Chapter 14

Federal Research and Development in Illinois

- Approximately $1.4 billion of federal R&D funds are spent each year in Illinois.
- Illinois ranks 17th among the 50 states, District of Columbia, and Puerto Rico in terms of the amount of federal R&D dollars received annually.
- Approximately 7 percent of all federal funds received by Illinois for purposes other than the direct support of individuals (i.e., such entitlements as retirement, and disability, and housing assistance) is spent on R&D.

Figure 14.1 – Sources of Federal R&D Dollars Spent in Illinois
(Total Federal R&D ~$1.4 billion)
BACKGROUND

In recent years, the federal government has spent in the neighborhood of $1.4 billion annually in Illinois on research and development (R&D) activities. On average, federal R&D dollars account for approximately 7 percent of all federal funds received by Illinois for purposes other than the direct support of individuals (i.e., such entitlements as retirement, disability, and housing assistance).

Most major federal agencies that currently support federal R&D efforts provide funding for R&D activities in Illinois. Foremost among these agencies is the Department of Energy (DOE), which accounts for 48 percent of the federal R&D dollars spent in the state. The Department of Health and Human Services (HHS), the Department of Defense (DOD), and the National Science Foundation (NSF) account for an additional 22, 11, and 10 percent, respectively. The remaining federal R&D dollars spent in Illinois come collectively from the Department of Agriculture (USDA), the National Aeronautics and Space Administration (NASA), and several other agencies.\(^{14}\)

All federal R&D dollars spent in Illinois either cover the costs of operating federal R&D units in the state, including paying the salaries of federal R&D personnel working at these units, or are awarded as grants, contracts, or cooperative agreements to entities located in the state. The following is an overview of what becomes of these federal R&D dollars once they arrive in Illinois.

FEDERAL R&D UNITS IN ILLINOIS

Argonne, Illinois, is home to DOE’s Argonne National Laboratory–East.

- Argonne National Laboratory–East is a part of a federally funded research and development center (FFRDC) sponsored by DOE and operated by the University of Chicago. The other portion of this FFRDC is in Idaho Falls, Idaho. The laboratory is home to more than 200 R&D programs, ranging from studies

\(^{14}\) For a complete agency-by-agency breakdown of these R&D dollars, see Appendix C.
of the atomic nucleus to global climate change. It also designs, builds, and operates essential R&D facilities that would be financially prohibitive for a single university or company to build and operate. Among the laboratory’s R&D facilities are the Advanced Photon Source, the Intense Pulsed Neutron Source, and the Argonne Tandem Linear Accelerator System. This federally owned and contractor-operated facility annually receives approximately $320 million of core funding and conducts an estimated $237 million of specific R&D projects. The laboratory has about 3,555 employees. A portion of the laboratory’s funds is spent on the maintenance and operation of R&D equipment and facilities.

Batavia, Illinois, is home to DOE’s Fermi National Accelerator Laboratory.

- Fermi National Accelerator Laboratory, commonly referred to as Fermilab, is an FFRDC sponsored by DOE and operated by University Research Association, Inc. (UAR), a consortium of 89 universities in the United States, Canada, Japan, and Italy—most of which are U.S.-based. The laboratory explores the fundamental nature of matter and energy. In pursuit of this mission, it operates the world’s highest-energy particle accelerator, the Tevatron, and the world’s only hadron collider. Thousands of scientists from around the world, as well as 36 states, use Fermilab’s facilities to carry out research at the frontiers of particle physics. This federally owned and contractor-operated laboratory annually receives approximately $279 million of core funding, virtually all of which is spent on specific R&D projects, and has about 2,200 employees. A portion of the laboratory’s funds is spent on the maintenance and operation of R&D equipment and facilities.

Champaign-Urbana, Illinois, is home to DOD’s Construction Engineering Research Laboratories and USDA’s Agricultural Research Service (ARS) Research Facility at the University of Illinois.

