

Career Options in the National Labs

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Speaker Bio

✂ **Education:**

- ✂ BAMA, Edinboro University of Pennsylvania (1988)
- ✂ MAM, University of Virginia (1990)
- ✂ PhD, University of Virginia (1992)

Focus on Scientific Computing

✂ **Experience:**

- ✂ Post Doctoral Appointee in MCS (1992-1994)
- ✂ Assistant Computer Scientist in MCS (1994-)
- ✂ Adjunct Teaching Positions (UIC, COD) (1997-8, 1994)

DOE Lab Environment

- ⌘ **Mission:** *DOE, in partnership with our customers, is entrusted to contribute to the welfare of the Nation by providing the technical information and scientific and educational foundation for technology, policy and institutional leadership necessary to achieve efficiency in energy use, diversity in energy sources, a more productive and competitive economy, improved environmental quality, and a secure national defense*
- ⌘ 26 Laboratories
 - ⌘ ER Labs: Argonne, Oak Ridge, Lawrence Berkeley, and others
 - ⌘ DP Labs: Sandia, Los Alamos, Lawrence Livermore, and others
- ⌘ Funding for the labs provided primarily by DOE program offices and work for others
 - ⌘ E.g. Argonne's funding is ER (34%), Nuclear Energy (24%), Environmental Management (16%), Work for others (16%)

What Affects Lab Environments?

⌘ Lab Management

- ⌘ Argonne is managed by University of Chicago
- ⌘ Sandia is managed by Lockheed Martin
- ⌘ Livermore and Berkeley managed by UC system

⌘ Lab mission

- ⌘ Classified vs. Non-classified
- ⌘ Internal vs External recognition

⌘ Lab Funding

- ⌘ External
- ⌘ Internal

Argonne

- ⌘ **Argonne** is a multi-program national laboratory established in 1946 to focus on nuclear energy technology
- ⌘ Core competencies include:
 - ⌘ Basic Science (physics, chemistry, biology, etc)
 - ⌘ National User Facilities (APS, ATLAS)
 - ⌘ Environmental Management (alternative energy, clean-up, remediation, environmental risk, etc)
 - ⌘ Energy Resources (advanced batteries, fuel cells, electric power)
- ⌘ 4500 FTE's, approximately 800 are PhD scientists (1775 scientists and engineers total)
- ⌘ Total Funding (1999): \$470,000,000

MCS Division

- ✂ **Staff:** 35 PhD scientists, 15 postdocs, 15 scientific programmers, 8 support staff, 15 administrative staff
- ✂ **Facilities:** IBM SP (80 nodes), SGI Origin, SGI Onyx, CAVE, 3 I-Desks, Multimedia Lab, DSL, Terabyte storage facility
- ✂ **Funding Sources:** Core budget/Proposals/Soft money (LDRD, DOE programs, DARPA, NSF, etc)
- ✂ **Current MCS Research Projects:**
 - ✂ Numerical Libraries (PETSc, SUMAA3d, NEOS)
 - ✂ Low level software libraries (MPI, Scalable IO, Nexus)
 - ✂ Future's Laboratory (Collaboration, Multimedia, CAVE)
 - ✂ Distributed Supercomputing Laboratory (GLOBUS)
 - ✂ Computational Biology (Human Genome Project)
 - ✂ Applied Mathematics and Applications (Superconductivity, Automated Reasoning)

Research Career Advancement

- ⌘ Argonne has a “tenure-track” system for PhDs
 - ⌘ Assistant Scientist
 - Responsibilities include conducting/defining a course of scientific research, publishing, participating in proposal writing, may lead others’ work, committee work
 - 5 year up-or-out policy
 - ⌘ Scientist
 - Above plus demonstrated record of research innovation (through publications and external recognition), leads proposal writing and/or group projects
 - ⌘ Senior Scientist
 - Above plus national/international peer recognition, effective management skills, PI for one or more tasks, initiates new research directions

A Day in the Life

- ⌘ Research (45%)
 - ⌘ Coding, designing projects, supervising graduate and undergraduate interns, literature searches
- ⌘ Publishing (20%)
 - ⌘ Written several conference and journal articles
- ⌘ Professional Activities (20%)
 - ⌘ Guest editor of journals, conference committees, internal MCS committees, reviewed papers/proposals, adjunct professorships, panels
- ⌘ Proposal Writing (10%)
 - ⌘ Recently participated in LDRD, ASCI, DOE2000 proposals
- ⌘ Software Release (5%)
 - ⌘ Currently releasing BoilerMaker and Opt-MS software

Other Research Options

- ⌘ Scientific Engineer/Scientific Programmer
 - ⌘ Work as part of a research group, usually under the supervision of a staff scientist
 - ⌘ Responsibilities include code design and development, participating in writing papers and proposals, group planning meetings, demonstrations of technology
 - ⌘ These positions are not subject to the tenure track system (often are soft money positions associated with particular projects)
 - ⌘ Required education: most have a MS, some have a BS

Getting Started

⌘ Things I look for when hiring:

- ⌘ Pertinent research or software development experience
- ⌘ MS/PhD in computer science or computational science
- ⌘ Publication record
- ⌘ Experience obtained through internships (Argonne has many for both undergraduate and graduate students)
- ⌘ Evidence of good communication skills

⌘ Notes and Issues

- ⌘ The scientific research track is very rewarding and you have a good deal of independence, but it can be *very* time consuming
- ⌘ The two body problem abounds

My Research Interests

- ⌘ Interactive Visualization/Computational Steering
 - ⌘ BoilerMaker: pollution control system design in the CAVE
 - ⌘ Differencing engine: comparative analysis of numerical simulations
 - ⌘ Data reduction techniques for very large data sets
- ⌘ Scalable Unstructured Mesh Computations
 - ⌘ Mesh Optimization Algorithms
- ⌘ Large-Scale Application Solution
 - ⌘ High-Temperature Superconductivity
 - ⌘ Thermonuclear Flashes on Astrophysical Objects