role for ATLAS.

Calorimeter – Major event is the complete installation of the BNL-built Signal Feedthroughs in the ATLAS barrel cryostat and successful vacuum tests of the cryostat allowing the start of installation of the Electromagnetic Modules. Also the development of a radiation-tolerant power supply has been accomplished. BNL is preparing for the system test of a crate full of Front End Boards.

Muon System Fabrication of Cathode Strip Chambers has started.

Computing – Excellent progress on the Tier I center and software. BNL is making a significant contribution to Data Challenge 1 (DC1). BNL is leading the Event Data Model for ATLAS and with the discarding of the Objectivity Database is leading the effort on the hybrid event store using open source components. BNL is leading the Liquid Argon reconstruction and data base efforts in ATLAS and is contributing to the object-

oriented muon reconstruction (MOORE). Torre Wenaus is working at CERN part time as the Applications Leader of the LHC Grid Computing Project.

- ATF - Experiment AE22, the Staged Electron Laser Accelerators phase II has been constructed and initial results obtained, including the largest acceleration in an Inverse Free-Electron Laser accelerator.

Condensed Matter Physics (CMP) Summary: CMP scientists continue to play key roles in the construction and operation of two facilities at the Advanced Photon Source, the CMC-CAT and IXS-CAT beam lines for advanced x-ray scattering studies. They also play the leading role in development of a new spectrometer for SNS called HYSPEC. Overall, our performance has been "EXCELLENT."

Facility Performance Assessment

Overall, the performance of those facilities already in operation meets or exceeds expectations. The RHIC experiments are evolving toward their baseline configurations. In their first two runs the detectors' up-time generally exceeded the 50% planning number. Following each run there has been an extensive shutdown during which major detector enhancements have been performed on schedule and within budget. The performance of the APS beam lines has been judged to be excellent.

1.3.1.4 Superconducting Magnet Division

Budget and Schedule Performance

LHC magnet program - within budget and ahead of CERN installation schedule

LHC superconducting testing - within budget and on schedule

RHIC helical magnet program - within budget and on schedule

DESY/HERA magnet program - final spare magnet delivered in support of installation schedule

Facility Performance Assessment

Performance specifications and objectives for magnet programs have been met or exceeded.

1.3.2 BasicEnergy Sciences

1.3.2.1 Chemistry Department

Budget and Schedule Performance

Measure 1-'Evaluation of infrastructure support for LEAF'. In an environment of tight operating budgets the need for machine operators was analyzed to see if program money could be saved by having one of its principal operators absorb certain tasks of the Building Manager. It was determined there was enough infrastructure support to reduce its operators by .2 FTEs. This reduction saved the program approximately 30K, and enabled other program objectives to be met.

Measure 2-'Facilitate the installation of a new Cyclotron'.

Facility Performance Assessment

Measure 1-'Evaluation of infrastructure support for LEAF'. In the future the Safety Assessment Document (SAD) will be modified to allow individuals to run the machine with an operator "on call."

1.3.2.2 National Synchrotron Light Source

Budget and Schedule Performance

During FY2002, the NSLS implemented a planning model which included a Department Strategic Plan, an Annual Operating Plan and Individual Staff Objectives that were designed to meet Department goals. As part of this planning process a new budgeting system was implemented which required individual plans for all routine operations and for proposed projects for FY2002. This process was initiated early in FY2002 with a call operating requirements and project proposals. Operating funds were allocated according to need and proposals for non-routine tasks were prioritized to meet Department goals. Funds were allocated as appropriate. Later in the year, progress was reviewed and adjustments were made where necessary.

Facility Performance Assessment

The storage rings continue to operate in a remarkable fashion. The NSLS was the first of the 'second generation' light sources and has been in continuous operation for over 20 years. There are some aspects of the machine that are becoming prone to age and exposure related failures. Capital and AIP projects related to the accelerator complex have been selected to emphasize continuing high reliability and availability on systems for which impending problems can be anticipated. It is noteworthy that some unanticipated failures have occurred, but the lost time has been kept to a minimum largely through the experience and dedication of the staff. As an example, just prior to the May 2002 shutdown, the injection shutter for the UV ring developed a significant leak in the actuator bellows. Work around solutions were developed that facilitated operations and a replacement shutter was fabricated in two weeks that was successfully installed during the shutdown. Including the discovery of the problem, troubleshooting, and field measurements to make the new shutter, the total lost operations time was only 34 hours.

Facility Availability

During FY 2002 through June 30, the NSLS has operated compared to its schedule as follows:

VUV X-ray

Scheduled Time [hr] 4322 3528

Operations [hr] 4215 3394

Unscheduled Operations [hr] 141 510

Reliability [%] 98% 96%

Availability [%] 101% 111%

User Survey Results

At the end of beam run users are asked to provide feed-back in a number of key areas such as machine performance, beam capability, and NSLS infrastructure support such as training, safety program, beam turn-on, etc. Although not utilized by every research team, the NSLS management receives considerable feedback from the User Administrative offices that collect and tabulate the responses on a monthly basis. Copies of the monthly reports are distributed to NSLS managers for their information and action as appropriate. The feedback is very positive on NSLS programs, though specific issues about particular performance areas is periodically raised that require examination by the appropriate managers.

1.3.3 Life Sciences

1.3.3.1 Biology Department

Budget and Schedule Performance

Three of our NSLS macromolecular crystallography beamline underwent significant upgrades during the NSLS winter shutdown. The upgrades to facilities were performed within budget and on schedule.

The NASA funded Booster Applications Facility, currently being constructed for the radiobiology user community, is on schedule and within budget.

Facility Performance Assessment

All the facilities have had outstanding performance by operating on schedule and within budget even during periods of major re-construction.

Facility Availability

The Scanning Transmission Electron Microscopy Facility continues to operate 40 hours/week. The Biology Department operates five beamlines at the NSLS for Macromolecular Crystallography. Operations are limited to NSLS availability. Operations are about 215 days/yr, beamline maintenance and upgrades are scheduled during NSLS shutdowns. This year three beamlines were totally rebuilt during the NSLS winter shutdown.

The NASA Radiobiology Program had one run this year consisting of 150 hours of AGS beamtime. It was used by 80 researchers conducting 27 different experiments.

User Survey Results

All macromolecular crystallography user comments have been positive (as evidenced by the End of Run reports). Advisory committee feedback is used to develop a path forward for the facilities.

1.3.3.2 Medical Department

Budget and Schedule Performance

In the Isotope Production Facility, the production expenses are on budget and billing of isotopes shipped is on schedule (within 4 days of shipment).

The construction project for NASA funded Booster Applications Facility for the Radiobiology program is on schedule and on budget.

Facility Performance Assessment

The Medical Department is responsible for and/or provided oversight to the following facilities, all of whom achieved outstanding performance as evidenced by the following:

1. BNL Clinical Research Center:

Approximately 343 human subject visits, under 42 IRB-approved protocols, were coordinated and processed by the CRC. The CRC provides core support to clinical researchers in the areas of protocol coordination and implementation, subject scheduling, administrative assistance, clinical facility housekeeping, pharmacy services, infection control monitoring and clinical record maintenance for all human subject research conducted at BNL. They also underwent a successful audit by the Office of Human Research Protection (OHRP) this spring and received a 99 out of a

possible 100 score from the Joint Commission for Accreditation of Healthcare Organization (JCAHO) during its triennial review in September, 2002. During the reporting period, investigators from the Medical and Chemistry Departments, as well as collaborators under the NASA/AGS program, utilized the CRC to carry out IRB-approved research involving human subjects.

Efforts were initiated by L. Chang during FY 2001 to pursue NIH/NCRR funding as a General Clinical Research Center (GCRC). Preliminary investigations led BNL to initiate a relationship with SUNY, SB that currently has funding for its GCRC. Efforts continued into the current fiscal year to submit a supplemental proposal to NIH so that the BNL facility could operate and be funded by NIH as a satellite of the Stony Brook Facility. These efforts will continue into FY 2002; due to NIH grant review timetables, funding is not likely to occur until FY 2003.

2. BNL Animal Facility (BLAF):

The BLAF housed a population of rodents, rabbits and baboons. The facility maintains accreditation by the Association for the Assessment and Accreditation of Laboratory Animal Care International (AAALAC) and is periodically inspected by the U.S. Department of Agriculture. The facility houses, maintains and cares for all animals used in approved animal studies at BNL. Such research includes, on average, 25 active protocols held by approximately 15 investigators including members of the Medical, Chemistry and Biology departments as well as collaborators utilizing the AGS/NASA facility and NSLS.

In June, 2002 the BLAF successfully underwent its triennial AALAC inspection.

3. Radiation Therapy Facility (RTF):

The RTF, operated under agreement with the Department of Radiation Oncology at SUNY, Stony Brook, provides radiation therapy to local cancer patients. The facility supported approximately 800 patient visits during the fiscal year, while providing a foundation for related research and collaborations between SUNY, Stony Brook and the Medical Department.

4. The NASA Radiobiology Program had one run this year consisting of 150 hours of AGS beamtime. It was used by 80 researchers conducting 27 different experiments.

5. The Isotope Production Facility had 3 process improvements on Co-55, Co-57, Ge-68 development which are all underway. The MS Project schedules were submitted and all projects to date are on schedule.

Facility Availability

All facilities managed by the Medical Department were available as planned during the year. This is evidenced by the following:

- The Clinical Research Center is utilized by all investigators involved in human subject research at BNL. There were 12 internal users from the Medical and Chemistry departments. FY 2002 BNL external users included our collaborators from SUNY SB, Albert-Einstein School of Medicine and NYU.
- The BNL Animal Facility is responsible for the housing and care of all animals used in approved IACUC protocols at BNL. Users included members of the Medical and Chemistry departments; total number of investigators was 17. External users during the past included NASA/AGS users and NSLS users from NIH.

- The Radiation Therapy Facility, located in Pavilion 4 of Building 490 is operated by Medical Department collaborators from the Department of Radiation Oncology at SUNY, Stony Brook.
- The NASA Radiobiology Program had one run this year consisting of 150 hours of AGS beamtime. It was used by 80 researchers conducting 27 different experiments. Researchers are NASA funded and from BNL, other universities as well as some from the Italian Space Agency.
- The Isotope Production Facility had 3 process improvements on Co-55, Co-57, Ge-68 development which are all underway. The MS Project schedules were submitted and all projects to date are on schedule.

1.3.4 Energy, Environment and National Security

1.3.4.1 Environmental Sciences

Budget and Schedule Performance

Environmental Sciences does not operate a DOE Facility. The FACE facility in Duke, North Carolina, is not an official DOE Facility.

1.3.4.3 Nonproliferation and National Security

Notes, Issues, Trends and Assumptions:

There are no facilities within the Nonproliferation and National Security Department.

1.3.5 SNS - Spallation Neutron Source Project

Progress on SNS

C-A performance was outstanding.

- All critical milestones have been met
- Long-lead procurements have been placed
- Staffing is up ~100 FTE's as planned
- Preparations are under way to fully obligate the ~\$29 M in FY 2002 funding

In summary, the milestones identified in the work packages that cover FY 2002 work have been fulfilled.

1.4 Effectiveness and Efficiency of Research Program Management

Supporting information for BSA Research Program Management performance for Fiscal Year 2002 has been organized into the following data categories:

- Management Goals and Processes for Fiscal Year 2003
- Number of New Associate Scientists (or Above) Hired
- Number of New Research Associates Hired
- Significant Improvements in Infrastructure and Management Systems that Support Research
- Safety Enhancements
- Steps Toward Development of Next Generation Facilities and Research Tools
- Discussion of Make up of the Facility User Community
- Steps Toward Improvement of Proposal Quality and Opportunities
- List the Number of International Collaborations
- List of Projects/Programs Involving Collaboration with Others
- Number of Users
- List of WFO Projects and Sponsors
- Staff Profile
- Visiting Scientist Profile
- Funding Profile for the Last Seven Years
- Other Awards
- Other Publications, Citations, Press Releases for this Fiscal Year
- Number of Co-Authored Papers, CRADAS, etc.

Each Department within each BSA Scientific Directorate has provided supporting performance information within the above format. The following is a compilation of that performance data.

1.4.1 High Energy and Nuclear Physics

1.4.1.1 Collider Accelerator Department (C-A)

Management Goals and Processes for Fiscal Year 2003

- Accelerator systems will continue to be improved to enhance research quality.
- Accelerator operations will continue to be aligned with DOE mission.
- Facility operations enhancements reviewed and approved by the DOE Division of Nuclear Physics
- WFO planning to continue with NASA (AGS & BAF) and with non-federal entities for a RCMS

Number of New Associate Scientists (or Above) Hired

- One Senior Scientist

Number of New Research Associates Hired

- Two Research Associates (junior scientists)

Significant Improvements in Infrastructure and Management Systems that Support Research

- RHIC: cryogenic system, facility infrastructure, power supplies etc. have been repaired and implemented. Approx. 2-3 years at present funding left to go.
- AGS: Siemens MG Set under installation after failure caused by General Electric Corporation faulty QA program
- Booster: slow extraction system under installation for BAF
- LINAC: Polarized proton ion source is operational
- BAF: Construction is on schedule

Safety Enhancements

- Consolidating and updating all of the C-A facility Safety Assessment Documents into a unified C-A SAD. Approximately 30% complete.
- Prepared and issued the Acceptance Plan for Routine Operations of the TTB with Low Mass Ions and RHIC with Deuterons, February 5, 2002
- Prepared and issued the Accelerator Safety Envelope (ASE) for the Tandem Van de Graaff and Tandem to Booster Transfer Line, December 1, 2001
- Prepared and issued the Commissioning and Acceptance Plan for the Operation of Booster Application Facility, February 15, 2002
- Prepared and issued a USI associated with the BAF SAD: Change to Critical Devices Listed in BAF SAD, April 9, 2002

Steps Toward Development of Next Generation Facilities and Research Tools

- RHIC II: Electron cooling R&D commenced with DOE support, including Bates Lab, TJNAF and BINP
- eRHIC: Conceptual design commenced
- Neutrino Source: Conceptual design commenced
- RCMS: Conceptual design was completed. Seeking non-federal funding.
- RSVP: Canadian funding obtained. Currently awaiting NSF funding

List the Number of International Collaborations

There are six International Collaborations:

- CERN (Switzerland): Collider Beam Dynamics
- KEK (Japan): High Intensity Proton Synchrotron Systems
- TRIUMF (Canada), KEK (Japan) INR (Moscow-Russia): Polarized Proton H-minus Source
- ITEP: Polarized Jet
- BINP (Novosibirsk-Russia): EBIS Ion Source Electron Gun
- BINP (Novosibirsk-Russia), AES, JINR (Dubna-Russia), TJNAF: RHIC Electron Cooling (RHIC II)

Facts and Figures for FY 2002

List of Projects/Programs Involving Collaboration with Others

Non-DOE Funded Programs That Connect To DOE:

- NASA radiobiology at AGS and BAF
- RCMS (Pennsylvania), Stony Brook, etc., Medical Synchrotron
- NSF High-Energy Physics RSVP experiments (R&D funding, construction funds pending) TRIUMF etc.

Collaborations with Other Laboratories or Universities:

- KEK (Japan) High Intensity Proton Synchrotron Systems
- TRIUMF (Canada), KEK (Japan) INR (Moscow-Russia) Polarized Proton H-minus Source
- ITEP Polarized Jet
- BINP (Novosibirsk-Russia) EBIS Ion Source Electron Gun
- BINP (Novosibirsk-Russia) AES, JINR (Dubna-Russia), TJNAF, RHIC Electron Cooling (RHIC II)
- University of Pennsylvania, Stony Brook RCMS (Rapid Cycling Medical Synchrotron)
- ORNL, ANL, LANL, LBNL, TJNAF on SNS Project
- CERN (Switzerland) Collider Beam Dynamics
- Bates (MIT) eRHIC R&D

Number of Users

- The number of users that were administered through the RHIC & AGS Users' Center:

AGS:	433
ATF:	17
RHIC:	1028
Tandem:	120
Total:	1598

List of WFO Projects and Sponsors

- Booster Application Facility: NASA
- Genetics and Epigenetic Effects: NASA

Staff Profile

Tenured	12	Professional	152
Continuing	26	Scientific	51
Term	10	Technical	247
Research Associates	3	Administrative	28
		Management	4
		Total	482

Funding Profile for the Last Seven (7) Years

2002	133,912,000
2001	127,859,000
2000	116,475,000
1999	N/A
1998	N/A
1997	N/A
1996	N/A

Number of Co-Authored Papers, CRADA's, etc.

- CRADA # BNL-C-01-03, Non-Vacuum Electron Beam Welding with Acceleron Inc.
- CRADA # BNL-C-02-07, Accelerator design of a proton therapy facility with Accel Instruments, GMBH

Co-Authored Papers:

- The majority of C-A publications have co-authors. As stated in Metric 1.1.1.1, Peered-Reviewed Publications for FY 2002, C-A has a total of 89 publications in referred journals, major reports and proceedings. The list of published documents is available from the C-A Department Chairman's Office.

1.4.1.2 Physics Department

Management Goals and Processes for Fiscal Year 2003

- Nuclear Physics Summary: Nuclear Physics management goals in the Physics Department center on maintaining and improving the research capability of the groups working at RHIC. New post-docs have been hired (especially in the STAR and RHIC Spin Groups) and scientists with critical expertise in the RHIC experiments are being recruited and promoted. The PHENIX Group is currently searching for a senior scientific hire with leadership potential. NP and HEP management is also involved in developing a small but highly leveraged effort in relativistic heavy ion collisions at CERN's Large Hadron Collider.
- High Energy Physics Summary: The HEP effort will be right-sized by department management to face the challenge of new operating budget levels. HEP management will also continue to develop new areas of research where BNL expertise can play a high impact

role in the U.S. HEP effort. These areas include very long baseline neutrino oscillations and linear colliders. The Accelerator Test Facility (ATF) is being integrated into the Physics Department. It is under HEP but will have a role in the eventual luminosity upgrade of RHIC, therefore it is also connected to ongoing NP efforts.

- Condensed Matter Physics (CMP) Summary: CMP's Effectiveness and Efficiency of Program Management is 'OUTSTANDING.' Significant steps have been taken toward rebuilding the Theory Group through the hiring of Alexei Tsvelik, a world-renowned theorist as Group Leader, and a second Associate Physicist, Fabian Essler. We are presently searching for a junior or mid-career level theorist in Electronic Structure. In addition, a number of new post docs and students have been added to the staff during the last two years.
- A collaborative effort within the Center for Neutron Science and the Neutron Scattering Group has accomplished its near-term goals of moving instrumentation from the HFBR to HFIR and NIST as well as establishing a BNL presence at HFIR associated with the US-Japan Cold Source. The latter includes the hiring of a junior level scientist who is now stationed at ORNL. In addition, a Science-Alliance has been established with NIST to set up a permanent presence of BNL at the NIST reactor, including the hiring of a junior level beam line scientist.
- The activity described here and in Section 1.1.1.2 represent significant new developments in BNL's CMP programs and are directly responsive to DOE requests.

Number of New Associate Scientists (or Above) Hired

- Eight Associate Scientists*

*Includes the transfers and movement to and from professional staff

Number of New Research Associates Hired

- Seventeen Research Associates*

*Includes transfers and movement to and from professional staff

Significant Improvements in Infrastructure and Management Systems that Support Research

- Department management undertook a comprehensive review and restructuring of administrative support within the department. The restructuring is expected to be completed within the next few months.

Safety Enhancements

- Physics has an excellent safety record and approach to the safe conduct of research. The Department continues to develop processes and documentation that finds uses within the Laboratory beyond the Physics Department.
- The expertise of safety management is currently expanding to encompass the needs of the ATF group, whose transition to Physics brings along with it aspects of accelerator operation not currently in the Physics portfolio.

Steps Toward Development of Next Generation Facilities and Research Tools

- NP: The management of the department will oversee the process of detector upgrades for the RHIC program during the coming year.
- HEP: The management of the department was involved in design and development work for the KOPIO project, as well as targets and beams for long baseline neutrino oscillation experiments.

- CMP: A Letter of Intent was submitted for the purpose of building a BNL-based spectrometer called HSYPEC at SNS.

List the Number of International Collaborations

- The Physics Department participates in international collaborations at RHIC, AGS, NSLS, etc. which, in the aggregate, has several hundred international participants.

Facts and Figures for FY 2002

List of Projects/Programs Involving Collaboration with Others:

- Almost every NP, HEP and CMP effort involves collaboration - national, international or both. They are listed in the annual Field Work Proposals to the DOE.

Number of Users

- The average number of Visiting Appointments, Guest Appointments, and Research Collaborators in Physics is about 125 in total. In addition, at any given time there are several hundred users of RHIC, AGS, NSLS and other BNL facilities who are supported through the Physics Department.

List of WFO Projects and Sponsors

- COBASE Grant (Shapiro): National Research Council
- EPSCoR (Strongin): NSF
- Dynamics of Thin Metal Films (Gibbs): Sandia
- Assist ORAU in EPSCoR Conference (Strongin): ORAU
- D-0 Run 2b Upgrade (Kotcher): FERMILAB
- Japan Coop. Prog. Neutron Scatt. (Shapiro): Univ. Tokyo
- US ATLAS Barrel Cryostat (Gordon): Univ. Rochester
- KOPIO Detector R&D (Sivertz): Yale Univ. (NSF)

Staff Profile

Tenured	41	Professional	62
Continuing	34	Scientific	161
Term	56	Technical	40
Research Associates	30	Administrative	32
		Management	2
		Total	297

Visiting Scientist Profile

- Four Total: (HEP 1, NP 2, CM 1)

Other Awards

- Awards are listed in 1.1.1.2

Other Publications, Citations, Press Releases for this Fiscal Year

- Publications are enumerated in 1.1.1.2

Number of Co-Authored Papers, CRADA's, etc.

Publications are enumerated in 1.1.1.2

1.4.1.3 Instrumentation Division

Management Goals and Processes for Fiscal Year 2003

In support of vital BNL programs:

- RHIC Detector Upgrades (silicon and TPC);
- e-cooler; e-RHIC
- High Current Photocathodes;
- Si-detectors for Polarimeters;
- Si-detectors & microscopy;
- Protein crystallography.

-

State of the art core technology:

- Fine-grained Si and gas detectors;
- Low noise microelectronics from submicron to nanoscale;
- Femtosecond, photon and particle beam generation & diagnostics;
- New small animal PETs;
- Neutron detectors for SNS;
- Solar neutrino detectors;

Nano-fabrication

- Pattern generation;
- Deposition/ablation;
- Characterization.

Significant Improvements in Infrastructure and Management Systems that Support Research

- Real Time X-ray Inspection System was purchased for quality control and process verification of our Printed Circuit Boards.

Safety Enhancements

- Installed in our Printed Circuit Fabrication Facility a third tank in accordance with Suffolk County Article 12 requirements for secondary containment.

Steps Toward Development of Next Generation Facilities and Research Tools

R&D for future facilities (LHC, FNAL, Linear Collider):

- Si-detector technology, prototype fabrication, radiation hardness (the only facility for the U.S. HEP program),
- Microelectronics, low noise, submicron-to-nanoscale;
- Neutrino detectors, new concepts;
- Vertex-tracker;
- Picosec/femtosec beam diagnostics for future accelerators

List the Number of International Collaborations

- Ten

Facts and Figures for FY 2002

List of Projects/Programs Involving Collaboration with Others

Core Competencies and Program Areas Served

- Semiconductor, Gas, Liquid Detectors:
- X-ray, gamma-ray Detectors (1D, 2D);
- High Resolution Neutron Detectors;
- Silicon (strip-,pad-, drift-) Detectors;
- Fast Noble Liquid Calorimetry;
- Gas Detectors for High Particle Rates and Multiplicities (Cathodes Pad/Strip Chambers)

- Micro-electronics:
- Monolithic and Hybrid Low Noise Amplifiers;
- Data Acquisition Electronics;
- Fast Noble Liquid Calorimetry Readout.

- Laser, Optics & Microfabrication:
- Optics Metrology;
- Laser and Optics in New Accelerator Concepts Photocathodes, Picosecond Switching;
- Electro-optics and Ultrashort Laser -pulse Techniques;
- Micro/nano Fabrication.
- HEP Activities
- Projects/Experiments

- LHC, with Physics Dept:
- ATLAS liquid argon calorimeter; signal integrity, coherent noise; ATLAS CSCs and low noise electronics for muon detectors;

- AGS:
- KOPIO, Si-drift photo diode for calorimeter;
- MECO, calorimeter readout & electronics, tracker electronics.

List of WFO Projects and Sponsors

- MPPO PNNL Post Doc
- NSBRI
- LANL SPDs
- Argonne Detector

Staff Profile

Tenured	5	Professional	10
Continuing	8	Scientific	19
Term	4	Technical	17

Research Associates	2	Administrative	4
		Management	
		Total	50

Visiting Scientist Profile

- Dr. A.T. Hrisoho, Linear Accelerator Laboratory, Orsay, France. Work associated with low noise semiconductor components for signal processing in particle detectors.
- Dr. E.C. Gatti, Polytechnic Institute of Milan, Italy. Research and development on semiconductor drift chambers.
- Dr. E.M. Verbitskaya, Ioffe Physico, Technical Institute of Russian Academy of Sciences, Russia. Research scientist doing detector characterization.

Funding Profile for the Last Seven (7) Years

2002	5,690,000
2001	5,900,000
2000	5,880,000
1999	5,709,000
1998	5,081,400
1997	5,026,000
1996	4,789,000

Number of Co-Authored Papers, CRADA's, etc.

- CRADA's: 5
- Co-Authored Papers: 19

1.4.1.4 Superconducting Magnet Division

Safety Enhancements

- Established operating budget for ES&H issues.
- Updated website to include listing of personnel authorized to perform LOTO and initiate group LOTO; and areas with high noise level.

Steps Toward Development of Next Generation Facilities and Research Tools

- Neutrino factory storage ring design and magnet R&D
- High Field NMR
- GSI rapid cycling magnet R&D
- eRHIC
- Next Generation Hadron Colliders - High field magnet R&D
- NLC - Final focus magnet R&D

List the Number of International Collaborations

Total: Five

- GSI - rapid cycling superconducting magnets
- CERN - LHC superconducting magnet magnets and superconductor testing; ATLAS detector
- DESY - HERA luminosity upgrade magnets

- IHEP - BEPC-II magnets
- NLC

Facts and Figures for FY 2002

List of Projects/Programs Involving Collaboration with Others

- GSI - rapid cycling superconducting magnets
- LANL - large aperture quadrupole magnets for AHF Project
- ORNL - testing of SNS magnets
- FNAL - LHC superconducting magnets and superconductor testing
- LBL - superconductor testing
- CERN - LHC superconducting magnets and superconductor testing; ATLAS detector
- DESY - HERA luminosity upgrade magnets
- IHEP - BEPC-II magnets
- Neutrino factory and muon collider
- eRHIC
- NLC

Staff Profile

Tenured	2	Professional	18
Continuing	9	Scientific	12
Term	0	Technical	64
Research Associates	1	Administrative	3
		Management	1
		Total	98

Funding Profile for the Last Seven (7) Years

2002	15.4M
2001	13.4M
2000	17.0M
1999	N/A
1998	N/A
1997	N/A
1996	N/A

Number of Co-Authored Papers, CRADA's, etc.

Total: Two

- Design Study of Super-Conducting Partial Snake for AGS
- Inter-strand Resistance and AC Losses in Cored Rutherford Cables

1.4.2 Basic Energy Sciences

1.4.2.1 Chemistry Department

Management Goals and Processes for Fiscal Year 2003

Chemistry involvement within BNL plan in nanoscience (aligned with the DOE nanoscience goals) involves two funded proposals:

- Nanocatalytic materials focus on the electronic structure of metal-containing nanoparticles as a basis for understanding and controlling their catalytic activity and selectivity.
- Charge transfer in molecular nanosystems focuses on obtaining a fundamental understanding of the mechanism of charge transport on the nanoscale and in nanomaterials.
- LEAF Experiments combining electron pulse and laser pulse excitation are anticipated to achieve ~ 0.1 picosecond time resolution. This will give LEAF a unique ability to combine the well-defined energetics of accelerator experiments with the high time-resolution of laser experiments. The LEAF facility also holds significant promise as a unique core instrument in support of BNL's nanoscience initiatives.
- Catalysis program will focus on reactivity and structure correlations of nanoscale materials. Success in this area will require new expertise in materials synthesis as well as the development of characterization tools that can index in situ chemical activity with the spatial resolution of proximity probes. This will position the program to compete for the proposed DOE program "National Catalysis Research Institute."
- Gas-phase Reaction Dynamics program involves collaboration between BNL and Stony Brook University to investigate the dynamics of radical reactions using novel ion imaging and intense VUV radiation from the DUV-FEL facility at BNL.
- Imaging programs are integrating Micro-PET with radiotracer R&D efforts to validate its use in quantitative PET studies. DOE has provided funding for a new cyclotron dedicated to isotope production for the PET program. The recent upgrade of the Magnetic Resonance Imaging (MRI) scanner makes it possible to perform functional and physiological measurements using ultrafast MRI scans.

Number of New Associate Scientists (or Above) Hired

- One Associate Scientist

Number of New Research Associates Hired

- Twelve new postdoctoral Research Associates

Significant Improvements in Infrastructure and Management Systems that Support Research

- Removed cooling tower from Roof of Building 555
- Roof Repaired in Building 555
- Two new air conditioners for Building 906
- Two portal monitors installed along with shelving in Building 906
- Upgrade of reheat system in Building 555
- Computer upgrades
- Access to internet upgraded

Safety Enhancements

- Electrical drops installed in hallways so custodians could access outlets and not tie-up labs or have extension cords extending throughout the halls.

Steps Toward Development of Next Generation Facilities and Research Tools

- Improved the laser system of the LEAF by installing a 30HZ YAG laser.
- Purchased Ebco Cyclotron which is presently under construction in Vancouver.
- Upgraded Magnetic Resonance Imaging (MRI) scanner.

Steps Toward Improvement of Proposal Quality and Opportunities

- Attending DOE and NAS organized National Workshop on Counterterrorism, Catalysis and Energy to position us for submission of proposals and improve ability to respond to calls from funding agencies. Four scientists attended three workshops.

List the Number of International Collaborations

- Twelve

Facts and Figures for FY 2002

List of Projects/Programs Involving Collaboration with Others

- Solar Neutrino Research
- Thermal, Photo- and Radiation-Induced Reactions in Condensed Media
- Gas-Phase Molecular Dynamics
- Photoinduced Molecular Dynamics in the Gas and Condensed Phases
- Catalysis: Reactivity and Structure
- Radiotracer Chemistry and Neuroimaging
- High-Field Magnetic Resonance Imaging
- Positron Emitter Labeled L-Boronophenylalanine for BNCT
- Injection of Electrons and Holes into Nanostructures
- Catalysis on the Nanoscale: Preparation, Characterization and Reactivity of Metal-Based Nanostructures
- Universal/Imaging Studies of Chemical Dynamics
- PHOBOS Research
- PHOBOS Operations

List of WFO Projects and Sponsors

- Molecular Logic Gates, P.I. John Miller
- PET Studies in Cocaine Abusers, P. I. Nora Volkow
- Radiotracer R&D in Nuclear Medicine and Neuroscience, P.I. J. Fowler
- Brain Metabolism in Alcoholics with and without Challenge, P.I. N. Volkow
- Pharmacokinetics of Physcostimulants and Reinforcement, P.I. N. Volkow
- Nondiamagnetic Agents in In Vivo ^{23}Na and $^1\text{H}_2\text{O}$ MR, P.I. C. Springer
- 4 Tesla MRI Bolus CR Studies of Human BBB Permeability, P.I. C. Springer
- Optimizing Intensity and Duration of GVG Pharmacotherapy, P.I. S. Dewey
- PET Investigations of Abused Inhalants, P.I. M. Gerasimov
- Catalytic Mechanism of Human Mn Superoxide Dismutase, P.I., D. Cabelli

Staff Profile

Tenured	17	Professional	7
Continuing	10	Scientific	63
Term	10	Technical	8
Research Associates	26	Administrative	5
Post Docs		Management	
		Total	83

Visiting Scientist Profile

- One hundred forty-two total collaborators.
- Twelve scientists collaborating from National Laboratories.
- Remaining guests from academia or BNL retirees.

Funding Profile for the Last Seven (7) Years:

2002	16271
2001	17362
2000	15240
1999	15225
1998	14612
1997	13610
1996	14171

Other Publications, Citations, Press Releases for this Fiscal Year

- N/A (Department does not keep track of this information) Public Affairs has information pertaining to our community outreach.

Number of Co-Authored Papers, CRADA's etc.

- Ninety-three peer reviewed papers.

1.4.2.2 National Synchrotron Light Source

Management Goals and Processes for Fiscal Year 2003

- Provide highest priority to establishing a major upgrade to the NSLS facility to provide increased photon brightness and beam line capability.
- Provide high priority to the allocation of resources to upgrade existing beam lines.
- Maintain the injector systems and storage rings in a manner to ensure continued high reliability.
- Improve beam line productivity and management; and eliminate non-productive beam lines, which do not have upgrade possibilities

- Stimulate increased interest and awareness of NSLS accelerator and beam line research and provide high priority to improving communication with NSLS stakeholders regarding NSLS accomplishments

Number of New Associate Scientists (or Above) Hired

- One Associate Scientist

Number of New Research Associates Hired

- Five Research Associates

Significant Improvements in Infrastructure and Management Systems that Support Research

- A major reorganization to better align department resources and to encourage improved planning of department priorities and commitments was completed.
- The budget process was revised to permit better definition and prioritization of department needs. Each operating organization was asked to examine their FY 2001 operating budget and to justify their FY 2002 budget requests in writing.
- A new process was developed for the submission, review and approval process for NSLS projects utilizing operating, capital and AIP funds.
- Significant progress in communicating with users and external stakeholders was achieved through the establishment of the Information & Outreach Program.

Safety Enhancements

- NSLS safety record was very positive in FY 2002 and continues trends of recent years. Highlights are as follows:
- Only one recordable injury has been experienced and NSLS injury rates continue significantly lower than the BNL average.
- Radiation exposures to NSLS staff and users continue at very low levels. Total collective whole body dose equivalent has been averaging about 50 mrem per year for several years.
- Environmental issues have a very positive trend. No reportable spills have occurred in several years, compliance with environmental regulations is very high, and hazardous waste generation rates continue to decline. The NSLS was audited this year for ISO 14001 compliance and was found to be in good shape.
- Three occurrences were experienced in the first half of calendar year involving our users that required considerable investment of time to review and address. These incidents were a strong reminder that the biggest challenge facing our facility involves our highly transient user population who come from all types of institutions, many of whom do not have the same safety culture and expectations that are present at BNL.

Steps Toward Development of Next Generation Facilities and Research Tools

- NSLS has vigorously pursued several aspects of long-range facility development with an eye toward the next generation of facilities and research. In experimental capabilities, NSLS has expanded its research program with special emphasis on tools to support soft condensed matter and nanoscience research. These include coherent imaging techniques (photon correlation spectroscopy or 'speckle'), microprobes methods, magnetic scattering, and a

nascent ultrafast program based in part on the existing Source Development Laboratory (SDL) capabilities. These investments have been made to provide expertise within the staff that will help provide the next generation of experimental tools, as well as integrating with the thrust areas of the BNL Nanoscience Facility.

- In a parallel effort the NSLS has a research program in accelerator based source development. The SDL continued supporting high brightness electron beam based research including collaborations with the SLAC Linac Coherent Light Source, and the DESY TTF-FEL that is expected to be a key component of next generation sources. The SDL achieved a major milestone in the first phase of the Deep Ultra-Violet Free Electron Laser (DUV-FEL) this year with its first lasing in Self Amplified Spontaneous Emission mode. Work for supporting laser seeded operation is well underway with initial direct seeding anticipated by the end of fiscal 2002.
- Armed with knowledge from our existing facility operation and our research program in source and science technology, the NSLS examined a number of facility upgrade pathways through the fiscal year. These ranged from in-place upgrade of the existing x-ray ring to a new purpose built machine with capabilities not currently available in any synchrotron facility. A thorough examination of the in-place options and hybrids that would introduce new technology to the existing storage ring revealed unacceptable compromises in potential machine performance and/or research program interruption. Therefore work is shifting to full time consideration of options that provide an ultra low emittance storage ring based source that would provide more high performance insertion devices than can be supported by the existing NSLS x-ray ring. In addition, a possible upgrade to an energy recovery system that would provide for single pass operation of the machine is being developed. This approach opens up the possibility of significant enhancements in photon beam brightness for user experiments through reduced overall electron beam emittance and symmetric beam size (round beams) that are a substantial benefit to some imaging methods. In addition, the single pass configuration can in principle support extremely short pulses that would constitute a completely new tool at higher photon energies (x-rays as contrasted to visible light) for the growing ultrafast science community.

Discussion of Make up of the Facility User Community

- The NSLS user community continues to be one of the largest user populations in the world. In the last few years, greater than 2500 users per year participate in the research programs conducted on the experimental floors. More than half of our users come from the Northeastern states indicating the importance of the NSLS to the region. However, 25% come from other parts of the US and 16% come from foreign indicating the importance of the facility at the national and international level.
- A wide variety of research is also conducted at the NSLS with more than 6 major fields of research involved. The greatest numbers of users are in the life and material sciences, with very significant numbers from chemical, geology and environmental sciences. The publication rate from NSLS research exceeds 800 per year, with nearly 150 per year in premier journals.