- The Construction Engineering Research Laboratories are a unit of the Engineer Research and Development Center within
DOD’s U.S. Army Corps of Engineers. The center is headquartered in Vicksburg, Mississippi, with related units in Hanover, New Hampshire, and Alexandria, Virginia. Its R&D activities address the question of how best to support sustainable military installations. Specifically, its research focuses on increasing the Army’s ability to more efficiently construct, operate, and maintain its installations and ensure environmental quality and safety at a reduced life-cycle cost. It is located in Champaign to facilitate working with the College of Engineering and other units of the University of Illinois at Champaign-Urbana. This federal unit annually receives about $46 million of federal R&D funds, approximately $20 million of which are spent on in-house activities, and has about 305 civilian personnel. This core staff is supplemented by an additional 100 people from the university.

• The ARS Research Facility at the University of Illinois is a unit of USDA’s ARS. It consists of three research divisions focusing on plant physiology and genetics, crop protection, and photosynthesis. The facility conducts research in different areas that contribute to optimal agricultural management. One division researches and identifies rate-limiting steps in nitrogen metabolism in addition to maintaining and evaluating soybean germplasm and corn genetic stock. The research of another division focuses on improving pest management systems to ensure their efficiency and environmental safety, while the research of a third division focuses on identifying and modifying rate-limiting factors of the photosynthesis process. This federal R&D unit annually receives about $3.7 million of federal R&D funds and has about 42 FTEs.

Chicago, Illinois, is home to a unit of DOD’s Office of Naval Research.

• The R&D Management Command is a unit of the Office of Naval Research (ONR) inside DOD. ONR is headquartered in Arlington, Virginia, and provides R&D managers to oversee the extramural R&D programs of the Navy and Marine Corps performed by universities, nonprofit organizations, or for-profit
companies. ONR sponsors extramural R&D programs in information, electronics, and surveillance; ocean, atmosphere, and space; engineering, materials, and physical science; human systems; and naval expeditionary warfare. This federal unit annually receives approximately $652,000 of federal R&D funds to support the in-house management activities of about 14 FTEs.

Evanston, Illinois, is home to a USDA Forest Service R&D Work Site.

- The R&D Work Site is a unit of the North Central Forest Experiment Station inside USDA’s Forest Service. It conducts research on the management of forest environments for urban populations. Specific research activities of this unit include developing and providing information and guidelines for managing urban forest settings based on improved understanding of urbanites’ values, perceptions, and interactions in these settings. This federal R&D unit annually receives approximately $1.4 million of federal R&D funds and has about seven employees.

Great Lakes, Illinois, is home to DOD’s Naval Dental Research Institute.

- The Naval Dental Research Institute is a unit of DOD. It researches, develops, and tests new methods and materials for limiting oral disease, reducing dental emergencies, maximizing operational readiness, and promoting dental health for Navy and Marine Corps personnel. This federal unit annually receives approximately $1.8 million of federal R&D funds, all of which are spent on in-house activities, and has about 11 civilian personnel.

Hines, Illinois, is home to a Department of Veterans Affairs (DVA) R&D unit.

- While the principal focus of the VA Medical Center in Hines, Great Lakes Health Care System/Edward Hines Jr. Hospital, is providing medical care to veterans, it is also the location of a number of research activities. In a recent year, this federally
owned and operated facility was the site of 592 projects with total funding of approximately $7.2 million. These R&D activities focus on a wide range of topics, including spinal cord injuries, obstructive lung diseases, drug treatments and therapies, and prostatic neoplasms.

Peoria, Illinois, is home to USDA’s National Center for Agricultural Utilization Research.

- The National Center for Agricultural Utilization Research (NCAUR) is a unit of USDA’s ARS. It conducts research on new uses of agricultural commodities for industrial and food products. Organized into 10 research divisions, this federal R&D unit maintains a mixed portfolio of interdisciplinary science, covering the spectrum from fundamental to applied research, including food quality and safety, mycotoxins, bioactive agents, oil chemicals, plant polymers, biomaterial processing, fermentation processing, microbial properties, biopolymers, and new crops. It also serves as USDA’s primary Technology Transfer Facility. This federal R&D unit annually receives approximately $26 million of federal R&D funds and has about 257 FTEs.

