Environmental Management Sciences Program

EMSP Workshop
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Office of Biological and Environmental Research

The DOE Office of Environmental Management (EM) was created in 1989 to

Address the environmental legacy from over 50 years of nuclear weapons research, production, and testing - some of the most technically challenging and complex work of any environmental program in the world

From the 1995 Galvin Commission Report

There is a particular need for long term, basic research in disciplines related to environmental cleanup … Adopting a science-based approach that includes supporting development of technologies and expertise … *could lead to both reduced cleanup costs and smaller environmental impacts at existing sites and to the development of a scientific foundation for advances in environmental technologies.*

Brief History of the EMSP

- A response to an early recommendation to EM (Galvin Report, 1995)
- Implemented in Fiscal Year 1996, first grants awarded August 1996
- Initial annual budget of $50 million
- Jointly managed by SC and EM since its inception
- Since 1998 Notices targeted at EM needs (e.g., HLW, subsurface, D&D)

EMSP Goals

- Provide scientific knowledge that will revolutionize technologies and clean-up approaches to significantly reduce future costs, schedules, and risks

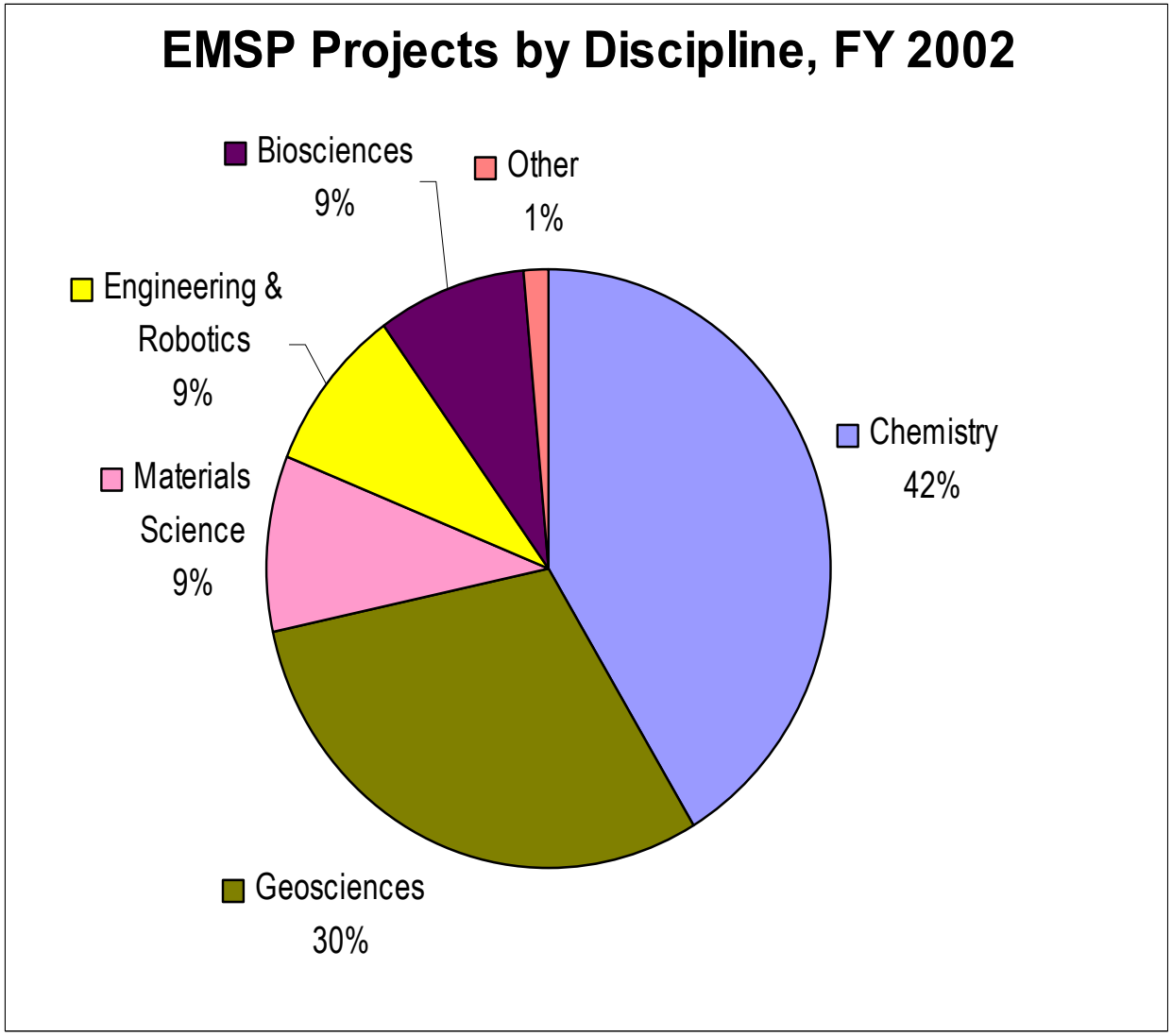
- "Bridge the gap" between broad fundamental research that has wide-ranging applicability such as that performed in DOE's Office of Science and needs-driven applied technology development that is conducted in other parts of the agency and in the private sector