Steps Toward Improvement of Proposal Quality and Opportunities

- This year we initiated a major outreach program to increase the awareness of external stakeholders of NSLS capabilities with the objective of providing new opportunities for use of the facility. A new information and outreach section was created to provide users and potential users up-to-date technical information about beamlines and end stations, to hold regular short courses to train inexperienced users of specific experimental techniques, and to sponsor scientific workshops to explore new opportunities and encourage new collaborations.

List the Number of International Collaborations

- Five International Collaborations

Facts and Figures for FY 2002

List of Projects/Programs Involving Collaboration with Others:

- “High Brightness Electron Beams” in collaboration with Wasadec University, Tokyo
- “High Brightness Electron Beams” in collaboration with IHEP, Beijing,
- “Small Gap Super Conducting Insertion Devices” in collaboration with Anka Light Source, Karlsruhe
- “High Brightness Electron Beams for FEL Applications” in collaboration with DESY and SLAC
- “High Gain Harmonic Generation in FELs” in collaboration with Sincrotron Trieste
- Hard X-ray Micro fabrication Applications Research is being undertaken in collaboration with Sandia Livermore and Honeywell Federal Manufacturing & Technologies.

Number of Users

- The total number of users for FY 2002 will not be available until Oct. 2002. The total number in FY 2001 was 2523.

List of WFO Projects and Sponsors

- “Design, construction and operation of a new beam line at X-6a” NIH - \$5M over several years
- “Short Wavelength High Gain Harmonic Generation Free Electron Laser” Air Force Office of Scientific Research Medical FEL Research Program (\$200 K FY 02).
- “Laser Seeded FEL and HGHG Experiments” Office of Naval Research (\$200K – FY2002)

Staff Profile

Tenured	11	Professional	36
Continuing	6	Scientific	35
Term	12	Technical	73
Research Associates	6	Administrative	18
		Management	4
		Total	166

Visiting Scientist Profile

- Students: 8
- Postdocs: 2
- Scientists: 17

Funding Profile for the Last Seven (7) Years

2002	34,301,000
2001	34,725,000
2000	32,111,000
1999	32,176,000
1998	30,996,000
1997	27,670,000
1996	31,203,000

Other Awards

- Mentor recognition for FY01 mentoring of PST student; in FY02, mentor to two PST students evaluating X-ray and VUV magnet position data.

Other Publications, Citations, Press Releases for this Fiscal Year

Users: Three Dissertations

Staff: One Book,

Eight Press Releases:

- July 25, 2002: Nanoscale Crystallography Reveals Hidden Structural Details
Thomas Vogt, BNL; Valeri Petkov, et al., Michigan State University
<http://www.bnl.gov/bnlweb/pubaf/pr/2002/bnlpr072502.htm>
- July 18, 2002: Scientists Create New Material With Varying Densities of Gold Nanoparticles
Rajendra Bhat and Jan Genzer, North Carolina State University (NCSU); Daniel Fischer, National Institute of Standards and Technology (NIST)
<http://www.bnl.gov/bnlweb/pubaf/pr/2002/bnlpr071802.htm>
- June 27, 2002: Scientist Wins Award for High-Pressure Research
Yongjae Lee, Physics Dept, BNL
<http://www.bnl.gov/bnlweb/pubaf/pr/2002/bnlpr062702.htm>
- June 17, 2002: New Insight Into Origin of Superconductivity in Magnesium Diboride Daniel Fischer, Yimei Zhu, Genda Gu, Arnold Moodenbaugh, Johan Taftø, Tom Vogt and James Davenport, Guenter Schneider and Qiang Li (Brookhaven National Laboratory, National Institute of Standards and Technology (NIST), and the University of Oslo in Norway)
<http://www.bnl.gov/bnlweb/pubaf/pr/2002/bnlpr061702.htm>
- June 5, 2002: Conducting-Insulating Materials Reveal Their Secrets, Tonica Valla, Peter Johnson (Physics Dept, BNL)
<http://www.bnl.gov/bnlweb/pubaf/pr/2002/bnlpr060502.htm>
- December 19, 2001: Scientists Identify Molecular Structure of Cancer-Related Proteins
<http://www.bnl.gov/bnlweb/pubaf/pr/2001/bnlpr121901.htm>
- December 13, 2001: Scientists Discover New Material That Expands Under Pressure
<http://www.bnl.gov/bnlweb/pubaf/pr/2001/bnlpr121301.htm>
- December 4, 2001: Enzyme Studies at Brookhaven Lab May Lead to New Antiviral Agents
<http://www.bnl.gov/bnlweb/pubaf/pr/2001/bnlpr120401.htm>

Number of Co-Authored Papers, CRADA's etc.

- Users: Two hundred sixty four journal articles, of which seventy eight are premier
- NSLS Staff: Six journal articles, of which one is premier

Please note that this is not a complete list at this time.

1.4.2.3 Materials Sciences Department

Management Goals and Processes for Fiscal Year 2003

- The main goals for the Materials Science Department (MSD) are concerned with implementing new management and operating procedures for the new department.
- An active search is underway for a permanent chair and new plans and procedures for operations and administration (business and personnel) are being constructed and will be implemented in FY 2003.
- A departmental strategic Planning Committee is in place and is producing a strategic plan and proposed new initiatives for the department.
- Discussions are in progress with the Technology Transfer Office (M. Bogosian, et al) concerning more efficient and effective approaches to obtaining WFO funding from DARPA, NASA, etc. Discussions between the Interim Chair of MSD and the Chair of the Biology Department to initiate the planning of new initiatives in Biomaterials research.
- MSD staff are playing vital roles in planning and implementing research thrusts and instrumental clusters in the new BNL Center for Nanoscale Functional Materials.

Number of New Associate Scientists (or Above) Hired

- None

Number of New Research Associates Hired

- Four, these are:
- K. Sasaki (McBreen/Adzic group)
- M. Beleggia (Zhu group)
- Y. Mo (McBreen/Adzic group)
- R. Klie (Goldhaber fellow, Zhu group)

Significant Improvements in Infrastructure and Management Systems that Support Research

- The essential committees and Memoranda of Understanding (MOU's) with other Departments (Chemistry) and directorates (EENS) necessary for the operations of the new Materials Science Department are in place and are functional.
- Improvements and revisions of the Departmental operational procedures, based on the first year of operations, are in progress.
- Research plans have been implemented for interdepartmental (BES directorate) collaborations under the aegis of the Materials Center

Safety Enhancements

- Considerable progress was made in the disposal of legacy waste. Improved housekeeping procedures for the Materials Science Building (480) have been implemented.

Steps Toward Development of Next Generation Facilities and Research Tools

- A new world-class, state-of-the-art high-energy-resolution monochromator for transmission electron microscopy has been ordered. This instrument will greatly enhance chemical mapping and detection energy spectroscopy in nanoscale systems

Steps Toward Improvement of Proposal Quality and Opportunities

- The MSD Strategic Planning Committee was created to consider new initiatives and to recommend departmental procedures for 'quality control' on LDRD proposals.

List the Number of International Collaborations

There are a total of 11 for the Materials Science Department. They are as follows:

- Two international collaborations are in place and a third has been planned in the area of transmission electron microscopy and electron-beam methods for the synthesis of nanoscale materials. These involve Y. Zhu et al (BNL) with:
J. Taftø, et al, University of Oslo (Norway)
R. Egerton, M. Malac, et al, University of Alberta (Canada)
G. Van Tandeloo, et al, University of Antwerp (Belgium) [planned].
- M. Suenaga (MSD) is a participant in the 'U.S. - Japan Collaborative R & D Program on AC Electrical Power Applications of High-Temperature Superconductors: AC Loss Measurements and Analysis and Conductors Development' (NSF funded).
- L.H. Lewis is a participant in the NSF Division of International Programs Sponsored Research Program, 'Structure-Property Relations in High Coercivity Bulk Amorphous Alloys' with Hanoi National University, Vietnam National Center for Science and Technology, and the International Training Center for Materials Science, Hanoi Institute of Technology.
- J. Fajer, et al, involved in collaborations on porphyrin research with these international groups:
Prof.D.Mansuy, Universite' Paris V, (Paris, France): Biomimetic cytochrome P450 catalysts; self-assembled macromolecular assemblies for light harvesting.
Prof.A.Giraudeau and Dr.J.P.Gisselbrecht, Universite' Louis Pasteur, (Strasbourg, France): synthesis and electrochemistry of novel porphyrins for catalysis.
- Dr.C.Kay, Free University of Berlin, (Berlin, Germany): magnetic resonance and theoretical calculations of excited states and radicals of photosensitizers for photodynamic therapy and artificial photosynthesis
- Hugh Isaacs is involved in three international collaborations on corrosion research:
Study of atmospheric corrosion of metals in marine environments using the NSLS, Aaron K. Neufeld, CSIRO - Sustainable Materials Engineering (Australia).
Study of the corrosion of steel in concrete and the action of corrosion inhibitors, Mary P. Ryan, Department of Materials, Imperial College of Science, Technology and Medicine. (London, UK)
Development of current and impedance techniques for the study of corrosion, Dominique Thierry, Swedish Corrosion Inst, (Stockholm, Sweden)

Facts and Figures for FY 2002

Staff Profile:

Tenured	6	Professional	6
Continuing	8	Scientific	28
Term	6	Technical	3
Research Associates	8	Administrative	1
		Management	0
		Total	38

Visiting Scientist Profile:

- There have been three scientists visiting in the Materials Science Department during FY2002 for periods of 1 month or longer:
 - Prof. Johan Tafto, University of Oslo
 - Prof. Ray Egerton, University of Alberta
 - Prof. Marc deGraef, Carnegie Mellon University

Funding Profile for the Last Seven (7) Years

2002	FY 02 \$7.4M – note2
2001	NA – see note1
2000	NA – see note1
1999	NA – see note1
1998	NA – see note1
1997	NA – see note1
1996	NA – see note1

Notes, Issues, Trends and Assumptions

Note 1: This is the first year of Departmental status for Materials Science.

Note 2: FY2002 total funding: \$7.4M

This is made up of the following components:

- Office of Science, BES/DMS: \$4070K
- Office of Science, BES/DCS: \$1410K
- Office of Energy Efficiency and Renewable Energy: \$1040K
- LDRD: \$440K
- CRADA: \$220K
- Other: \$220K

1.4.3 Life Sciences

Accomplishments - Summary

- A major focus of Life Sciences research program management this past year was to improve our alignment with the DOE and NIH missions, particularly the role that DOE/OBER expects to have in 'Bringing Genomes to Life', and the expanding role of NIH in imaging (a new institute was formed) and addiction research. This focus moved us to hire several key scientific staff to establish the capabilities that are consistent with BNL's existing facilities and expertise. Specifically, strategic hires were made to lead the animal MRI facility, the CryoEM facility, and the research associated with complex microbial communities (Genomes to Life). Additionally, 12 research associates were hired to support the Directorate's initiatives.
- Regulatory reviews of the Clinical Research Center and the Animal Facility were successfully completed. These facilities and their associated staff continue to support laboratory wide initiatives in pre-clinical and clinical research.
- Research was conducted safely and, with several minor exceptions, in a regulatory compliant manner. Where opportunities for improvement exist, measures have been taken to solicit input from external groups to achieve the desired outcome. This is particularly evident in the radiological controls area where the Independent Oversight and Quality Offices have assisted us in evaluating where improvements can be made and in analyzing the effectiveness of actions that have been taken.
- Research has been effectively managed to meet the goals of BNL's Environment Management system. Scientists in Life Sciences identified a significant number of pollution prevention projects, several of which were funded by the Laboratory because of their payback.

Notes, Issues, Trends and Assumptions

- The Business Management aspect of the Life Sciences Directorate went through a significant transition this past year. Administrative support needs and resources continue to be evaluated to identify ways to conduct our activities more effectively.
- Infrastructure improvements that are supported by Laboratory funds need to continue in order for initiatives like the animal MRI facility and the cryoEM capability to be successful. Upgrades of aging research laboratories and building support systems are also part of the need for continued investment in infrastructure improvements.

1.4.3.1 Biology Department

Management Goals and Processes for Fiscal Year 2003

- The Center for Complex and Membrane Protein Structure will continue to be a large initiative for the Biology Department.
- In FY03, the Department's efforts will focus on the recruitment of a Bioinformaticist. The Bioinformaticist will complement the current components of the Center which, in addition to the already existing protein expression, protein complex, and protein engineering programs, include a new Membrane Protein Crystallographer, two new Soil Molecular Microbiologists, and a cryoElectron Microscopist, who will start in early FY03.

- The Biology Department will propose a partnership in the BNL nanotechnology initiative in an effort to add a biological component to the initiative and to connect it with the Center for Complex and Membrane Protein Structure.
- To promote the new cryoElectron Microscope and microscopist, the Biology Department will organize a cryoEM workshop with presentations by several prominent cryoEM scientists as well as local (BNL, SUSB, CSHL) microscopists and structural biologists to present uses for the technique to internal and external scientists as well as DOE and NIH program managers.
- The Biology Department will collaborate with SUNY Stony Brook in the development of a graduate degree program in Bioinformatics, which will be run similarly to the already existing SUNYSB-BNL graduate programs in Molecular Biology, Genetics, and Pharmacology.
- In collaboration with the Medical and Chemistry Departments, the Biology Department will begin development of an Imaging Program in Cancer. Initial efforts will be directed toward imaging gene expression and function as well as tumor development in transgenic mouse models. This effort also will connect with the new NIH Cancer Institute at SUNY-SB.
- In collaboration with the Medical Department, we will participate in the development of a Space Medicine Program which will concentration on understanding and developing countermeasures for radiation effects as well as understanding behavioral changes through brain imaging.
- The Biology Department will continue to develop a seminar and visitor exchange program with other National Laboratories to promote scientific collaborations.
- The Biology Department will continue to develop graduate program opportunities for students at BNL by providing limited support for graduate students at SUNY-SB and other institutions and by participating in or hosting graduate program retreats.

Number of New Associate Scientists (or Above) Hired

- During this reporting period the Biology Department successfully recruited and hired a Membrane Protein Crystallographer and two soil microbiologists. A new cryoElectron Microscopist recently accepted an offer of employment. He will start in early FY03. These scientists will enhance the Laboratory's research portfolio and, coupled with the staff we already had, put us in better alignment with DOE missions for not only the Genomes to Life Initiative but for bioremediation and counterbioterrorism research.
- In addition, a new crystallographer was hired to manage the operation of one of our NSLS crystallography beamlines (X26C).

Number of New Research Associates Hired

- Five Research Associates were hired. A Goldhaber fellowship was just awarded to a research associate who has started work in John Shanklin's lab.

Significant Improvements in Infrastructure and Management Systems that Support Research

- Many of the laboratory facilities being used by the Center for Complex and Membrane Protein Structure have either been renovated or are in the process of being renovated. A new

laboratory and supporting areas have been completely renovated for the new membrane crystallographer (completed 5/02).

- Space for the two soil microbiologists is currently in the process of being renovated.
- The room for the CryoElectron Microscope has been modified to meet the needs of the instrument and plans have been drafted for the renovation of supporting wet lab and image processing space for the instrument.
- Pollution Prevention funding was obtained to purchase a digital imaging system for the Department. This will improve the quality of the research data being collected and will reduce the amount of photographic waste generated.
- DOE capital funds were used to purchase other shared equipment such as a phosorimager, high-end digital imager and ultracentrifuge.

Safety Enhancements

- BNL has management systems in place. We are now in the process of refining them to make them work more effectively and efficiently. This is done through participation on advisory teams and subject area development (and re-development) teams (Work Planning and Control, Biological Safety, CMS advisory group). Those refinements done at the lab-level have given us more flexibility at the Department level so that we can improve our programs.
- Significantly upgraded our Controlled Environment Radiation Facility (both by the physical state and the documentation) to make it compliant with the new Radiation Generating Device regulations. This was done through a team effort, lead in large part by our Facility Support Rep. and Facility Manager. Funding for the upgrade was supplied by the Biology Department.
- In process of developing a biosafety in research subject area. The Biology Department is critical in this effort as we manage the Institutional Biosafety Committee and work with the majority of the etiologic agents on the site. We have already enhanced the membership on the BNL Institutional Biosafety Committee to include members of affected laboratory organizations such as Occupational Medicine, Emergency Response, Security as well as a member from DOE-BAO.

Steps Toward Development of Next Generation Facilities and Research Tools

- Recently secured OBER funding to build a new x-ray crystallography beamline at the NSLS. This beamline, X29, will produce an x-ray beam that is five times as bright as our wiggler beamline, X25, and 75 times as bright as our bending magnet line, X12C. X29 will be the brightest x-ray source east of the Advanced Photon Source in Chicago.
- A cryoElectron Microscope, supported by OBER, will arrive soon as a component of the Center for Structure of Complex Membrane Proteins for the analysis of two-dimensional arrays of membrane proteins, isolated complex particles, and frozen tissue sections. This will complement the Scanning Transmission Electron Microscopy Facility. This microscope will facilitate the analysis of protein complexes such as heavy metal antiporters, and other molecular machines of relevance to the DOE bioremediation effort.

- The NASA funded Booster Applications Facility is still under construction and is on schedule and within budget.

Discussion of Make up of the Facility User Community

- The user facility community for all our facilities is made up of universities, government facilities, and a private industry both from the US and abroad.
- The Scanning Transmission Electron Microscopy Facility: 75 Investigators from 47 different institutions; 5 from other DOE facilities, 42 from universities.
- NSLS Macromolecular Crystallography Users: 114 Groups came consisting of 5 private Industry, 4 from other DOE facilities, 105 from universities. 7 of the 114 were from foreign institutions.

Steps Toward Improvement of Proposal Quality and Opportunities

Several steps have been made, both at the Directorate and Department levels, toward improvement of proposal quality and opportunities:

- Key Biology Department scientific staffs have been involved in workshops to formulate DOE's call for proposals in key areas such as the Imaging component of the Genomes to Life Initiative.
- For our larger proposals (Genomes to Life, Carbon Sequestration) the Directorate has provided critical resources to put together a quality proposal. These include: Graphic Designers, Project Managers, Printing Services, as well as a coordinator at the Directorate level.
- Lobbying in congress by BSA and others (such as the recent visit to Congress by members of the Center for Molecular Toxicology) has helped our stature on proposals we submit.

List the Number of International Collaborations

The Biology Department has many international collaborators.

- One of our main initiatives, The Genomes to Life program, involves collaboration with Limburgs Universitair Centrum in Belgium as well as other US institutions.
- We organized a p53 Workshop in Rome, Italy, which lead to an application to NIH for development of mouse models for cancer research by an international team of senior scientists.
- One of our NASA-funded Radiobiology experiments involving the use of fish as a model system to study heavy ion effects is a collaborative effort with a group from University of Tokyo, Japan.
- A researcher from the Hungarian Academy of Sciences Biological Research Center in Szeged, Hungary came to BNL to collaborate on a project to study thylakoid lipids.
- A collaboration with a group from Nagoya City University School of Medicine in Japan is about to yield a publication in EMBO Journal on defective p53 mediated transcription and increased resistance to ionizing radiation in Chk2-deficient mice.

Facts and Figures for FY 2002

List of Projects/Programs Involving Collaboration with Others

The Biology Department has several large collaborations with others:

- Brookhaven is a member of the National Space Biomedical Research Institute. As a result of this membership, BNL is represented on the NSBRI Board of Directors.
- The Biology Department also partners with SUNYSB on the National Institute of Environmental Health Sciences (NIEHS) funded Center For Molecular Toxicology. 36 Faculty from SUNYSB and BNL participate in this broad effort to understand the molecular and cellular mechanisms whereby toxic agents impact human health and the environment.
- BNL Life Sciences partners with the State University of New York at Stony Brook (SUNYSB) to run several graduate programs including: Genetics, Biochemistry and Structural Biology, Molecular Microbiology, Biomedical Engineering, and Neuroscience.
- The Biology Department is a member of the New York Structural Genomics Research Consortium (NYSGRC), which is supported by the Protein Structure Initiative of the National Institute of General Medical Sciences (NIGMS) to be a Pilot Structural Genomics Center. Procedures are being developed for high-throughput x-ray crystallography of proteins.

Number of Users

- Scanning Transmission Electron Microscopy Facility: 75
- Macromolecular Crystallography Facilities: 235
- NASA Radiobiology Program: 80

List of WFO Projects and Sponsors

- DOD, Differential Expression of DNA Double-Strand Break Repair Proteins in Breast Cells, ANDERSON
- DOD, Structural Studies of Intact Clostridium Botulinum and Neurotoxins Complexed with Inhibitors Leading to Drug Design, SWAMINATHAN
- NASA, Germ Cell Mutagenesis in Medaka Fish Following Exposure to Heavy, High Energy Cosmic Ray Nuclei, SETLOW
- NASA, Genetic and Epigenetic Effects Produced by High Energy Heavy Ions, B. SUTHERLAND
- NIH, Genetic Variation in Human NHEJ DNA Repair Genes, ANDERSON
- NIH, Vaccine Intervention for Lyme Borreliosis, DUNN
- NIH, Clp: An Archetypal ATP-Dependent Protease, FLANAGAN
- NIH, Adenovirus-Receptor Interaction: Structure, Function and Retargeting, FREIMUTH
- NIH, The Structural Basis of Selective Permeability in Aquaporins, FU
- NIH, Adenovirus Protease Reg & Antiviral Dev, MANGEL
- NIH, DNA Damage Clusters: Repair in Mammalian Cells, B. SUTHERLAND
- NIH, DNA Damage Quantitation by Single Molecule Laser Sizing, J. SUTHERLAND
- NIH, Macromolecular Crystallography at the NSLS, SWEET
- NIH, STEM Mass Mapping and Heavy Atom Labeling of Bimolecules, WALL
- NSBRI, Effects of Deep Space Radiation on Human Hematopoietic Stem Cells / Effects of Long-Duration Space Flight upon Stem/Progenitor Cell Biology and Function, B. SUTHERLAND

Staff Profile

Tenured	14	Professional	27
Continuing	5	Scientific	43
Term	13	Technical	7
Research Associates	11	Administrative	13
		Management	0
		Total	90

Visiting Scientist Profile

The Biology Department has had many visiting scientists over the past year. They have come from the Department of Defense, other DOE facilities, universities and many foreign institutions.

Funding Profile for the Last Seven (7) Years

2002	17.9 Million
2001	15.25 Million
2000	15.76 Million
1999	16.00 Million
1998	16.52 Million
1997	15.53 Million
1996	15.0 Million

Other Awards

- BNL Spotlight Awards - FY 2001: Thomas Langdon, Richard Sautkulis, Edward Whittle
- Perfect Attendance Award - CY 2001: Phyllis Tinsley-Smith

Other Publications, Citations, Press Releases for this Fiscal Year

- Special Issue of Environmental and Molecular Mutagenesis (Journal of the Environmental Mutagen Society), Vol. 38, No. 2/3, pp. 87-260 (2001) published "A Richard B. Setlow Festschrift" (volume of writings by different authors presented as a tribute to a scholar). This festschrift was dedicated to the "Father of DNA Repair," Richard B. Setlow, in the year of his 80th birthday. They include contributions from many of his former students and colleagues who welcome the opportunity to say "Thank you, Dick!" The website where the table of contents and abstracts for the issue are located is <http://www3.interscience.wiley.com/cgi-bin/issuetoc?ID=86511335>
- A collaboration between our Proteomics group and SUNY SB lead to a cover of the Journal of Biological Chemistry, Vol. 277(22), May 31, 2002. The cover shows a DNA repair enzyme "caught in the act." A Schiff base intermediate of Escherichia coli formamidopyrimidine-DNA glycosylases (Fpg), an enzyme responsible for excising oxidatively damaged purines from DNA, has been chemically reduced, and the resulting trapped complex was structurally determined. The structure, shown here with a modeled

everted 8-oxoG base, reveals for the first time the mode of Fpg interactions with damaged DNA. For details see the article by Gilboa et al., pages 19811-19816.

- An international collaboration led to a cover of *Environmental Science & Technology*, Vol. 35(21), November 1, 2001. The redroot pigweed plant (*Amaranthus retroflexus*), shown in artist Loel Barr's cover illustration, has until now been mainly known as a highly toxic, nuisance plant commonly found in pastures. Plant ingestion by cattle, swine, sheep and goats can cause breathing problems, trembling, weakness, abortions, coma, and ultimately death. The leaves, stems, and roots of the plant are all dangerous to these and other animals. Why then, you might ask, would anyone want to cultivate such a plant? In their assessment of phytoremediation's progress in the United States and Europe, researchers Daniel van der Lelie, Jean-Paul Schwitzgubel, David Glass, Jaco Vangronsveld, and Alan Baker provide an answer. The redroot pigweed plant is particularly useful for phytoremediating radionuclide-contaminated sites. In field trials it was successfully used to accumulate significant amounts of radioactive cesium (Cs-137) in its leaf and stem biomass. In a growing market on both sides of the Atlantic Ocean, this and other plants are increasingly being used to phytoremediate site contamination.
- Press Releases: Four
 1. 12/19/01 'Scientists Identify Molecular Structure of Cancer-Related Proteins' (Rajashankar)
 2. 12/4/01 'Enzyme Studies at Brookhaven Lab May Lead to New Antiviral Agents' (Mangel)
 3. 9/25/01 'Scientists Discover How Some Viruses Take Strong Hold of Cells' (Freimuth)
 4. 6/30/01 'Scientists Push Enzyme Evolution Into High Gear, work could lead to mass production of useful plant products ' (Shanklin)

Number of Co-Authored Papers, CRADA's etc.

The majority of Biology Department publications are co-authored. Biology had twenty-four peer-reviewed publications.

1.4.3.2 Medical Department

Management Goals and Processes for Fiscal Year 2003

- Install new very high field animal magnetic resonance instrument for functional and spectroscopic studies in animals, now that additional funds have been obtained from the Office of National Drug Control Policy.
- Continue biomedical engineering initiative by expanding our capabilities in both PET and MRI, and in combined use of both modalities.
- Continue efforts to obtain funding for the Cyclotron Isotope Research Center (CIRC), a facility to serve as a year-round domestic source of medical isotopes for nuclear medicine, for R&D, and for education and training.
- In the isotope research and production program, to continue to investigate the use of the isotope Sn-117m for cancer therapy and for the treatment of painful bone metastases in cancer patients, and to optimize development of bio-engineered molecules with potential for radiopharmaceutical utility.

- Extend x-ray microbeam radiation research with the NSLS by investigating the radiobiological mechanisms underlying the ability of microbeams to spare normal tissues while killing tumors, and to evaluate the potential of microbeams for treating tumors.
- Continue evaluation of candidate radiopharmaceuticals in rodent and in vitro models, and the use of these models to extend observations made in human PET experiments.
- Use the small animal PET scanner (Micro-PET) to enhance integration of human PET technology with mainstream biomedical science, and begin similar use of the small animal MRI scanner.
- Expand the use of transgenic animals in Medical Department programs.
- Strengthen the Program in Space Radiation Biology by recruiting an established scientist in this area, and intensifying efforts to increase level of funding from NASA. This will enable us to better utilize the Booster Application Facility (BAF) when it commences operation during FY03.
- Enhance long-term ability to obtain funding from the National Institutes of Health by improved mentorship of young scientists and scientists-in-training.

Number of New Associate Scientists (or Above) Hired

- The Medical Department hired one new scientist, Helene Benveniste. She will be part of the MR Imaging program and will be responsible for the new Animal MR machine.

Number of New Research Associates Hired

- The Medical Department hired seven new Research Associates.

Significant Improvements in Infrastructure and Management Systems that Support Research

- A benchtop research laboratory was renovated for our new MR scientist using GPP funds.
- Currently renovating space in the Medical Department, Bldg 490 for an Animal MR machine and supporting preparatory space.
- The Department has also utilized it's own funds to dispose of some legacy issues. An old chemical incinerator that was located behind Bldg. 490 was removed. Two rooms, which contain large amounts of excess chemicals, are also in the process of being cleaned out.

Safety Enhancements

- BNL has management systems in place. We are now in the process of refining them to make them work more effectively and efficiently. This is done through participation on advisory teams and subject area development (and re-development) teams (Work Planning and Control, Biological Safety, CMS advisory group). Those refinements done at the lab-level have given us more flexibility at the Department level so that we can improve our programs.
- The Radiation Protection program in the Medical Department has been assessed due to several radiation related occurrences. We are in the process of working with the researchers and the Radiological Controls Division to develop procedures which enable the researchers to work efficiently and maintain a compliant program.

Steps Toward Development of Next Generation Facilities and Research Tools

- The PET scanner designed for rats and mice (microPET) commissioned in FY 2001 was used by Brookhaven's scientists and outside collaborators as a new scientific tool for pre-clinical research to measure biochemical transformations and the movement of drugs in living animals.
- Two specialized PET devices were developed in FY 2002 to measure radiotracers in blood. One is a beta probe implanted in a blood vessel, and the other is a co-incidence detector positioned external to the wrist to measure the concentration of positron emitters. Both promise to make PET studies simpler and safer.

Discussion of Make up of the Facility User Community

- The Medical Department operates the Clinical Research Center, which is used by the Imaging programs to bring in human subjects for their clinical trials.
- As part of the NASA Radiobiology program, the Medical Department hosts users who are NASA funded and are mostly from U.S. Universities and other National Laboratories. There are also some users who are from Italy as part of an agreement NASA has with the Italian Space Agency.

Steps Toward Improvement of Proposal Quality and Opportunities

Several steps have been made, both at the Directorate and Department levels, toward improvement of proposal quality and opportunities:

- An internal review: The Medical Department Chair reviews or designates a reviewer for proposals developed by Investigators that may not have the expertise at grant writing, before they are sent out to funding agencies.
- Medical Department scientific staff were involved in workshops to formulate future calls for proposals in key areas (Ernst, NIMH Workshop on "Mental Health Research Issues in HIV Infection and Aging").
- For larger proposals the Directorate has recently been providing critical resources to put together a quality proposal. These include: Graphic Designers, Project Managers, Printing Services, as well as a coordinator at the Directorate level.
- Lobbying in congress by BSA and others has helped increase our visibility and therefore our stature on proposals we submit.

List the Number of International Collaborations

- As part of the NASA Radiobiology Program there are several groups who are funded by the Italian Space Agency who come here to study heavy ion effects.
- The Medical Department Scientific staff is involved in many international collaborations.

Facts and Figures for FY 2002

List of Projects/Programs Involving Collaboration with Others

- The Imaging Program collaborates with SUNY Stony Brook and others to develop the ability to monitor the brain function of an awake animal; this would be a major advance in neuroscience.
- Human Subjects are often recruited as part of collaborations with medical schools such as Albert Einstein and New York University.

- A collaboration with SUNY Stony Brook and Harvard University was established to use the short-lived positron-emitting isotopes to study environmental stressors on plants.
- Progress continues on functional MRI studies using the BNL 4 Tesla scanner. The increased sensitivity resulting from last year's upgrade allow us to detect the passage of contrast agents across the blood-brain-barrier (BBB) in the white matter of the normal human brain.
- Brookhaven and Psimei Pharmaceuticals Ltd. continue to work together under a CRADA to develop Brookhaven-invented boron compounds for experimental radiation therapy for cancer, as well as other cancer treatments. In March 2002, our progress was measured in experiments at MIT.
- S. J. Gately and A. N. Gifford collaborate with the University of Connecticut on the study of the brain cannabinoid system.

Number of Users

- The Clinical Research Center processed 343 human subject visits for 42 active Institutional Review Board protocols. The protocols are for 12 internal Principal Investigators as well as scientists from external universities such as Albert Einstein, NYU and SUNY Stony Brook.
- The NASA Radiobiology Program hosted 80 researchers conducting 27 experiments during this reporting period.
- The Brookhaven Laboratory Animal Facility (BLAF) housed animals for 25 different IACUC protocols involving 15 principal investigators plus short-term care for NASA experimenters' animals.
- The SUNYSB operated Radiation Therapy Facility had 800 patient treatments.

List of WFO Projects and Sponsors

- NIH, Beneviste, Helene. "Imaging Illicit Drug Abuse: Development of a New Test Bed Using MRI..."
- NIH, Chang, Linda. "Methamphetamine and AIDS: Toxic Interactions in Animals"
- NIH, Chang, Linda. "Neuroimaging of HIV Progression in Cocaine Abusers"
- NIH, Chang, Linda. "Project 5: Proton Magnetic Resonance Spectroscopy (1h MRS) in Schizophrenia"
- NI Drug Abuse, Chang, Linda
- NI Drug Abuse, Chang, Linda. "Neuroimaging and Mentoring in Drug Abuse Research"
- NIH, Chang, Linda. "GCRC Supplement to the SUNY Stony Brook GCRC Site"
- NIH, Dilmanian, F. Avraham. "Effects and Techniques in Microbeam Radiation Therapy"
- NI Neurological Disorders and Stroke, Dilmanian, F. Avraham. "Microbeam Radiation Therapy for Gliomas"
- US Department of Defense, Dimanian, F. Avraham. "Comparing X-Ray Microbeams and Broad Beams at Optimal configurations..."
- US Department of Energy, Dimanian, F. Avraham. "Bystander Effects and Adaptive Responses Elicited in Low Doses of Low..."
- NIH, Dimanian, F. Avraham. "Effects and Techniques in Microbeam Radiation Therapy"
- NIH, Ernst, Thomas. "Attentional Modulation in Early Sensory Processing"
- NI Mental Health, Ernst, Thomas. "Selegiline, Oxidative Stress and HIV Dementia"
- Tufts University, Ernst, Thomas. "In Vivo Proton MRS Studies of Cerebral Injury in HIV"
- NI Drug Abuse, Gately, Samuel John. "Brain Imaging and Drug Abuse"

- NIH, Gatley, Samuel John. “Human Brain Pharmacokinetics of (-)-Delta-9 THC”
- NIH, Gatley, Samuel John. “Feto-Maternal Pharmacokinetics of Abused Inhalants”
- NI Drug Abuse, Goldstein, Rita Z. “Behavioral Correlates of fMRI Response in Cocaine Users (K23)”
- NIH, Pena, Louis. “Synthetic FGF Analog for Medical Device Applications”
- US Department of Energy, Srivastava, Suresh. “Radiolabeled Progenitor Stem Cells for InVivo PET Imaging and...”
- NIH, Telang, Frank. “fMRI response in Cocaine Users, Correlation with PET”
- NIH, Thanos, Panayotis (Peter) K. “microPET Imaging and Rodent Models of Drug Abuse”
- NIH, Volkow, Nora. “PET Studies of Brain DA in Stimulant Abusers”
- NIH, Volkow, Nora. “PET Studies of Brain Dopamine in Stimulant Abusers”
- NI Drug Abuse, Volkow, Nora. “Studies in Cocaine Abuse”
- NI Drug Abuse, Volkow, Nora. “Summer Research With NIDA”
- NI Drug Abuse, Volkow, Nora. “Summer Research With NIDA”
- NIH, Wang, Gene-Jack. “Brain Dopamine Pathology in Obese Individuals”
- NIH, Wang, Gene-Jack. “Brain Dopamine Pathology in Obese Individuals”

Staff Profile

Tenured	2	Professional	14
Continuing	6	Scientific	31
Term	16	Technical	3
Research Associates	7	Administrative	29
		Management	
		Total	77

Visiting Scientist Profile

The Medical Department hosts many visiting scientists on a regular basis. They come from the US and abroad and from Universities, Government Labs, and private industry.

Funding Profile for the Last Seven (7) Years

2002	11.54 Million
2001	9.18 Million
2000	9.95 Million
1999	7.81 Million
1998	10.0 Million
1997	9.50 Million
1996	9.15 Million

Other Awards

- Spotlight Awards: Joan Terry, Karen Apelskog, Slawko Kurzak

Other Publications, Citations, Press Releases for this Fiscal Year

Press Releases:

- 6/2/01 A. Dilmanian, 'Experimental Microbeam Radiation Therapy May Offer Improvement Over Traditional Radiation Treatments'
- 9/9/01 P. Thanos, 'Gene Therapy Reduces Drinking in 'Alcoholic' Rats'
- 12/1/01 N. Volkow, 'Methamphetamine Delivers 'One-Two' Punch to the Brain'
- 12/1/01 N. Volkow, 'Brain Shows Ability to Recover From Some Methamphetamine Damage'
- 3/1/02 N. Volkow, 'Study Reveals Differences in Patients' Response to Ritalin'
- 3/22/02 L. Chang, 'Brookhaven Town Honors Two Brookhaven Lab Employees'
- 4/15/02 M. Gerasimov, 'Brain-Imaging Study Offers Clues to Inhalant Abuse'
- 4/16/02 T. Ernst, 'Tamoxifen and Estrogen Have Similar Effects on the Brain'
- 6/20/02 G-J Wang, 'More Clues About Obesity Revealed by Brain-Imaging Study'

Number of Co-Authored Papers, CRADA's etc.

The majority of Medical Department publications are co-authored papers.

1.4.4 Energy, Environment & National Security

1.4.4.1 Environmental Sciences

Management Goals and Processes for Fiscal Year 2003

- Formed a functional management team around a new Associate Laboratory Director
- Submitted a strong proposal to obtain funding for BNL's EnviroSuite Initiative
- Submitted strong LDRD proposals
- Strengthened Department's image at the Laboratory

Number of New Associate Scientists (or Above) Hired

- Three (3) Associate Scientists

Significant Improvements in Infrastructure and Management Systems that Support Research

- Proposal Tracking Data Base developed and operated by the EENS Business Operations Office

Safety Enhancements

- Prepared east hot cell in Bldg. 830 for scientific work

Steps Toward Development of Next Generation Facilities and Research Tools

- Successfully operated FACE facility at Duke Forest, North Carolina.
- Continued development of the Single-Particle Mass Spectrometer for characterization of aerosol particles and field-tested soil carbon measurement system.

