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Foreword to Special Issue on Human-Systems Research Across the U.S. Department of Energy

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Welcome to this special issue of the *Journal of Human Performance in Extreme Environments* dedicated to the topic of "Human-Systems Research Across the U.S. Department of Energy." This issue includes papers generated for a special interest symposium held in conjunction with Resilience Week 2016, which took place August 16–18, 2016, in Chicago. The symposium was organized by Phil Bennett and Mika Armenta of Sandia National Laboratories, who have also written the afterword to this special issue.

The five papers in this special issue hold in common that they represent research on human systems conducted through one of the national laboratories operated on behalf of the U.S. Department of Energy (DOE). The U.S. DOE owns 17 national laboratories as depicted in Figure 1. Ten of these laboratories serve the U.S. DOE Office of Science, three are affiliated with the National Nuclear Security Association (NNSA), and the remaining four are part of other divisions of the U.S. DOE.

The original national laboratories were born out of the Manhattan Project during World War II and were subsequently operated by the Atomic Energy Commission (AEC). The AEC served multiple roles, including development and stewardship of U.S. nuclear weapons, development and regulation of nuclear energy, and scientific research—much of it related to peaceful uses of the atom such as medical isotopes. In 1975, the AEC was divided into the U.S. Nuclear Regulatory Commission and the Energy Research and Development Administration. In 1977, the Energy Research and Development Administration joined with the Federal Energy Administration and the Federal Power Commission to become the U.S. DOE.

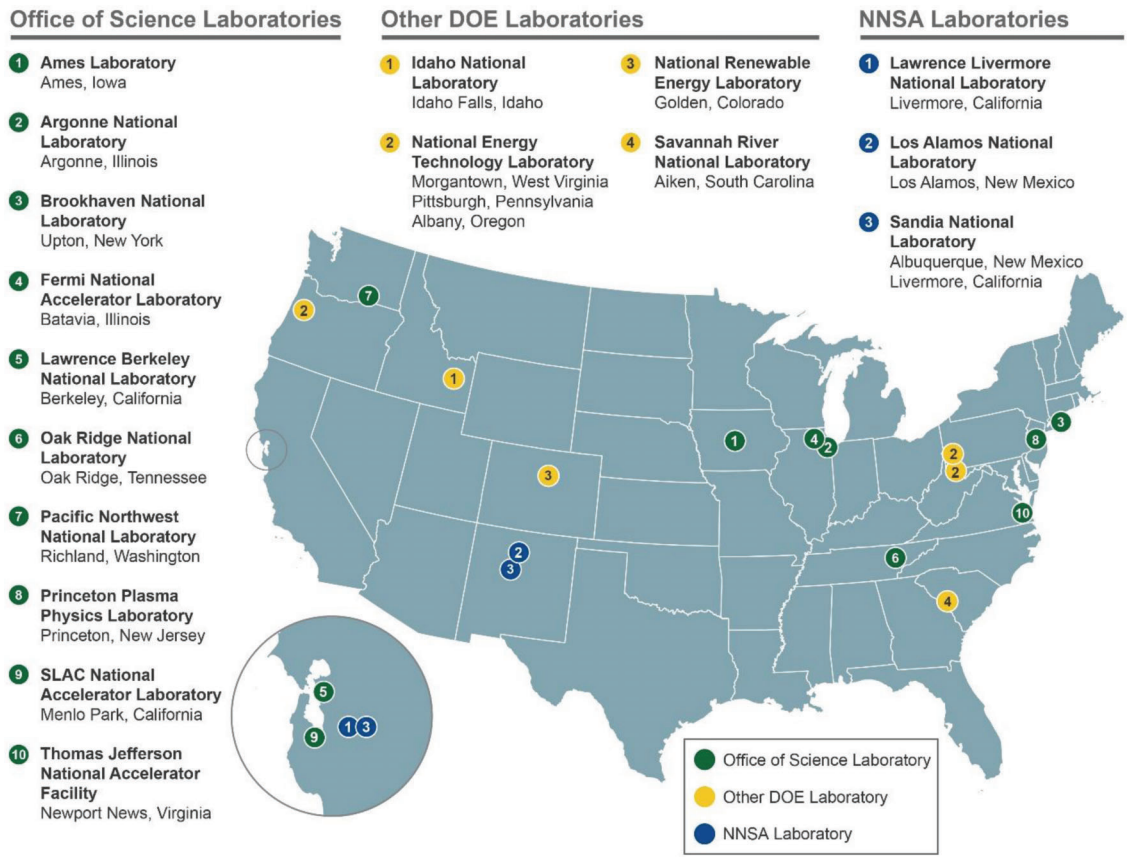

Figure 1. U.S. Department of Energy National Laboratories (Photo courtesy of Office of Science, U.S. DOE).