Rock Island, Illinois, is home to a unit of DOD’s Armament Research, Development, and Engineering Center.

- The Rock Island Site is a unit of the Army’s Armament Research, Development, and Engineering Center inside DOD. The center is headquartered in Picatinny, New Jersey, with subordinate research activities in Rock Island, Illinois; Watervliet, New York; and Aberdeen, Maryland. The center’s focus is on integrating complex armament technologies into guns, ammunition, and fire control systems through research, development, acquisition, and sustainment. The Rock Island Site provides essential production capability for artillery/gun mounts, equipment integration, spare parts, and other equipment for the armed forces, as well as the assembly of tools, sets, kits, and outfits that support equipment in the field. This federal unit annually receives approximately $50,000 of federal R&D funds for
in-house activities and has about 130 civilian personnel, only a fraction of whom are directly involved in R&D activities.

Urbana, Illinois, is home to DOI’s Illinois District Office of Water Resources.

• The Illinois District Office of Water Resources is a unit of DOI’s USGS. It oversees the R&D activities of USGS’s National Water-Quality Assessment (NAWQA), Ground-Water Resources Assessment, Toxic Substances Hydrology, and Federal State Cooperatives programs. The NAWQA program conducts research on the nation’s surface and groundwater resources to better understand the effect of pesticides, erosion, and bacterial contamination on water quality. The Ground-Water Resources Assessment program studies groundwater systems to develop models and simulations to better understand the workings of these systems. The Toxic Substances Hydrology program studies the behavior of toxic substances in hydrologic environments. These research activities investigate subsurface contamination at local releases and aquatic ecosystem contamination on a watershed and regional scale. The Federal State Cooperatives program studies the effects of agricultural chemicals, floods, droughts, and waste disposal on water supply and groundwater quality. This federal unit annually receives approximately $1.9 million in federal R&D funds.

Chicago and Danville, Illinois, are home to VA Medical Centers. While the principal focus of all of these federally owned and operated facilities is providing medical care to veterans, each center is also the location of a number of research activities. In a recent year, these federally owned and operated facilities have been the site of 486 R&D projects with total funding of approximately $4 million. These R&D activities focus on a wide range of topics, including radiotherapy, prostatic neoplasms, lung neoplasms, and drug therapy.
Federal R&D Grants to Illinois Entities

Every major institution of higher education in Illinois is the recipient of significant federal R&D dollars each year through grants made by federal agencies to faculty, graduate students, and research centers. The vast majority of the R&D grants are made by HHS, NSF, and DOD to individual faculty members and therefore ultimately inure to the benefit of such institutions as the University of Illinois, the University of Chicago, Northwestern University, Loyola University, Illinois Institute of Technology (IIT), Southern Illinois University (SIU), Finch University of Health Sciences/Chicago Medical School (FUHS/CMS), Northern Illinois University (NIU), and Chicago State University. The table below shows the total number of R&D grants that were active in FY 1998, highlighting those made by HHS, NSF, and DOD to parties at the various institutions and estimates of the total dollars transferred to them in FY 1998 pursuant to the terms of these grants. Among the grants in the “Other Agencies” category going to U of Illinois are $14 million from DOE, $8 million from USDA, $4 million from NASA, $3 million from the Department of Education, and $2 million from the Environmental Protection Agency (EPA). The grants in this same category going to the U of Chicago are split between DOE and NASA.