Steps Toward Improvement of Proposal Quality and Opportunities

- Development and use of the Proposal Tracking Data Base

List the Number of International Collaborations

Four (4)

Facts and Figures for FY 2002

List of Projects/Programs Involving Collaboration with Others

Department Sponsor Project Activity Title

- Argonne National Laboratory
86375 86375 ARM Program
86375 86376 CSPHOT Instrument Mentor
86375 86377 MMCR Instrument Mentor
86375 86378 External Data Center
86375 86379 External Data Algorithms
- Battelle Memorial Institute
88389 88389 Common Household Activities and Exposure to Disinfection By-Products in Tap Water
- Battelle Pacific Northwest Laboratory
86028 86028 Battelle - PNNL ARM Program
86028 86029 External Data Algorithms
86028 86031 Site Management
86028 86313 PIF Data Management
86028 86314 Web Application
86028 86315 SGP SDS Development
86028 86316 Surface Characterization
86028 86317 Satellite Data Coordination
86028 86318 External Data Center
86028 86319 Integrated Data Base
86028 86322 Classified Satellite Data Products
86028 86351 Instrument Mentoring (86028)
86028 86352 NSA - Log
86028 86353 TWP - LOG
86320 86320 Reprocessing Data
86555 86555 Tracer Preparation and Analysis for Fall 2000
- VTMX-CBNP Experiments
86584 86584 Aircraft Measurements PNL 2001 Field Experiment
- Lockheed Martin Energy Research Corporation
86540 86540 Assembly of a Control System for One 24-Valve Face Ring
- National Energy Technology Laboratory
86578 86578 CO2 Sequestration Project - New Mexico
86585 86585 CATS Analyses - NETL Oak Ridge National Laboratory
86554 86554 Mercury Waste Profiling
88176 88176 EE ORAU Travel
- Oakland Operations Office (NERI)
18252 18252 Plant Response to Global Change:
Physiological and Molecular Mechanisms Underlying Long-term Acclimation to Elevated Carbon Dioxide and Tropospheric Ozone
- Penn State
87581 87581 Development of Cloud Property Retrieval Algorithms at ARM Boundary Facilities

- Rocky Flats
86386 86386 Biomobility of Actinides
- Sandia National Laboratory
86304 86304 WIPP
86542 86542 UAV
- Savannah River
86552 86552 Subcon Focus Area Lead Laboratory
86591 86591 PUREX Alternative Treatment Review - Savannah River Site
- SUNY Albany
87504 87504 PMTACS-NY Supersite Program
- SUNY Stony Brook
87510 87510 A Study of the Outer Shelf, Shelfbreak Front, and Slope From Long-Term ADCP and Hydrographic Observations From the MV Oleander
- Univ. of California/Scripps Inst. Of Oceanography
87518 87518 The Collection of Shipboard Acoustic Doppler Current Profiler Data During the Shelf-Basin Interaction Program
- University of Miami
88191 88191 Technical Support for Fabrication Testing and Calibration for Two New PRP Instruments
88347 88347 Fabrication of a Portable Radiation Package for Atmospheric Optical Measurement
- University of Minnesota
87566 87566 FACE Facility at Cedar Creek

List of WFO Projects and Sponsors

Department Sponsor Project Activity Title:

- Aerodyne Research Incorporated
85652 85652 Aerosol Sampling
87505 87505 Develop a Versatile Aerosol Mass Spectrometer for Organic Aerosol Analysis
- ARCO El-Djazair Co. (BP Amoco Co.)
85682 85682 CATS Tracer Project Center for Energy and Environment
85696 85696 Center for Energy and Environment CATS Analysis
- CON ED
87597 87597 Equipment for Rapid Cable-Leak Locating and Detecting Capabilities
- Constellation Nuclear
85676 85676 Tracer Gas Study
- Department of Defense
05372 05372 A Field Program to Identify TRI Chemicals and Determine Emission Factors From DOD Munitions Activities
05584 05584 Collection and Processing of Shipboard Acoustic Doppler Profiler Data from the Japan/East Sea Project
- Enermodal Engineering Limited
85659 85659 CATS/PFT Testing
- Environmental Protection Agency
05351 05351 New York/New Jersey Harbor Contaminated Sediment Processing and Decontamination Technologies Full Scale Production Demonstration - Phase 2

Commercialization: Facility Planning/Infrastructure Development
05376 05376 Developing a Decision Support Technology Matrix and Reference Guide
05396 05396 Southern Oxidants Study Research Program at Brookhaven National Laboratory (SOS-BNL)
05509 05509 New York/New Jersey Harbor Contaminated Sediment Processing and Decontamination Technologies Full Scale Production Demonstration
81363 81363 CATS

- Georgia Institute of Technology
87509 87509 Measurement of Particle Chemical Composition During NASA TRACE-P
Guangzhou Institute of Geochemistry
85723 85723 Develop Particle-into-Liquid System
- Hikawa Shoji Kaisha, Ltd.
85702 85702 Portable Radiation Package
- ITT Industries
85625 85625 ITT - Dugway
87507 87507 Ultraviolet Raman Spectral Signature Acquisition and Short-Range Raman Lidar
Optical Physics
- JAMSTEC
28599 28599 Shipboard Ocean and Atmospheric Radiation
- KeySpan
87564 87564 Determination of Gas Flow Rates at LILCO Gas-Fired Power Stations
87587 87587 Remediation of Soils Contaminated with Lead Paint
- Maine Yankee Atomic Power Company
85640 85640 Analysis of Soil Samples
85658 85658 Analysis of Soil Samples
85727 85727 PAB Test Pit Groundwater
- NAHB Research Center
85690 85690 PFT Testing
- National Academies
09712 09712 IAEA Training
- National Aeronautics and Space Administration
05517 05517 Validation of the Sea WiFS Atmospheric Correction Scheme Using Measurements of Aerosol Optical Properties
05578 05578 Tracer Study of Long-Range Transport in Support of the Big Bend National Park Regional Aerosol and Visibility Observational (BRAVO) Study
05587 05587 Representation of Aerosol Microphysics in Regional to Global Scale Models
- National Renewable Energy Laboratory
86569 86569 Support for PFT of Ventilation Effectiveness
- Newmont Metallurgical Services
85641 85641 Mercury Stabilization
- NSF-NOAA
05590 05590 Aerosol Measurements at Cheju Island During ACE-Asia: Aerosol Number Size Distribution, Particle Hygroscopicity, and Individual Particle Size and Chemical Composition
- Radiological Services Inc.
85621 85621 Radiological Services, Inc.

- Research Triangle Institute
85547 85547 Research Triangle Institute - CATS
- Royalty
09133 09133 Feasibility Studies for Technologies Used to Treat Mercury Contaminated Materials
- Suffolk County
87594 Dissolved Organic Nitrogen and Brown Tide Blooms in Long Island's Coastal Waters: Testing the Groundwater Hypothesis
- Texas National Resources Conservation Commission
87506 87506 Analysis of G-1 Aircraft Data Collected During TexAQS 2000
- The Port Authority of New York and New Jersey
88309 88309 Newark Port Authority of New York and New Jersey Tracer Detection Technology Corporation
85689 85689 Tracer Detection Tech
- Usi
85648 85648 Tracer Technology
- Woods Hole Oceanographic Institute
87576 87576 GLOBEC: Frontal Exchange Processes Over Eastern Georges Bank
87598 47556 GLOBEC: Shipboard ADCP Data Collection and Retrospective Analyses

Staff Profile

Tenured	6	Professional	24
Continuing	15	Scientific	35
Term	8	Technical	4
Research Associates	6	Administrative	7
		Management	1
		Total	71

Funding Profile for the Last Seven (7) Years

2002	\$20.8M
2001	\$19.5M
2000	Dept. created 2001
1999	N/A
1998	N/A
1997	N/A
1996	N/A

Other Publications, Citations, Press Releases for this Fiscal Year

- Peter Daum - Houston
- Paul Kalb - Mercury
- Larry Kleinman - Houston
- Dan Imre

Number of Co-Authored Papers, CRADA's, etc.

- Sixteen (16) co-authored papers
- (One CRADA) Aquatic Plants for Phytoremediation of Toxic Metals and Radionuclides in Sediment.

1.4.4.2 Energy Sciences and Technology

Management Goals and Processes for Fiscal Year 2003

- The department has taken proactive measures to improve its planning process. We have established a strategic council to reduce stove-piping and increase the effectiveness of our initiatives. We are working on three initiatives for next year. Our major difficulty is the lack of significant program development funds. The department is having an external committee review the department this year to suggest improvements.

Number of New Associate Scientists (or Above) Hired

- None

Number of New Research Associates Hired

- One

Significant Improvements in Infrastructure and Management Systems that Support Research

- The PeopleSoft system is still very difficult to use, but progress is being made and we can now obtain useful information from it with less difficulty.
- Progress has not been made in integrating our many separate databases. This leads to significant difficulties in tracking progress and managing resources.

Safety Enhancements

- Continue to review and modify our safety processes; continuously review on 1.3.5 experimental safety review forms and associate training requirements.

Steps Toward Development of Next Generation Facilities and Research Tools

- The Department has drafted a white paper that was submitted to the laboratory director that would develop a new thermal hydraulic test facility for nuclear power plant applications.

Steps Toward Improvement of Proposal Quality and Opportunities

- Formed a strategic council that is charged with identifying and pursuing research opportunities.
- Established review procedures and committees for major calls, e.g. NERI, and have established a standard format for such proposals.
- Encouraging staff to participate on proposal review committees and have made funds available for that purpose.

List the Number of International Collaborations

- Ten

Facts and Figures for FY 2002

List of Projects/Programs Involving Collaboration with Others

- Albuquerque Operations Office
86333 86333 Enhanced Surveillance for Comprehensive Asset Tracking Technology
- Battelle Pacific Northwest Laboratory
86158 86158 SDRS BOA from PNNL (Cl. Status - Activities)
86158 86176 South Ukraine-Unit 1 (Task 8) (86158)
86158 86185 Rivne Unit 3 Full Scope Simulator - 1.2.16 (86158)
86158 86188 1.1.2.16 - Rivne NPP Unit 2 Full Scope Simulator (Task 17) (86158)
86158 86195 Technical Assistance for IBRAE Quality Assurance and Peer Review of Novovoronezh Units 3 and 4 In-Depth Safety Assessment (NOVISA) (86158)
86158 86199 1.1.2.8 Ukraine Simulator SPDS Support (Task Order 31) (86158)
86158 86202 Task Order 28: Review of South Ukraine - 1 NPP In-Depth Safety Assessment Project (86158)
86158 86203 Ukraine Simulator Training Course (Task 34) (86158)
86158 86214 Task 35: Zaporizhzhya NPP Unit 1 Full Scope Simulator (86158)
86158 86221 Rivne-In-Depth Safety Analysis Project (86158)
86158 86224 Task 29A - 1.2.1.9 Zaporezhzhya Safe Shutdown Analysis (86158)
86158 86225 Task 42: TA for Eng. Technologies and Developments QA and Peer Review of Zaporizhzhya Nuclear Power Plant... (86158)
86158 86226 Task 43: TA for Engineering Technology and Developments QA and Peer Review of Khmelnytsky (86158)
86158 86227 Task 44: Comparative Analysis of the Results of Two VVER-1000 Level 1 PRA (86158)
86158 86228 Task 46: Probabilistic Risk Assessment Department of Scientific and Engineering Center for Nuclear Radiation Safety During Peer Review of the Novovoronezh NPP Unit 3 Level 1 PRA (86158)
86158 86381 Task 45: Technical Review and Analysis of Insights and Perspectives on Russian NPP Safety (86158)
- Cornell University
87739 87739 CADD-Based Expert System for Passive Snow Control
87751 87751 Torte Law Database
- Idaho Operations Office
86566 86566 Generation IV Technology Roadmap
- Los Alamos National Laboratory
86595 86595 HMS Modeling Code - LANL
- National Renewable Energy Laboratory
86571 86571 Support for Integrated Environmental Strategies - MARKAL - Shanghai, China
- Oak Ridge National Laboratory
88177 88177 ORAU TRVL - NE - Czajkowski and US DOE Lab Technology Research Program Review - Rohatgi; Travel Expenses for NERI Review
- Oakland Operations Office (NERI)
86365 86365 A Proliferation Resistant Hexagonal Tight Lattice BWR Fuel Core Design for

Increase Burnup and Reduced Fuel Storage Requirements (CI Status - Activities)
 86368 86368 Modular and Full Size Simplified Boiling Water Reactor Design With Fully Passive Safety Systems
 86387 86387 Modular and Full Size Simplified Boiling Water Reactor Design With Fully Passive Safety Systems - Phase II
 86389 86389 A Proliferation Resistant Hexagonal Tight Lattice BWR Fuel Core Design for Increase Burnup and Reduced Fuel Storage Requirements - FY 2001 (CI Status - Activities)
 86389 86390 Safety of High Conversion Boiling Water Reactor - FY 2001 (86389)
 86389 86391 Design of a High Conversion Boiling Water Reactor - FY 2001 (86389)
 86392 86392 Optimization of Heterogeneous Utilization of Thorium in PWRs to Enhance Proliferation - FY 2001
 86393 86393 NERI 01-022 Particle Bed Gas-Cooled Fast Reactor (PB-GCFR) Design
 86395 86395 Development of GEN IV Advanced Gas-Cooled Reactors With Hardened/Fast Neutron Spectrum
 86396 86396 M2AL67853 BNL Support to System Technologies
 86397 86397 M2AL 67853 BNL Support to Systems Studies Extra

List of WFO Projects and Sponsors

Department Sponsor Project Activity Title:

- Agency of International Development
05378 05378 USAID-Sponsored BNL Workshop
- BioCat, Inc.
87600 87600 Biochemical Upgrading of Petroleum
87706 87706 Development of Methods to Enhance Heavy Oil Production in Offshore Environments
- CANDU Owners Group Inc.
85708 85708 Independent Expert Panel Review of Reactor Physics Uncertainties
- Chevron
87584 87584 Catalytic Coprocessing of CO and CO₂ into Methanol Via the BNL Low Temperature Methanol (BNL-LTM) Process
- Concurrent Technologies Corp.
87591 87591 Advanced Zinc Phosphate Conversion Coatings for Electroplated Steel
- Department of Defense-U.S. Army
05554 05554 Enhance Burner Design (Continuation of Project ID 05591 and 05586)
05586 05586 Breadboard Prototype 500 Watt Thermophotovoltaic Power Source
- Department of Transportation
09710 09710 Applying Probabilistic Safety Assessment Approaches to Aircraft Safety
- Edtek, Inc.
88310 88310 EDTEK
- Electric Power Research Institute
87704 87704 Guidance for Digital Control Room Technologies
- Emission Control 2000 LLC
87727 87727 Evaluation of EC 2000 Devices for Oil-Fired Residential Heating Systems

- Enconet Consulting
87758 87758 PSA Applications for Regulatory Use
- Energy Research Center
87701 87701 New York State Premium Low Sulfur Fuel Marketplace Demonstration
- Environmental Protection Agency
04323 04323 AMEC 1.2
- Gas Research Institute
87752 87752 Development of a Device to Breakup Concrete Pavement
- Glaztec, Incorporated
87716 87716 Use of Chitosan as a Water-Based Anti-Corrosive Coating Material
- Insight Technologies, Inc.
87574 87574 Two-Stage Oil Burner with Load Tracking Control
- 87760 87760 Field Tests of the Flame Quality Monitor
- International Resources Group, Ltd.
87742 87742 Development of the MARKAL-MACRO Model for Hong Kong
- JAERI
87718 87718 Proton Nuclear Cascade Process
- KeySpan
87571 87571 Development and Demonstration of an Asbestos Treatment Process for Use in a Utility Environment
- 87715 87715 CBC-Filled Wire Mesh Composite Capping for Retaining Berm Foundation
- 87759 87759 Polymer Grouts and Polymer Composite Liners for Retaining Excavated Wall Foundations
- Mass. Institute of Technology
87710 87710 Joint Work With MIT on CRADA BNL C-01-07
- NASA
05518 05518 Reaction Pathways and Thermodynamic Studies of Atmospheric Reactions
- National Combustion Company Inc. (NATCO)
85704 85704 NATCO Testing and Analysis
- National Institute of Standards and Technology
05379 05379 Reactor Analysis in Support of the NIST Research Reactor (CI Status - Activities)
- 05379 05380 Task 1: System Thermal-Hydraulic Analysis (05379)
- 05379 05381 Task 2: Analysis of Neutronic Parameters (05379)
- National Oilheat Research Alliance
87765 87765 Maximizing Fuel Performance in Residential Heating Systems
- NOCO Energy Corporation
87711 87711 Low Cost Bioheating Oil Application
- North Atlantic Treaty Organization - NATO
09714 09714 The Structure and Risk Assessments of Nuclear Power Plants' (NPPs) Safety in Relation to Aircraft Crash
- NYSERDA
87580 87580 Variable Firing Rate Oil Burner Using Pulsed Fuel Flow Control
- 87585 87585 Improved Electric Power Efficiency in Heating Equipment - Phase II
- 87703 87703 High Efficiency, Condensing Heating Appliance Firing Low Sulfur Oil
- 87705 87705 The Use of Biodiesel Blends in Space Heating Equipment

- Radkowsky Thorium Power Corporation
87748 87748 Radkowsky Thorium Fuel Project
87761 87761 Thorium Fuel Project
87762 87762 Thorium Fuel Project - Subcontracts
- Raytheon Technical Services Company
85687 85687 Technical Services to Raytheon Technical Services Company for the FAA Wire Degradation Study
- Royalty
09010 09010 Upgrade the Electrical Component Test Facility in Building 815
09125 09125 Microcombustion Lab Measurement Equipment
09132 09132 Laser Doppler Flame Velocity Studies
- Swedish Nuclear Power Inspectorate
87709 87709 Assistance to the Swedish Nuclear Power Inspectorate (SKI)
- U.S. Nuclear Regulatory Commission
04172 04172 Technical Assistance in Support of DSSA Reactor Systems Issues (CI Status - Activities)
04174 04174 TA in Support of DSSA Review and Resolution of Licensing and Technical Issues Raised by the NRC (TIAs) (CI Status - Activities)
04231 04231 Japanese Collaboration on Seismic Issues
04641 04641 Nuclear Safety Research Information Meeting
13029 04601 Task 1.2 Administration of IMUG (13029)
13029 04739 Task 2.11: Modify Draft Letter Report and Submit Final Report
13029 13029 Technical Support in Risk Assessment (CI. Status - Activities)
13029 15285 Subtask 2.10 (13029)
13273 13273 Technical Support for the Russian Kalininskaya VVER-1000 Probabilistic Risk Assessment (Beta Project) (94)
13337 13337 NUREG-0700 - Rev. 2
13342 13342 Screening Reviews of Seismic - IPEEE (CI. Status - Activities)
13342 13351 Task 3: Seismic Insights (13342)
13355 13355 Support to State Nuclear Regulatory Committee of Ukraine
13367 13367 Seismic Response of Degraded Structures & Components
13388 13388 Technical Assistance in Support of Division Systems Safety and Analysis Plant Systems
Branch Licensing Actions (CI. Status - Activities)
13388 15037 Task 3: Technical Assistance for Review of the Prairie Island Waterhammer and Two-Phase Flow Analysis (13388)
13388 15038 Task 4: Technical Assistance for Resolution of Waterhammer and Two-Phase Flow Issues (13388)
15089 15089 Support in Development of Consensus PRA Standards (CI. Status - Activities)
15089 15209 Task 4: Finalizing the ASME Standard Appendix (15089)
15136 15136 Ukraine Priority 3.1 - Safety Analysis and Licensing Procedures – Ukrainian Regulator Training (CI. Status - Activities)
15136 15147 Task 1: Containment Analysis (15136)
15173 15173 Russia Priority 1 - Licensing Basis and Safety Analysis - Russian Regulatory Authority (CI. Status - Activities)
15231 15231 Low Power and Shutdown Risk Study - Level 2

15232 15232 Support to State Nuclear Regulatory Committee of Ukraine
 15238 15238 Credit for Operator Action
 15253 04930 Task 4: Igniter Cost Benefit (15253)
 15253 15253 Risk-Informing Part 50 (Cl. Status - Activities)
 15253 15254 Task 1: Plan for Risk Informing Part 50 Recommendations (15253)
 15253 15255 Task 2: Plan for Risk Informing Part 50 Changes (15253)
 15253 15256 Task 3: Meetings (15253)
 15253 15355 Task 2: Plan for Risk Informing Part 50 Changes (15253)
 15263 15263 Reactor Oversight Program Support (Cl. Status - Activities)
 15268 15268 TA License Renewal LRA (Cl. Status - Activities)
 15272 04798 Task 3: Review of Nuclear Energy Institute (NEI) Industry Initiative, NEI 00-01
 Industry
 Integrated Methods for Addressing Circuit Failure Issues and Resolution of Associated
 Circuits Issue (15272)
 15272 15272 Technical Assistance in Support of DSSA Regulatory Licensing Improvements (Cl.
 Status - Activities)
 15276 04813 Task 8: South Texas Fire Protection Inspection (15276)
 15276 04843 Task 6: Oconee Fire Protection Inspection (15276)
 15276 04847 Task 7: Comanche Peak Fire Protection Inspection (15276)
 15276 04966 Task 9: Susquehanna Fire Protection Inspection (15276)
 15276 15276 Specialist Support for NPP Inspections (Cl. Status - Activities)
 15286 15286 Armenian Nuclear Regulatory Authority - Development of Safety Analysis Review
 Capability
 15288 15288 Technical Support for the Russian Kalininskaya VVER-1000 PRA
 15289 15289 Technical Assistance for Safety Analysis and Licensing Procedures - Ukrainian
 Regulatory Training
 15289 15290 Task 5: Training on Pressure Vessel Fluents (15289)
 15292 04232 Task 1: Power Cables (15292)
 15292 04233 Task 2: Splices (15292)
 15292 04235 Task 4: Dissemination (15292)
 15292 15292 EQ/Aging Power Cables and Electrical Penetrations (Cl. Status - Activities)
 15293 04771 Task 4: Integration of Case Studies (15293)
 15293 15293 TA for Risk Assessment of Nuclear Materials and Waste (Cl Status - Activities)
 15294 04731 Task 6: Review of Multi-Plant Submittals: Request for Relief From Certain of the
 ASME, Section XI Code Requirements for Inservice Inspection of Systems and
 Components (15294)
 15294 04772 Task 7: Review of the Robinson, Unit 2, Request for Relief From Certain of the
 ASME, Section XI Code Requirements for Inservice Inspection of Systems and
 Components (15294)
 15294 15294 TA in Support of the Div. Of Engineering Review of Inservice Inspection Relief
 Request Licensing Actions (Cl Status - Activities)
 15295 04295 DCS Specific Activities (15295)
 15295 04297 General Reactor Analysis (15295)
 15295 04703 Technical Assistance (15295)
 15295 15295 Reactor Core Analysis (Cl Status - Activities)

15296 04334 Task 1: Benchmarking and Maintenance of NRC Significance Determination Process
 Notebooks in Support of Inspection and Assessment Program Development and Oversight (15296)

15296 04335 Task 2: Technical Support for Phase 2 of the Shutdown Significance Determination Process (15296)

15296 04931 Task 4: Upgrading SDP Guidance Developed for IMC 0609 Appendix H (Containment Integrity SDP) (15296)

15296 13646 Task 1A: Benchmarking and Maintenance of NRC Significance Determination Process (SDP) Notebooks in Support of Inspection and Assessment Program Development and Oversight (15296)

15296 15296 Support for Inspection and Assessment Program Development and Oversight (CI Status - Activities)

15296 15313 Task 3: Development of Supplementary Guidance on External Events Risk Characterization for NRC Significance Determination Process (15296)

15297 15297 Boiling Water Reactor Fluence

15298 15298 Dry Cask PRA

15299 15299 TA in Support of the Division of Engineering Regulatory Licensing Improvement Activities (CI Status - Activities)

15300 15300 Peer Review BWR Internals

15302 04612 Task 1: Literature Review (15302)

15302 04614 Task 2: Technical Meetings (15302)

15302 04616 Task 3: Workshop (15302)

15302 04634 Task 4: Research Coordination (15302)

15302 15302 Collaborative Research on Wire System Aging (CI Status - Activities)

15303 15303 Strengthening Kazak Regulatory Authority

15304 15304 Support to State Nuclear Regulatory Committee of Ukraine (CI Status - Activities)

15305 04668 Task 1: Technical Support and Training (15304)

15306 15306 Support to State Nuclear Regulatory Committee of Ukraine - U-9550

15309 15309 Improved Methods for Performing Importance Analysis

15310 15310 Armenian Nuclear Regulatory Authority - Development of a Safety Analysis Review Capability

15311 15311 SPAR Model Development Level 2/LERF

15312 15312 Technical Assistance in Support of Technical Evaluation of Non-Power Reactors - University of Maryland License Renewal

15314 15314 Reactor Analysis for High-Burnup Fuel

15315 15315 Risk Informed Initiatives for Nuclear Materials

15316 15316 Risk Associated With Cable Aging

15317 15317 Advanced Reactor Regulatory Framework Development

15318 15318 Digital Systems PRA

15319 05147 Task 1: Review of AP1000 Design Control Document Sections 3.8.2, 3.8.3, 3.8.4, and 3.8.5 Pertaining to the Design of Nuclear Island Structures (15319)

15319 05148 Task 2: Review of AP1000 Design Control Document Sections 3.1.1, 3.6.2, and 3.9

Pertaining to Piping Design Acceptance Criteria (15319)
 15319 15319 Technical Assistance in Support of the Division of Engineering Review of Design
 Certification Applications (CI Status - Activities)
 Union Fenosa Generacion
 87503 87503 Review of CNJC Design Documentation for Proposed Control Room
 Modifications

Staff Profile

Tenured	2	Professional	28
Continuing	41	Scientific	53
Term	7	Technical	4
Research Associates	3	Administrative	12
		Management	3
		Total	100

Funding Profile for the Last Seven (7) Years

2002	24.8
2001	27.5
2000	N/A
1999	N/A
1998	N/A
1997	N/A
1996	N/A

Other Publications, Citations, Press Releases for this Fiscal Year

- Several press releases on our work for the G-8 Energy ministers conference, John O'Hara's work with the FEC, and our R&D 100 awards.

Notes, Issues, Trends and Assumptions

- The management systems are becoming more useful, but at a glacial pace. It is assumed that G&A will continue to increase, but yield less. An example is the environmental chargeback, which is being fixed even though it is reasonable to assume that we will have less waste to dispose of next Year.

1.4.4.3 Nonproliferation and National Security

Management Goals and Processes for Fiscal Year 2003

- Maintain current sponsorship for existing programs by ensuring that all work efforts are conducted with the utmost quality, on time and within budget.

- Establish new sponsors for counterterrorism work within NNSA, FEMA and ultimately the Dept. of Homeland Security.
- Ensure that all staff is aware of their overall responsibilities to the Department, Laboratory, sponsors and themselves.
- To continue to build existing SCAPA Program by building on activities and funding, including development of biological emergency exposure criteria.
- Encourage submittal of at least one LDRD proposal by each Scientific/Professional staff member.
- To integrate the CAP Program into existing NNS programs or proposals with the intent of adding value.
- To propose a process for development of “Safe-Return” numbers, that is, chemical or biological concentrations, analogous to ERPGs, that will not cause adverse health effects to returning residents or workers at disaster sites.
- Increase overall funding and increase number of Project Leads in the DOE MPC&A Program.
- Diversify funding sources to other parts of DOE and obtain funding from other organizations

Number of New Associate Scientists (or Above) Hired

- One: Ph.D, Sci.D, Biologist

Significant Improvements in Infrastructure and Management Systems that Support Research

- Continued improvement of SCAPA’s existing reference system, including scanned, computer retrievable documents.
- Database for project, recommendation, guidance tracking TST Process Changes.
- Completed computer system for documentation required for foreign travel, particularly to Russia; this achievement is a combination of DOE/NNSA and BNL work.

Safety Enhancements

- Safety topic included in all Department Staff Meetings.
- Installation of night lights for hallways.
- Staff member is Building 197 Building Manager.
- Staff member is an advisor to BNL environmental restoration groups
- Staff member on the Environmental Management System Pollution Prevention Committee for the EENS Directorate.

Steps Toward Improvement of Proposal Quality and Opportunities

- Provide internal review of all proposals prior to their submission to outside organizations.
- Develop closer working relationship with DOE HQ by more frequent visits and temporary working assignments for staff in DC and through the use of consultants.
- Staff participated in courses to improve their technical capability in MPC&A and related technical subjects.
- Staff participated in BNL courses to improve communications capabilities.

List the Number of International Collaborations

- Eighty Three

Facts and Figures for FY 2002

List of Projects/Programs Involving Collaboration with Others

- Counterterrorism Workshop, 'New York Metropolitan Region: Counterterrorism and Infrastructure Assurance Technology Needs,' April 9-11, 2002.
- AMEC Project 1.5-1: Radiation Monitoring at an RF Naval Site.
- District Heating Pipe Coating Facility, Snezhinsk, Russia.
- DOE Task Force on Energy Assurance.
- International Workshop on Spent Nuclear Fuel Management at the Andreeva Bay Site.
- USDOE Emergency Management Advisory Committee (EMAC) Subcommittee on Consequence Assessment & Protective Actions (SCAPA), AIHA Emergency Response Planning Guideline (ERPG) Committee, EPA Federal Advisory Committee (FACA) for Acute Exposure Guideline Limits (AEGL), CDC Working Group on Bioterrorism Research Priorities for Public Health Response.
- TEMASU - Terrestrial Magnetic Surveyor
- Terra Hertz Reflectometry Project (FAA)
- Green Building Technologies with Battery Park City Authority
- Calverton High Technology Incubator with Stony Brook University, Stony Brook
- TIRC programs with New York State
- Initiatives for Proliferation Prevention (IPP), International Science and Technology Centers.
- Technical Survey Team for DOE MPC&A Program.
- Several collaborations with Russian Institutes on Material Protection Control and Accounting upgrades on nuclear materials.
- Collaboration with the technology laboratory of Virginia Polytechnic Institute and State University.
- Collaboration with the Center for International Trade and Security, University of Georgia.
- Collaboration with United Technologies in the area of fuel cell research.
- Collaboration with ORNL in performing a safety evaluation of the HIFR.
- Course entitled "International Organizations" being taught by a staff member at the State University of New York at Stony Brook.
- A staff member is assisting Lorex Industries with the development and demonstration of a laminar flow meter for UF6 measurements at the blend-point under the auspices of the U.S.- Russian Uranium Purchase Program.

List of WFO Projects and Sponsors

- AMEC Project 1.5-1: Radiation Monitoring at an RF Naval Site funded by the US Department of Defense.
- Terra Hertz Reflectometry - DOT / FAA
- Green Building Technology - Battery Park City Authority

Staff Profile

Tenured	0	Professional	12
Continuing	13	Scientific	14

Term	1	Technical	0
Research Associates	0	Administrative	8
		Management	1
		Total	35

Funding Profile for the Last Seven (7) Years

2002	\$79,783,746
2001	\$56,884,462
2000	
1999	
1998	
1997	
1996	

Other Awards

- Brookhaven EENS Directorate Leadership Award

Other Publications, Citations, Press Releases for this Fiscal Year

- A report on PICASSO-AMEC was presented at the Russia-NATO Advanced Research Workshop on Unresolved Issues Remaining in the Decommissioning of Nuclear Powered Vessels and in the Environmental Remediation of Their Supporting Infrastructure, Moscow, 22-24 April 2002.
- A report on “Automated Environmental Radiation Monitoring at RTP Atomflot and the Polyarninsky Shipyard” was presented at the 5th International Conference on Environmental Radioactivity in the Arctic and Antarctic, St. Petersburg, 16-20 June 2002.
- Press Release: BNL Bulletin articles and press releases on BNL Counterterrorism activities. International Safeguards Workshop: Design and Testing for High Reliability, 15-17 October 2001:

J. R. Lemley was a principal organizer of the Workshop and its Scientific Secretary
Executive Summary, J. R. Lemley, et al.

Technical Summary, J. R. Lemley, et al.

Proceedings published on CD

Summary of the Closing Plenary Session of the 42nd INMM Annual Meeting, J. R. Lemley, et al., Journal of Nuclear Materials Management 30(2), Winter 2002, 48.

Workshop on Design and Testing or High Reliability: Challenges and Progress, J. R. Lemley, et al., 43rd INMM Annual Meeting, Orlando, FL, 23-27 June 2002.

Review of BNL Atmospheric Sciences Division Research Projects for National Security Relevance, J. R. Lemley, BNL Report SAC 02-03, 30 January 2002.

Physical Security for a Photovoltaic Production Facility, J. R. Lemley, Draft Report for BNL Environmental Sciences Department, revised 3 May 2002.

Number of Co-Authored Papers, CRADA's etc.

- Twenty two

TABLE OF CONTENTS

CRITICAL OUTCOME 2 PERFORMANCE DETAIL

2.0 Environmental Restoration	2
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2.0 Environmental Restoration

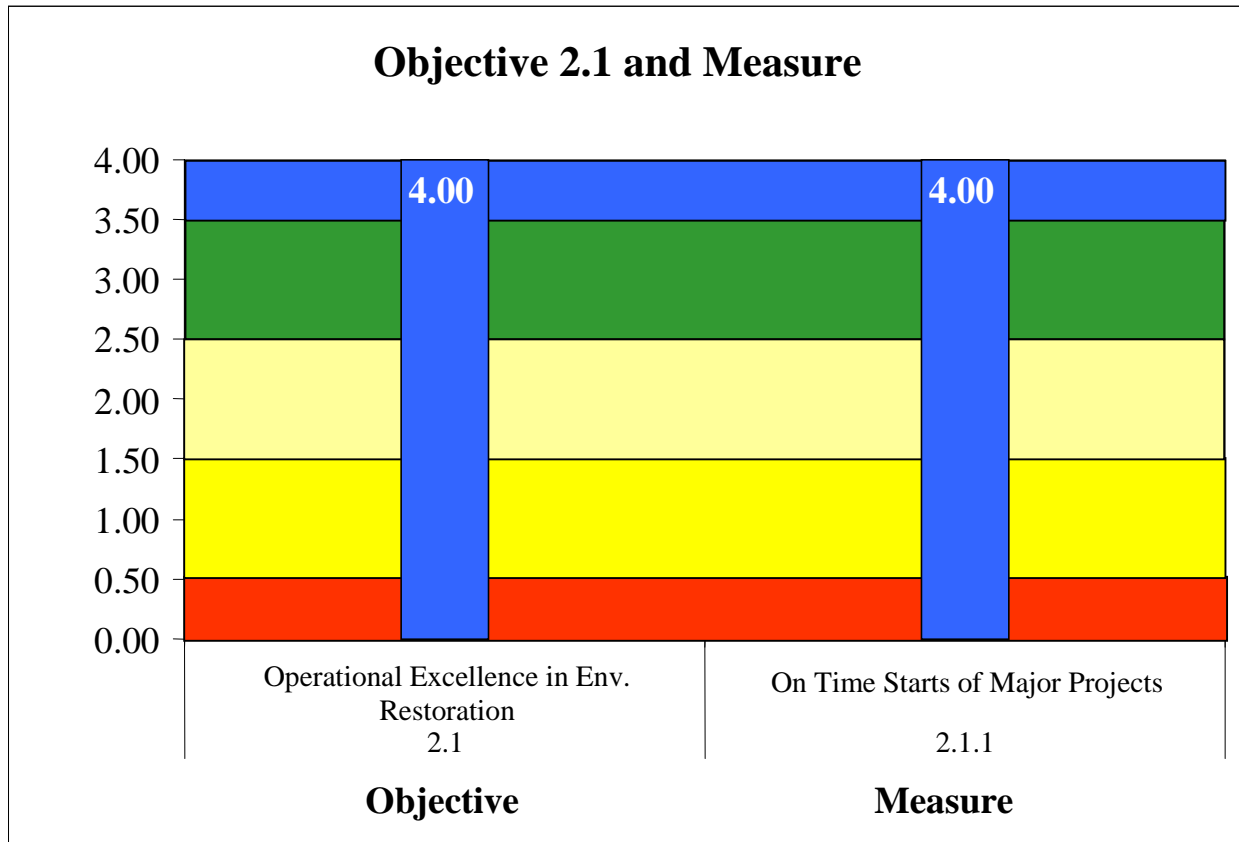
The weight of this Outcome is 8% of total.

BNL Will Deliver “Best-In-Class” Solutions In Conducting The Environmental Restoration Program. Focused Upon Completion, The Results Will Be Protective Of The Environment, Cost Effective, And Performed In An Open Exchange With The Community, Our Regulators, And Other Stakeholders. BNL Will Continue To Keep The Commitments Agreed To In The Memorandum Of Understanding Signed By Dr. Marburger And Mr Holland On May 4, 2001.

2.1 Operational Excellence in Env. Restoration

The weight of this Objective is 60%.

BSA will incorporate operational excellence into work planning, authorization and implementation. Hazards are identified and mitigations developed during work planning. Work authorization includes levels of coordination and management review appropriate to risks and impacts. Incidents are reported promptly and timely actions are taken to resolve the problem and prevent recurrence. Trends are analyzed and feedback provided to improve performance. Management systems in use are effective tools in minimizing or avoiding events that could compromise safety or impact project costs and schedule.



2.1.1 On Time Starts of Major Projects

Accomplishments

No. 1: Bldg 811 cleanup postponed to FY 04 due to funding; BCP authorizing schedule change has been approved.

No. 2: 650 major project start commenced on time.

No. 5: Sediment trap major project start commenced on time.

No. 7: Middle Road startup completed on time.

