Careers at National Laboratories

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It's common for math majors and professors to be aware of possible careers outside of teaching, especially jobs like data science, finance, actuarial science, and some government agencies. But from my experience talking with undergraduates, graduate students, and professors in mathematics, careers at National Laboratories are not as well known. It's my goal in this article to give you some background and history of the national lab system, a glimpse into the work mathematicians do, and, finally, some insight into getting a job at a national lab.

The national lab system grew out of a large investment by the US Government in scientific research during World War II. One of the more prominent efforts was the Manhattan Project, which established sites in Los Alamos (New Mexico), Oak Ridge (Tennessee), and Hanford (Washington), with the purpose of research and development for nuclear material and weapons manufacturing. These three sites ultimately led to the creation of Los Alamos National Laboratory and Sandia National Laboratory in New Mexico, Oak Ridge National Laboratory in Tennessee, and Pacific Northwest National Laboratory in Washington. Additional research in the Chicago, Illinois area in reactor technologies led to the creation of Argonne National Laboratory, and a push for competition created Lawrence Livermore National Laboratory in Livermore (California). There are now seventeen Department of Energy National Laboratories all across the country engaging in multidisciplinary research relevant to today's scientific challenges. At Pacific Northwest National Laboratory (PNNL), for example, we focus on earth and biological science, physical and computational science, energy and environment, and national security.

There is not just one role for a mathematician in the national lab system. We do theoretical math research in areas like category theory, differential equations, graph theory, optimization, and operations research tackling applications in scalable algorithm development, sensor design, biology, chemistry, cyber security, power grid, machine learning, and more. We have the ability to participate in the full project life cycle, from proposal development, project planning, and execution all the way to software development and deployment. If that all sounds very overwhelming, don't worry, it's not like that from day one. As an early-career mathematician, you would be brought in on one or two projects and be expected to utilize your specific skills to contribute to project deliverables. As time goes on and your network develops, those skills will be recognized by others. You may be asked to join other projects, help write sections of proposals, and get more responsibility as you gain experience.

If a career at a national lab sounds interesting, there are some things you can do while still in school in order to be more successful. Because a lot of work at a lab deals with real data and implementation of algorithms, courses in statistics, data science, and programming are very helpful. Additionally, given that all of our research ultimately is applied, it's good to have a breadth of knowledge beyond mathematics. Take classes like physics, chemistry, biology, or economics in order to build up knowledge and vocabulary outside of math. Most of our teams are interdisciplinary and rely on communication with non-mathematician colleagues, including management. Classes in technical writing and presentation skills can give you a head start in these areas. Finally, the best way to really know what it's

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like to work at a national lab is to do an internship. Each lab has its own internship programs, which can typically be found in the jobs section on its website. For a complete listing of the national labs with links to their home pages, see `https://www.energy.gov/national-laboratories`.

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Credits

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