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In 2000, the NNSA was formed as a semi-autonomous agency within the U.S. DOE for the express purpose of stewardship of nuclear weapons in the U.S.

The U.S. DOE national laboratories were created to blend the best of industry and government. They generally employ a government-owned, contractor-operated (GOCO) approach to combine industry agility with government missions. Sandia Laboratory (now Sandia National Laboratories) was the first national laboratory to follow this model, bringing in a division of AT&T's Bell Labs (then arguably one of the world's premier research and development centers in industry) to operate the laboratory. From this initial laboratory created according to the motto to render "exceptional service in the national interest," other laboratories have been created out of existing military installations or as new facilities under an umbrella of industry and government collaboration. While much of the funding for the national laboratories comes directly from the U.S. DOE, the GOCO model allows the laboratories flexibility to support other government agencies or even private industry.

The U.S. national laboratories form a key part of the so-called Iron Triangle of military, academia, and government. The laboratories are focused on different primary areas of research, from accelerators (i.e., Fermi National Accelerator Laboratory, Stanford Linear Accelerator Laboratory (SLAC), and Thomas Jefferson National Accelerator Facility) to nuclear energy research (i.e., Idaho National Laboratory) to renewable energy (i.e., National Renewable Energy Laboratory) to nuclear weapons (i.e., Lawrence Livermore, Los Alamos, and Sandia National Laboratories). Many of these laboratories have grown to become multipurpose laboratories that serve broad national research interests related to energy, security, and safety. The U.S. national laboratories also house a number of world class and unique scientific user facilities.

One characteristic of the U.S. DOE national laboratories is that they are decentralized, acting as autonomous research facilities. In some cases, laboratories have competing facilities by design, to encourage innovation through healthy competition. There is no current headquarter office of the U.S. DOE that is responsible for human-systems research. While many government agencies have specific functions at their headquarter offices to facilitate human-systems research, the U.S. DOE maintains this function locally at the national laboratories.

This decentralization and alignment to research focus areas at the laboratories have resulted in a diverse range of human-systems research. This special issue highlights some of that diversity, including:

- Incorporating humans into technology readiness scales (see See et al., 2018, this issue),
- Datamining databases of obituaries for cancer risk models (see Yoon & Tourassi, 2018, this issue),
- Using neural networks for biomarker identification in radiologists (see Yoon et al., 2018, this issue),
- Applying human factors to enhance cybersecurity awareness (see Scholtz et al., 2018, this issue), and
- Measuring physiological and cognitive aspects of strenuous activities (see Divis et al., 2018, this issue).

These articles are but a snapshot of human-systems research in the U.S. national laboratories, but they clearly demonstrate the breadth of research.

The U.S. DOE national laboratories are an asset to serve vital national interests through science and engineering. One important part of that scope is human-systems research. The *Journal of Human Performance in Extreme Environments* is hosting these papers, not because the research necessarily represents common conceptions of extreme environments. Rather, the papers represent research at the forefront of U.S. energy, safety, and security interests. The papers cover topics like technology readiness and cybersecurity that might not be as readily disseminated in other research environments. Consideration of human aspects of the systems represents a noteworthy scientific contribution in many of the safety and security domains that routinely serve as the backdrop for research at the national laboratories. We are proud to host the first convergence of human-systems research across the U.S. national laboratories. We look forward to future contributions that can further showcase the U.S. DOE's human-systems research and unique facilities and expertise. Importantly, the findings from these research projects are being disseminated at no cost through this journal for domestic and international benefit.

We hope you will find this special issue informative, helpful, and enjoyable!

Disclaimer

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