No. 8: Western South Boundary major project start commenced on time.

No. 12: Cooler removal major project start commenced on time.

The Contract change resulting in removal of BGRR filter "starts" was approved. As part of this change to Appendix B, BAO and BNL mutually agreed to add an additional major project start:

NEW: Start loading Stockpiles 6A and 7 no later than September 10.

Results:

Because of schedule performance on the stockpile sorting project, BNL was able to accelerate the loading and shipment of these stockpiles into FY02; this milestone was met on September 10.

Analysis

All eleven major project starts have been achieved on or ahead of schedule. Moreover, in most cases, the "started" work was completed on schedule or is now proceeding on or ahead of schedule without operational events or mishaps. Changes have been formally processed via approved BCPs. All major project starts have been formally documented via letters to the DOE. These accomplishments correspond to *Outstanding* performance.

Results indicate that BNL is increasingly effective in planning and executing cleanup work. On time starts and incident free work indicate that work planning has been thorough and accurate. Additional leadership oversight and strategy development in the area of sub-contacting have been particularly effective in project execution involving sub-tier contractors without substantial post-work issues and claims; sub-tier contractor work is consistently and successfully completed. Lastly, BNL has routinely delivered work on schedule. This again points to effective work planning and execution. Routine schedule reviews, instituted well over a year ago, continue to serve as effective project performance feedback loops.

Results

Score (0~4.0)	Rating
4.00	<i>Outstanding</i>

Supporting Assessment Measures for 2.1

SAM #1, Project and Program Management Systems, Score 3.50, Rating *Excellent*

The following tasks and assessments were conducted in support of this SAM:

- 1) DOE Independent Assessment Team (focused on BGRR, Program management and Waste Management),
- 2) BSA EM Oversight Committee (focused on Groundwater, Surface projects as well as cost and schedule performance, project execution and risk),
- 3) Baseline Change process self assessment,
- 4) HFBR 413 Compliance,
- 5) Second DOE Independent Assessment Team visit did not occur (focus was to be on O413 compliance),
- 6) Earned Value and Reporting,
- 7) Monthly Reporting Improvements,
- 8) Baseline Change Maintenance and Distribution and,
- 9) Second BSA EM Oversight Committee (focus on HFBR initiated on 9/18, second meeting on 10/29)

SAM #2, Stakeholder Involvement, Score 3.80, Rating *Outstanding*

In support of this SAM, surveys were conducted to review and assess stakeholder involvement and communications in the following areas:

- 1) CAC Interaction,
- 2) BGRR project (overall)
- 3) BGRR Restructuring,
- 4) Offsite Groundwater system installation,
- 5) EM/CEGPA/DOE interaction,
- 6) OU III Outreach,
- 7) Working Group Interaction and,
- 8) Regulatory Interaction

SAM #3, Waste Management, Score 3.65, Rating *Outstanding*

The following evaluations and assessments were conducted in support of this SAM:

- 1) Cost evaluation of EM waste management options (including NTS disposal option),
- 2) WMD approval of EM waste shipments,
- 3) I/O Assessment of project specific WM plans,
- 4) Compilation of unplanned waste costs,
- 5) Monitor completion of the soils strategy by the Soils Working Group,
- 6) Option for Shipping rad material via rail through Queens,
- 7) Reduction of 2 of 4 BGRR waste streams in FY02 (3 were reduced),
- 8) Monitor completion of project specific waste management plans for all stored waste generated from BGRR activities and,
- 9) Assess EMD compliance with EM Waste Management Plan.

SAM #4, Work Management, Score 3.20, Rating *Excellent*

The following tasks and assessments were conducted in support of this SAM:

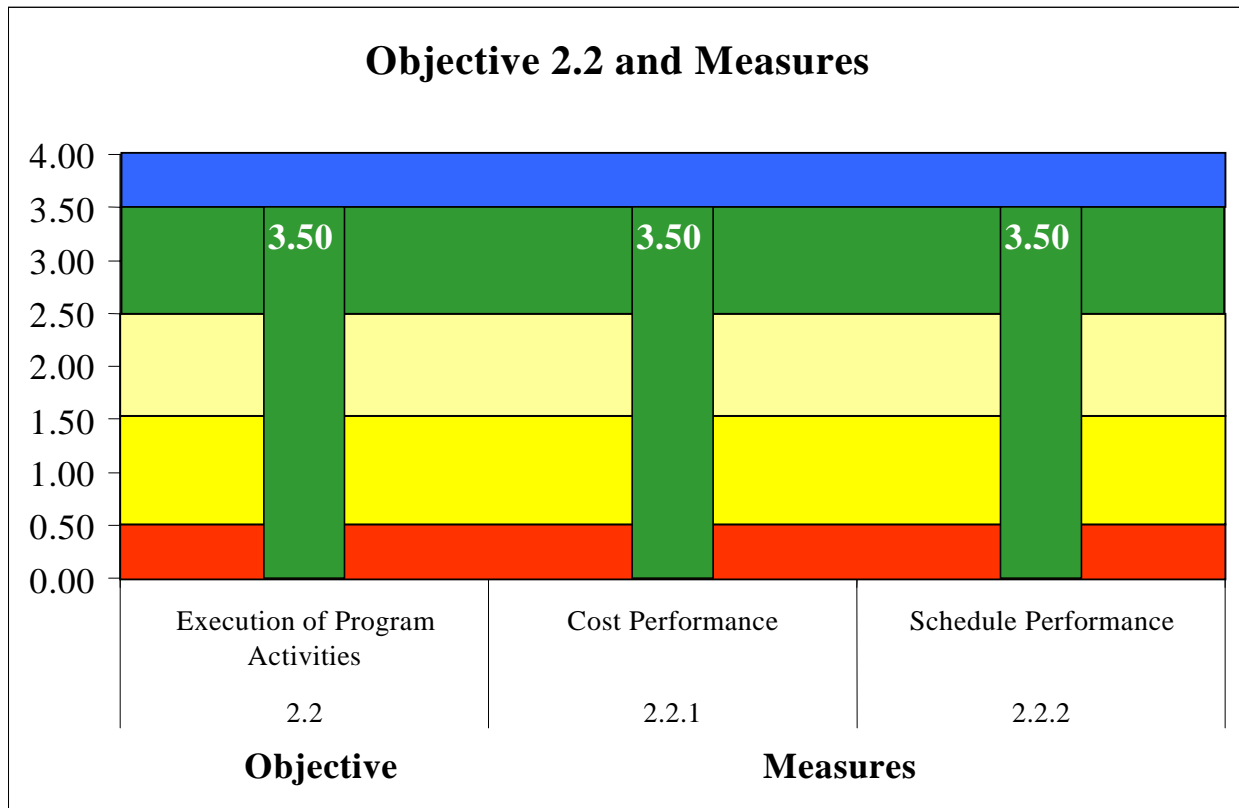
- 1) Revise and reissue work control procedures OPM 2.1-Work Planning and Control System and OPM 4.5-Implementation, Control and Configuration of Field Work Activities,
- 2) Perform Worker Safety and Health Self-Assessments (One scheduled, one unscheduled),
- 3) Perform a Worker Safety and Control Assessment and,
- 4) Perform a Work Controls Surveillance.

All findings and observations are being addressed with specific corrective action plans. These plans and actions are being tracked to completion via ATS or the Re-Engineering Action Item list.

2.2 Execution of Program Activities

The weight of this Objective is 40%.

BSA will expertly, expeditiously, and economically plan, conduct, and complete decontamination and decommissioning of surplus facilities; removal and disposal of wastes; and remediation of soils and groundwater contaminated by past practices. These projects will be safely but aggressively undertaken, closely controlled, and focused on completion. BSA will aggressively manage cost and schedule performance within acceptable performance measures and achieve all major Interagency Agreement milestones on or before their commitment date with the regulatory agencies.



2.2.1 Cost Performance

Accomplishments

The FY02 year end EM program CPI, excluding the BGRR, was 1.06. This CPI is a calculated number which considers earned value that was added to the program during FY02 during this year for situations in which the work was performed in a previous year. The 1.06 evaluated CPI also considers and makes adjustments for accruals that were not in alignment with the year in which the work was performed. In short, the evaluation process ensured that there was an objective comparison of budgeted cost of work performed against actual costs for FY02.

Analysis

The composite FY02 CPI for the BNL EM program is forecasted to be 0.99; The EM team is finalizing earned value, actual and accrued costs to close out FY02. This represents a substantial improvement over FY00 and FY01 (0.85 and 0.93, respectively). EM program performance excluding the BGRR was evaluated to be 1.06, as described above.

The 1.06 CPI would numerically support a rating of 4.0 for this performance measure. However, BNL acknowledges several issues and opportunities that warrant a reduced rating:

- Even though the 650 outfall project was completed in accordance with the contract and IAG milestone, unfavorable performance resulted in schedule compression towards the end of the project which necessitated additional work being accomplished on overtime.
- There may have been a missed opportunity to reduce the scope of the 650 outfall project. BNL expended substantial effort in performing the work as described in the Baseline. However, the removal of a small radionuclide inventory by uncovering and removing a substantial length of buried pipe may have been avoidable even though the Baseline and ROD specified otherwise. A more proactive and wholistic review of Baseline work and the regulatory bases documents may result in opportunities to streamline the BNL EM program.
- The BGRR project to date cost variance at the conclusion of FY02 (23%) was marginally higher than the 20% condition stated in the assumptions. The basis for this condition was to ensure that the BGRR would not continue to perform throughout FY02 with a spiraling deficit. The 3% deficit indicated that this intent was fundamentally achieved. In fact, unforeseen lower canal radiological conditions represent a substantial portion of the unfavorable BGRR FY02 and project to date variance. This alone could have decreased the variance percentage to less than 20%. It is also noteworthy that the project to date variance, as a percentage, was the same (i.e. 23%) at the end of FY02 as it was at the end of FY01. In fact, all of the new work performed against BNL's BGRR path forward has been performed at a CPI in excess of unity. In short, the full intent of this condition has been realized. Nonetheless, BNL believes that some reduction in the rating against this performance measure is appropriate.

Based on the foregoing, BNL's rating of its performance against Performance Measure 2.2.1 is 3.50.

Results

Score (0~4.0)	Rating
3.50	<i>Excellent</i>

Details

Cost Performance Index	Amount
Budgeted Cost of Work Performed	\$15078K
Actual Cost of Work Performed	\$12650K

2.2.2 Schedule Performance

Accomplishments

20 of 21 appendix B milestones were met on or ahead of schedule. One milestone, the submittal of the Peconic River proposed remedy to the IAG on August 22, was late. The IAG commitment was re-scheduled to September 13 and the proposed remedy was actually forwarded to the regulators on September 19.

Prior to the close of the fiscal year, BNL was successful in accelerating the completion of six milestones into FY02. These milestones include the development and submittal of five remedial action work plans for regulatory review, and the completion of the Magothy aquifer characterization and publication/delivery of the associated draft report to the DOE prior to the close of the fiscal year. From a program to date perspective, BNL continued to make substantial progress in closing the schedule variance gap. Program to date SPI improved from 0.97 at the end of FY00 to 0.98 at the end of FY01. BNL continued to close the unfavorable schedule variance. Program to date SPI, at the conclusion of FY02, now stands at 0.99.

Analysis

One milestone was late during FY02. BNL had completed the work necessary to submit the proposed remedy prior to the re-scheduled September 13 IAG commitment. However, the change in delegation authority from DOE-HQ added a review cycle that was not in the Baseline nor within the control of BAO or BNL. The actual submittal was constrained by this final review. Notwithstanding the IAG schedule, BNL acknowledges that the August 22 Appendix B milestone was late. As discussed with several DOE officials, BNL and the DOE are jointly conducting a critique of the risk assessment and remedy development/review process with the objective of identifying lessons learned that can be deployed to other projects encompassed by the BNL cleanup program.

BNL successfully accelerated the completion of six milestones into FY02. With these six milestones and having been late with one milestone, BNL is numerically qualified for a rating of 4.0 against this performance measure. However, BNL acknowledges several circumstances which justify a reduced rating:

- The 650 outfall project was completed on schedule. However, schedule performance issues throughout project execution resulted in increased costs and complicated the verification survey and close out of the project.
- Throughout the fiscal year, BNL was challenged to keep the Peconic River project on schedule. Risk assessment work fell behind schedule which compressed the schedule for remedy development and review.
- BNL needs make better use of new and existing tools to examine performance at the project-at-completion horizon. Schedule analyses are being enhanced to consider the program at the strategic level in addition to the tactical level; BNL needs to continue to build on this initiative.
- BNL needs to implement several actions to improve the working relationship with Suffolk County. The status quo represents a schedule liability that warrants focused attention by BNL.

Based on these circumstances, BNL believes that a rating of 3.50 is appropriate for this measure.

Results

Score (0~4.0)	Rating
3.50	<i>Excellent</i>

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3.0 Laboratory Management and Operations

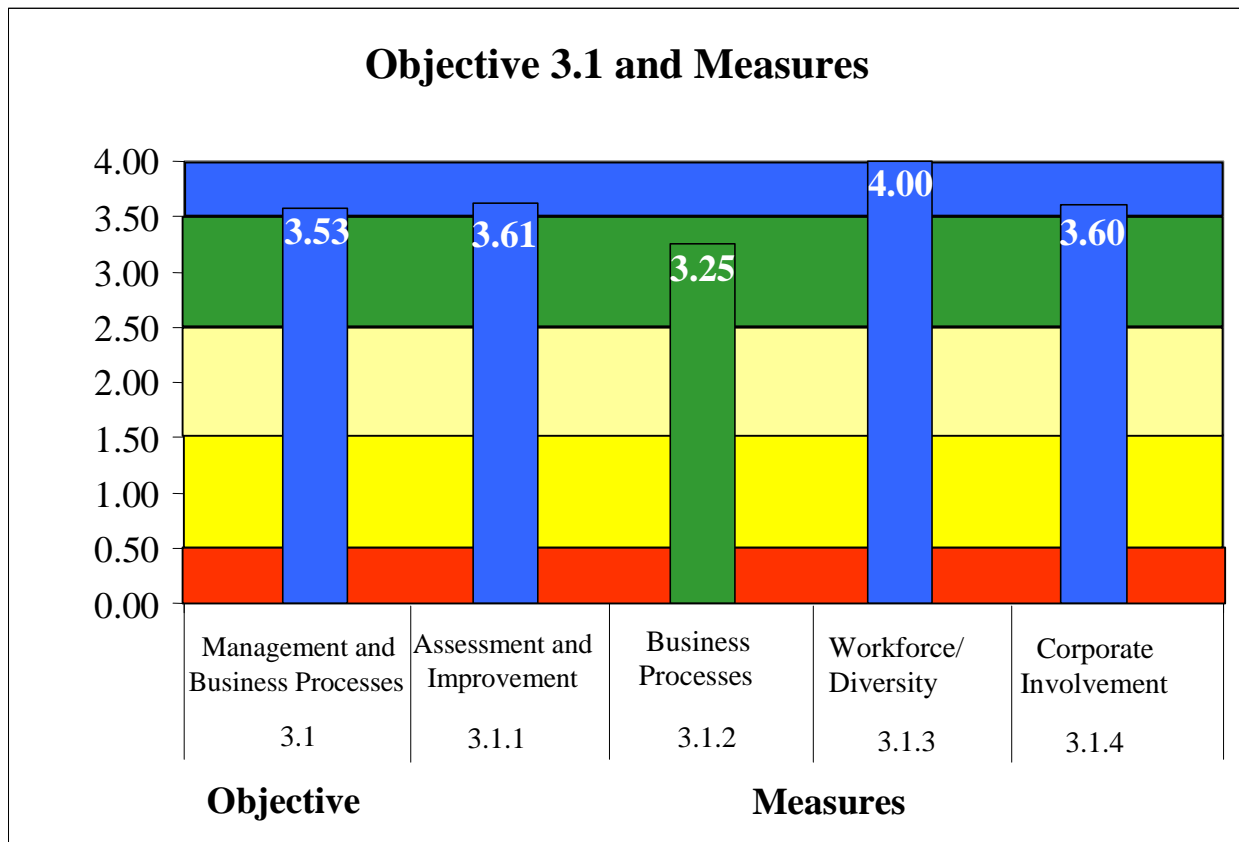
The weight of this Outcome is 32% of total.

BNL Will Manage And Enhance Operations And Management Processes To Provide An Effective And Efficient Work Environment That Enables The Execution Of The BNL Mission In A Manner Responsive To Customer And Stakeholder Expectations.

3.1 Management and Business Processes

The weight of this Objective is 55% of total.

BSA will develop, implement, evaluate, and improve management tools and processes to attract, hire and retain a highly qualified and diverse workforce and enable the workforce to effectively and efficiently support the Laboratory scientific and cleanup missions.



3.1.1 Assessment and Improvement

Accomplishments

In FY02 the Laboratory and BAO jointly agreed to focus on enhancing the role of Laboratory self-assessment in support of performance-based management. Two initiatives were undertaken

1) 29 Supporting Assessment Measures and 2) continuation of the successful Enhance Evaluation Management Systems that were initiated in FY01. As a result of these efforts, significant understanding and involvement in the self-assessment process were achieved that have influenced the FY03 performance measures. For FY 03 Management Systems will be assessed, Management System Maturity evaluations will continue, and an independent third party will evaluate the Laboratory's Management Systems assessment program.

The overall score and rating for this measure is based on the results of the two sub-measures discussed below and the inroads made in advancing the self-assessment program supporting performance-based management.

Results

Score (0~4.0)	Rating
3.61	<i>Outstanding</i>

3.1.1.1 Overall Evaluation of the Lab's Self-Assessment Program

Accomplishments

DOE/BAO and BSA have jointly agreed to use the evaluation of performance on Supporting Assessment Measures (SAM) as the primary information source for the overall evaluation of the Laboratory's Self-Assessment program. The objective was to evaluate the maturity of the Laboratory's Integrated Assessment Program in terms of Approach, Deployment, and Results. This information was captured in 29 Supporting Assessment Measures Plans approved by both the BNL and BAO SAM owners. The SAMs themselves are discrete assessments of generally non-mission related support processes or activities. An assessment program evaluation document/guide was jointly developed and approved by BNL and BAO. It provides guidance in developing and evaluating the three elements of a SAM; approach, deployment, and results. It also contains scoring criteria for evaluating each element.

A core team of four BAO and four BNL senior managers provide oversight, direction and evaluation for this process. BAO and BNL SAM owners have been identified and their responsibilities defined. The eight core team members recognized that the process is new and would be maturing as it was being implemented.

Analysis

Summarizing the results of the FY 02 SAM process the major highlights were:

- 1) The assessment process was defined by development of the "Assessment Program Evaluation Guide" which defined the self-assessment program including criteria for determining performance rating. This document was approved by BAO and BNL on 2/12/02;
- 2) SAM plans were developed and agreed to by BAO and BNL SAM owners. The SAM plans each contained three dimensions:
 - Approach - defines expectations and supporting tools, procedures and processes for managing the assessment(s).
 - Deployment – defines strategy for implementing the plan.

- Results - defines success criteria to achieve improved performance and reducing institutional risk.
- 3) Roles, responsibilities, and accountability of BAO and BNL SAM owners were assigned resulting in counterparts (BAO& BNL) communicating, interacting, and becoming more engaged;
 - 4) Deeper understanding of self assessment expectations by both BAO and BNL owners;
 - 5) Laid the groundwork for establishing an FY03 Assessment and Improvement Objective focusing on Management Systems which will provide a much more meaningful evaluation of broad BSA performance. The three elements that make-up this FY 03 Objective are:
 - Management System Objectives and Assessment Activities
 - Consensus-based User/Peer Reviewer Maturity Determinations
 - Third Party Evaluations of the Management Systems Assessment Program

The 29 SAMs there sub-elements and final rating are as follows:

SAM #	SAM TITLE	RATING
1	Project and Program Management Systems	3.50
2	Stakeholder Involvement	3.80
3	Waste Management	3.65
4	Work Management	3.20
	• Work Controls SOPs	
	• Worker Safety & Health SA	
	• Worker Planning & Control SA	
5	Human Resources	3.75
	• Compensation	
	• Benefits	
6	Legal Services	3.60
7	Property Management	3.58
8	Procurement Management	2.00
9	Requirements Management	3.85
10	Technology Transfer	4.00
11	Training and Qualifications	3.75
12	Uncosted Balances	3.90
13	Work-for-Others (WFO)	3.70
	• Federal	
	• Non Federal	
14	Environmental Compliance	4.00
	• Air Emissions	
	• PCB Management	
15	Maintain ISO 14001 Registration	4.00

16	Progress Toward Accelerator Authorization Basis Upgrades	3.60
17	Radiological Control	3.60
	• ALARA Program	
	• Organization and Administration	
	• External Dosimetry	
	• Radiological Dose Reports to Individuals	
	• Emergency exposure Situations	
	• Instrumentation and Calibration	
	• Release Criteria	
18	Recycling of Solid Waste	4.00
19	Regulated Waste Management	4.00
20	Safety and Health	3.22
	• Design Review Program	
	• OSHA Regulated Carcinogens	
	• NFPA 70E Compliance	
	• Biohazards/Biotoxins	
	• Construction Safety Inspection	
	• Industrial Exhaust Ventilation	
21	Worker Involvement in Work Planning and Control	3.57
22	Building Manager Program	4.00
23	Safeguards and Security	3.80
24	Counterintelligence	2.50
25	Emergency Planning and Preparedness	3.80
26	Energy Management	4.00
27	Management of Maintenance Activities	4.00
28	Information Services	3.01
29	World Wide Web	2.93
Average Score		3.60

As mentioned previously each one of the 29 SAMs were evaluated on the three dimensions; approach, deployment and results. Evaluations were performed by BAO and BNL SAM owners for there respective SAM with an agreed upon final score and rating. The final rating and score for this element is an average of the 29 evaluations.

Results

Score (0~4.0)	Rating
3.60	<i>Outstanding</i>

3.1.1.2 Enhance Evaluation of Management Systems

Accomplishments

Verification of the Quality Assurance Program (QAP) was initiated in FY01 and completed in FY02. The tool developed for review of the QAP can also be applied to ALL of BNL's Management Systems. The tools provide a methodical approach to evaluating management system deployment and performance. These tools are based on the management system life cycle which consists of five transitional phases as follows:

- Development: Documentation of policies and procedures
- Implementation: Policies and procedures are put into use
- Verification: Demonstrated wide-spread use and acceptance
- Behavioral Impacts: Change in culture, attitudes, and work habits
- Performance results: Sustained change in operational performance

The level of risk to the institution drives the length of the life cycle and the time at which sustained "performance results" must be achieved. The complexity and size of the population affected by the management system also impact the time required to transition through these phases.

Development of the management system maturity evaluation tools did not support completion of the QAP Verification in FY01. A performance measure was developed for completing that verification in FY02 using the newly developed tools. In FY02, Management System Evaluations were conducted on the five systems in which the Quality Program is deployed. These management systems are:

- Integrated Assessment
- Training & Qualification
- R2A2 Process
- Records Management
- Quality Management.

All Management Systems Evaluation reports were submitted within the planned schedule. A Summary Report was issued on May 14, 2002, which outlines the health and status of the overall Quality Program at BNL. All actions are complete regarding this performance measure.

Analysis

BNL has completed all actions required by the QAP Verification Plan. The Summary Report – "BNL QAP Verification Process" states: "The MS Evaluations showed a high degree of maturity in all but a few areas, indicating the *systemic* weaknesses in BNL's Quality Assurance Program have been identified and corrected." An earlier evaluation of the QAP Verification process (performed in FY01) stated: "The BNL Quality Program is in compliance with 10CFR830.120." This evaluation also commended BNL on the use of the MS Evaluation process as an effective tool for verifying implementation.

After the Summary Report submittal, several Management Systems Stewards have developed and are tracking improvement actions to bring their management systems further along the life cycle-path.

In addition to verifying the QAP and successfully completing the elements of the performance measure, BNL is now realizing an additional long-term benefit (not a requirement) as a result of the QAP Verification process: the acceptance and the institutionalization of the Management System Maturity Evaluation, which has been carried into BNL's FY03 performance measure. By institutionalizing the process of Management System evaluations, risk-based progression plans will be required and tracked at the institutional level. This will dramatically improve the visibility and attention given to the maturation of BNL Management Systems in general, and goes far beyond the elements of the BNL Quality Assurance Program.

Our rating in this performance area is a 3.7.

Results

Score (0~4.0)	Rating
3.7	<i>Outstanding</i>

3.1.2 Business Processes

Accomplishments

This is a rollup of two sub measures, 3.1.2.1 Baseline study of Laboratory Business Systems and 3.1.2.2 Work-for-Others (WFO) Business Systems.

Measure 3.1.2.1 Baseline Study has made good progress. BSA and BAO counterparts have met several times. BSA has developed a finalized matrix of indicators. The matrix was shared with DOE. These indicators will be evaluated in FY 2003 for definitions and applicability to BNL business processes, and a determination made on the basis of comparisons to be used (e.g. trending or direct comparison with industry/Laboratory 'best-in-class' indicators).

Significant progress has been made on the second measure, WFO Business Systems. This measure contains two sub-parts: a) Development of a WFO database providing historical project financial information on WFO work; and b) Development and implementation of fully-electronic WFO billing to DOE/Chicago. The BNL and DOE POCs have met and are in agreement with the WFO Database development outline. The database has been developed and is in testing at this time. The WFO Billing process efforts is complete, DOE CH is satisfied with BNL data inputs and the DOE BAO is now receiving data electronically from the Fiscal Division to allow for reconciliation of the WFO billing.

Results

Score (0~4.0)	Rating
3.25	<i>Excellent</i>

Notes, Issues, Trends and Assumptions

The area of subcontract administration along with other aspects of procurement, while not part of the FY02 business processes performance measures, have surfaced as needing continued and additional corrective actions. While 4 of the 5 items identified during the FY02 subcontract administration Inspector General review (large procurement approvals, advanced notices, non-competitive procurement justifications and vendor database errors) have been corrected, additional training for Tech Reps remains in progress. Although significant improvements have been achieved in many aspects of procurement, areas such as procurement organization and personnel performance, further effort is required in procurement quality, vendor database validation, process re-engineering, and procurement networking. These issues, as well as a go-forward plan, will be addressed within the procurement Balanced Scorecard (BCS) Report submitted to DOE-BAO for FY 2002. For FY 03, the BSC will be appropriately modified and a performance measure proposed to ensure that the proper level of visibility and attention remains on this area.

3.1.2.1 Baseline Study of Laboratory Business Systems

Accomplishments

At our first quarterly Self Assessment meeting with DOE on February 4, 2002, BSA presented the following schedule for this measure:

Project Scope

- Jan/Feb - Identify study group - BNL and DOE/BAO team
- Jan/Feb - Identify Management Systems
- Jan/Feb - Compile measures from other labs
- Mar/Jul - Establish indicators
- Aug/Sept - Specific indicators identified for FY '03.

On August 2, 2002, we presented to DOE a set of specific indicators to be considered in FY 03. DOE accepted the list and developed FY 2003 Contractual measures for the Benchmark/Baseline Study. Therefore, we have achieved an *Excellent* rating for this measure.

The background to this achievement is as follows:

- 1) The work remained on schedule;
- 2) A detailed listing of the indicators and the cognizant Management Systems that can be benchmarked and the basis for that determination were developed; and
- 3) The indicators and Management Systems that cannot be benchmarked and the basis for that determination were also developed.

The expectations for this measure require additional discussion and mutual development between BAO and BSA. The measure called for the identification of key measures and indicators to monitor and evaluate performance, focused primarily on Management Systems. There are two applicable uses of these indicators: Compare them by benchmarking against industry, DOE Labs or other organizations; or, alternatively, use them as internal trend indicators. There was disagreement with DOE/BAO on how to determine the applicable indicators. Based on the 2/4/02 discussion, BAO believed the preferred approach was to: (a) Survey industry and other Laboratories to determine what managements systems can be benchmarked (that is, determine where there is sufficient comparative definition and data); (b) Apply that information to determine which BSA indicators to select.

F&A believed that a more time- and labor-effective approach is to select those indicators we find important to evaluate the effectiveness and efficiency of our business systems, and THEN to examine how those indicators might be benchmarked for comparative purposes. If there is no ability to benchmark particular indicator(s), then they will be used for internal trending. F&A's initial step was to request our Divisions/Offices to look at their operations and propose what indicators and management systems they believe would be appropriate for their operations, including examining what comparative information might exist, what others are doing, and to contact their counterparts at other Labs. Concurrent with this process, we established an ALDFA team to review the input received, consisting of Mary Petersen, Mark Israel, Kevin Fox, and Greg Ogeka. An initial compilation has been made for both indicators and management systems, and these are being validated against what is being done by other Laboratories.

The first face-to-face status meeting with DOE/BAO was held on 3/25/02. BSA shared with DOE the progress that was made in identifying the Management Systems that can be benchmarked. BSA prepared a chart that linked the SBMS Business Management Systems with the business systems listed in Article 51 and 62 of the Prime Contract. In addition we included proposed indicators for these business systems. The approach disagreement described above was the subject of a lengthy discussion that requires additional dialog. F&A and BAO agreed to review the business systems again and consider outside sources for determining systems for benchmarks.

A second source of information at the Hackett Group (a benchmarking firm) was pursued to provide some evaluation as to the applicability of industry benchmarks to a DOE laboratory research environment.

A meeting was held on April 3, 2002. In attendance were R. Gordon and J. DaSilva of BAO and B. Sack, G. Ogeka, and K. Fox of BNL. At the meeting the parties agreed to the following:

- The universe for the business indicators was the previous chart submitted to DOE. The chart listed the five SBMS Management Systems--Financial Management, Acquisition Management, Administration Support Management, Property Management and Records Management. The chart also included Prime Contract Article 51, Financial Management System, and Article 62, Management Controls.
- Using the above chart, BNL will develop a matrix of indicators from internal sources, other Laboratories, and The Hackett Group.

- BNL will present this list to DOE for discussion and selection of proposed indicators.

Based on the above meeting BNL collected data on business indicators and best practices from NREL, PNNL, BNL Contractual Measures, BNL Self Assessments, and the Hackett Group. The data from all of these sources was evaluated, and a matrix was developed that listed all the possible indicators. The indicators were sorted by function and BNL has developed its recommendation of which indicators should be contractual performance measures and which indicators should remain as internal self-assessment measures.

The matrix is a comprehensive list of possible business indicators as well as some best business practices. In many cases BNL has already adopted the best business practices. This is an early indication that our business systems are moving in the right direction. A third meeting was held on August 3rd to share this matrix of indicators with BAO partners (K. Fox /J. DaSilva). The two partners agreed to the following:

- The Baselines indicators selected are those areas on the Matrix that have Hackett data.
- That for FY 03 BNL will request a third party to review the proposed list of indicators to validate they are appropriate for our study.

The metric for this measure was as follows:

Outstanding	Study partially implemented.
Excellent	Study completed with specific indicators identified.
Good	Study is scoped.
Marginal	Study is not scoped.
Unsatisfactory	No progress.

The score of an outstanding 4.00 required the study to be partially implemented. This means that the Laboratory would identify the various indicators, acquire DOE's agreement of the indicators, and then actually start collecting data for these indicators. This was a true stretch goal. The task of scoping the requirement and gaining agreement on the possible indicators with DOE was a very involved task and took the full year. Therefore, the rating of *Excellent* is deemed appropriate.

Results

Score (0~4.0)	Rating
3.00	<i>Excellent</i>

3.1.2.2 Work for Others (WFO) Business Systems

Accomplishments

This is a rollup of two sub measures, 3.1.2.2.1 Improving WFO Billing System and 3.1.2.2.2 Develop WFO Database. Both BNL owners have met with their DOE counterparts several times

and clarified the requirements of the measures. In the WFO Billing System, the Fiscal Division has satisfied all of the DOE/Chicago requirements regarding system requirements and submission of data. In addition, they have worked closely with the DOE-BAO and have satisfied their need for data in order to reconcile the WFO Billing. This measure is complete and received a rating of 4.0. The Budget Office has met with their DOE POC, verified the database structure and data fields necessary for the Database, and has developed the database. They are currently testing the database to ascertain that it can handle the volume of data, which will flow into the system and plan. Due to problems with the WEB interface software (application bugs), it was not possible to meet the requirements of 4.00 rating which was to have the database fully operational by the end of Fiscal Year 2002. The revised schedule is to have the database fully operation in FY 2003.

Results

Score (0~4.0)	Rating
3.50	<i>Excellent</i>

3.1.2.2.1 Improve WFO Billing System

Accomplishments

This Measure (to restructure the Work For Others/Other Federal Agencies billing and collection process and the related Financial Information System reporting) has been completed on schedule. Under the Fiscal Services Division’s management, the DOE/Chicago conversion timeline requirements were met ahead of schedule, and billing data is currently being transmitted electronically to the DOE’s IPAC system. DOE/Chicago is completely satisfied, and no longer requires that hard copy invoices to be sent to them. We have also partnered with the DOE/BAO office and completed re-engineering their internal process that had required manual posting of hard copy invoice data into Excel spreadsheets for their tracking of WFO documents. This should have the effect of reducing the number of staff hours required. Fiscal Services Division is now downloading WFO data directly from PeopleSoft into the DOE/BAO-formatted spreadsheet, and electronically forwarding the completed spreadsheet to DOE/BAO. They have indicated complete satisfaction with this implementation. This measure is complete.

Results

Score (0~4.0)	Rating
4.00	<i>Outstanding</i>

3.1.2.2.2 Develop WFO Database

Accomplishments

In the fourth quarter, the Budget Office has had several meetings with the following organizations:

Department of Energy - Brookhaven Area Office

Office of Intellectual Property
Business Systems Division
BNL Scientific Departments

These meetings were focused on finalizing the design requirements of the WFO Database and initiating the programming to develop the various interfaces and panels that the users would be viewing. The WFO database structure has been finalized. The People Soft database has been studied and all required fields have been identified. These cost fields will become part of WFO Database and will be updated every month from PeopleSoft database. All WFO related reports will use this data and will be available through a web interface.

All software and libraries have been tested for their usability and co-existence. Being a web based approach; the WFO database utilizes various programs and libraries. "Flashfiler" is being used as backend database, which will host all WFO related data. The programming language is Delphi and there are different libraries that are being used for other purposes like connecting to PeopleSoft database (Direct Oracle Access), Producing Acrobat PDF reports (PDF), Reporting (Fast Report with Pragman Filters for Excel downloads). The web interface is provided using a product called EWF from Developers Express.

All related hardware has been procured.

Programming on business rules, including Workflow and Approval process, has begun. Efforts now are being directed at programming user interfaces and creation of test data.

To clarify the progress made described above the BNL Budget Office personnel met with DOE-BAO (Palladino, DaSilva) on 11/13/02. The Budget Office performed a live demo of the database. This demonstration showed that the database included all the data fields necessary to generate the required reports. The demonstration also included building a query and producing an actual test report from the PeopleSoft and PIQ databases. BNL agreed to provide the following backup information to DOE by Friday 11/15/02 to support progress described above.

Backup Information

1. Tables with all fields
2. Copies of reports to be generated
3. Further description of the progress made on this measure

In FY 2003, BNL will work with DOE to develop a plan that fully implement the Database.

Results

Score (0~4.0)	Rating
3.00	<i>Excellent</i>

3.1.3 Workforce/Diversity

Accomplishments

From October 1, 2001 to present, there were a total of 117 requisitions filled in the Officials & Managers and Professional EEO categories. Of those 117, 83 or 70.9% had at least one diversity candidate, i.e. female or minority. This represents a raw increase of 9.8% or a relative increase of 16.0% over the 61.1% average for the two base reference years of 1998 and 1999 for this measure. This far exceeds the 10% improvement required to achieve a performance level of *Outstanding*.

Results

Score (0~4.0)	Rating
4.00	<i>Outstanding</i>

3.1.4 Corporate Involvement

Accomplishments

Summary Evaluation and Rating:

Brookhaven Science Associates is committed to active corporate involvement in the management of BNL. Overall, performance for corporate involvement is rated as *Outstanding* with a score of 3.6. Performance for all areas is acceptable and an *Outstanding* rating is warranted in accordance with agreed upon metrics. The self-evaluation rating is adjusted to the lower end of *Outstanding* in recognition of the delay in permanently filling the position for the Laboratory Director and other science and technology managerial positions. Examples of specific accomplishments for the basis of the rating are discussed below.

Specific Accomplishments:

- **Providing highly skilled candidates for senior management positions at the Laboratory:**

In FY02 the primary senior management position addressed by BSA was the Laboratory Director. Following the announcement of Dr. Marburger's departure at the end of FY 2001, BSA selected Dr. Peter Paul as acting director and initiated an exhaustive search for an outstanding replacement. Initial attempts to find a Director were unsuccessful. On May 1, 2002, the BSA partners, Battelle and Stony Brook University restarted the search process. BSA defined the search criteria, identified several nationally known search firms with expertise in filling high-level scientific/academic positions, and held a formal interview/competition to select one firm to conduct the search. On May 15, 2002, an interview committee conducted an in-depth review of each of the firm's qualifications. The committee consisted of:

Dr. Shirley Strum Kenny, President, Stony Brook University
Dr. Carl Kohrt, President & CEO, Battelle
Dr. Robert McGrath, Provost, Stony Brook University

Mr. Donald McConnell, Senior Vice President, Battelle
Mr. Robert W. Smith, Jr., Senior Vice President, Battelle

A search firm was selected and immediately began the task of preparing a list of candidates. The interview process began in August. A list of candidates will be recommended to the BSA Board in October.