- Focus the Nation's science infrastructure on critical DOE environmental management problems

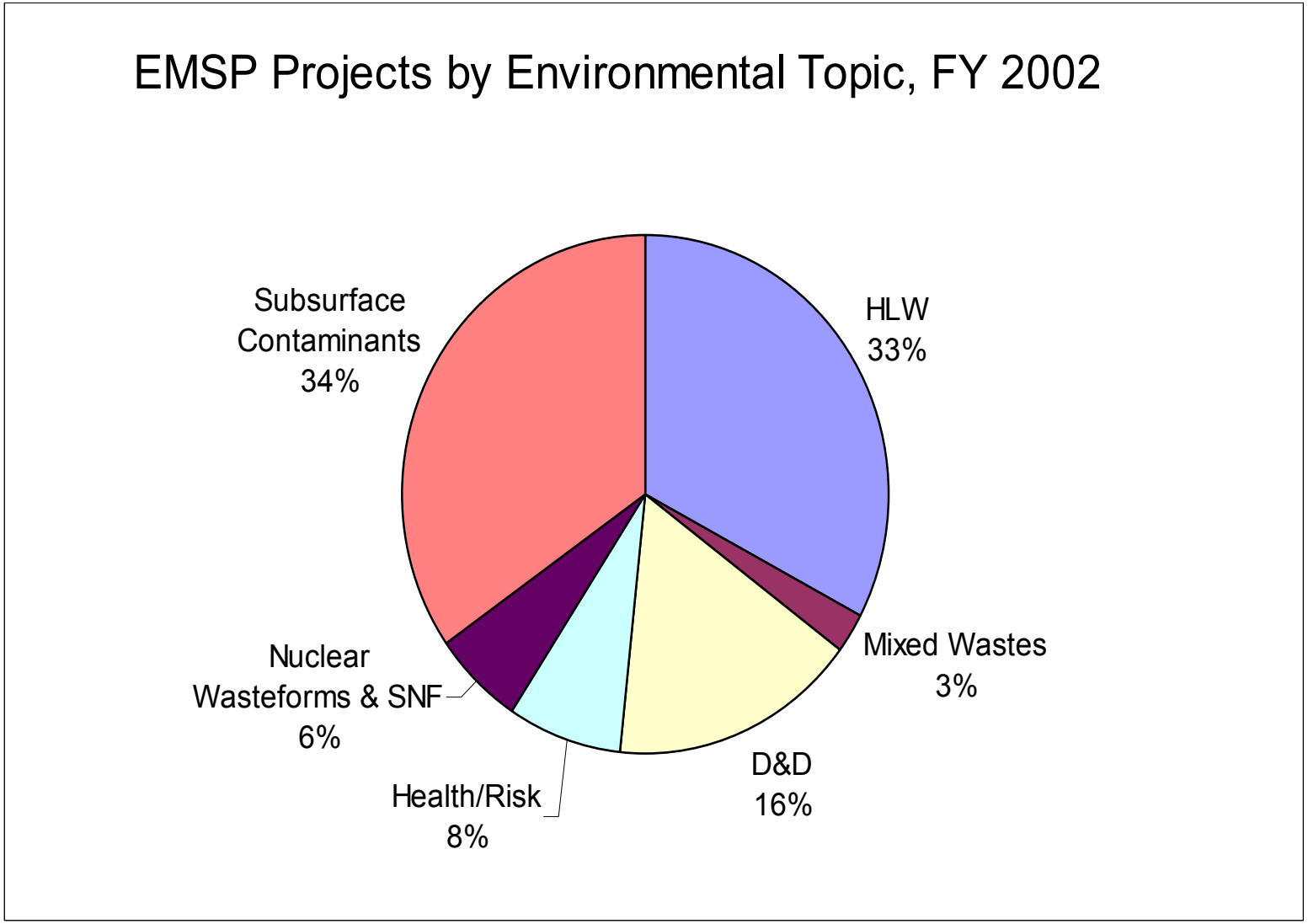
EMSP Facts

- To date has supported:
  - 361 research projects at 97 universities and 33 laboratories
  - In 40 States and 7 countries
  - Over 550 university students at all levels
  - Over 1100 peer-reviewed articles and presentations
  - More than 30 projects that were deployed or commercialized
- Current budget is $30 million