Table 14.1 – Sources of Federal R&D Grants to Higher Education in Illinois

<table>
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<tr>
<th>Institution</th>
<th>HHS</th>
<th>NSF</th>
<th>DOD</th>
<th>Other Agencies</th>
<th>Total</th>
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<td>Amount</td>
<td>#</td>
<td>Amount</td>
<td>#</td>
<td>Amount</td>
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<tr>
<td>U of Illinois</td>
<td>$86M</td>
<td>518</td>
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<td>585</td>
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<tr>
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<tr>
<td>IIT</td>
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<td>7</td>
<td>$1M</td>
<td>19</td>
<td>$3M</td>
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<td>39</td>
<td>$2M</td>
<td>37</td>
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<tr>
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<td>1,498</td>
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<td>665</td>
<td>$30M</td>
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</table>
These activities are particularly significant because they fund much of the “basic research” so critical to expanding our knowledge and understanding of fundamental scientific phenomena. In addition, these funds account for a substantial portion of the dollars available each year to various academic departments within these institutions, such as the Chemistry Department at the University of Illinois.

Several other nonacademic institutions in Illinois also receive a significant amount of federal R&D grants each year. Foremost among the institutions that received R&D grants in FY 1998 are Rush-Presbyterian-St. Luke’s Medical Center in Chicago ($30 million), the American College of Obstetricians and Gynecologists ($6 million), and the American College of Surgeons in Peoria ($4 million).

Scattered among these grants, as well as among the contracts discussed in the section below, are small business innovative research (SBIR) awards. These are special awards made by the SBIR programs supported by the 10 federal agencies with annual budgets for extramural R&D of more than $100 million. In a recent year, small businesses in Illinois received 68 SBIR awards totaling $15 million. Examples include a $600,000 award from the Navy to Horrigan Analytics in Chicago to develop a configurable mine countermeasure dynamic planning tool and a $200,000 award from USDA to C&A Country Gardens in Clinton to develop a foam in-place mulching method for specialty crops.

Also included among these grants are formula grants from federal agencies. Formula grants differ from the much more common project grants in that the money transmitted through formula grants is allocated to a state or one of its subdivisions in accordance with a distribution formula prescribed by law or regulation. Among the formula grants benefiting Illinois are ones valued at more than $5.4 million from USDA’s Cooperative State Research, Education, and Extension Service (CSREES) to State Agricultural Experiment Stations, forestry schools, and veterinary colleges for the support of research in agriculture, forestry, and animal health and disease. Similarly, a modest formula grant goes from the U.S. Geological Survey (USGS) inside the Department of the Interior (DOI) to the Water Resources Research Institute in Illinois every year to foster research in water and water-related problems.
Other Federal R&D Activities in Illinois

Several entities located in Illinois also receive notable sums in the form of contracts or cooperative agreements from federal agencies for specific R&D efforts. By far, the majority of these funds go from DOD to Northrop Grumman, which in FY 1998 received close to $276 million in contracts for R&D work on such programs as the Joint Surveillance and Target Attack Radar System (JSTARS) and the F-15E aircraft. In addition, North Central Regional Educational Laboratory, Primex Technologies, and IITRI each received between $18 million and $30 million of R&D contracts from federal agencies in FY 1998. The University of Illinois and Northwestern University also received contracts from various federal agencies to conduct R&D for the federal government that collectively totaled $15 million in FY 1998. Although these amounts are notable, they do not come close to eclipsing the funds that these institutions receive from federal R&D grants.

A total of $71 million of federal R&D dollars in the form of cooperative agreements was also received in FY 1998 by entities located in Illinois. By far the largest of these cooperative agreements ($10 million) came from DOE to M-C Power Corporation for research on the design of molten carbonate fuel cells. Other federal agencies awarding cooperative agreements to Illinois-based entities include NSF, DOD, and DOC. Among these latter cooperative agreements are awards supporting three of NSF’s Science and Technology Centers—the Center of Astrophysical Research in Antarctica, which is headquartered at the University of Chicago; the Center for Advanced Cement-Based Materials at Northwestern University; and the center for Superconductivity at the University of Illinois-Urbana. The latter center is the largest federally funded university-based research effort on high-temperature superconductivity in the United States. In addition, Illinois is home to two of NSF’s Materials Research Science and Engineering Centers—the Materials Center at the University of Chicago and the Materials Research Center at Northwestern University in Evanston, Illinois.