- In August 2002, a BSA-commissioned review team discussed below identified the need for BNL to re-establish ESH&Q as an assistant Laboratory Director position and fill the position as soon as possible. In September BNL management accepted this recommendation, requested Dr. Kenneth Brog, a Battelle VP, be assigned as Interim EH&Q Manager, and initiated a formal search for a permanent person.
 - Positions for three level 2 managers within BNL's Basic Energy Sciences Directorate, i.e. Chemistry Department Chair, Material Science Department Chair, and the Nanoscience Center Director, remain open. The position opening for the Nanoscience Director is relatively new. However, the Chemistry Department Chair and the Materials Science Department Chair positions have had interim managers since January 2000 and August 2001 respectively. BSA recognizes the importance of having these positions filled with long-term managers for stability and growth in the respective programs. The search for the uniquely qualified individuals to fill these positions appears to be near a conclusion. Outside candidates have been selected and employment offers are being developed for each of them. Formal offers are imminent.
 - Providing proven management systems and processes for enhancing business operations.
 - Building from a highly successful employee community volunteer program implemented by Battelle in Columbus Ohio, BSA has implemented a similar program entitled "Volunteers in Partnership". The program is designed to enhance the image of the Laboratory and contribute to employee morale by providing corporate support to employee led initiatives that contribute to the well being of the greater Long Island community.
 - A cooperative effort has been initiated to explore establishment of a joint Travel credit card (T-Card) using a shared procurement between PNL and BNL, with options for utilization by NREL and ORNL as well as BMI Corporate. This is expected to significantly improve the operation of the current T-Cards at PNL and BNL as well as increase the discount to the Laboratory.
- **Facilitating the implementation of these with long-term assignments of key leaders and short-term assignments of subject matter experts:**
 - Two Battelle personnel augmented a procurement program compliance self-assessment team. One individual provided legal expertise to the team. The other participated to evaluate the program against best commercial practices.
 - As part of an integrated effort by Battelle-affiliated laboratories to support the DOE-SC initiative on external regulation, Battelle personnel assisted BSA staff in developing the BNL input to DOE.

- BSA corporate partner, Battelle, provided a Radiation Protection Manager to conduct one of the Triennial Assessment functional element reviews at BNL in the first quarter of FY02. In addition, another Battelle-affiliated laboratory, Oak Ridge National Laboratory provided support on the deer radiological screening program at BNL.

- **Conducting management assessments in various areas of Laboratory operations:**
 - The third Brookhaven Science Associates (BSA) Corporate Oversight Review was conducted from October 29-November 2, 2001. The review scope involved four areas that were determined by BSA senior management to be of importance to Brookhaven National Laboratory (BNL) operations, including Leadership Changes, Management Systems Feedback and Improvement, Organizational and Institutional Self-Assessments, and Price-Anderson Amendments Act (PAAA) and Quality Program effectiveness. This last area was augmented by a review conducted in September and early October (2001) of the Laboratory's response to DOE Headquarters Office of Enforcement (EH-10) findings on the PAAA Program.
 - On August 2, 2002, BSA initiated a Laboratory Operations Committee review at BNL to assess operational matters and discuss lessons-learned from current practices across BNL, ORNL and PNNL. The Committee, headed by Jeff Smith (ORNL) and Don McConnel (Battelle/BSA Board), and including the Deputy Director for Operations from PNNL and other senior Battelle managers from Columbus, Oak Ridge and Pacific Northwest, met with the BNL senior management operations team. Discussion topics focused on Laboratory performance trends and/or obstacles to achieving long-term Laboratory operational strategic objectives, including all issues identified within the DOE FY01 Performance Evaluation, DOE/BAO Quarterly Progress Letters and a number of other topics of mutual interest. This type of continuing corporate oversight provides a forum for broad-based, senior management guidance, direct exchange of best-in-class operational processes and lessons-learned, and an in-depth understanding of the issues confronting BNL and the other Battelle Laboratories.

- **Providing strategic guidance to the science, technology and cleanup missions of the Laboratory:**
 - The BSA Science and Technology Steering Committee provides science advice and guidance to Laboratory management and reports to the BSA Board of Directors. The members of the Committee represent the corporate partners (SUNY Stony Brook and Battelle Memorial Institute) as well as the Core Universities (Columbia, Cornell, Harvard, MIT, Princeton, and Yale). The Committee provided Laboratory management with advice in many areas of science and technology, including High Energy and Nuclear Physics, upgrades to RHIC and the NSLS, initiatives in the Basic Energy Sciences, Life Sciences, and Energy, Environment and National Security directorates.
 - Two external reviews were commissioned by the S&T Steering Committee. The Environmental Sciences Department review was conducted on July 14-16, 2002,

and the Energy Sciences and Technology review was conducted on July 29-31, 2002. The Environmental Sciences Review Committee made recommendations that responded to the charge, including identifying the strengths and weaknesses of the scientific programs, determining whether the programs are well positioned to advance the science and serve the DOE mission, determining whether the major initiatives are appropriate and realistic, identifying potential sponsors and critical university/industry partners, providing input on current opportunities for growth in the missions areas and in research and development, evaluating staffing mix and skills, and providing guidance on strategic hires.

- The Energy Sciences and Technology Review Committee made recommendations responding to their charge to determine whether the Department's structure is appropriate and the activities responsive to perform mission-oriented energy research, development, demonstration, and deployment activities; if the "work for others" activities are responsive to the needs of the US government, industry, state, and regional organizations; to validate that the major initiatives are appropriate and realistic; to provide guidance on how to grow mission areas, identify opportunities for new initiatives, research and development; to provide insight into whether the Department's resources are sufficient to carry out planned activities, and to evaluate current staffing and provide guidance on strategic hires.
- External review panels are in the process of being formulated to conduct reviews in Physics/CAD/CAP and the National Synchrotron Light Source (NSLS) during the 2003 fiscal year.

- **Facilitating the exchange of ideas and practices between other organizations affiliated with BSA corporate partners that bring benefits to DOE and/or BNL:**
 - Coordinated by Battelle's Pacific Northwest Division, since last February BSA has actively engaged in the U.S. Department of Energy's new model contract initiative with several other laboratories whose contracts are coming up for renewal (principally Pacific Northwest National Laboratory and Lawrence Berkeley National Laboratory), as well as the senior contract administrators from Battelle and University of California. Two significant pronouncements supplied the opportunity for a new contracting approach - the President's Management Agenda emphasizing the delivery of measurable performance results, and the recent memo from DOE's Under Secretary Card establishing six contracting principles for the DOE Office of Science (SC) laboratories. We have worked closely with DOE's SC Working Group led by Steve Silbergleid (DOE-CH Chief Counsel), who, as the Under Secretary's designee for contract renewal negotiations, is leading a DOE team from HQ and the Chicago, Oakland, and Richland Operations Offices, including senior management from the DOE Brookhaven Area Office, that is restructuring the SC laboratory contract model. Senior BNL managers have had several high-level meetings (Richland, Denver, Salt Lake City, and Albuquerque) to capture the lessons learned from the Lawrence Berkeley Best Practices Pilot, the implementation of national standards and culture change resulting from the Kansas City Plant transition, the NNSA performance assurance process and governance approach at Sandia National

Laboratory, and the recommendations from the Hamre report on Science and Security in the 21st Century.

- On November 5 and 6, 2001 a Battelle ESH&Q integration meeting was held at Oak Ridge National Laboratory. The meeting focused on 4 themes; Standards Based Management Systems; Performance Based Management/Integrated Assessment, Integrated Safety Management, and Environmental Management Systems/Pollution Prevention. Actions in each of these themes that were viewed to be beneficial for all/most of the Laboratory's involved in the integration initiative were identified. A follow-up meeting was held at NREL in Denver Colorado in June 2002.
- In support of the 'user pays' philosophy for waste management recently initiated by DOE-SC, BNL staff participated with PNNL and ORNL staff in the development of a highly innovative waste charge-back system that allows for accurate waste forecasting and charge-back of waste disposal costs on an individual project basis. Use of this system is expected to result in significant reductions in waste generation and associated costs. The system will be piloted at PNNL in FY03 and lessons learned will be provided to other DOE labs through an initiative of the SC Laboratory consortium on waste management.
- A corporate Diversity Team, working on a Battelle-Columbus approach to attract and retain members of under-represented groups, gathered a group of representatives from national laboratories for which Battelle is a managing partner for a kick-off meeting in Columbus on August 20th and 21st. They have defined their charter to include fostering a common diversity vision and philosophy, facilitating diversity culture change, advising and educating executive leadership, and leveraging purchasing power with respect to recruiting and university relationships. They will meet quarterly to develop and advance objectives related to their charter.
- Several staff from BNL participated in an independent assessment to support an accelerated ISMS deployment at ORNL. ORNL has built on several processes deployed at BNL (Assessment Tracking System, Performance Based Management etc.) Involvement in the assessment has enabled BNL staff to become familiar with the ORNL modifications for consideration in next generation improvements at BNL.

Results

Score (0~4.0)	Rating
3.60	<i>Outstanding</i>

Supporting Assessment Measures for 3.1

SAM-5, Human Resources, Score 3.75, Rating *Outstanding*

Human Resources Supporting Assessment Measure

The FY 2002 supporting assessment measure for Human Resources covered two areas - Compensation and Benefits. The two assessments were conducted independently and a description of each is presented below:

Compensation

The self-assessment for compensation was conducted according to a set of criteria established by DOE for appraising contractor compensation programs. The criteria include philosophy and strategy for pay delivery programs; system for establishing a job worth hierarchy; method for relating internal job worth hierarchy to external market; system that links performance to compensation decisions; method for planning and monitoring the expenditure of funds; and system of communicating the program to employees.

Between April and July of 2002, BNL collected data on a range of compensation practices at other organizations, particularly other DOE Laboratories, and researched compensation literature, to provide a basis for validating the approaches that BNL has taken. BNL gathered information on its performance relative to the criteria, analyzed it, validated it, and developed conclusions on BNL's performance relative to the criteria. Finally, BNL prepared a comprehensive report that summarized its findings and defined action plans to address areas where improvement opportunities were identified. The report was presented to DOE in July 2002. During the course of the assessment, BNL completed a number of action plans related to improvement opportunities. The score for the compensation assessment was agreed to at 3.65.

Benefits

The self-assessment for benefits was conducted according to a set of criteria agreed to by DOE. The assessment included the use of benchmark surveys for medical and retirement plan designs at other laboratories, review of medical, retirement, and severance benefits by the Employee Benefits Committee, development of a formal communications plan to announce CY03 benefit program changes, maintenance of legal and regulatory compliance for benefits programs, and a customer satisfaction survey for new employees. Extensive information was gathered from the other laboratories in order to compare to BSA's benefits. Overall, the benchmark surveys indicate comparability of medical and retirement plan designs. Rising medical costs indicated an area for further analysis. Such analysis was conducted by the Employee Benefits Committee who ultimately proposed several modifications to the medical plan that were approved by the BSA Board and become effective on January 1, 2003. Formal communications of such changes were a joint effort between Human Resources and CEGPA and resulted in large amounts of information being provided to employees and retirees to advise them of the plan changes and to explain the reason for such changes. In addition, regulatory plan compliance was maintained for all benefit programs, including non-discrimination testing, proper notification of plan changes, etc. As for the customer satisfaction survey, results indicate the Benefits Office is providing a high level of customer service to new employees and that we are meeting or exceeding their expectations.

The overall score for the benefits assessment was agreed to at 3.85.

SAM-6, Legal Services, Score 3.60, Rating *Outstanding*

The Legal Services SAM consisted of four Sub-Measures for '02. The first two - Compliance

with legal management procedures, and the Use of ADR, were assessed subjectively by DOE (BAO and CH). The second two - Innovative improvements, and Timeliness and Quality of work products, were assessed against objective commitments made by the Legal Office at the beginning of the year, including an outside legal review of terms and conditions in BNL construction contracts against industry standards, and a 360 Degree assessment of BNL's legal services by laboratory staff.

At its mid-year review, DOE CH identified deficiencies in the application of Staffing & Resource Plans to cases, which resulted in a "**Good**" rating for submeasure 1. DOE CH raised this to "**Excellent**" for year end. Submeasure 2 was rated "**Outstanding**" based on DOE's review of the Legal Office files for ADR consideration. Submeasure 3 received an "**Outstanding**" as a result of completing a review by outside experts of the legal terms and conditions in BNL's construction contracts. Finally, Submeasure 4 was rated "**Outstanding**" after DOE's review of the results of the 360 Degree assessment sent out to laboratory staff and management.

SAM-7, Property Management, Score 3.58, Rating **Outstanding**

DOE developed the concept of a Balanced ScoreCard (BSC) to be used by all M&O contractors as a self-assessment tool for identifying Property Management weaknesses in the areas of: 1) Customer (25%), 2) Internal Business (55%), 3) Learning & Growth (13%), and 4) Financial (7%).

With DOE guidance and working closely with the BAO Contacting Officer, PPM created a draft BSC plan, which was submitted on 2/6/02 and was reviewed and approved by BAO and CH*.

The following tools were utilized to respond to the BSC (self-assessment):

- Surveys
- Quarterly Data tracking and analysis (Sources of data are: PeopleSoft inventory and asset management systems, PPM property and budget records, and Staff Services Division vehicle records.)
- PPM division internal records and Goal Planning and Performance Appraisal.

The final report presents results for all measures, as well as actions taken.

SAM-8, Procurement Management, Score 2.0, Rating **Good**

DOE developed the concept of a Balanced ScoreCard (BSC) to be used by all M&O contractors as a self-assessment tool for identifying Procurement Management weaknesses in the areas of: 1) Customer (30%), 2) Internal Business (52%), 3) Learning & Growth (13%), and 4) Financial Perspective (5%) to ensure PPM follows "Best Business Management" practices; establishes and maintains business systems and processes that meet BNL's mission, vision, and strategy statements; accomplish established goals; and comply with applicable statutes, regulations, and prime contract terms and conditions,

PPM submitted BSC Plan to DOE-BAO on 10/30/01, with addendum, based on IG audit, submitted 4/22/02. (IG audit resulted in 5 issues, concerning processes for: 1) sole source; 2) documenting Subcontract files when delivery dates/milestones are missed; 3) Technical Representative Training; 4) Compliance with Prime Contract requirements: Article 121, FAR

52.222-11, Subcontract (Labor standards); 5) advance notices to DOE-BAO for review/consent when sole source acquisition costs are increased by amendments or modifications exceeding the \$100K threshold.)

PPM Manager held regularly scheduled meetings with: PPM deputies; DOE-BAO; ALD FOR F&A, PPM management and supervisors; staff. PPM Mgr. presented activities to DOE-BAO at quarterly briefings, with the final report, 10/31/02, including an action plan for inclusion in the Strategic Plan.

SAM-9, Requirements Management, Score 3.85, Rating *Outstanding*

BNL's Requirements Management (RM) Process was targeted for assessment as one of the Supporting Assessment Measures (SAMs) incorporated in Appendix B of the Prime Contract (DE-AC02-98CH10886) for FY02. BNL management engaged the BNL Independent Oversight (IO) Office to address the SAM by conducting an independent assessment of the RM process. IO assisted the manager of the RM/SBMS Office in planning the assessment.

Upon completion of the assessment, the SBMS Office completed an Action Plan to address the recommendations in the report. These actions are being tracked via ATS.

BAO was an integral part of the process throughout, and meetings were held to access Approach/Deployment/Results in the 3rd and 4th quarter of the year. All three were rated as ***Outstanding***.

SAM-10, Technology Transfer, Score 4.00, Rating *Outstanding*

The objective of Technology Transfer SAM was to evaluate the effectiveness of the Laboratory's technology transfer efforts. This evaluation was conducted primarily through the use of customer surveys to determine overall satisfaction of sponsors/collaborators in research projects at BNL, and through measurement of patent licensing activity. Results of the evaluation showed that sponsored and collaborative research customers reported a high level of satisfaction through customer survey feedback. Patent licensing activity during FY02 resulted in a 7% increase in Gross Licensing Revenue and a 12% increase in Net Licensing Revenue over FY01 totals, continuing a five-year upward trend in both areas. The percentage of BSA patent properties that are licensed increased from forty-six percent at the end of FY01 to fifty-one percent at the end of FY02.

SAM-11, Training and Qualification, Score 3.75, Rating *Outstanding*

The Laboratory has implemented a training and qualifications program that identifies requirements needed for staff based on work performed and tracks the completion of these requirements. The SAM used the indicators (completion of required training results and the percentage of individuals linked to job training assessments results) to monitor the status of satisfying training and qualification requirements for Laboratory employees and transient staff.

SAM-12, Uncosted Balances, Score 3.90, Rating *Outstanding*

The Department of Energy's Chicago Operations Office Financial Management Division requires Brookhaven National Lab to include an assessment on Uncosted Balances each fiscal year. The assessment measures the uncosted balances as a percentage of total available funding.

The funds measured are limited to the Operating funds received from the Office of Science (SC) and the Assistant Secretary for Environmental Management (EM). Uncosted balances at year-end are expected to be in the 6-8% range. The Budget Officer reported quarterly to the ALD F&A and DOE BAO that the spending and obligation of reportable funds was tracking at a level less than 6% and the Lab expected to be below the 6-8% range. The actual composite unobligated balance for operating funds from SC and EM at end of FY02 is 1.7%

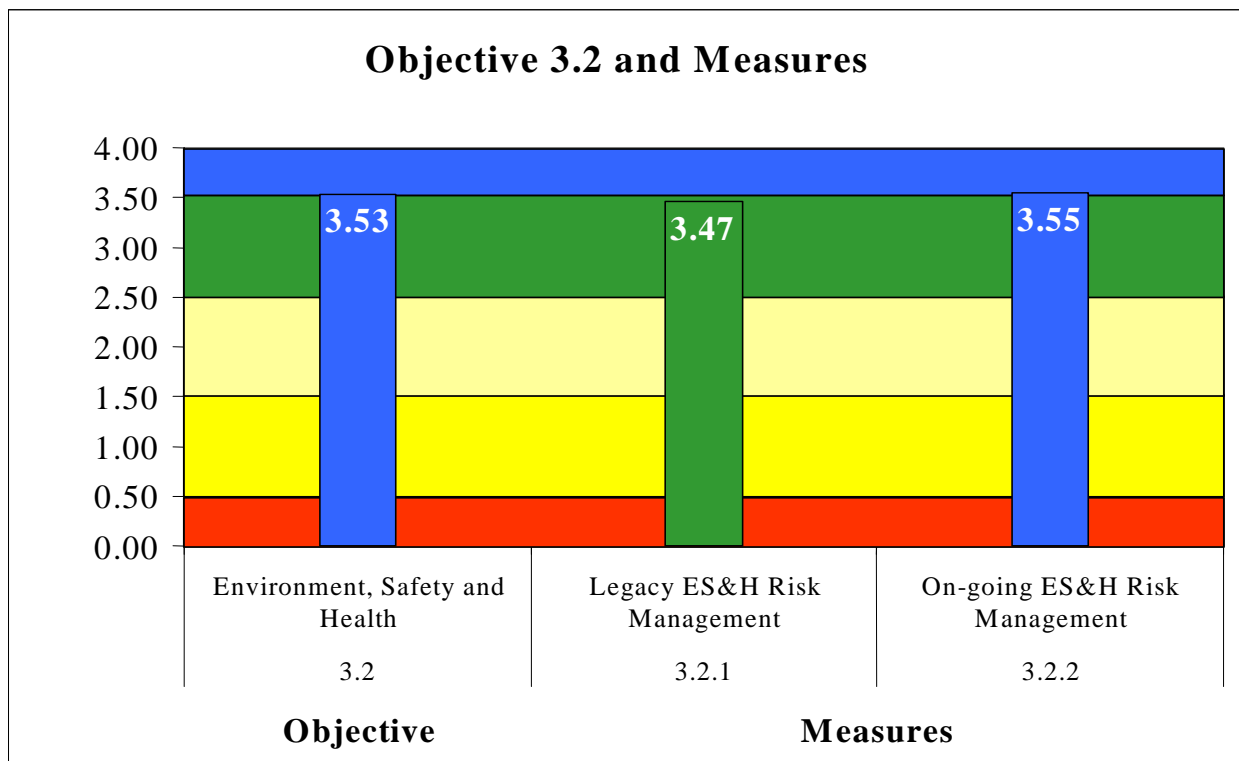
SAM-13, Work for Others Processing, Score 3.70, Rating *Outstanding*

BNL performs work for non-DOE entities through its Work for Others (WFO) Program. The objective of this assessment was to evaluate the effectiveness of the Laboratory's WFO Program by measuring customer satisfaction, tracking and analyzing the cycle time for processing WFO proposals, and stress the use of standard agreement formats on new proposals. A review of the statistics shows that processing time continues to be efficient, down from 16 to 14 days. Customer satisfaction continues to improve. The consolidation of overall responsibility for WFO is in process. The Laboratory has completed the required changes to the consolidated self-assessment and will be forwarding it to DOE in October 2002.

3.2 Environment, Safety and Health

The weight of this Objective is 15%.

BNL will develop, implement, and continuously improve management systems, processes, and services to effectively and efficiently manage environment, safety, and health risks associated with the legacy vulnerabilities and work associated with support of ongoing Laboratory mission activities.



3.2.1 Legacy ES&H Risk Management

Accomplishments

Overall, performance for this measure is rated as *Excellent* with a score of 3.47. Elements of this measure addressed site hazard footprint management, specifically baselining the radiological footprint of several facilities, and chemical disposition upon employee termination.

Analysis

Radiological footprints were completed for nine of eleven (~80%) facilities scheduled for completion, which corresponds to an *Excellent* rating in accordance with agreed-upon metrics.

Information for baselining was generated through interviews, walkthroughs, records, review, and limited characterization data. The data has been collated in tables for ease of use or abstracted where on-going activities for characterization exist (e.g. AGS lead, steel, and block yard). The baseline documents will be updated as additional information is updated. Progress for FY02 was less than initially planned primarily because of a late start and also because there was significantly more archival material to review than anticipated. The two building that were not completed have been added to the schedule for FY03.

Performance for the measure for chemical disposition for employee terminations is rated as *Outstanding* with a score of 3.9. A total of 54 employees who had chemical containers assigned to them, terminated employment from BNL in FY02, 53 (98.1 %) of whom reconciled their chemicals within one month of their termination date.

Results

Score (0~4.0)	Rating
3.47	<i>Excellent</i>

3.2.1.1 Site Hazard Footprint Management

Accomplishments

Progress is ongoing on this measure with one dedicated FTE and periodic support from the technician pool. Additional resources will be allocated to improve the pace. RCD has completed 9 of the 11 facilities in this performance measure for a score of 82%, which is an *Excellent* rating. The two buildings that were not completed are #555 and #830. These buildings will be added to the footprint activities for FY03.

Analysis

The data gathered by the point-of-contact for this activity included interviews, walkthroughs, records review, and limited characterization data. The data has been collated in tables for ease of use or abstracted where ongoing activities for characterization exist such as the AGS lead, steel, and block yards. The data will be updated when additional information is available, i.e. living documents. Results of the work are summarized in Executive Summaries. An additional report

will be generated to summarize Lessons Learned for the RCD management to review for guiding FY03 activities.

Results

Score (0~4.0)	Rating
3.00	<i>Excellent</i>

3.2.1.2 Chemical Disposition Upon Employee Termination

Accomplishments

Metric Status Summary for end of FY 2002.

- Chemical Management System
- FY 2002 Terminated Employees Report
 - Number of Employees Leaving BNL in FY 02: 275
 - Number of Terminated Employees who were responsible for Chemicals: 54
 - Number of Terminated Employees who reconciled within one month: 53
- Employees with 100% disposition of assigned chemical containers within one month of termination date = **98.1%**

Analysis

A total of 54 employees with chemical containers assigned terminated BNL in FY02, 53 of these employees reconciled their chemicals within one month of their termination date. According to the performance metric, BNL rating for this measure is *Outstanding*. Employees with 100% disposition of assigned chemical containers within one month of termination date = $(53/54 \times 100) = 98.1\%$.

Results

Score (0~4.0)	Rating
3.92	<i>Outstanding</i>

3.2.2 On-going ES&H Risk Management

Accomplishments

Overall, performance for this measure is rated as *Outstanding* with a score of 3.55. This measure consists of four sub-measures; Pollution Prevention, Transportation Safety, OSHA Reportable Injury Management, and Chemical Safety Performance. An evaluation of the performance under each submeasure is discussed below.

Analysis

Pollution Prevention

Performance for measures related to Pollution Prevention is rated as *Outstanding* with a score of 4.0. All Laboratory organizations submitted at least the minimum pollution prevention proposals

or success stories, with several organizations submitting far greater than the minimum required number of proposals.

In FY02 \$119K was invested in P2 and the annual cost savings from these investments is estimated to be \$268K. Some of the key issues impacting P2 program management include loss of direct EM funding, the DOE P2E2 goals are far reaching, and “low-hanging fruit has been picked”. As pollution prevention is a core EMS commitment, continued management attention will be given to ensure the sustained success of the program.

Transportation Safety

Performance towards the measures for Transportation Safety Implementation is rated as **Outstanding** with a score of 4.0. Documentation of all Safety Assessment Methodologies (SAMs) was completed either on, or ahead, of schedule. A detailed, methodical process was used to determine the appropriate set of transportation activities requiring SAMs. The process included the use of subject matter experts, existing data sources such as the chemical management system, line questionnaires, and field walkdowns. The thoroughness of the process provides laboratory management with high confidence that transportation activities are being identified and appropriate controls are established. The approach also enabled identification of operational enhancements that lowers the level of risk for on-site transportation activities.

Additional milestones (all completed ahead of schedule) to support the transportation program enhancements included:

- Development of training programs for Contractor Vendor Orientation, General Employee Training, and General Awareness Training,
- Completion of general awareness training and modification of Job Training Assessments, for appropriate personnel, and
- Development of a Hazardous Material Transportation Web-site

OSHA Reportable Injury Management

Performance for this measure is rated as excellent with a score of 2.97. This measure is rated as a composite of three injury management rates, Total Recordable Case Rate (TRCR), Lost Workday Rate (LWDR), and Lost Work Case Rate (LWCR). Each rate is equally weighted (1/3) for evaluation of the measure composite. Performance for the LWDR and TRCR is rated as outstanding and excellent respectively. However, the LWCR is rated as good.

Laboratory management has observed that occupational injury management performance has been decreasing since 2000. Several actions were taken in FY02 in an effort to reverse the undesirable trends including, presentations to the senior management team (Policy Council, and Management Council) which focused on responsibility and accountability for management of the potential for worker injuries and the management of lost time as a result of those injuries. These communication initiatives were augmented by articles in the Monday Memo. Additionally, a Safety Awareness Day was held on July 8, 2002. This day, sponsored and endorsed by the Laboratory Director included

It should be noted however that Occupational Injury management performance trends in FY03 will be impacted by new OSHA reporting criteria. Additional management attention may also be necessary to offset other factors that tend to negatively influence occupational injury management (e.g. increasing costs of benefits, uncertainty in or decreasing budgets etc.)

Chemical Safety

Overall performance for chemical safety is rated as *Excellent* with a score of 3.31. Seven rooms were randomly inspected for conformance to general chemical management requirements (bar code and correct owners) resulting in a score of 3.42. Five rooms were inspected for conformance to requirements for management of peroxide forming chemicals (labeling, storage, and testing). The results of those inspections warranted a rating of 3.2.

To improve chemical management performance laboratory management initiated several enhancements in FY02 including; the addition of user-friendly on-line forms to assist in deletions and transfers, modifications to the exit readiness evaluation process to include consideration of chemical inventories, and publication and the completion and implementation of the working with chemicals subject area.

Results

Score (0~4.0)	Rating
3.55	<i>Outstanding</i>

3.2.2.1 Pollution Prevention

Accomplishments

List of Organizations along with the number of P2 Proposals and success stories/lessons learned submitted:

- Basic Energy Sciences Directorate (1 proposals submitted, 1 success story written)
- EENS Directorate (2 proposals submitted)
- Environmental Management Directorate (2 proposals submitted)
- Facilities and Operations Directorate (6 proposals submitted)
- Finance and Administration Directorate (3 proposals submitted)
- High Energy & Nuclear Physics Directorate (2 proposals submitted)
- Life Sciences Directorate (6 proposals submitted)
- All other Directorates had environmental goals as required.

Results

Score (0~4.0)	Rating
4.00	<i>Outstanding</i>

3.2.2.2 Transportation Safety Implementation

Accomplishments

The goal of the Transportation Safety Re-engineering Project (TSRP) was to re-engineer the BNL Transportation Safety Program to bring it into full compliance consistent with all applicable DOE/ Federal/State Regulations, DOE contractual requirements and SBMS system format. As part of the TSRP, the following aspects of the TSP have been developed and have either been implemented or are under continual implementation:

- 1) Established a “Management System” for Hazardous Material Transportation Safety,
- 2) Revised the Transportation Safety Manual and includes it in Standards Based Management System (SBMS) as a “Program Description”,
- 3) Developed four Subject Areas;
 - a. Transportation of Hazardous Materials Offsite;
 - b. Transportation of Radiological Materials Offsite;
 - c. Transfer of Hazardous Materials Onsite;
 - d. Transfer of Radiological Materials Onsite.
- 4) Upgraded Dept/Division specific SOP’s to provide detailed implementing information,
- 5) Appointed a Transportation Safety Officer (TSO) to serve as the management system Subject Matter Expert with authority for transportation safety matters.
- 6) Established Transportation Safety Working Group (TSWG) with representation from BAO, WMD, Safeguards & Security, PPM, NSLS and ESH that served as the developer of the SBMS documentation. The TSWG also continues to assist the TSO in implementing and maintaining the TSP portion of the SBMS as it matures and/or requires changes. In addition, BNL Senior Management has approved the charter for the operation of the TSWG.

The Transportation Safety Re-engineering Project Implementation Plan was tracked to completion using the Laboratories institutional Action Tracking System and was completed ahead of schedule.

The TSRP resulted in an implementation plan which identified milestones itemized in 3.2.2.2.1 and 3.2.2.2.2. These milestones were designed to further implement, sustain and improve the re-engineered TSP. This effort will also aid BNL considerably in the satisfactory completion of the DOE-required triennial compliance assessment (this assessment has not been scheduled but will be for FY 03 and will include some members 'independent' of BNL.

Results

Score (0~4.0)	Rating
4.00	<i>Outstanding</i>

Details

Milestone	Milestone Date	Actual or Projected Date
Develop/implement haz. Material training for Contractor Vendor Orientation, Gen. Employee Training and Gen. Awareness Training	11/30/01	11/9/01
Complete development of "Hazardous Material Transportation" web site	1/30/02	12/04/01
Identify personnel who need gen. Awareness training, train, modify JTA	3/30/02	3/21/02
Identify, prioritize schedule SAMs throughout depts/divs. To cover current transportation activities	3/30/02	3/20/02

Notes, Issues, Trends and Assumptions

All milestones in 3.2.2.2 were completed ahead of schedule.

3.2.2.2.1 Complete the Following Milestones

Accomplishments

- 1) Contractor Vendor Orientation was modified to include the necessary hazardous material transportation training. This orientation was modified on 10/25/2001; see pages 17 and 18 of script. General Employee Training was modified to include the necessary hazardous material transportation training. This orientation was modified on 5/23/2001, see page 6 of script. The General Awareness Training, called 'Transportation of Hazardous Material-General Awareness (TQ-HAZMAT)' was developed and posted to the Training and Qualification Web Page on 11/9/01 (see email Harrington to Training Coordinators). The course is subdivided into two parts 'TQ-Hazmat-A' is for those staff determined to be DOT Hazmat Employees and must take a test and 3 year re-qualification and 'TQ-Hazmat-B' is for staff that are not DOT Hazmat Employees and are not required to test or requal. The training may be accessed at <http://training.bnl.gov>.
- 2) The 'Hazardous Material Transportation' Web Site was developed to communicate hazmat requirements, provide points of contact and resources for hazmat transportation compliance. The web page is available at <http://www.bnl.gov/bnlweb/hazmat.html> and was officially posted in its final form on 12/04/02.
- 3) All Department/Division Training Coordinators and Transportation Points of Contact were notified on 11/9/2001 that the training was available and again on 1/28/02 (see email hoey to distribution) of the need to identify personnel who need to take the general awareness training, train them and modify their Job Training Assessments (JTA's) as appropriate. Subsequent contact by the Transportation Safety Officer with the Training Coordinators and Points of Contact was made during the course of the process to identify and prioritize SAM's, (see response for item 4 below) to assure that required personnel had taken the training and JTA links updated. All the necessary personnel have now been

identified and taken the appropriate training (A or B). This training is documented on the T&Q database where a course Attendance Report can be run which shows by Department who has taken each course and the date taken, in addition individual employee reports can be run which show the JTA linkage.

- 4) An exercise was conducted to identify, prioritize, and schedule Safety Assessment Methodologies (SAM's) needed throughout the departments/divisions to cover current transportation activities. This exercise was both methodical and detailed and included the following steps;
 - The TSO (and select members of the Transportation Safety Working Group) met with each dept/division POC and selected line personnel to review their transportation activities and make determinations as to what needed to be documented under the SAM process, and to discuss and verify required training.
 - Several existing resources at the laboratory were used to gather information including the etiologic agent survey, chemical management system dept/division inventory runs, MSDS database and walkdowns of selected areas flagged during the resource review.
 - A Hazardous Material Transport questionnaire was generated for each dept/division in conjunction with the POC to document types of materials, quantities, frequencies, locations and a determination if the materials fell under a MOT exemption or would need to be SAM'ed or otherwise controlled (i.e. SOP, placards).

All milestones of 3.2.2.2.1 are complete

3.2.2.2.2 Develop Safety Assessment Methodologies

Accomplishments

An exercise was conducted and completed (see 3.2.2.2.1) to identify, prioritize and schedule Safety Assessment Methodologies (SAM's) needed throughout the departments/divisions to cover current transportation activities. This exercise was both methodical and detailed and included the following steps;

- The TSO (and select members of the Transportation Safety Working Group) met with each department/division POC and selected line personnel to review their transportation activities and make determinations as to what needed to be SAM'ed, and verify training.
- Several existing resources at the laboratory were used to gather information including the etiologic agent survey, chemical management system dept/division inventory runs, MSDS database and walkdowns of selected areas flagged during the resource review.
- A Hazardous Material Transport questionnaire was generated for each dept/division in conjunction with the POC to document types of materials, quantities, transport frequencies, locations and a determination if the materials qualified under a MOT exemption or would need to be documented under the SAM process or otherwise controlled (i.e. SOP, placards).

This exercise was beneficial in identifying areas that would benefit from operational changes, SBMS subject area modifications or operating procedure changes to lower the level of risk for transportation activities. It also identified that in some cases a SAM may not be necessary if for example the commodity is placarded as per DOT, or specific SOP's already include SAM requirement. Specifically this exercise: 1) identified certain pesticides/herbicides that could be reduced in quantity or eliminated from the inventory; 2) identified that transportation of regulated medical waste would need to be covered in a SAM but will also result in some potential changes to the Regulated Medical Waste subject area to assure that all requirements are in one place; and 3) that certain SOP's that are existing for source transfers may be modified to assure that SAM requirements are incorporated and/or appended with SAM information.

The Schedule is as follows:

Hazardous Material	Dept/Division	Status	SAM Completion Date
Oil with flash point > 141 F	Site	Drafted	5/30/02
Compressed gas (flammable)	Site	Drafted	5/30/02
Compressed gas (non flammable)	Site	Drafted	5/30/02
Cryogenic Liquid (flammable)	Site	Drafted	5/30/02
Cryogenic non (flammable)	Site	Drafted	5/30/02
Regulated Medical Waste	BO, CO, NSLS, MO		8/30/02
Botulinum Toxin	Biology	Complete	2/27/01
Pesticides/Herbicides	Biology		7/30/02
Chromyl Fluoride	Chemistry	Complete	10/8/01
Vacinnia	Instrumentation	Complete	2/28/02
Activated Carbon Filters	Environmental Restoration		7/30/02
Blip Targets	Medical	SOP	8/30/02
Seimans Oil (tank)	CAD		6/30/02
AC 500	CAD	Complete	2/5/02
H-3 tankers	CAD		6/30/02
Beam Seperator	CAD	Complete	2/20/02
Fuel Delivery Fuel Oil & gas	PE	Placarded	7/30/02
Water Treatment Chemicals	PE	Riggers delivery	7/30/02
Sodium Hypochlorite (Tanker)	PE	Placarded	7/30/02
Waste Oil (Tank)	PE		7/30/02
#2 Fuel Oil (Tank)	PE		7/30/02
Nitrogen Tube Trailers	PE	Placarded	7/30/02
Radium/Berrilium Sources (sigma pile)	Reactor	Complete	9/24/01

There were three changes to the original schedule as follows:

- 1) **Activated Carbon Filters:** Upon further investigation the activated carbon filters used in this application is not a regulated material under DOT and as a result no SAM is necessary. Vendor data is available to support the materials classification.
- 2) **Water Treatment Chemicals:** PE Riggers Delivery: PE has decided to eliminate this issue by doing vendor delivery directly to the site where the chemical is used, thus a SAM is not required.
- 3) **Waste Oil (Tank):** This tank is only for used compressor oil which is not a regulated material under DOT, thus a SAM is not required.