EMSP Projects by Discipline



EMSP Project by Problem Area



Some EMSP Accomplishments

- Collaborative research a reality: a majority of EMSP projects are collaborations between scientists at two or more institutions
- Improved communication between scientists and site managers
- Many of the most prominent researchers in key disciplines are leading research directed at solving EM cleanup problems
- At the same time, many young researchers are becoming involved: in 2001-2002 about 20% of lead PIs were in the first ten years after their Ph.D.

The EMSP Web Site

http://emsp.em.doe.gov/

Links to:

- Funding, contacts, interim and final reports for every project, easily searchable
- Accomplishments
- Research needs and solicitations
- Internal and external reports

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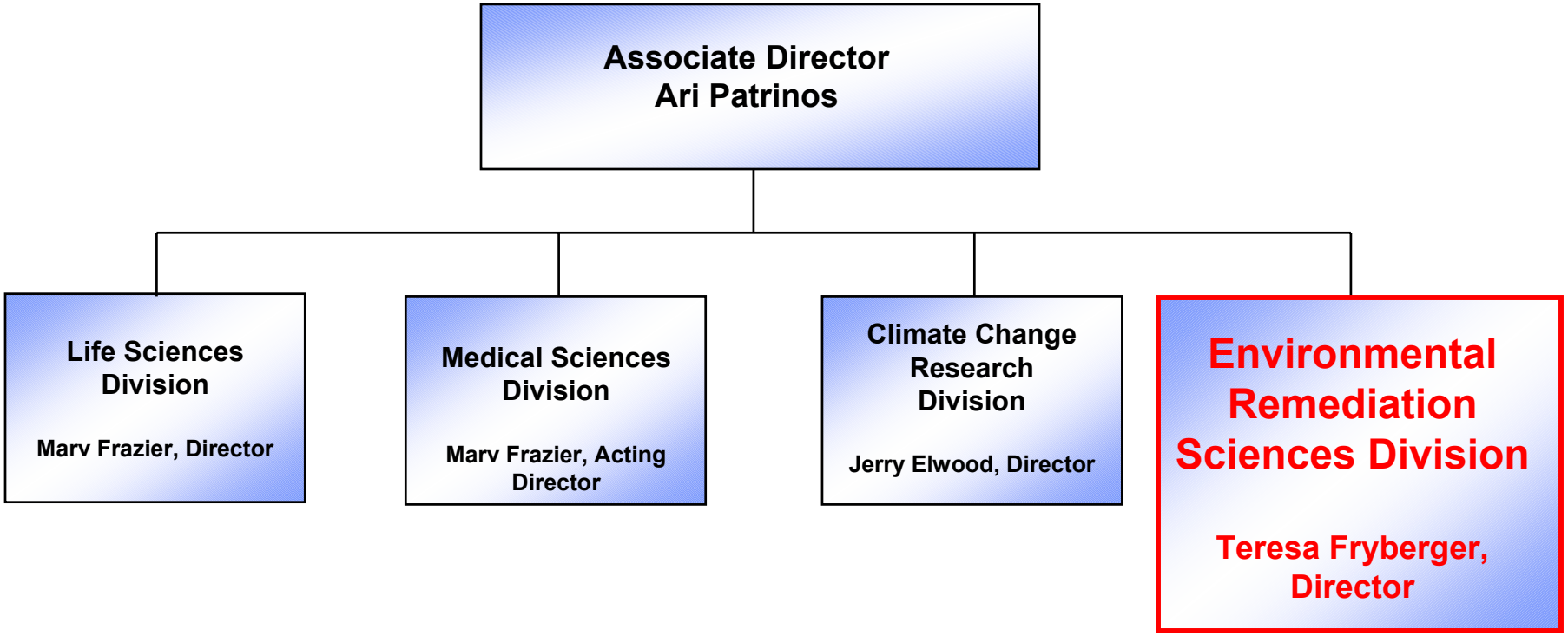

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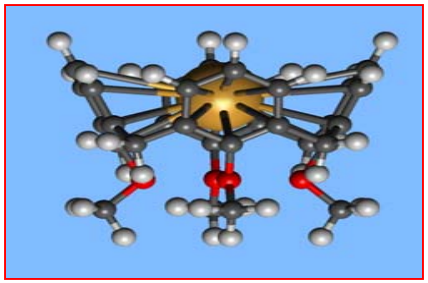
Environmental Remediation Sciences

R&D for solutions to DOE's long-term environmental cleanup challenges

D. radiodurans reduces uranium



complexation ions with tetramethoxycalix[4]arene of cesium

The Environmental Management Science Program (EMSP) is developing the scientific basis for risk-based decision making and "breakthrough" approaches to cleaning up the nuclear weapons complex.