3.2.2.3 OSHA Reportable Injury Management

Accomplishments

From the CAIRS Table S3, the most recent complete BNL calendar year data (January to December 2001) are as follows:

TRCR = 2.6	LWDR = 24.9	LWCR = 1.2
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The DOE 5-Year Averages (1996 through 2000) for the measures are as follows:

TRCR = 3.2	LWDR = 43.5	LWCR = 1.4
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Based upon the rating criteria that '*Good*' is equal to +/- 15% of the DOE 5-Year Average, '*Excellent*' is equal to <15% - 30% the DOE 5-Year Average and '*Outstanding*' is equal to <30% the DOE 5-Year Average, BNL Scores are:

TRCR = 3 for ' <i>Excellent</i> '	LWDR = 4 for ' <i>Outstanding</i> '	LWCR = 2 for ' <i>Good</i> '
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The Composite Score is $(TRCR) 3 \times .33 + (LWDR) 4 \times .33 + (LWCR) 2 \times .33 = 2.97$.

BNL Composite Rating is *Excellent*.

This Performance Measure is complete for FY02.

Results

Score (0~4.0)	Rating
2.97	<i>Excellent</i>

Details

Reportable Rate	Rating	Actual or Projected Score
TRCR (Total Recordable Case Rate) = 2.6	<i>Excellent</i>	NA
LWDR (Lost Workday Day Rate) = 24.9	<i>Outstanding</i>	NA
LWCR (Lost Work Case Rate) = 1.2	<i>Good</i>	NA

Notes, Issues, Trends and Assumptions

Corrective Actions:

Performance Measure 3.2.2.3 is complete for FY02 and has an *Excellent* Rating based upon a score of 2.97. BNL noted that Occupational Injuries performance indicators have been increasing since 2000. Several initiatives were implemented to increase awareness and control by BNL managers and employees regarding our safety statistics. The first initiative was Safety Awareness Day which was held on July 8, 2002. An Action Plan has been prepared with specific projects designed to reverse the OI trends.

There are three performance measures against which BSA is measured under the current contract:

- 1) Recordable Case Rate (TRCR)
- 2) Lost Work Case Rate (LWCR)
- 3) Lost Workday Rate (LWDR).

Over the past few years, BSA has achieved significant improvement to these measures. New OSHA Reporting criteria will have a negative impact on BNL's OI performance measures. An increase of thirty percent for TRCR and LWDR is projected.

Any positive changes in 29 CFR 1904 are negated by these facts:

- 1) Expansion of the standard also includes additional requirements and clarifies definitions which will result in an increase in the number of recordable cases, such as the inclusion of all muscular skeletal disorders and non-working parking lot injuries such as falls on ice going to or from work.
- 2) The Lost Work Cases will increase because of the expansion of types of cases that fall into the work-relationship category.
- 3) Lost workdays are capped at any combination of days away from work (DAW) and restricted days (RWD) up to 180. The problem is that the count kept is no longer workdays, but calendar days. This will be the most drastic increase.
- 4) Rates are still determined by actual hours worked.
- 5) DOE has ordered that all cases occurring up to 12/31/01 be estimated and capped.

3.2.2.4 Chemical Safety Performance

Accomplishments

This measure includes 3.2.2.4.1, Chemical Inventories and Accountabilities and 3.2.2.4.2, Peroxide Forming compounds.

For 3.2.2.4.1, there were 7 rooms randomly evaluated during FY02 resulting in a score of 3.42 for a Rating of *Excellent*. For 3.2.2.4.2, there were 5 rooms randomly evaluated during FY02 in a score of 3.2 for a Rating of *Excellent*. The combined score for 3.2.2.4 is 3.31 for a Rating of *Excellent*.

Results

Score (0~4.0)	Rating
3.31	<i>Excellent</i>

3.2.2.4.1 Chemical Inventories and Accountabilities

Accomplishments

There was no data collected for this measure during the first two quarters of FY 02. All assessments against this measure will be obtained during the last two quarters of the calendar year.

During the third quarter of FY 2002 two rooms were randomly selected for evaluation. The combined scores for each room were 82.1% and 84.6%. The average of the combined scores is 83.4%.

During the fourth quarter of FY 2002 five rooms were randomly selected for evaluation. The combined scores for each room were 85.6%, 92.2%, 75.9%, 89.5%, and 89.8%. The average of the fourth quarter combined scores is 86.6%.

THE FINAL SCORE FOR FY 2002 IS 85.4% RESULTING IN AN '*EXCELLENT*' RATING due to the following improvements in CMS:

- 1) Addition of user friendly on-line forms to assist in deletions and transfers.
- 2) Improved communication with the PPM staff.
- 3) Modification of the ERE process to include chemical inventories reconciling activities during changes to work locations.
- 4) Improved processes to provide feedback to chemical users.
- 5) Re-enforcement communication for CMS Performance at ESH Coordinators Meetings.
- 6) The completion and implementation of the 'Working with Chemicals' Subject Area.

Analysis

BNL achieved an *Excellent* rating in chemical inventory management. The combined scores from seven locations randomly selected ranged from 75.9% to 92.2%. This performance measure is still a useful safety behavior driver and should continue for the next several years.

Results

Score (0~4.0)	Rating
3.42	<i>Excellent</i>

3.2.2.4.2 Peroxide Forming Compounds

Accomplishments

A total of five rooms were randomly surveyed for proper testing and labeling of these chemicals. Four rooms scored 100%. The fifth room surveyed did not contain eight of the nine chemicals listed in the CMS inventory and contained another peroxide forming chemical that did not

belong in the room. Neither of the two peroxide forming chemicals found in the room had been properly tested and labeled. The FY 02 score was 80% (Room #1 -100%, Room #2 - 100%, Room # 3- 100%, Room #4 - 100%, Room # 5 - 0%).

Results

Score (0~4.0)	Rating
3.20	<i>Excellent</i>

Supporting Assessment Measures for 3.2

SAM-14, Environmental Compliance, Score 4.00, Rating *Outstanding*

Approach- tools used included assessment plan and checklists. Scopes were comprehensive and technical. Stakeholder involvement was high dependent on responsibilities. Deployment- Assessment was complete on or ahead of schedule. Assessment is document in written format and communicated via opening and closing meetings, as well as distribution of a written report. Results- All findings were brought to the attention of management through the closing meeting. Corrective actions identified are tracked in Family ATS and assigned to the responsible department and manager. Key findings are also brought to the attention of regulators and the public via the CAC and the IAG (example; air assessment results at BLIP).

SAM-15, Maintain BNL's ISO 14001, Score 4.00, Rating *Outstanding*

The EMS assessment was conducted by an outside party- NSF which is the registrar for our ISO 14001 registration. Assessment was successful with 1 minor non-conformance which was corrected. This successful surveillance audit maintained our ISO 14001 registration. Score was *Outstanding* by both DOE and ESD

SAM-16, Accelerator Authorization, Score 3.60, Rating *Outstanding*

Progress towards accelerator authorization basis upgrades is evident with the majority of active work on or ahead of schedule.

SAM-17, Radiological Control, Score 3.60, Rating *Outstanding*

Conduct a 3-year comprehensive assessment of the Radiological Control Program (FY02 areas: ALARA (including personal contamination events and rad. exposures.), Organization. & Admin., External Dosimetry, Radiological Dose Reports to Individuals, Emergency Exposure Situations, Instrument Calibration & Maintenance (partial), and RadCon (release criteria).

RC Division response relied primarily on its Self-Assessment Plan, with additional input from: management direction, Implementation Guides, result of assessment records, Radiological Awareness Reports, Non-compliance Tracking System Reports, and Facility Support Monthly Reports

Requirements for *Outstanding* performance in all 5 measures have been or are anticipated to be met: Four assessments completed, one per quarter, prior to 1/01/02. 128% of Self-Assessment Records performed in FY02, i.e. 32/quarter required – 41 completed). Jan-July 02 monthly reported completed on time, with Aug & Sept on schedule. In spite of FS Mgr. leaving, RCD

anticipates achieving 90% of reports will be completed on schedule. 100% of Corrective Action Plans were generated within one month of final report for FY02. 100% of S-A records with non-compliances noted have been dispositioned.

SAM – 18, Recycling, Score 4.00, Rating *Outstanding*

- Corrective actions, when deemed necessary are formally entered in to the F&O Corrective Action Tracing system. At the 3rd Quarter Review, it was decided that a corrective action was necessary to rekindle interest and participation in the recycling program by the Laboratory population. As such, corrective action 3683 was assigned to C. Johnson. This was accomplished on September 30, 2002 in an informational and motivational email to the Building Managers and Recycling Coordinators.
- The primary continuing issue concerning this SAM is Laboratory participation. This is why various awareness techniques were applied throughout the year (e.g., recycling awareness pamphlets, addressing Building Managers, web based awareness games, and participation in the American Forest & Paper Association recycling award program).
- BNL has sustained excellence in achieving high rates of recycling since the mid 90's. Over the last several years performance of recycling has been included as a DOE/BSA Critical outcome and has achieved a high "*excellent*" to "*outstanding*" rating.
- This assessment did not result in the identification of new vulnerabilities, but did substantiate the known vulnerabilities, i.e., Lab participation.

SAM-19, Regulating Waste Management, Score 4.00, Rating *Outstanding*

Monitor and evaluate regulated waste management activities; and address significant deviations from expected performance trends in the areas of: 1) routine and non routine waste streams; 2) assess compliance at all 90-day accumulation areas and a representative sampling of Satellite Accumulation Areas; 3) Assess compliance with DOE Order 435.1 (RWM), WMD's 43.51 Implementation Plan, and the 4) BNL RWM Basis Document; and 4) Perform all regulatory reporting on time.

- WMD submitted quarterly reports on waste generation on or near schedule.
- An unannounced inspection of the Laboratory's 90-day hazardous waste storage areas and satellite accumulation areas was performed (see next bullet). Corrective action for the following discrepancies was taken: 90-day areas of Bldgs. 463 and 555 each had containers that did not indicate the placement date; containers were dated by WMD and the 90-Day Area Managers. In Bldg. 244, a full 55-gallon drum was not dated; therefore, date of 3-day limit was unknown. Container was moved to 90-Day area.
- Results of a hazardous waste assessment, conducted 5/02, were presented to the EMS/GIG Env. Issues meeting on 5/16/02, with the final report issued 7/02. This assessment identified 45 discrepancies (including the 3 listed above), requiring corrective

actions. As of 6/12, all corrective actions were implemented with no outstanding items to be resolved.

- An implementation plan to assess WMD's compliance with 435.1 was prepared 3/17/02.
- In response to DOE-BAO's report on the assessment of radioactive waste management, a causal analysis was conducted 6/20/02, a series of corrective action planning meetings were held (including a briefing to the BNL community on 5/16/02), and a Corrective Action Plan was completed on 7/2/02 ahead of schedule.
- Required regulatory reports were completed on time and are on-going.

SAM-20, Safety and Health, Score 3.22, Rating *Excellent*

SHSD Design Review Program: SHSD is to perform a quantitative review of the SHSD Design Review process.

SHSD reviewed the most recent 25 design packages, including the SHSD processing time, the timeliness of comment transmittals to the customer and the review response rate. These were compared against predetermined quantitative assessment criteria. The qualitative results of data collected for this assessment is that the design review program is not being utilized by all Laboratory organizations. A corrective action plan was developed and all corrective actions are completed. In conjunction with these findings a Laboratory –wide assessment of the design review process was performed by Independent Oversight during FY02.

SAM-21, Worker Involvement, Score 3.57, Rating *Outstanding*

A critical element of Integrated Safety Management is worker involvement in work planning. This Supporting Assessment Measure (SAM 21) was created in order to determine the Laboratory worker's perspective of their involvement in work planning and control activities. The scope of the assessment was to determine to what level Lab Workers feel they are involved in the planning aspects of the tasks they are required to perform. Worker in this case meant Union and non-union craftsman, laborers, technicians, first line supervisors, and scientists. Approximately 700 ten-question surveys were distributed to the Lab work force; we received 267 responses. The results, and some observations from the LAB SAM Owner, were distributed to each group of individuals that responded to the survey.

3.3 Site Infrastructure, Facilities, and Operations

The weight of this Objective is 10%.

BNL will maintain and improve the efficiency and reliability of the site infrastructure and manage projects to upgrade site facilities to meet the objectives of the Strategic Facility Plan and Master Site Plan. Site operations will be managed to ensure effective protection of personnel, property, the general public, national security interests, proprietary information, classified matter, and sensitive unclassified information.

08/01/02-09/30/02 - Prepare draft RFP and draft Facility lease.

Management Focus for the Coming Quarter

BNL drafted an RFP and Facility Lease Agreement based on survey questions. (see meeting of 06/28/02 above) Metes and Bounds sent to DOE-CH for preparation of land lease.

Results

Score (0~4.0)	Rating
4.00	<i>Outstanding</i>

3.3.2 Project Management

Accomplishments

Project Management performance during FY02 was *Outstanding*. All line item projects were on or ahead of schedule and one line item was completed. The GPP program as a whole, including FEMP and SLI projects is on schedule. All major milestones have been met and costing and obligation plans have been met or exceeded. All projects completed this year completed their full baseline scope.

Analysis

The Project Management summary measure is 97.1% which corresponds to an *Outstanding* rating. This is based on the following factors: a1 = 100%, a2= 99.6%, b1=85.7%, b2 = 100% and c=100%. (As described in Appendix "B" of the contract)

Management Focus for the Coming Quarter

Additional emphasis will be placed on management of GPP projects.

Results

Score (0~4.0)	Rating
4.00	<i>Outstanding</i>

3.3.2.1 Funds Committed: (a1)

Accomplishments

Commitment of funds for line item projects was ahead of schedule and exceeded the planned commitment goals. Commitment of funds for GPP projects were slightly behind schedule but within the 12% contingency range thus achieving 100% of the overall funds commitment target.

Analysis

The Electrical Modifications Phase II project and Groundwater Protection Project are ahead of schedule and have accordingly committed funds earlier than the baseline plan. The GPP program is slightly behind the planned fund commitment schedule due to delay in the NSLS Office Upgrade however other GPP projects are ahead of schedule and have largely off-set the impact of NSLS delay. The net result is commitment of funds is on-schedule.

Management Focus for the Coming Quarter

Line item project performance will continue to be closely monitored. The upcoming FY03 GPP program will address changes in schedule to on-going GPP projects from FY02 and will be closely monitored for performance.

a1 Value	1.0
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3.3.2.2 Funds Costed: (a2)

Accomplishments

All line item projects are on or ahead of schedule which resulted in outstanding cost performance for FY02. The Sanitary Upgrade Phase III line item is complete however a small uncosted balance remains due to the contract closeout process. The GPP program cost performance as a whole is on schedule.

Analysis

The cost plan for FY02 was \$11,124k, the actual cost was \$11,079k resulting in 99.6% cost performance which yields a 4.0 or *Outstanding* cost performance rating.

Management Focus for the Coming Quarter

Continued emphasis on schedule performance will help maintain outstanding cost performance.

a2 Value	.996
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3.3.2.3 Project Schedule Compliance (GPP and IHEM): (b1)

Accomplishments

Seven GPP projects were scheduled for completion this year. This measure includes the FEMP project Elimination of Once Through Cooling Water and the SLI project Excess Facilities Disposal. Six of the seven projects were completed on-time; one was completed two weeks late.

Analysis

Six of seven projects completed on-time yields an 85.7% on-time completion rate.

Management Focus for the Coming Quarter

On-time completion of GPP projects is one of the most challenging aspects of the Project Management performance measure due to the many variables affecting the schedules. Management will focus on the mix of large and small GPP projects in the FY03 program to improve performance.

b1 Value	.857
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Notes, Issues, Trends and Assumptions

Two projects originally scheduled for completion this year (B463 Lab/Office Upgrades and B901 Cyclotron Installation) were rebaselined due to schedule impacts that were beyond the control Plant Engineering. Schedule performance on these projects will be included in the FY03 performance measure.

3.3.2.4 Project Schedule Compliance (Line Item): (b2)

Accomplishments

All Line Item milestones scheduled for FY02 to date have been completed on time. These include Design Complete and Construction Start for both the Electrical Mods Phase II and Groundwater Protection projects and Construction Complete for the Sanitary Phase III project.

Analysis

Five out of Five line item milestones were completed in FY02 yielding a 100% rating.

Management Focus for the Coming Quarter

There are no line item milestones scheduled for completion in the next quarter however, progress on these projects will be closely monitored to assure future milestones will be met.

b2 Value	1.0
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3.3.2.5 Scope Completed Within Approved Baseline

Accomplishments

Eight projects were completed in FY02, one line item, five GPP, one FEMP and one SLI. All of these projects completed the entire baseline scope of the project.

Analysis

Eight out of eight projects completed the entire baseline scope yielding 100%.

Management Focus for the Coming Quarter

Several projects are scheduled for completion in the upcoming quarter (1Q03). The projects will be closely monitored to assure they complete their full scope.

c Value	1.0
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Supporting Assessment Measures for 3.3

The Directorate was responsible for the following six SAMs this year, five of the six were rated *Outstanding* by DOE:

SAM – 22, Building Manager, Score 4.00, Rating *Outstanding*

- Three opportunities for improvement associated with the FUA Program were identified, prioritized, entered into the F&O tracking system and are documented in the Final Assessment Report. All three items were immediately acted upon and thus have been completed and closed in the tracking system without deviation to schedule.
- No significant issues were identified in the performance of this SAM. Opportunity for improvement were identified and immediately acted upon. In fact, all were closed prior to the release of the final assessment report.
- Sustained excellence and improved operational performance is clearly evident for FUAs at BNL as indicated in the results of this SAM. The FUA's were initiated at BNL in 1999. All FUAs were completed and posted on SBMS by April 2000. In the spring/summer of 2001, the Laboratory conducted an initiative to review and revise, as necessary, the FUAs. Global changes, including format changes, addition of hyperlinks, and a new section to capture historical information, were made to all FUAs. Facility specific modifications were made as required. This initiative was completed in September 2001. The FUA Steward continually uses the monthly Building Manager meetings as a platform to discuss activities and requirements that may affect and/or be used to improve the FUA program. In addition, the FUA Steward provides one-on-one assistance in the maintenance and updates of FUA. Additionally, the numerous “triggers” in Lab-related documents (1.3.5/1.3.6 process; work permits; and ORE/ERE process) serve as reminders to assess the potential impact to the FUAs.
- Though this was a comprehensive assessment that covered a majority of the users on site, the assessment did not result in the identification of vulnerabilities or significant opportunities. It is evident from this assessment that the FUA program is clearly connected into strategic/institutional plans at BNL as indicated in the numerous SBMS connections.

SAM – 23, Safeguards and Security, Score 3.80, Rating *Outstanding*

- The assessment found that the overall management and implementation of the applicable S&S by SSD is effective and, with the exception of the Foreign Visits and Assignments Program, addresses all applicable requirements. This conclusion has been validated by the past DOE inspections of 1998, 1999 and the December 2001 inspection which was just concluded; and a review of the F&O Self-Assessment program by the BNL Independent Oversight Office.
- Increased security requirements, budget constraints, and personnel and equipment resource issues, have affected Division established commitments, the review and improvement of existing work processes, and progress on new initiatives. Management initiatives during FY02 attempted to focus on some of these areas, however, progress on these initiatives has been affected by the same issues that precipitated the initiative.

SAM-24, Counterintelligence, Score 2.5, Rating *Good*

This assessment has been conducted in accordance with the CI SAM Plan for the Brookhaven National Laboratory. The CI Program requirements that were identified for this assessment were drawn from the Office of Counterintelligence, Counterintelligence Program Standards Guide, dated March 2002.

The scope of this assessment included the seven (7) major topical areas of the CI Program. They are identified as:

- 1) Executive Management
- 2) Program Management
- 3) Unclassified Foreign Visits and Assignments
- 4) Information and Special Technologies
- 5) Analysis
- 6) Training and Awareness
- 7) Liaison

The assessment was conducted through document reviews and individual inputs and information obtained from CI personnel holding responsibility for each of the individual program topical areas. The assessment will focus on specific criteria chosen and agreed upon by the BNL SCIO and the BAO Owner.

The SAM assessment for FY 02 resulted in no identified findings or recommendations. The BNL and BAO SAM owners reviewed and concurred with the results of the assessment.

SAM – 25, Emergency Planning and Preparedness, Score 3.80, Rating *Outstanding*

- The evaluation of the Monitoring and Assessment Support Center (MASC) concluded that it remain in its location in building 490. It was further recommended that as radiological hazards at BNL diminish, this evaluation should be repeated.
- The evaluation of the site siren and plectron warning systems concluded that both systems remain in place and continue to be an integral part of the BNL's emergency management system. In addition, because of recent Federal Communication Commission rulings, it is recommended that another Plectron system be purchased and available by the end of 2004. An Activity Data Sheet (ADS) was prepared to obtain a new system. It is further recommended that the siren system remain in place as a site-wide warning system.
- Consolidation of the Emergency Plan and Security Plan was accomplished with Safeguards and Security personnel.

SAM – 26, Energy Management, Score 4.00, Rating *Outstanding*

- The energy management systems in place helped us achieve the desired results and reach the outstanding category for reduction in energy use. No corrective actions outside the routine continuous improvement of the operation were identified.

- BNL has sustained excellence in reducing the laboratories energy use. BNL's energy management programs have reduced BTUs/sq. ft 28% below the 1985 base line year. Currently there are several new projects that replace energy wasteful equipment, expand our system capability and re-commission the operation of the existing systems.
- This assessment did not result in the identification of new vulnerabilities, but did substantiate known vulnerabilities such as:
 - Goals are strictly related to energy reductions without consideration to cost. However, the funding mechanism to accomplish these goals is determined primarily on a life cycle cost bases.
 - Reductions in IHEM programs funding levels, accompanied with BNL current below market level energy costs have further reduced the funds available to meet these goals.
 - As the more cost-effective projects are accomplished, it takes higher funding levels to sustain the same rate of energy reduction.
 - The evaluation systems that are used are not corrected for weather variations so on a year-by-year bases, weather variations will skew the results.
 - Other goals look to consolidate space, resulting in higher energy use per sq. ft.
 - DOE converts electricity to energy at 3410 BTUs/kWh. No losses to produce the electricity are accounted for. This method, from an engineering base, is incorrect. We could drop our energy use by 20 -25 % and meet all our goals by changing from fossil fuel to electric heat but in reality we would not save any energy. From a global perspective we would actually use close to twice the amount of energy.
 - Reductions in energy consumption are fuel dependent. In order to save energy (BTUs) we need to save steam energy, in order to save dollars we need to save cooling or electric energy.

SAM – 27, Management of Maintenance Activities, Score 4.00, Rating *Outstanding*

- This SAM resulted in a corrective action to submit an ADS seeking funding for contracted inspection services in order to reduce CAS cycle time. The ADS ranking resulted in funding for FY02 that will place the CAS on a three-year cycle. In addition, the team has and continues to investigate and implement corrective/improvement actions. These actions are prioritized by the team and tracked as part of their meeting minutes. To date there have been no significant deviations.
- This SAM consisted of performing an analysis of maintenance and capital renewal, CAS, FIMS population, and timely response to data calls. The F&O Maintenance Initiative Team has been meeting regularly to track these items and to discuss maintenance issues. As a result of these meetings not achieving a CAS cycle of 3-years (i.e., to survey one-third of the site floor area per year) became a significant issue. Without this data, funding assumptions would be faulty. To resolve this issue the team took immediate action. The CAS procedure was revised to incorporate a multi tiered inspection methodology created by the team. One key aspect of the procedure change is that permanent buildings with a continuing mission will be

inspected on a three-year cycle. Buildings without a continuous mission will not have the capital renewal component of the CAS inspection included. In addition, ISES was subcontracted to supplement BNL's CAS inspections. This will allow the Lab to achieve a three-year inspection cycle by the end of this FY.

- BNL's has clearly sustained excellence and improved operational performance. The Maintenance & Capital Renewal Analysis has had a positive influence with DOE HQ and has been used as a point of reference to review other Laboratories maintenance and capital renewal programs. The CAS cycle time performance has gone from marginal to outstanding due to the additional resources allocated toward this activity. This represents one of the largest improvements in any goal in this year's performance. Gloria Baldwin, DOE HQ, acknowledged, in her e-mail to John DiNicola, BNL's effort in fully supporting the implementation of the FIMS database, which was completed ahead of schedule. In addition, Joe Eng acknowledged at a meeting with Ed Murphy and his staff that maintenance data calls have had an excellent history of responsiveness.
- The activities of this assessment have resulted in identification of significant opportunities and awareness of vulnerabilities. This is most evident in the generation of the Maintenance & Capital Renewal Analysis report which resulted in zero-basing our annual requirements, identifying what we are currently doing, as well as what we do not have funding to accomplish. Additionally, not achieving a CAS cycle of 3-years and its effect on funding resulted in obtaining funding to place the program on track to achieve this goal. Combined this information will have a clear connection to strategic and institutional planning.

3.4 Information Technology

The weight of this Objective is 10%.

BNL will provide a cost effective, reliable, and secure computing/communications infrastructure for administrative computing, and support to scientific programs for unique computing problems.

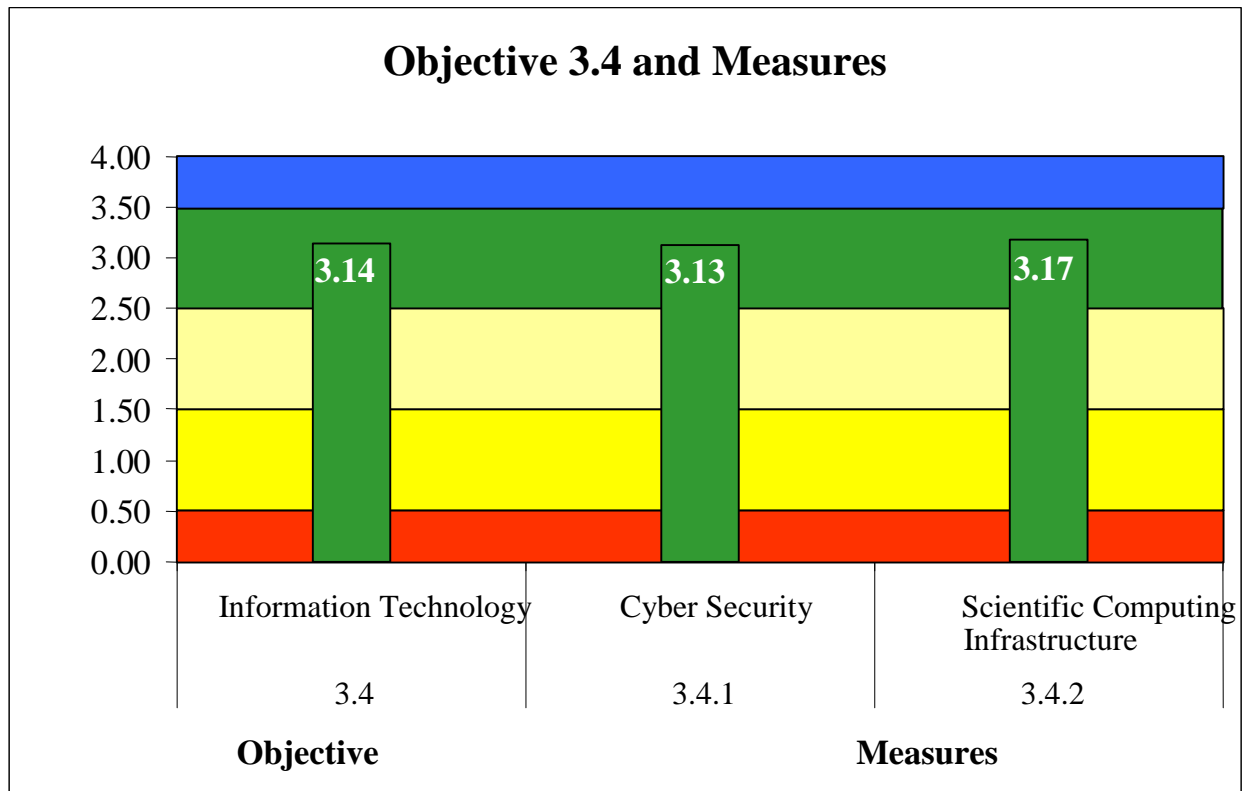
Performance Level Metrics

Note:, All the measures within this objective are date driven milestones. The following metrics apply:

Metric: Each milestone will be awarded points as follows based on accomplishment of that milestone:

<i>Outstanding</i>	<i>Bettering a milestone date by >30 days</i>	<i>4 Points</i>
<i>Excellent</i>	<i>Meeting a milestone date</i>	<i>3 Points</i>
<i>Good</i>	<i>Missing a milestone date by <45 days</i>	<i>2 Points</i>
<i>Marginal</i>	<i>Missing a milestone date by >45 days</i>	<i>1 Point</i>
<i>Unsatisfactory</i>	<i>Missing a milestone date by >90 days</i>	<i>0 Points</i>

The evaluation of the Performance Measure will be the numerical average of the scores of the supporting milestones.



3.4.1 Cyber Security

Accomplishments

All of the major initiatives of the original BNL CSPP have now been accomplished with the completion of pilot programs in the areas of strong authentication and application strategy. The results of these pilot programs have indicated unexpected complexities within the Laboratory infrastructure, necessitating changes in strategy in both areas. In spite of the challenges, in both cases the associated performance measure milestones were met, as detailed in 3.4.1.1. In parallel to completing the initial CSPP, the Laboratory has also created the mechanisms needed for developing future versions of the plan. The processes needed to make the CSPP responsive to various drivers (e.g. DOE directives, technology, changes in threats) are now in place, as described in the milestones noted in 3.4.1.2. The update/review of the current CSPP was accomplished during the 2nd quarter of FY02, and represents the first implementation of the recently established CSPP review process. Processes have also been established for other initiatives that will drive changes to the CSPP, such as review of scientific program/network requirements, “MITTENS” data, and threat analysis. Additional information on progress in each specific area related to testing/reviewing/evaluating the CSPP can be found in 3.4.1.2.

Analysis

Implementation of the Laboratory’s CSPP has been very challenging, but generally successful, and has greatly reduced the vulnerability of the Laboratory to Cyber Security attacks that would have been simple only a few years ago. However, in order to prevent backsliding, it is critical

that as the initiatives related to BNL’s CSPP move forward; emphasis continues to be placed on including BNL line management in the processes that affect changes to this plan. The overarching guideline is to ensure that the BNL science mission is protected, yet not negatively impacted by cyber security measures.

Management Focus for the Coming Quarter

Management focus for the first quarter of FY03 will be on preparing for the peer-review and self-assessment of BNL’s Cyber Security program, currently scheduled for November, 2002. A positive result from this review process will demonstrate that the basic elements of the BNL CSPP have been effectively implemented. Such an accomplishment would validate that BNL is positioned to move its Cyber Security Program to the next level, and will be able to develop an approach to Cyber Security that is proactive, preventative, forward thinking and sustainable.

Results

Score (0~4.0)	Rating
3.13	<i>Excellent</i>

Notes, Issues, Trends and Assumptions

Preparing for the Cyber Security Paradigm shift remains a priority and significant challenge. Success in producing a plan that will fully address the “paradigm shift” was severely limited during most of FY02. Progress has been incremental and will remain so until additional resources become available.

As of the beginning of the 3rd quarter, most of ITD’s resources (Cyber Security as well as other sections in ITD) had been diverted to the site-wide remediation (i.e. “patching”) of hosts. Since so many BNL machines were below the recommended patch levels, ITD established a 'swat team' to help support the site-wide remediation process – focused on closing the gap in patch levels. Such measures alone failed to achieve and sustain a secure host-based architecture. The Laboratory did not have enough full-time, competent, well-trained System Administrators (SAs) responsible for keeping their systems updated with the latest security patches. Even in departments where there are qualified SAs, they often do not have the time/resources to appropriately handle all of the associated SA responsibilities, particularly those critical to Cyber Security initiatives. The Chief Cyber Security Officer has discussed these responsibilities, now formally documented in a System Administrator R2A2 profile, with BNL's Department Chairs. The Chief Information Officer also presented this problem to the Laboratory Director and achieved temporary support for the ITD site-wide patching effort via additional outsourced System Administrators. With the help of this temporary support, during the last half of FY02 BNL was able to update most of its systems to a level where its hosts will be much less vulnerable to Cyber Security attacks (and pass the upcoming peer review and self-assessment in early FY03).

By the end of FY02, the establishment of the appropriate additional System Administrator resources required to sustain a secure host-based architecture at BNL for the long term was solved. ITD's current outsourcing contract was renegotiated, consolidating all of our services with one vendor and enabling ITD to undertake system administrator responsibility for most of the machines at the Laboratory, thus ensuring appropriate remediation. This new contract

doubles the SA resources provided by the temporary outsourced support and extends this support (originally scheduled to end in 5/03) over a 3-year period. These resources will result in a dramatic improvement in the service level for system administration services.

A major issue for the coming fiscal year is the funding for FY03. This will affect BNL's ability to fully address the Counterintelligence (CI) finding regarding the access of foreign nationals to systems and applications. Through pilot programs and their evaluations, (see details under Item #4 in the Notes Section of 3.4.1.1) BNL has determined that a comprehensive approach to address the CI finding is currently infeasible. A more restrictive project scope, focused on BNL critical and sensitive systems, would be achievable. However, FY03 funding (approximately \$500K) for the restricted scope strategy was not approved by DOE. Consequently, it will not be possible for BNL to completely address this area, which is the last remaining layer in the BNL CSPP implementation and the only layer that differentiates one host from another. With the funding that is available in FY03 (approximately \$200K), BNL will take steps to implement a strategy for the restricted scope. Additional resources beyond the \$200K will be required to fully address all of the systems required to implement a more comprehensive and permanent solution.

Also see the notes for 3.4.1.1 and 3.4.1.2

3.4.1.1 Cyber Security Program Plan Implementation

Accomplishments

All FY02 milestones designating completion of the Laboratory's Cyber Security Program Plan (CSPP) have been accomplished. Focus for the beginning of FY02 was on the areas of strong authentication, host-based security and application strategy. Results of the first Kerberos pilot results changed the approach originally planned for developing a strong authentication system. The original pilot indicated a conflict with the BNL infrastructure. A new strategy was proposed and implementation begun during the second quarter, using LDAP (Lightweight Directory Access Protocol) as the common Application Program Interface. This Kerberos/LDAP initiative was completed at the end of August, ahead of its projected schedule. The results of the pilot have been formally documented. In accomplishing the pilot, testing was carried out both internal and external to ITD. Kerberos has proven to be capable of providing the secure single-sign-on capabilities required at BNL, and the successful integration with OpenLDAP is a significant step in moving toward the possibility of integration with a Microsoft Active Directory. In addition to the Kerberos initiatives, during the 1st quarter of FY02 deployment of HP Openview agents (Radia) was continued from the previous year, with emphasis on the scientific desktop. This deployment is considered complete, with the understanding that BNL is in 'maintenance mode', i.e. that Radia agents will continue to be installed as desktops are replaced/added on both the Scientific and Operations areas of the Laboratory. The implementation of the Cyber Security Application strategy was begun as scheduled, via a pilot program (Melillo) which validated the technology. Discussion with the vendor about the results of the pilot revealed that BNL infrastructure issues would make full deployment an impossibility, i.e. very costly and time-consuming. Subsequent discussions have focused on limiting the scope to critical IT systems in order to balance requirements against cost. Additional details on the milestones for implementing the BNL CSPP can be found in the Notes Section.

Milestone	Milestone Date	Actual or Projected Date	Points
Complete the deployment of Kerberos	3/31/02	12/31/01	4
Evaluate and Deploy a Kerberos pilot using LDAP API	9/30/02	08/30/02	4
Complete the deployment of HP Openview	12/31/01	12/31/01	3
Implementation of the Cyber Security Application strategy developed in FY01	1/31/02	3/11/02	2

Results

Score (0~4.0)	Rating
3.25	<i>Excellent</i>

Notes, Issues, Trends and Assumptions

1. The original Kerberos pilot was completed ahead of the scheduled milestone date, with the conclusion being that the original Kerberos implementation conflicted with NIS (Network Information System) functionality. Migration to NIS+ was considered but also determined to be an unreasonable approach in the BNL environment (e.g. platform support issues). A new approach, using LDAP as the common API was proposed. Status - Completed
2. A request to add a new performance measure milestone for the implementation of a Kerberos/LDAP pilot was generated by ITD and approved by DOE. This resulted in an additional milestone being added to the original 3.4.1.1 performance measure. Host login authentication using Secure Shell (SSH) was validated and piloted on the grid nodes. Samba authentication was piloted on phenix.replicator.bnl.gov. Several LDAP servers (3) and Kerberos Key Distribution Centers (3) were established by the 3rd quarter of FY02, and LDAP/Kerberos authentication was successfully tested on the Linux platform. Kerberos/Cryptocard authentication was also tested, but with less promising results. The pilot was completed at the end of August, and the results documented. Status - Completed
3. Radia agents have been installed on approximately 75% of the administrative and scientific desktops. This was accomplished by the target date of 12/31/01 with over 2200 scientific desktops having the Radia client. Status - Completed
4. The application strategy defined a pilot program for establishing a mechanism for determining access to systems and applications across the site. The pilot was accomplished on schedule. The results indicated that the technology was useful and relevant, but many questions were raised regarding infrastructure requirements. Further discussions with the vendor (Melillo) were held, leading to the growing conclusion that the deployment strategy be focused only on critical systems. Note that the rating of *Good* for this milestone was due principally to the extended time used, during multiple meetings both internal to ITD and with the vendor, to fully explore the initial results of the pilot and to determine the most rational strategy for the future. Status - Completed

3.4.1.2 CSPP Test, Review, and Evaluation Mechanisms

Accomplishments

A number of initiatives were established in FY02 with the underlying goal being to ensure that the BNL CSPP remains responsive to the rapidly evolving cyber security risks without negative impact on the Laboratory mission. During the first quarter of FY02, a Cyber Security Program Plan (CSPP) update/review process was developed and presented to the Cyber Security Advisory Council (CSAC). In response to a DOE request, this review process now includes BNL Line Management in addition to CSAC, Cyber Security Operations, etc. During the second quarter this new review process was deployed as the most recent changes in the CSPP have been presented to and discussed with BNL managers. Plans were developed for utilizing the results of the "MITTENS" tool. This includes a strategy as to what information is most useful for BNL system administrators. A process for reviewing the impact of scientific IT requirements on Cyber Security was developed, with the key element being the formulation of bridging plans in the major IT areas of networking and scientific computing. A formal Cyber Security threat analysis program was developed and formally documented. Key elements of this program were presented by BNL's Chief Cyber Security Officer to BNL's line managers, during a meeting held (during the fourth quarter) on the next BNL Cyber Security Program Plan. Although an outline for dealing with the predicted and critical Cyber Security "paradigm shift" is in place, and some preliminary work done to assess the rapidly-changing cyber security environment, a fully developed plan will not be available as projected.