Bioremediation Research (NABIR) provides the understanding of how microbes that naturally exist in soils can stabilize metals and radionuclides. Studies span the range of microbial genetics of all the way to field studies at actual contaminated sites.

The Environmental Molecular Sciences Laboratory (EMSL) is serving environmental users from around the world by providing the leading edge of computational and experimental capabilities for understanding processes at the molecular level.

The Savannah River Ecology Laboratory (SREL) is studying the ecological impacts of remediation activities in real time at the Savannah River Site while providing hands-on educational programs at the Site.

Environmental Remediation Sciences Division

- STAFF
  - Teresa Fryberger, Director
  - Roland Hirsch, EMSP Program Manager
  - Anna Palmisano, NABIR Program Manager
  - Paul Bayer, Facilities Program Manager
  - Brendlyn Faison, IPA, Hampton University
  - Henry Shaw, Detailee, LLNL
  - 3-4 new slots (hopefully)

Environmental Remediation Sciences: FY03 Budget (thousands of $)

NABIR	$24,720
EMSP	$29,900
EMSL	$38,000 (operations)
SREL	$ 6,800
Misc.	$10,100
Total	**$109,500**

Minus ~12M for unfunded Congressional earmarks in FY03!

Largest program of its kind anywhere!

Environmental Remediation Sciences: Mission

Enable scientific advances that help solve currently intractable environmental problems or otherwise provide break-through opportunities for DOE environmental missions, while also contributing to the general advance of the scientific fields involved.

Environmental Remediation Sciences: Goals

- Provide science to inform decisions about environmental remediation and stewardship
- Advance scientific foundations that enable innovative remediation technologies and methodologies
- Synthesize and integrate across disciplines to foster new scientific approaches that match the complexity of the problems

ERSD Characteristics

- Primary focus is on a subset of DOE-EM relevant issues
  - *That are currently "intractable"*
  - *Where science can have the greatest impact*
- Highly interdisciplinary – integrates results from biology, geology, chemistry, ecology, *etc*.
- Committed to developing and supporting a suite of field research sites
- Develop a "toolbox" of characterization and monitoring tools.

Develop an Understanding of Contaminant Fate and Transport

- Subsurface science – geochemistry, biogeochemistry, geophysics, hydrology
- Characterization and monitoring
- Modeling/theory/simulation
- (Scaling)
- (Surficial transport)
- (Trophic transfer)

Development of Cutting Edge Remediation Techniques

- Bioremediation/Phytoremediation
- *In situ* chemical or thermal stabilization
- Characterization and monitoring techniques
- (Materials science for designer membranes, barriers, and caps)

New Approaches for Managing and Treating Wastes

- Chemistry of high pH solutions;
- Tailored separations processes for reducing volume, waste form toxicity and increasing waste form quality;
- Remote characterization and process monitoring techniques

Improve the Scientific Basis for Long-Term Stewardship of Sites (LTS) where Residual Contamination Remains

- Predictive tools for contaminant behavior
- (Advanced sensors, monitoring tools, and protocols)

Determination of Risks of DOE Wastes and Contaminated Media to Human Health and Environment

- Contribute to the determination of risk through characterization, ability to predict contaminant behavior, and ecological studies
- Bioavailability and fate
- Ecological monitoring
- Trophic transfer

Impacting the Cleanup

- Work directly with cleanup staff at sites to identify and collaborate on the field research sites.
- Work on specific site problems
- Sponsor frequent technical exchange workshops with sites to ensure that we are addressing their problems and
- Develop a strategy to “advertise” our successes.

Opportunities

- To support the success of the largest environmental cleanup ever attempted
- To "revolutionize" environmental studies—bringing much-needed rigor and the new tools of genomics, nanoscience, and computing to bear.
- Our research will apply to a much broader set of problems (e.g. water quality, future energy options, waste minimization, mining and industrial wastes)