Milestone	Milestone Date	Actual or Projected Date	Points
Establish a formal review process for the CSPP	12/31/01	10/31/01	4
Establish a plan for utilizing the results produced by the MITTENS	4/30/02	4/30/02	3
Establish a process for the review of scientific IT requirements	4/30/02	4/30/02	3
Introduce a formal threat analysis program as described in the BNL CSPP	9/30/02	8/30/02	4
Develop a plan for responding to the Cyber Security "paradigm shift"	9/30/02	12/20/02	1

Results

Score (0~4.0)	Rating
3.00	<i>Excellent</i>

Notes, Issues, Trends and Assumptions

- 1) A process for reviewing and updating the CSPP was defined and presented to the Cyber Security Advisory Council (CSAC) for discussion during October, 2001. In addition to the accomplished milestone, the process, which emphasized the inclusion of BNL line

management in the latest CSPP review/update process, was also implemented during the second quarter of FY02. Status - Completed

- 2) Mechanisms for using the results of the “MITTENS” tool, and distributing the information site-wide, were developed by Cyber Security Operations. The CSPP update/review process described in item 1 includes mechanisms for incorporating new threats into the plan. Status - Completed
- 3) A process was developed for capturing the cross-dependencies between scientific IT requirements and their impact on the BNL Cyber Security program, specifically as to how these would drive additional IT investments. Key to this process are the bridging plans that define scientific/networking requirements. Budget impacts and cross-dependencies are captured during ITD Staff meetings and Section Budget meetings, specifically: 1) Capital program budget review 2) New program budget review meetings. Status - Completed
- 4) BNL’s Threat Analysis Program (which provides input to the Risk Assessment Process) has been established and documented. This program includes: BNL’s schedule for formally reviewing threats, identification of the sources of threats (DOE Notices, SANS, information gained from regular discussions held with Cyber Security counterparts at other DOE Labs, Consultant groups), examples of threats specific to BNL, the threat review process, and countermeasure development. The Threat Analysis document includes an explanation of how changes in the threat environment will drive updates to BNL’s CSPP. Status - Completed
- 5) The high-level strategy for attacking the coming Cyber Security “paradigm shift” was developed and was a key part of the Cyber Security Budget presentation for DOE/Chicago in March, 2002. This included an outline of the expected changes (new attack scenario), planning assumptions, and expected costs. The current expectation is that further development of the plan for the “paradigm shift” during FY02 will be minimal, hence the projection of the score of “marginal” (1) for this performance measure milestone. (See Issues and Trends for 3.4.1) Status - Behind Schedule

3.4.2 Scientific Computing Infrastructure

Accomplishments

Many major elements of the performance measure for Scientific Computing have been accomplished as projected. See 3.4.2.1, 3.4.2.2, 3.4.2.3 for descriptions of the specific accomplishments for 1) the Visualization Program, 2) Computing Resources, 3) New Technology Assessments.

Analysis

During FY02, success has been achieved in improving the rate of growth in providing Scientific Computing services, as well as strengthening and broadening collaborations with local/regional institutions. Evidence of the latter can be found associated with the Riken QCDOC (Quantum chromodynamics on a chip) project, where BNL is expanding and deepening its partnership with both IBM and Columbia University, building on the success of the original Riken QCDS (Quantum chromodynamics on digital signal processors) project. A key example of the

enhancement in Scientific Computing services can be found in the recently established Scientific Computing Centers of Excellence: Visualization, Grid Technology, and the Code Center. The major challenge continues to be the improvement of those common Scientific Computing resources used by all Laboratory science programs, and the development of new programs/services that are vital to the Scientific Mission of BNL. The recent hiring of two post-doctoral candidates in the Visualization and Parallel Computing areas will significantly foster more rapid growth within the Visualization program, but additional resources will be required to expand support in other equally vital areas.

Management Focus for the Coming Quarter

In the next quarter, there will be a strong emphasis on the QCDOC computer, from both a hardware and software perspective. With the other scientific computing Centers of Excellence relatively well established, Grid Computing will receive considerable attention in the coming months. An intensification of effort in dialog with Department and Laboratory management will be undertaken to better understand the opportunities for meaningful contributions in scientific computing. This includes enhancing those processes already established for formal, direct, and continuing involvement with BNL's major User Groups (an initiative begun early in FY02).

Results

Score (0~4.0)	Rating
3.17	<i>Excellent</i>

Notes, Issues, Trends and Assumptions

Also see the notes for 3.4.2.1, 3.4.2.2, and 3.4.2.3

The challenge is to ensure that ITD's Scientific Computing services remain strongly connected to the BNL scientific programs. This includes, as a minimum, improving communication techniques in order to 1) make sure that the Scientific Computing services under development are those needed by Laboratory programs, i.e. they add value, and 2) ensure that the user community is aware of the availability of the Division's Scientific Computing services. An ongoing issue is the need for increased resources to expand and sustain these new Scientific Computing service initiatives. Recognizing that BNL funding will be limited, ITD has been investigating how its' internal resources can most effectively be redeployed in order to more effectively support the needs of BNL's Scientific community.

3.4.2.1 Visualization Program

Accomplishments

The implementation of a high-speed visualization system was completed in mid-April, with the arrival of the necessary hardware at the end of March. In the third quarter, parallel processing techniques continued to be developed for use on a Linux Cluster. The Visualization Program was further strengthened by the addition of two post-doctoral candidates, responsible for a number of accomplishments in the areas of visualization and parallel processing. Additional details on

accomplishments, including methods developed/deployed to support visualization, can be found in the Notes Section.

Details

Milestone	Milestone Date	Actual or Projected Date	Points
Implement and support a high-speed visualization system	2/28/02	4/15/02	2
Develop and deploy remote visualization methods	6/30/02	5/30/02	4

Results

Score (0~4.0)	Rating
3.00	<i>Excellent</i>

Notes, Issues, Trends and Assumptions:

- 1) Visualization software was developed using parallel processing techniques. Cluster hardware was ordered during 12/01 and received on 3/29/02 (later than expected due to vendor delays). Implementation of the high-speed visualization system was completed by 4/15/02. Status - Completed
- 2) By the end of May, a number of remote visualization methods were developed and deployed, some with the assistance of two recently hired post-docs, with expertise in the fields of parallel processing and visualization. These included:
 - Exploration of high quality visualization over long distances, with the deployment of remote visualization theatres at Alfred and Jamestown including stereoscopic projector system and scientific visualization software
 - Evaluation of an IBM high-resolution display (9 megapixels) with applications to High Energy and Nuclear Physics and Computerized Microtomography
 - Collaboration with Argonne National Lab in the development of parallel processing techniques and on the reconstruction of tomography datasets
 - Deployment of an SGI Graphics Linux cluster to drive a tiled or composited display with Chromium and VTK visualization software for large data sets
 - Remote visualization access of large data sets on windows desktop computer using the Visualization Linux cluster as the visualization server, and a windows client running Exceed X server and Exceed 3D software

Status – Completed

3.4.2.2 Computing Resources

Accomplishments

The upgrade of ITD's high-performance computing resources was completed ahead of schedule. The first installment of the BNL Linux Cluster (BLC) was completed by mid-April. The remaining hardware items, including SUN Clusters and Storage Area Network access hardware were installed early in the 4th Quarter of FY02. Infrastructure preparation has been completed,

for the Riken prototype configuration (QCDOC machine with additional achievements occurring in the software arena. Infrastructure accomplishments included augmenting the current Uninterruptible Power System (UPS) in the BNL Computing Facility (BCF), and installing/testing a prototype air-conditioning system. The UPS will result in the ability to provide both the new Riken machine as well as the production machine (which previously was not on the UPS) with uninterruptible power. The new air-conditioning system will provide a more efficient cooling system for the QCDOC machine. In addition, the production Riken machine (QCDSF) has been reconfigured to provide a test-bed for the QCDOC machine. Progress has also been made on conversion of the Message Passing Interface (MPI), an initiative which will enhance the variety of scientific codes that will be supported by the QCDOC machine. See the Notes Section for other details on this quarter's achievements.

Milestone	Milestone Date	Actual or Projected Date	Points
Upgrade the high-performance computing resources required for support of Laboratory scientific initiatives	9/30/02	8/30/02	4
Commence installation and testing of a prototype configuration for the BNL Riken QCDOC machine	9/30/02	01/20/03	1

Results

Score (0~4.0)	Rating
2.50	<i>Good</i>

Notes, Issues, Trends and Assumptions

1. The high-performance computing resources have been enhanced by the installation of a Storage Area Network for Linux and SUN, deployed in the 1st quarter of FY02. Cluster hardware was ordered, received and installed by 4/15/02. Additional SUN Cluster hardware and Storage Area Network access hardware was installed by August. Status - Completed
2. Preparatory work required in the BNL Computing Facility (BCF) for the BNL Riken QCDOC has been completed. Physical site preparation, including clearing the area, electrical and air conditioning upgrades, were accomplished as scheduled. The air-conditioning system design used for the original Riken QCDSF machine was modified and improved. A prototype system based on this new design was installed into the QCDSF and tested. Test results revealed that this new system functions extremely efficiently. As a result, this system will be used in the QCDOC infrastructure. Site preparation for the QCDOC also included a substantial expansion of the BNL Computing Facility's UPS to one megawatt, which will enable support for the Riken machines. In addition the current Riken machine, QCDSF, has been reconfigured to allow it to function as a test-bed for codes that will eventually run on QCDOC. ITD staff is making progress in MPI (Message Passing Interface) conversion, which will enable the QCDOC to run a wider variety of scientific programs. ITD has also provided Columbia University with the hardware/software that is allowing them to run simulations of the new chip that is central to the design of the QCDOC machine. At Columbia's request, the initial installation work, even that involving ITD staff, was

performed at Columbia. It should be emphasized that in those areas that ITD had total control over, performance is considered to be **Outstanding**, with all required initiatives accomplished either on or ahead of schedule. The QCDOC chip, to be manufactured by IBM, has been delayed and is projected to be available in the 2nd quarter of FY03 at the earliest. Since the availability of this chip is key to the installation of a true prototype QCDOC configuration, this milestone cannot be met by the end of FY02, hence the rating of "1". Status - Behind Schedule. BNL requested relief from this measure since the problem was beyond the Lab's control. The request was denied.

3.4.2.3 New Technology Implementation Assessments

Accomplishments

Several New Technology Implementation Assessments (NTIAs) have been established, in support of specific Laboratory scientific initiatives. In all areas, milestone targets have been completed ahead of schedule. Achievements include: The integration of the Java language into the AGS Controls Group; conversion of the Climate model code to take advantage of parallel processing; and the initiation of a working group to support Grid technology. The latter will impact a number of multi-site collaborations, such as US Atlas. Additional details can be found in the Notes Section.

Milestone	Milestone Date	Actual or Projected Date	Points
Perform a prototype New Technology Implementation Assessment	7/31/02	6/10/01	4
Establish a service for Parallel Processing Conversion of legacy computer codes	2/28/02	1/15/02	4
Computational Grid technology program	9/01/02	3/30/02	4

Results

Score (0~4.0)	Rating
4.00	<i>Outstanding</i>

Notes, Issues, Trends and Assumptions

- The Java project, under the guidance of D.Stampf (a member of ITD's Scientific Computing Services Section) was completed in early June. The following key elements of this project were accomplished:
 - A series of lectures on the Java language was provided by Dave Stampf to AGS staff
 - The JBuilder Integrated Development Environment was installed on AGS machines
 - Bridge libraries were created that permit one to gain full access to the accelerator's control points
 - Portions of the AGS system are now running in Java
 - Java culture taking hold in Spallation Neutron Source (SNS) development, due to having common staff between AGS and SNS

Status - Completed

2. A service for parallel processing conversion of legacy codes was established. One example is L.Slate's (ITD Scientific Computing Services Section) work on the parallel processing conversion of the Climate model code. Status - Completed
3. A program of investigating, deploying and supporting Computational Grid technology was initiated by March, 2002. This included the establishment of an ITD Computational Grid Working group. The group members have educated themselves on the grid technology and have been attending the Globus meetings. A 7-node test cluster has been established within the Division. A proposal for an Access Grid node (required by ATLAS/CDIC) was developed and approved. The Access Grid node was established in ITD's Seminar Room and its' capabilities are being explored. Status - Completed

Supporting Assessment Measures for 3.4

SAM-28, Information Services, Score 3.01, Rating *Excellent*

The Information Services SAM contained two independent components; the creation of a Network Bridging Plan and establishment of a Resource Efficient NT-Server Environment. The Network Bridging Plan was developed and finalized by 5/02 and is the mechanism for ensuring that BNL's scientific requirements drive BNL's network strategy. To create this plan, a cross-functional working group, whose membership represented the entire BNL community, was formed. The resultant Network Bridging Plan was presented to the BNL Management Council.

The plan for creating a Resource Efficient NT-Server Environment, located in the Building 459 Data Center, was scaled back from the original, due primarily to resource issues. Lack of sufficient capital funds and, during the last half of FY02, re-direction of ITD personnel to support the more critical lab-wide host remediation effort necessitated an altered strategy for consolidation/enhancement of server resources. In spite of these problems, 21 administrative NT servers were migrated into the Bldg.459 Data Center during FY02, thus providing efficiency gains, an enhanced environment (backup, UPS, clean power, security) and improved maintenance programs for these systems (which included servers from BSD, OMC, Safeguards & Security, Reactor, SBMS, Central Shops).

BNL's SAM review process resulted in an overall rating of *Excellent*, using the evaluation formula, which included rating the approach, deployment and results. The results portion of the Information Services SAM was rated *Excellent*, based on the average score of the two major elements.

SAM-29, World Wide Web, Score 2.93, Rating *Excellent*

The main focus of the World Wide Web SAM was to develop a Web Infrastructure Model for BNL. Due to resource issues (i.e. key ITD personnel dedicated to the lab-wide host remediation effort) in the last half of FY02, progress toward the intended result, which keyed on the evaluation of the pilot for distributed content management software, was deliberately halted. In spite of this, steady incremental progress continued to be achieved for other aspects of the

WWW SAM during FY02, resulting in success in meeting 3 out of the 5 milestones defined in the SAM. Specific examples include:

Web Application Customer base increased for both Science & Administration Number of sites hosted increased; current status:

- Sites hosted on Unix - 54
- Sites hosted on NT - 283
- Intranet machines - 90
- Extranet machines - 193

Graphics/Multimedia service development was initiated
Software packages installed and evaluated, e.g. 3D Studio Max (3DS)
3D visualization package for desktop (trueSpace)

BNL's SAM review process resulted in an overall rating of **Excellent**, using the evaluation formula which included rating the approach, deployment and results (and emphasized approach and deployment). The results portion of the World Wide Web SAM was rated as **Good**.

3.5 Communications and Trust

The weight of this Objective is 10%.

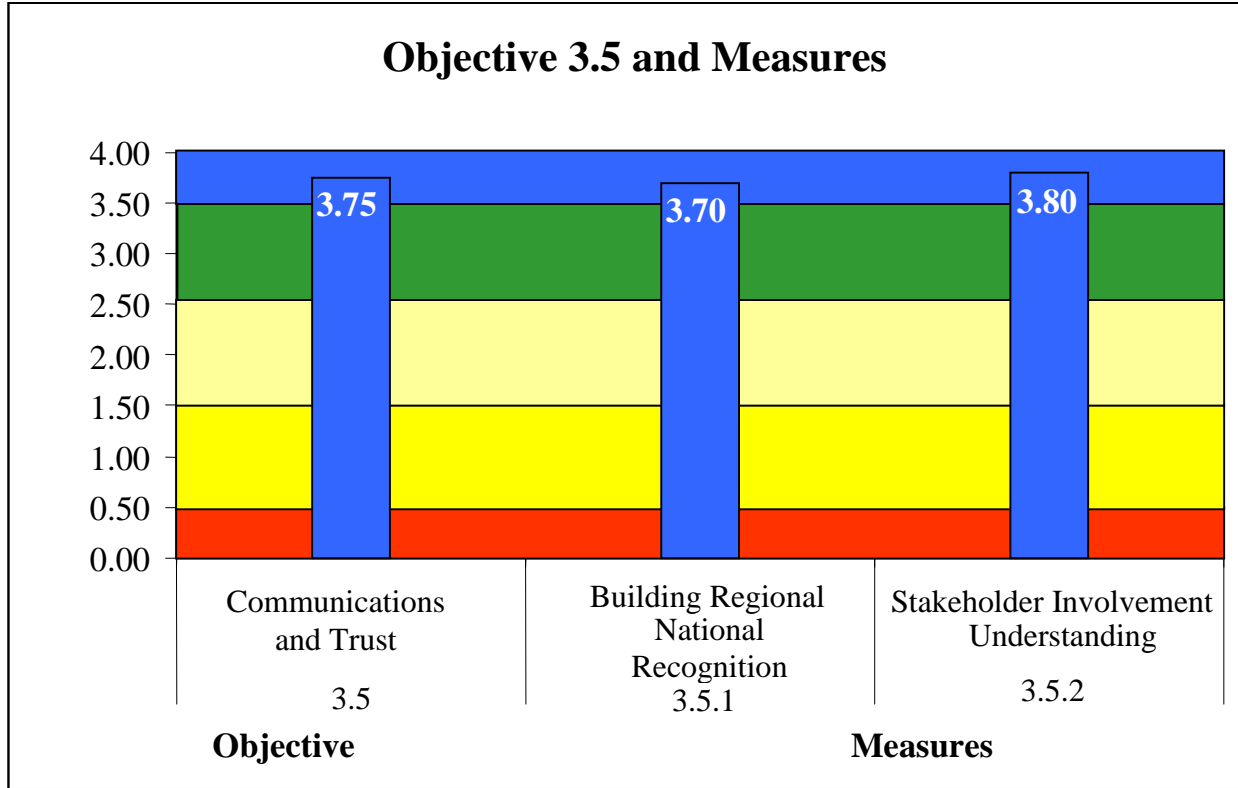
The Laboratory will enhance the foundation of trust and confidence it has built by: strengthening existing relationships and building new relationships with key stakeholders, elected and appointed officials, civic leaders, and other important constituencies; effectively communicating the Laboratory's scientific initiatives and accomplishments; generating community enthusiasm for Laboratory research programs; and working to fulfill the education mission shared with DOE.

Purpose and Supporting Information

The Laboratory's Communications, Community Involvement, and Education Program plans serve as a guide to the many activities and initiatives that will be pursued in FY02 to fulfill this objective and to help meet the expectations and performance measures of science and operational departments and divisions across the Laboratory.

Each element of the plan will include associated self-assessment activities for the appropriate organization (e.g. CIGPA, Departments, and Divisions). Stakeholder feedback will be collected and research and self-assessments will be conducted throughout the year to determine program effectiveness, to evaluate program utility, and to make mid-course corrections as necessary.

Performance towards this objective will be based on accomplishment of the goals set forth in the Communications, Community Involvement and Education plans. BNL and BAO will conduct an independent peer review process or other selected process that both parties agree is necessary and appropriate to evaluate the Laboratory's communications, community involvement, and education programs. The peer review or other process selected will focus primarily on the measures below.



3.5.1 Building Regional and National Recognition

Accomplishments

National and regional recognition of Brookhaven National Laboratory and its funding agency, the Department of Energy, was strongly supported by the communications and educational efforts undertaken by the Laboratory in fiscal year 2002. Communications planning was instrumental in many of the successes experienced.

With the American public reminded every day about events of 9/11 and continued threats to homeland security, Brookhaven’s scientific expertise and technology R&D aimed at countering terrorist threats has captured press attention all through this fiscal year, with stories appearing in The New York Times, Newsday, Discover Magazine, and many others media outlets.

Brookhaven researchers supported Senator Charles Schumer at a press conference in New York City, during which the Senator proposed legislation to fund nuclear detection devices for ports and border crossings. Media for that event, on May 12 at Pier 88, included: TV - NY1, CBS, NBC, ABC, Fox, WB11, Ch. 41; radio - 880, 1010, AP; and print - The NY Times, NY Post, Daily News, Newsday, AP, NY Sun. CEGPA provided strategic counsel and media training to the researchers, along with direct assistance at the event.

CEGPA also provided media and communications support for the Laboratory’s Energy, Environment & National Security Directorate’s participation in three events: the NY Metropolitan Region Counter-Terrorism and Infrastructure Assurance Technology Needs

Workshop, in April (NYC/Long Island); the G-8 Ministers of Energy Conference, in April/May (Detroit); and the first anniversary of the White House energy policy, in May (Washington, D.C.).

Earlier in the year, in March, a workshop on a proposed nanocenter at Brookhaven was attended by over 400 scientists and garnered significant national recognition for the Laboratory. Congressmen Sherwood Boehlert (R-NY) and Felix Grucci (R-NY) participated as speakers, along with Patricia Dehmer of DOE, Russell Besette of NYSTAR, and more than a score of notable scientists from around the world. Press attendance at the workshop included: Newsday, Small Times, Inside Energy, Information Week, UPI, Nature Materials (new Nature publication, will launch 9/02), Red Herring, The NY Times LI section, LI Business News. Other interested media included Crain's, New Technology Week, and New Scientist. Feedback from reporters covering the workshop was positive. Communications support included preparation of printed materials for a press kit, a dedicated nanocenter website, printed and electronic advertisements to generate attendance and recognition, communications with elected officials, a targeted press outreach, and training, counsel and support for the workshop's scientific principals. The Bulletin carried a full-page spread on the workshop and key participants.

Owing to the success of the workshop and subsequent peer reviews, Secretary of Energy Spencer Abraham and Congressman Grucci came to Brookhaven on June 14 to announce DOE's support for the nanocenter. Newsday, LI Business News, LI Advance, Inside Energy, New Technology Week, Small Times, UPI, TV 55 and News 12 carried the news. CEGPA was instrumental in organizing and planning the visit. Communications support included preparation of a press kit, exhibits, and banners; broadcast e-mail to employees; and a follow-up article in the Bulletin.

During FY 02, Brookhaven medical research also made headlines around the world, with press releases on inhalant abuse and obesity leading the placements. Retired Brookhaven chemist Raymond Davis Jr. won a National Medal of Science, the country's highest award for lifetime achievement in fields of scientific research. Media preparations were done with sensitivity and care as Dr. Davis is now in his 80s and frail.

The fourth quarter of FY 02 saw pronounced media interest in two very different science announcements - one on the age of the Vinland Map (chemistry applied to archaeology) and the other on a refined measurement of the magnetic moment of the muon (physics).

Anticipating that news on the Vinland Map would attract a broader-than-normal audience to Brookhaven, CEGPA prepared additional content for the Lab's website. Media staff also pitched the announcement to such target audiences as the Scandinavian/American Association and media outlets in the Midwest. Media coverage included Newsday, Washington Post, Time Magazine, Nature, Associated Press, Chemical & Engineering News, BBC Radio, WUSB, WSHU, TechTV, Science and Technology News Network, Long Island Advance, Mas Alla De La Ciencia (Spain), La Nacion (Argentina), Australia Morning Breakfast (Radio), Reuters, AP New Haven, Dagens Nyheter (Sweden), Science, NPR, Science News, Gazeta Mercantil (Brazil), Discover, Dan's Papers. Within a week after the announcement, web visits to the Vinland Map site numbered more than twice what news releases normally attract. In addition, e-mail inquiries were high and included contact by specialists with their own Vinland Map websites.

The announcement on the muon measurement was a follow-up to news more than a year ago. As before, the exact wording of the news release required long negotiations with the scientists. Media coverage included Science, Nature, The NY Times, Boston Globe, CERN Courier, Newsday, USA Today, APS media office, and JSIR Journal.

CEGPA also helped organize a media day for Brookhaven researchers collaborating in a multi-lab/university field study of air pollution over New England. We also created exhibit materials and handouts. This effort is an extension of our work with the researchers on a field study in the Houston region in 2000, one of the most comprehensive air quality studies ever conducted in the U.S. Here's what chemist Stephen Springston said recently: "Thanks for your work organizing media day for the program. The level of reporting and the media's awareness of what we do has improved markedly over the past several years."

New tri-fold brochures and fact sheets designed to foster public understanding of Brookhaven science were produced in FY02. Subjects included: the proposed nanocenter, addiction research, technology transfer, CIRC, RSVP, AGS, LEAF, NSLS, life sciences, and counter-terrorism.

During FY02, the Laboratory's website was enhanced to include more information describing major Laboratory programs and research initiatives. New websites have been constructed to highlight the proposed Center for Nanoscale Science Research and Brookhaven's contribution to the Spallation Neutron Source and ATLAS projects. Existing sections of the Laboratory website have been expanded or significantly revised, including the RHIC and NSLS websites and pages describing addiction research at BNL. Other departments that have aligned their pages with the new format include Environmental Management, Physics, Environmental Sciences, Environmental Services, Environmental Restoration, ESH & Q, and the Hazardous Material Transport Program.

Still other features have been added to the website to further increase its value as a communication tool. To facilitate rapid research and accommodate reporters and science writers who wish to feature stories on Brookhaven, "hard science" press releases have been grouped together on a single page and a new press release-only search function has been added to the "news and information" section of the general site. All press releases from 1995 to the present are now searchable by a single keyword.

Special attention continues to be paid to maintaining valid links, revisions of time-dependent information and daily revisions to the Laboratory home page to maintain relevant content and attract repeat visitors. Also, in the fourth quarter, CEGPA purchased a new computer for streaming video on the web. Previously, special arrangements had to be made and hardware set up each time streaming video was requested. This was difficult to coordinate and made use of streaming video on the web rare. With the dedicated computer, an increased number of lectures, presentations and meetings are now being made available on the BNL website.

Discover Brookhaven, the Laboratory's new science magazine, was launched online in a virtual format in June. When printed copies were available during the fourth quarter, CEGPA saw to it that the science ALDs sent personalized cover letters and copies to special mailing lists,

including program sponsors. Feedback was positive. Thomas Kirk, Associate Director for High Energy and Nuclear Physics, for example, received a thank-you from Rita Colwell, director of the National Science Foundation. To see an online copy of the magazine, go to:
<http://www.bnl.gov/bnlweb/pubaf/discover/default.html>

Efforts similar to those made on the main BNL website have been exerted in revising the Lab's Office of Educational Programs (OEP) web pages. In addition to restructuring the format to match that of the main scientific pages, the site was reorganized to be user friendly for target audiences, metatags were employed to enhance search results, and the main page was upgraded to include a direct link to the education pages. New graphics have been added as well as contest pages listing the winners. Webmasters of science education websites were contacted and asked to include links to BNL's OEP web site. All of these enhancements have resulted in more visitors being referred to the BNL website.

The educational programs at BNL continue to be a strong national recognition asset for both BNL and DOE. This year over 18,000 students visited the science museum, about 1,500 students participated in science contests, over 60 high school students participated in multi-week programs, and more than 100 undergraduate students completed scientific internships through DOE funded programs. Many other programs supported additional students and teachers throughout the year. Examples include the 96 students and 8 teachers who participated in the Brookhaven Women in Science career day and the 22 Longwood High School teachers who attended a staff development day at Brookhaven. In order to maximize the opportunities in the area of science education and literacy, the Laboratory's elementary school programs were transitioned over to CEGPA's Office of Educational Programs. A strategic plan has been written and is now being implemented to capitalize on the unique science capabilities at BNL and the new organizational structure. The plan also supports further development of external partnership funding opportunities, and will strengthen the core educational programs at BNL.

Analysis

A rating of 3.7 is justified by the completion of all of the required aspects of this performance measure. The high level of coverage by nationally recognized publications, the successful campaign to site a nanoscience center at Brookhaven, the Big Apple award by PRSA, and the recognition of the media relations activities by the peer review team support the *Outstanding* rating.

Further support for this rating is the exceptional progress made not only on the structure of the BNL websites, but also the usage of the sites to provide timely, interesting and mission based information to a wide variety of stakeholders.

The educational website has been redesigned and a strategic plan has been put in place.

Management Focus for the Coming Quarter

The focus over the next quarter will include maintenance of the core communications programs for the Laboratory. Additionally, as the priorities for FY 03 are refined, communications activities to support these priorities will be established.

Results

Score (0~4.0)	Rating
3.70	<i>Outstanding</i>

3.5.2 Stakeholder Involvement and Understanding

Accomplishments

In accordance with the requirement of this performance measure, a systematic process to trend potential and nascent issues that could affect the Laboratory is in place and is being piloted. Language in the performance measure stated that this process should be linked to the BNL article tracking database and other internal and external sources. The database as well as other printed materials, websites and feedback from outreach programs are being systematically scanned and reviewed; links are oftentimes made, and then the information is shared with CEGPA staff. Where appropriate, the Assistant Laboratory Director for CEGPA shares information with the Policy Council. Approximately six potential issues have been identified and are being tracked through this pilot. The process is being evaluated against assessment criteria that include the time the effort takes, value gained and appropriateness for community involvement staff responsibility.

In addition, a process to track Lab issues is in place and is being used as an internal tool for CEGPA. CEGPA is currently evaluating its usefulness and the types of information that should be included. Depending upon the results of this evaluation, a determination will be made in the first quarter of FY03 as to how the information will be shared with a broader audience.

At the end of FY 02, more than 80% of Level 1 and 2 managers have received training in the Community Involvement in Decision Making process. In cooperation with the Department of Energy, 18 DOE managers were also trained. To date, 112 Level 1, 2 and 3 managers and project managers have been trained during the last two years. This training, coupled with the community involvement policies, procedures and R2A2 expectations, has helped to further build relationships with our customers, has provided valuable insights and feedback about their organizations, helped to identify key team members within Lab organizations and identified potential issues. In addition, managers gained an understanding of CEGPA's role as a resource. The culmination of these efforts has been a marked increase in line managers having stakeholder involvement responsibility, with CEGPA increasingly providing a facilitation and counseling role.

This year CEGPA continued to interface with Lab organizations to ensure that appropriate links are made between the community involvement procedure and other procedures within SBMS. Broad language for community involvement has been included in handbooks such as the Science Council Handbook; specific language has been incorporated in the Hazard Analysis procedure,

Hazardous Material Transportation Safety, Project Management, and ESH 1.3.5, among others. In addition, the Community Involvement Manager is an ex-officio member of the Institutional Bio-safety Committee, and several CEGPA staff are dedicated to the Environmental Management programs. The training conducted for managers and the use of the prompts in standard procedures for Laboratory departments have been key contributors to the issues tracking and trending activity.

The Laboratory initiated the "Volunteers in Partnership" (VIP) program (previously identified as Partnership BNL) in FY 02. The program provides support to employees and retirees who volunteer within their communities. The program, which is also supported by Brookhaven Science Associates through special funding, is intended to help gain recognition for the Laboratory and its employees for their good works and community spirit. An Advisory Committee has been formed and is meeting routinely. The Advisory Board members set guidelines and have begun to receive and to analyze requests for incorporation into the program. T-shirts are available to all employees who take part in the VIP program. The program was publicized in the Brookhaven Bulletin, Monday Memo, in Berkner, and in a flyer distributed Lab-wide that highlighted the VIP program, as well as other Lab volunteer initiatives.

Results from the employee survey, obtained in the first quarter of FY02, indicated that CEGPA communication vehicles were effective in conveying Lab information: the Bulletin had a "favorable" score of 92, Monday Memo 84, e-mail 81, and web 70. The survey indicated, however, that employees wanted more information on the Lab's strategic plans. Accordingly, CEGPA, in editorial meetings with the Interim Director, encouraged him to include that type of information in his Monday Memo messages throughout the year. A fourth quarter review of FY02 Monday Memos showed steady communication of strategic plans.

The search capabilities of the BNL website continue to be upgraded. Efforts are being initiated to make the Brookhaven Bulletin searchable. Lab press releases and statements were made searchable during FY 02.

In addition to the achievement of the task-specific performance measures highlighted above, the Laboratory was charged with maintaining two-way channels of communication with stakeholders such that frank and open dialogue could be conducted with Laboratory management on issues of importance. The Laboratory was also expected to make information available through a variety of means, to gather input from stakeholders, and to be responsive to that input. This has been an ongoing commitment for the Laboratory, and FY 02 activities have satisfied this continued expectation. Line managers have assumed responsibility for their respective areas, have readily participated in preparing for and conducting outreach, and have been quick to identify issues and seek Laboratory support on them as appropriate. Policies and procedures to guide the line managers are in place, and the training of managers have been effective in making the communications programs work. As these efforts continue, the participation and skill of line managers in the task of community involvement and outreach continues to improve dramatically. Several examples of stakeholder opportunities for accessing information, participating in decision making activities, and learning of the Laboratory response to various issues are detailed below.

Community Advisory Council:

The Community Advisory Council (CAC) has just celebrated its fourth anniversary. The CAC has met 44 out of the past 48 months, taking one summer month off each year. It has achieved quorum every month except one, during a meeting in 1998. Facilitation and administrative support is ongoing. Presentations have been given on environmental and Laboratory research projects. Preparations for presentations continue to be rigorous; the Lab's issue trending process is being utilized to ensure speakers are aware of community issues and prepared to answer questions from the community regarding the impacts of their research/operations on these issues.

The Community Advisory Council members have matured into a group that is less confrontational with each other and is more balanced in their counsel to Laboratory management. Lab management participates in each meeting and is open to listening and incorporating the CAC's perspective in their decision making. The Council, in turn, is aware that they are giving input to the top managers of the Laboratory.

In addition to presentations by the Laboratory's line managers, this year the CAC hosted presentations from outside groups, including one from a consultant for Neighbors Expecting Accountability and Remediation which has an EPA Tag grant; a presentation by a Suffolk County Department of Health Services hydrogeologist; and a panel discussion on risk assessments. In response to a Newsday article on the value of the CAC, all members who attended the subsequent meeting were queried. The twenty-three members present stated without qualification that overall the Council is both effective and worthwhile.

Environmental Restoration Project Outreach:

In addition to the routine interaction that the Environmental Restoration project managers have with the Community Advisory Council and the Brookhaven Executive Roundtable, many other community involvement mechanisms have been established to ensure that community concerns are incorporated in the cleanup decisions at BNL. The BGRR Working Group and the Peconic River Working Group (established in December 2001) provided early and substantive information to project managers interacting with the membership. An assessment of community member's perspectives about these working group interactions was very positive with regard to building trust and confidence, access to information, and the ability to dialogue with the project managers directly.

Roundtables were also held in FY02 to support the Peconic River sediment cleanup activities. The roundtables were focused on the process to achieve a cleanup decision for the Peconic River sediment. Subsequent to this, a fact sheet was mailed to the BNL mailing list to delineate the process. These activities, combined with the working group and visits to elected officials with an interest in the Peconic River, have enabled this controversial project to move forward. Many community members and elected officials actively contributed input that was instrumental in the final plans for the pilot studies conducted in two areas of the Peconic River.

Another key effort was interaction with community members to the south of BNL where off-site groundwater treatment systems are to be constructed. Small group meetings were held with

residents adjacent to the systems, approximately 170 residents who live south of the Lab were canvassed, a workshop was held, a fact sheet was mailed to entire community, and a question-and-answer follow-up document was sent after the workshop. Dialogue with many of these residents will continue in an effort to further build relationships with these important stakeholders. Elected officials associated with this area were, and continue to be, routinely briefed.

Outreach Programs:

A new initiative - lunchtime tours for Lab employees - was launched and is continuing. During the first four months of the program, approximately 100 employees took advantage of the opportunity to learn more about the site and its mission.

The envoy program is in its fourth year and continues to be successful in educating employees and in gathering feedback from community organizations. The presentations given during each meeting were opened up to other employees, specifically those involved in the tour program, so that others were further educated on what is going on internally at the Lab. During FY03 a second envoy program will be initiated, with an attempt to focus on the areas south of the Laboratory, which also will be part of CEGPA's effort to further build relationships with these residents.

The adult, college and professional tour program hosted more than 1900 participants, while the high school program gave tours to more than 950 students during FY02. Additionally, staff development days and special outreach days, including the Boy Scout Merit Badge program, Science Fair Help days, the Radiation and You program, local fairs and festivals, were successfully conducted. All of these opportunities have been focused on sharing information to targeted audiences and highlighting the Lab's research and mission. The sunny days and heat were a challenge for the Summer Sunday program; nevertheless, more than 5,000 visitors came to the Lab. Approximately 300 of the visitor signed up for Laboratory Link, a community newsletter that highlights research and special events at the Lab, indicating that our audience includes many science-interested publics. In addition, Laboratory Link and sign-up sheets are brought to all outreach efforts; feedback from some subscribers indicates this is an effective way to promote Lab research.

Almost 70 Speakers Bureau presentations were conducted this year. CEGPA continues to target audiences, including health professionals, business, and the Suffolk County fire/rescue groups. The Speakers Bureau has completed presentations to the fire/rescue organizations; this effort has helped to develop and maintain relationships with these organizations. In an effort to effectively use the time of speakers, the bureau has taken steps to only present to elementary schools where the speaker is a parent of a student in that school. Additionally, fewer career days are being given, and an increase in the number of presentations to business organizations such as Rotaries has been conducted.

This year, the Environmental Services Division, under the direction of Mark Davis, has upgraded the Camp Upton Historical Collection fulfilling the guidelines for preserving Laboratory cultural resources. A team of archivists have accessioned and catalogued the collection; CEGPA staff

manages the collection and worked closely with the team to provide counsel and direction. Interest post 9/11 has provided many opportunities to reach out to historical societies, organizations and individuals interested in the Lab's history. While focusing on Camp Upton, this outreach provides many opportunities to share Laboratory research with a broader audience. A well-designed logo has been completed; the concept and design was researched and adapted from a 1919 picture in the book, 77th Division History.

Ongoing assessments are made for all of the outreach programs ensuring that the time and effort of conducting them is measured against the value gained. Refinements are made, as appropriate, since there is full recognition that meaningful and ongoing relationships are key to CEGPA's success in this area.

Analysis

The Laboratory continues to place a high priority on the commitment to involve both internal and external stakeholders, to understand their perspective on important issues, and to incorporate the elicited input as practical. The programs supporting this effort continue at a high level and are now reaching maturity through the established processes, training, and issue management that is ongoing. Moreover, the continued self assessment and subsequent focused improvements and program refinements have further enhanced the effectiveness of these programs. The primary intent of this objective has been satisfied at a very high level. This has been confirmed through an independent peer review.

In addition to the primary focus of this objective, several specific activities were added to the performance criteria. These activities include the development of an issues anticipation process, upgrading the training of Level 1 and 2 managers in the community involvement in decision making process and the establishment of a new volunteer initiative. One deviation is noted, but is considered minor in impact to the overall assessment. A formal employee communications plan was not established in response to the employee survey done at the end of FY 01. However, an informal plan of action was established based on the survey results. A more formal approach was planned for when the new director was appointed. This has yet to occur. In response to the survey, additional information on the strategic direction of the Laboratory was incorporated into existing communications mechanisms such as the Brookhaven Bulletin and the Monday Memo. Additionally, the intranet, a primary source of information for employees, was greatly enhanced in FY 02. No further action was deemed necessary as the survey indicated that existing processes were effective and web upgrades were already well under way. In addition to these sources of information, employees actively participated in Laboratory communications and issues. Examples of other employee communications activities include briefings to the envoys, employee participation in the health benefit discussions, environmental roundtable participation, lunch time tours of facilities, and participation on the Quality of Life Committee.

In summary, the high level of performance in FY02 in this area is evident by the accomplishments. This was recognized by the peer review group as well. A rating of 3.8 has been established for this assessment.

Management Focus for the Coming Quarter

The processes related to stakeholder involvement, outreach and issue management will continue. Areas of focus will continue to be environmental cleanup of the Laboratory, strategic initiatives

for the success of BNL and DOE, science literacy, employee involvement and other areas as appropriate. These activities will be aligned with the FY03 performance measures when they are finalized.

Results

Score (0~4.0)	Rating
3.80	<i>Outstanding</i>

Notes, Issues, Trends and Assumptions

Several key projects in the environmental restoration area and the environmental services areas are expected to continue into FY 03. Decisions on these projects may be controversial and therefore result in ongoing visibility for the Laboratory with regard to environmental issues.

PERFORMANCE VARIANCE AND ISSUES ANALYSIS FISCAL YEAR 01 VERSUS FISCAL YEAR 02

This section of the FY 02 BSA Self Evaluation provides a performance variance analysis between the BSA FY 01 Self Evaluation and the BSA FY 02 Self Evaluation. Also included in this attachment is the treatment and status of issues that were raised in the DOE Fiscal-Year 2001 Performance Evaluation of BSA that was received on August 12, 2002. The format of this report is arranged according to the FY 2001 Performance Based Management Framework; that is, all the numerical references and variances are applied to the FY 01 Critical Outcomes, Objectives, Performance Measures, and Metrics.

This report is segregated into the following discussion topics:

- Summary Issues Management
- FY 02 Self Evaluation and Report
- Science and Technology Issues Management
- Environmental Safety and Health Issues Management
- Facility Infrastructure Issues Management
- Business Management Issues
- Environmental Restoration Issues Management

Summary Issues Management

Our customer has requested, in a submission cover letter, the disposition of actions associated with issues raised within the FY 01 DOE Evaluation. Customer feedback indicates that BSA has been unresponsive in addressing evaluation issues and concerns in a timely manner. BSA has taken this summary issue very seriously and has taken actions to be more responsive to our commitments and customer's expectations.

During FY 02, BSA and DOE Brookhaven Area Office (BAO) established quarterly performance reviews that commenced with the FY 02 Third Quarter Review held on July 19, 2002. Progress against FY 02 performance measures were discussed in addition to issues and concerns associated with meeting outstanding performance. Also during FY 02 a matrix of performance measure, objective, and critical outcome owners and their BAO counterparts was formed and a meeting held to define the roles, responsibilities, and communication requirements of the BSA owners and counterparts. This was established to provide unambiguous ownership and accountability of measure performance and enhance performance and issues communication during the performance year. BSA is striving for continuous performance communications between the performance owner and the customer counterpart, thereby providing an environment for immediate corrective action as well as mitigating performance-rating surprises at the end of the fiscal year. It is our intent to have the quarterly customer reviews serves only

as confirmation of performance versus identification of performance issues. BSA senior management has also increased the communication with their BAO counterparts in weekly issues meetings. BAO Quarterly Feedback Reports are now being generated and serve as an additional issues and communications management vehicle. The Office of Management Services, with Bruce Miller as point of contact, has increased responsibility associated with performance-based management. OMS, together with BAO will drive sustained improvement.

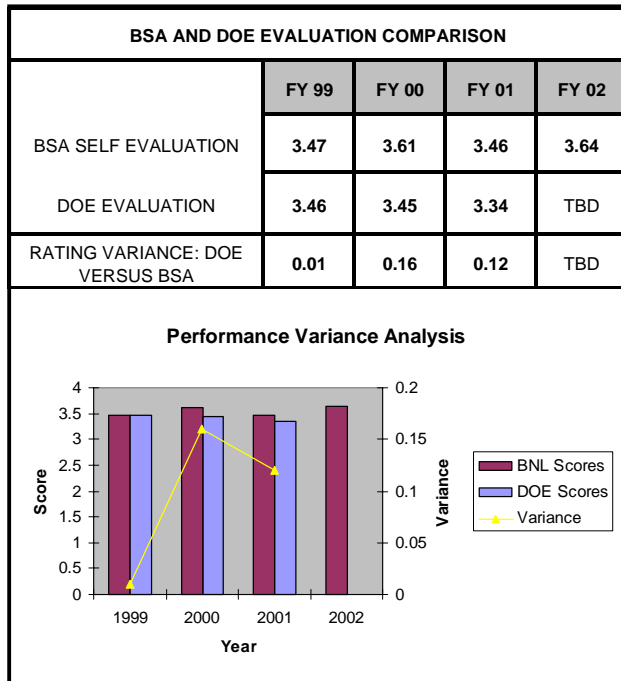
This multidiscipline national Laboratory has a comprehensive list of customers within multi-layer programs, offices, and locations. It is our action to continue to improve our management of customer expectations and provide for more effective and timely communication with our customers. Performance Based Management is our vehicle to drive those necessary improvements with the ultimate goal of seamless performance management.

FY 02 Self Evaluation and Report

We are committed to continue to improve our Self Evaluation Process and Self Evaluation Report. The following is the summary ratings for BSA and DOE for the last three fiscal years.

BSA is keenly aware that the FY 01 self-evaluation indicated a -.15 negative trend from our FY 00 self-evaluation and have taken steps to improve that performance. It is also

noted as a trend that our ratings are higher than our customer's ratings. Our actions taken in FY 02 to align the measure owners with the customer counterparts should narrow that variance. BSA corporate reviews held during FY 02 have provided increased management attention to performance improvement actions. It is noted that 38 out of the 55 evaluation scores (that include some redundancy roll-up) are within .02 rating points between the DOE and BSA evaluation. Those areas where there are either significant rating differences or if both evaluations indicate a less than **Outstanding** rating are targeted for discussion.



The quality of the Self Evaluation Report continues to improve. In order to better align our performance evaluation with the DOE HQ Program Office assessment, a Science and

Technology Evaluation Report (Critical Outcome #1) was developed and submitted to program customers on August 30, 2002. It is our hope that this report will better coordinate and integrate our evaluations. The compilation of the report from vastly different programs, functions, and authors adds a complexity for reporting consistency. We attempt to delicately edit the document and text without taking program or function quality away from the intended audiences. Therefore, the consistency of the text is at times, compromised in favor for the specific targeted audience for that section of the report. Our commitment is to continue to improve the quality and content of the report and any feedback from our customer is welcome.

The FY 01 performance issues are compiled into Table 1. The table contains a subset of the FY 01 Objectives and scores. The table identifies those objectives and measures that compare with an FY 02 objective and measure and identifies the scoring variance. The table also includes those FY 01 performance measures that have been referenced in the DOE evaluation as issues (shown in **GRAY**).

Science and Technology Issues Management

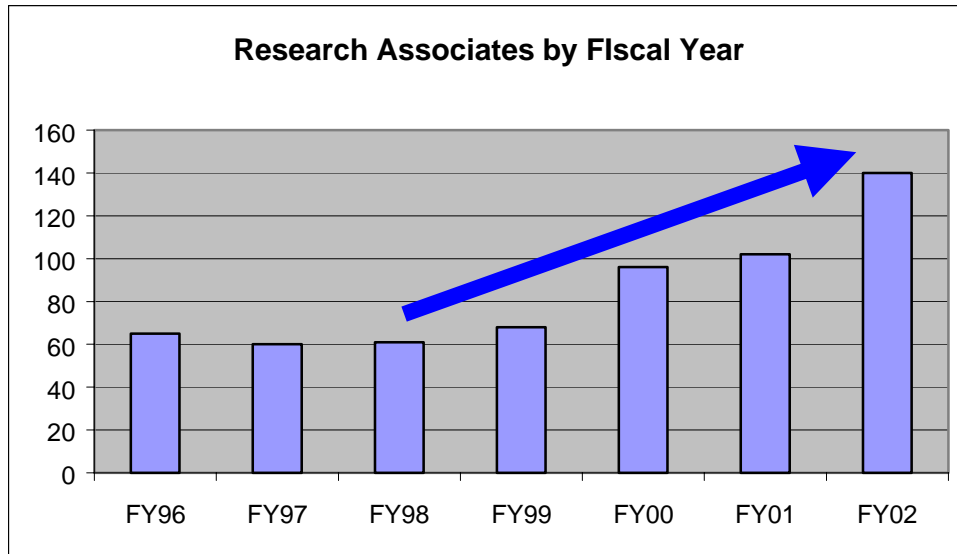
As indicated in Table 1, ratings for Objectives 1.1 through 1.3 for FY 03 were within .04 rating points. The major variance (-.38) appeared in Objective 1.4 Research Program Management. The individual documentation in the Research Program Management write-ups in the self-evaluation report is supported with the following information. BSA has rated the Research Program Management a score of 3.5 for FY 02 that is supported within the FY 02 evaluation report. The following responses only support the specific issues raised in the FY 01 evaluation.

BSA will work with their customer counterparts in FY 03 to better qualify and quantify the attributes of research program management to provide a vehicle for consistent scoring and drive performance improvement.

FY 01 Objective 1.4: Research Program Management: Staff Quality

There was scientific staff concerns raised within HENP, OBER, and BES. BSA has taken significant steps to maintain and increase the quality of its scientific staff.

- The Research Associate Status through FY 02 is as follows:



- **Significant Staff Appointments FY 02**

Ralph James (ALD EENS)
 James Misewich (MSD Chair)
 Lance Cooley (MSD S-2)
 Huilin Li (Biology S-2)
 Brian Boyer (NNSD S-2)
 Sergei Maslov (CM Theory)
 Christopher Homes (IR Spec)
 Fabian Essler (CM Theory)
 David Keyes (Columbia-CDIC)

- **Goldhaber Fellowships with BSA Support:**

Name	Previous Affiliation	BNL Department
Young-June Kim	MIT	Physics (John Hill)
Hua Gen Yu	Chinese Academy of Sciences	Chemistry (J.Muckerman)
Elena S. Lymar	Rockefeller Univ.	Biology (Carl Anderson)
Bernd Surrow	DESY	Physics (Gerry Bunce)
Robert F. Klie	Univ. of Illinois at Ch.	C-AD (Yimei Zhu)
Kimberly M. Mayer	Cal-Tech	Biology (John Shanklin)
Jian Wang	Cal-Tech	Env. Sciences(Dan Imre)
Peter Petreczky	Bielefeld University	Physics (Larry McLerran)
Oleg Gang	Harvard	Physics (Ben Ocko)
Seogjoo Jang	MIT	Chemistry(M. Newton)

FY 01 Objective 1.4: HENP Research Program Management

Issue: Communication with the user community has improved, although further effort is needed, especially to the broader community.

Response: BSA played a very active role in the Nuclear Physics Long Range planning. Also worked with MIT and other interested parties to develop Electron Ion Collider concepts.

Issue: The loss of Tom Ludlam from Laboratory Management has broken a vital link between the RHIC detector project and the BNL HENP management.

Response: Tom Ludlam continues to work with the RHIC detector community and has been charged to lead the R&D planning for the RHIC detector upgrades.

Issue: Recent loss of two outstanding theorists (in nuclear physics) will challenge management to quickly fill these important positions in order to maintain momentum in this area.

Response: The theory group maintained its forward momentum with post-docs and Goldhaber Fellows and with a close collaboration with the RIKEN BNL Research Center.

FY 01 Objective 1.4: OBER Research Program Management

Issue: Productivity of the one EMP technology project involving tracer data has been disappointing.

Response: This problem was caused by a specific instrumentation problem. Using BNL's own funds the problem was fixed and the work was completed one year behind schedule supported by the Directorate and Department instituting tighter internal oversight

Issue: The fact that BNL has only two Life Sciences research projects (excluding structural biology) does not speak very highly of BNL ability to respond successfully to BER calls for new Life Sciences research.

Response: BNL management has been aware of this weakness and is working hard to remedy it. BSA developed a comprehensive proposal in response to the Genomes to Life Request for Proposal. Although the proposal was not funded, it is planned to generate other related proposals and continue the realignment process.

FY 01 Objective 1.4: BES Research Program Management

Issue: The absence of succession planning for Dr. Isaacs and a plan that addresses the many opportunities that exist for corrosion research at BNL continue to have a

negative impact on the outstanding Mechanism of Metal-Environment program and its long-term future.

Response: The Material Science Department was established in order to strengthen this area of research. A distinguished scientist (Dr. James Misewich) from IBM has assumed chairmanship of the Department and a search is underway for the successor for Dr. Isaacs.

Issue: Although the scientific merit of the Superconducting Materials and Basic Materials Science of High-Tc Conductor Fabrication programs is outstanding and world class, the August 1999 peer review identified a lack of coherency in the plans, including how the pieces fit together and the organization of the teams, and a need for proactive identification and addressing of program issues, including securing appropriate collaboration where required.

Response: Dr. Lance Cooley from U. of Wisconsin joined the BNL superconducting material research group, strengthening the group's research capability as well as addressing issues that were of concern to the review committee.

Issue: A national laboratory program must be well integrated to be differentiable from university-based research.

Response: There is stronger emphasis now on the inter-departmental research program based on the existing BNL facilities and multi-disciplinary core competences of the Laboratory. Examples are:

- Biology-NSLS for the Macromolecular Crystallography Program
- Environmental Science-NSLS for EnviroSuite
- Material Science-Superconducting Magnet for Hi Tc material
- Instrumentation Division works with many Departments

FY 01 Objective 2.1 Environmental Safety and Health Issues Management

Although, strictly speaking, a number of ES&H Measures were not carried over into the FY 02 Appendix-B, the overall rating for the '02 ES&H measures improved from a 3.28 for ESH Operations to an outstanding rating of 3.53 for Objective 3.2: ES&H. FY 01 issues include the following:

FY 01 Measure 2.1.1.1: Environmental Results: FY 01 score of 2.64

This measure was not included in the FY 02 Appendix B. The compliance components for this measure were to consistently meet all SPDES permit limits, eliminate significant spills, and to submit reports on a timely basis. This measure is currently tracked as part of the ESD FY 2002 Self Assessment Plan. Through the third quarter update, the SPDES Permit Excursions Score of 18 (Excellent), Spills Score of 16 (Outstanding), and Report Timeliness Score of 4.9 (Outstanding) significantly improves the rating from FY 01.

FY 01 Measure 2.1.3: Occupational Safety Performance: FY 01 score of 2.58/DOE score of 2.26

The FY 02 corresponding measure is 3.2.2.3-OSHA Reportable Injury Management. The FY 02 BSA rating for this issue is 2.97, a .71 improvement in score. The write-up included in the FY 02 Self evaluation indicates that the LWDR-Outstanding, TRCR-Excellent, and LWCR-Good was equally proportioned and provides sufficient explanation for the LWCR rating.

FY 01 Measure 2.1.3.2: Chemical Safety Performance; FY 01 score of 2.4/DOE R score of 2.0

The FY 02 corresponding measure is 3.2.2.4 Chemical Safety Performance. The BSA rating for this measure is 3.31. Twelve rooms were randomly inspected for conformance to chemical inventory management or management of peroxide forming chemicals. Please see the Self Evaluation for a detailed description

FY 01 Measure 2.3.5: Radiation Control Program Implementation Performance; FY 01 score of 2.7/DOE score of 2.7

The FY02 corresponding measure is included in the Radiological Control Supporting Assessment Measure. The BSA score for this SAM for FY02 is 3.60 corresponding to a rating of *Outstanding*. This is a significant improvement over the FY01 score. An ongoing comprehensive assessment of the Radiological Control Program is underway primarily using an internal Self-Assessment Plan, with additional input from: Senior Management, various Implementation Guides, results of assessment records, Radiological Awareness Reports, Non-compliance Tracking System Reports, and Facility Support Monthly Reports.

FY 01 Objective 2.3 ESH&Q Systems (Integrated Safety Management); FY 01 score of 2.75

Several issues were raised by the DOE at the end of FY01 pertaining to the FY01 ESH&Q Measure; specifically, the FY01 Measure 2.3.1 ISMS Performance Composite. In addition, BSA notes the sub-optimal performance of FY01 Measure 2.3.3 Overall Evaluation of the Laboratory's Integrated Assessment Program.

FY 01 Measure 2.3.1 ISMS Performance Composite; FY 01 score of 2.2/DOE score of 2.2

The low score of Measure 2.3.1 resulted from poor scores in its underlying metrics. (Specifically metrics 3.2.1.1, Long-term Performance Monitoring of ISM with an FY01 score of 1.0 *Marginal* and 3.2.1.3 ISMS Improvement Plan with an FY01 score of 0.5 *Unsatisfactory*). While there was no one to one relationship between FY01's ISM Measures and Measures from FY02, the tenets and principles of ISM are embodied in FY02 Performance Measure 3.2.2, On-going ES&H Risk Management. The BSA score for this measure is 3.55 correlating to a rating of *Outstanding*. In addition, ISM ideologies are associated with the ES&H Supporting Assessment Measures. Seven out of eight of the aforementioned SAM's were rated as *Outstanding*, with one rated at *Excellent*. Integrated Safety Management is a key guiding philosophy of the Laboratory.

FY 01 Measure 2.3.3 Overall Evaluation of the Laboratory’s Integrated Assessment Program; FY01 score of 2.7/DOE score 2.7

The FY02 corresponding measure is included as FY02 Metric 3.1.1.1 (of the same name.) The BSA score for this Metric for FY02 is 3.60 correlating to a rating of *Outstanding*. It should be noted that this year’s measure is structured quite differently than the FY01 Measure. In FY02, the Integrated Assessment Program relied on 29 Supporting Assessment Measures to evaluate various Laboratory systems. This process is described in detail under metric 3.1.1.1.

FY 01 Objective 2.2: Facility Infrastructure Issues Management

Two areas of concern carried over from the FY01 Facility Infrastructure Performance Measures; the Condition Assessment Survey (FY01 score – 0.00) and Energy Utilization (FY01 score – 2.00). The balance of Facility Infrastructure Management was mostly *Outstanding* in FY01.

FY 01 Measure 2.2.2.2 Energy Utilization; FY 01 score of 2.0/DOE score of 2.0

The FY02 corresponding measure is included in the Energy Management Supporting Assessment Measure. The BSA score for this SAM for FY02 is 4.00 correlating to a rating of *Outstanding*. Although this measure is very weather dependent, BNL has sustained excellence in reducing the laboratories energy use. The energy management systems in place helped us achieve the desired results and reach the outstanding category for reduction in energy use and BNL energy management programs have reduced BTUs/sq. ft 28% below the 1985 base line year.

FY 01 Measure 2.2.2.3 Condition Assessment Survey Progress; FY 01 score of 0.0/DOE score of 0.0

The FY02 corresponding measure is included in the Management of Maintenance Activities Supporting Assessment Measure. The BSA score for this SAM for FY02 is 4.00 correlating to a rating of *Outstanding*. Last year’s *Unsatisfactory* performance resulted in a corrective action to submit an ADS seeking funding for contracted inspection services in order to reduce CAS cycle time. The ADS ranking resulted in funding for FY02 that places the CAS on a three-year cycle.

FY 01 Objective 2.4 Information Infrastructure; FY 01 score 3.16

Cyber Security (a Performance Measure under the Information Infrastructure Objective) is an issued raised by DOE in FY01 that has carried over into FY02. This Measure had the effect of the lowering the Information Infrastructure score from what would have been just over 3.4 (a high *Excellent*) to 3.16.

FY 01 Measure 2.4.2 Cyber Security; FY 01 score 2.83/DOE score 2.83

The FY02 corresponding measure is included as FY02 Performance Measure 3.4.1 (of the same name.) The BSA score for this year's Measure is 3.13 correlating to a rating of *Excellent*. BSA notes that while quantitatively our performance in this area has improved, continued management emphasis and diligence is warranted. This year, all of the major initiatives of the original BNL Cyber Security Program Plan (CSPP) have been accomplished with the completion of pilot programs in the areas of strong authentication and application strategy; the associated performance measure milestones were met, as detailed in 3.4.1.1. In addition, the processes needed to make the CSPP responsive to various drivers (e.g. DOE directives, technology, changes in threats) are now in place, as described in the milestones noted in 3.4.1.2. Additional information on progress in each specific area related to testing/reviewing/evaluating the CSPP can be found in 3.4.1.2.

FY 01 Objective 2.5 Excellence in Safeguards and Security; FY 01 score 2.5/DOE score 2.5

Counterintelligence is an area of concern for BSA. The FY02 corresponding measure is included as an FY02 Supporting Assessment Measure (of the same name.) This objective and its supporting Performance Measure are treated as one in this document. This year, a Counterintelligence assessment has been conducted in accordance with the CI SAM Plan. The CI Program requirements that were identified for this assessment were drawn from the Office of Counterintelligence, Counterintelligence Program Standards Guide, dated March 2002. The assessment was conducted through document reviews, individual inputs, and information obtained from CI personnel holding responsibility for each of the individual program topical areas. The SAM assessment for FY 02 resulted in no identified findings or recommendations. The BNL and BAO SAM owners reviewed and concurred with the results of the assessment. The FY02 score for Counterintelligence is 2.51, correlating to a rating of *Excellent*.

FY 01 Measure 3.1.1.3 Managers with Personal Development Goals in FY 2001; FY 01 score 2.1

This metric did not carry over from FY01 to FY02. In FY01, the Laboratory focused on management personal development goals. This year our focus has shifted to ensuring the success of the new Scientific Staff performance appraisal process.

FY 01 Measure 3.3.2 Waste Shipping and disposal Performance; FY 01 score 2.0

This Performance Measure carried over into FY02 as the Supporting Assessment Measures "Waste Management", and "Regulating Waste Management". While comparison from FY01 to FY02 is not unequivocal, the Measures are related and a comparison is applicable. The FY01 Measure, in essence, tracked negative performance, penalizing for improper or inaccurate waste characterization resulting in unforeseen costs. The Waste Management SAM for FY02 performed numerous assessments in an effort to foster diligent and cost effective characterization and removal of waste; score 3.65 correlating to a rating of *Outstanding*. The "Regulating Waste Management" SAM (working in conjunction with the aforementioned "Waste Management" SAM) fostered

the effective management of various waste streams and adherence to appropriate DOE orders; score 4.00 correlating to a rating of *Outstanding*

FY 01 Objective 3.4 Business Management Issues: Procurement

Although the score for Objective 3.4 was outstanding (4.0 BSA/3.93 DOE), an identification of related issues associated with procurement was identified in the DOE evaluation. Issues were identified for:

- Quality of Procurement Packages
- Contract Administration: Monitoring Deliverables
- Notification of Required Changes and Close-Out Activities

The Supporting Assessment Measure (SAM #8) for FY 02 procurement was rated a score of 2.0. Although progress was made during FY 02 in improving procurement, issues continued to surface regarding procurement quality that resulted in the low score. Procurement is attracting significant BSA senior management attention and steps are being taken to adequately address issues and concerns. Acquisition Management System Improvement has been configured as a project and is supported by members of Quality Assurance and the Office of Management Services. Part of the improvement agenda consists of those actions identified in the FY 03 procurement performance measure.

Actions already taken in FY 02 consist of the following:

Internal Procurement Quality

- Instituted contract administrator quarterly reviews of contract/purchase order files in accordance with BSC Compliance Checklist. This is in addition to the annual BSC compliance review. Deficiencies are discussed with individual buyers/contract specialists and overall results are considered in performance appraisals. Data is analyzed to identify trends which are discussed with the entire procurement staff as lessons learned.
- Revised the Procurement Summary checklists to include all issues identified in the above review to insure compliance with the POM. This revised Procurement Summary was added to PPM on-line document library.
- Instituted monthly contract workshops for procurement staff to discuss lessons learned on topical issues, e.g. sole source, cost analysis, etc.
- The Quality Programs & Services Office (QPS) hired a Procurement Quality Engineer who is been assigned to PPM. He has conducted a self-assessment of Laboratory procurement quality practices and procedures and presented an improvement plan to QPS, PPM and senior Laboratory management. Implementation of the plan has begun.
- Revised and strengthened JNCP templates used by “requisitioners” and PPM personnel to ensure that all required elements are addressed. These include a description of the item or service being procured, details of the market search conducted to obtain competition with results, a description of the proposed

contractor's unique capability, a determination of fair and reasonable cost, and a statement of planned action to overcome barriers to competition for the particular item or service in the future. Obtained DOE concurrence in revised templates.

- Conducted a workshop on JNCs for buyers and contracts specialists in conjunction with BAO. Also conducted a workshop for department contract administration representatives.
- PPM rescinded delegation of JNCP approval authority for procurements between \$25K and \$100K to buyers/contract specialists. PPM Competition Advocate approval of all JNCs over \$25,000, including amendments that will increase the aggregate value over \$100,000, is now required.
- PPM internal reduced buyer/contract specialist signature authorizations and requires supervisory approval of all actions >\$25K.
- The PPM administrator, with the assistance of procurement staff, scrubbed the database by eliminating all vendors who had not been used in three years and many duplicate entries. The revised database contains approximately 8,000 vendors. The database is being scrubbed for accuracy of socioeconomic classifications.
- The Small Business Liaison Officer reviewed the vendor data for all coded SDBs to ensure that vendors are certified by SBA. The status of non-certified suppliers was corrected.
- The PPM Quality Engineer and Small Business Liaison Officer now review additions to the supplier database prior to entry
- The PPM administrator, with the assistance of procurement staff, scrubbed the database by eliminating all vendors who had not been used in three years and many duplicate entries. The revised database contains approximately 8,000 vendors. An annual scrub to eliminate unused vendors will be performed.
- PPM obtained SF1413s for all active and newly awarded construction contracts and submitted them to BAO
- Modified the Procurement Summary checklist that is included in the contract file to include the SF1413 requirement.
- PPM modified its compliance review checklist to include requirement to obtain 1413 forms. Will be verified in quarterly internal compliance reviews.

Contract Administration

- Established a new Assistant Contract Administration Specialist position. This individual will be responsible for monitoring, tracking and documenting contract/purchase order delivery requirements through coordination with technical representatives, administrative personnel, contract specialists and contractors. Interviews are currently taking place. Selection is expected by about May 1.
- Technical representative training has been given a validity period of 3 years and initial certifications will expire on 9/30/03). Re-certification requirements are being developed.

- At contract award, each named technical representative will be sent a written reminder of responsibilities.
- All trained technical representatives will be sent a written annual reminder of their duties and responsibilities.
- Quarterly field reviews are being instituted.
- PPM will issue quarterly “lessons learned” to all certified technical representatives and department contract administration representatives.

Credit Card Program Improvements

- The PPM Credit Card Administrator, assisted by Internal Audit, conducts monthly oversight of credit card transactions in accordance with a defined strategy, to determine compliance with Laboratory policies and procedures. The three oversight activities are:
 1. Reviewing a statistical sample of credit card transactions from the prior month (sample provided by Internal Audit using ACL).
 2. Reviewing all credit card transactions made by 5 selected credit cardholders during the prior month.
 3. Reviewing a report of all transactions for the prior month sorted by vendor with a secondary sort by cardholder.

Results are contained in a monthly report documenting each of the above activities to supervisor, PPM manager, the ALD for Finance & Administration, and Internal Audit. “Lessons Learned” are compiled and will be distributed to all cardholders, department/division administrators and Level II Managers. The PPM manager will take actions commensurate with acts of non-compliance, if any, in accordance with the Procurement Operations Manual.

- PPM is developing a web-based refresher course that all cardholders will be required to complete before card renewal every two years.

Actions taken for FY 03 include development and implementation of a project plan for procurement improvements, acquisition management process evaluations and benchmarking, recommendations for improvements and improvement planning and execution, implementation of a supplier information system to increase procurement planning quality, incorporating contract administration matrix authority to the PPD Division Manager and reviewing the measurement process to better align with actual procurement performance.

FY 01 Critical Outcome 4.0 Environmental Restoration; FY 01 scoring 3.1/DOE rating 2.5; FY 02 score 3.8 ... FY 01 Objective 4.2 Execution of Program Activities; FY 01score 2.5/DOE score 1.6

Issues identified in the FY 01 DOE evaluation centered on missing regulatory milestones. The first milestone was missed by 16 days and was recognized by BSA and corrective

actions taken to negate any schedule delay due to milestone slippage. Two milestones were completed early. There was also a milestone extension in contention regarding the Boneyard Waste Project, therefore the score difference.

The Environmental Restoration Program has undergone substantive organizational and baseline improvements since FY 01. During FY 02 characterization data continued to influence disposition alternatives and risk management is becoming an increasing driver in planning and executing remaining restoration activities.

TABLE 1: BSA PERFORMANCE COMPARISON AND ISSUES

BSA FY 01 PERFORMANCE					BSA FY 02 PERFORMANCE			
PM #	PM TITLE	BSA RATING	DOE RATING	RATING VAR.	PM #	PM TITLE	BSA SCORE	BSA SCORE VARIANCE: (FY 02-FY01)
0	Brookhaven Science Associates: Overall	3.46	3.34	-0.12	0	Brookhaven Science Associates: Overall	3.64	0.18
1.0	Excellence In Science & Technology	3.62	3.51	-0.11	1.0	Excellence In Science & Technology	3.67	0.05
1.1	Quality of Research	3.70	3.70	0.00	1.1	Quality of Research	3.80	0.10
1.2	Relevance to DOE Missions and National Needs	3.70	3.69	-0.01	1.2	Relevance to DOE Missions and National Needs	3.80	0.10
1.3	Success in Constructing and Operating Research Facilities	3.60	3.56	-0.04	1.3	Success in Constructing and Operating Research Facilities	3.60	0.00
1.4	Effectiveness and Efficiency of Research Program Management	3.50	3.12	-0.38	1.4	Effectiveness and Efficiency of Research Program Management	3.50	0.00
2.0	Operational Excellence	2.98	2.97	-0.01	3.0	Laboratory Management and Operations	3.56	0.58
2.1	ES&H Operations	3.36	3.28	-0.08	3.2	Environment, Safety and Health	3.53	0.17
2.1.1	Environmental Protection Composite	3.43	3.43	0.00	3.2.1	Legacy ES&H Risk Management	3.47	0.04
2.1.1.1	Environmental Results	2.64				Included in ESD Self Assessment		
2.1.1.3	Pollution Prevention	3.99			3.2.2.1	Pollution Prevention	4.00	0.01

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BSA FY 01 PERFORMANCE					BSA FY 02 PERFORMANCE			
PM #	PM TITLE	BSA RATING	DOE RATING	RATING VAR.	PM #	PM TITLE	BSA SCORE	BSA SCORE VARIANCE: (FY 02-FY01)
2.1.3	Occupational Safety and Health	2.58	2.26	-0.32	3.2.2.3	OSHA Reportable Injury Management	2.97	0.39
2.1.3.2	Chemical Safety Performance	2.40	2.00	-0.40	3.2.2.4	Chemical Safety Performance	3.31	0.91
					3.2.2.4.1	Chemical Inventories and Accountabilities	3.42	
					3.2.1.2	Chemical Disposition Upon Employee Termination	3.93	
2.3	ESH&Q Management Systems	2.75	2.75	0.00	3.2.2	On-going ES&H Risk Management	3.55	
2.3.1	ISMS Performance Composite Long Term	2.20	2.20	0.00				
2.3.1.1	Performance Monitoring of ISM	1.00						
2.3.1.3	ISMS improvement plan	0.50						
2.3.1.4	Accelerator Safety Basis documentation	2.50						
2.3.3	Overall Evaluation of the Laboratory's Integrated Assessment Program	2.70	2.70	0.00	3.1.1	Assessment and Improvement	3.61	
					3.1.1.1	Overall Evaluation of the Lab's Self-Assessment Prgm	3.60	0.90
2.3.4	Quality Management System Verification	1.90	1.90	0.00	3.1.1.2	Enhance Evaluation of Management Systems	3.70	
2.3.4.2	Complete Verification Rad Con Program	1.00						
2.3.5	Implementation Performance	2.70	2.70	0.00				
2.3.5.1	Performance measurement based on ratings	2.50						
2.2	Facility Infrastructure	3.27	3.27	0.00	3.3	Site Infrastructure, Facilities, and	4.00	0.73

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BSA FY 01 PERFORMANCE					BSA FY 02 PERFORMANCE			
PM #	PM TITLE	BSA RATING	DOE RATING	RATING VAR.	PM #	PM TITLE	BSA SCORE	BSA SCORE VARIANCE: (FY 02-FY01)
						Operations		
2.2.2	Facilities/Infrastructure Management	1.99	2.00	0.01				
2.2.2.2	Energy Utilization is Effectively and Efficiently Managed	2.00				SAM #26: Energy Management	4.00	
2.2.2.3	Condition Assessment Survey Progress	0.00						
2.4	Information Infrastructure	3.16	3.16	0.00	3.4	Information Technology	3.14	
2.4.2	Cyber Security	2.83	2.83	0.00	3.4.1	Cyber Security	3.13	0.30
2.4.3	World Wide Web Support Strategy	3.40	3.40	0.00	3.4.1.1	Cyber Security Program Plan Implementation	3.25	
2.4.4	Scientific Computing Infrastructure Performance	3.50	3.50	0.00	3.4.1.2	CSPP Test, Review, and Evaluation Mechanisms	3.00	
2.5	Excellence in Safeguards and Security	2.50	2.50	0.00		SAM #24: Counterintelligence	2.51	0.01
2.5.1	Counterintelligence (CI)	2.50	2.50	0.00				
3.0	Leadership and Management	3.68	3.64	-0.04	3.0	Laboratory Management and Operations	3.56	-0.12
3.1	Leadership Managers with Personal Development Goals in FY2001 Goal Planning	3.42	3.37	-0.05				
3.1.1.3		2.10						
3.1.1.6	Diversity candidate offered position openings in "Officials & Managers" and "Professionals"	2.40				not carried forward		
3.1.2.1	Assessment of Training, Employee Involvement, Diversity and Communications	4.00	3.00	-1.00	3.1.3	Workforce/Diversity	4.00	0.00

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BSA FY 01 PERFORMANCE					BSA FY 02 PERFORMANCE			
PM #	PM TITLE	BSA RATING	DOE RATING	RATING VAR.	PM #	PM TITLE	BSA SCORE	BSA SCORE VARIANCE: (FY 02-FY01)
3.1.3	Corporate Involvement Performance	4.00	4.00	0.00	3.1.4	Corporate Involvement	3.60	-0.40
3.2	Communications and Trust	3.88	3.88	0.00	3.5	Communications and Trust	3.75	-0.13
3.3	Waste Management	3.20	3.20	0.00				
3.3.2	Waste Shipping and Disposal Performance	2.00	2.00	0.00		SAM # 19: Regulated Waste Management	4.00	2.00
3.4	Business Management	4.00	3.93	-0.07	3.1.2	Business Processes	3.25	-0.75
4.0	Environmental Restoration	3.10	2.50	-0.60	2.0	Environmental Restoration	3.80	0.70
4.1	Near Term Expectations	3.70	3.40	-0.30	2.1	Operational Excellence in Env. Restoration	4.00	
4.2	Execution of Program Activities	2.50	1.60	-0.90	2.1.1	On Time Starts of Major Projects	4.00	
					2.2	Execution of Program Activities	3.50	
					2.2.1	Cost Performance	3.50	
					2.2.2	Schedule Performance	3.50	