

Chapter 49

Federal Research and Development in Washington

- Approximately \$1.3 billion of federal R&D funds are spent each year in Washington.
- Washington ranks 18th among the 50 states, District of Columbia, and Puerto Rico in terms of the amount of federal R&D dollars received annually.
- Approximately 8 percent of all federal funds spent in Washington each year on matters other than the direct support of individuals (i.e., such entitlements as retirement, disability, and housing assistance) is spent on R&D.

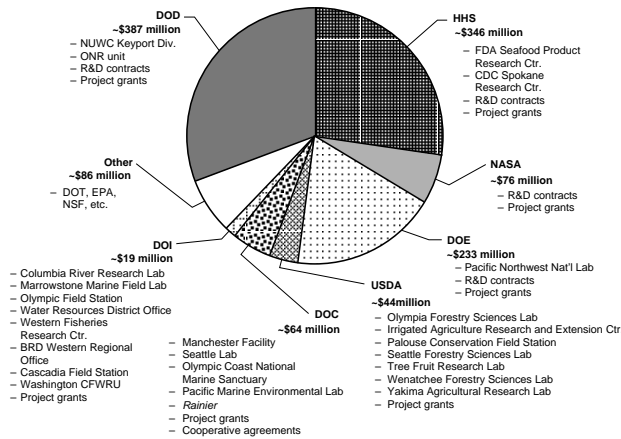


Figure 49.1 – Sources of Federal R&D Dollars Spent in Washington (Total Federal R&D ~\$1.3 billion)

BACKGROUND

In recent years, the federal government has spent in the neighborhood of \$1.3 billion annually in Washington on research and development (R&D) activities. On average, federal R&D dollars account for approximately 8 percent of all federal funds spent in Washington each year on matters 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 Washington. Foremost among these agencies are the Departments of Defense (DOD), Health and Human Services (HHS), and Energy (DOE), which account for 31, 28, and 19 percent of all federal R&D funds spent in the state, respectively. The National Aeronautics and Space Administration (NASA), the Department of Commerce (DOC), the National Science Foundation (NSF), and the Department of Agriculture (USDA) account for an additional 6, 5, 4, and 3 percent of all federal funds spent in the state, respectively. The remaining federal R&D dollars come collectively from several other agencies.⁴⁹

All federal R&D dollars spent in Washington 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 in the state. The following is an overview of what becomes of these federal R&D dollars once they arrive in Washington.

FEDERAL R&D UNITS IN WASHINGTON

Bothell, Washington, is home to HHS's Seafood Product Research Center.

- The Seafood Product Research Center is a unit of HHS's Food and Drug Administration (FDA). It conducts research on a wide variety of seafood, including finfish, crustaceans, aquatic animals, shellfish, and terrestrial food. Research analyses centers

⁴⁹ For a complete agency-by-agency breakdown of these R&D dollars, see Appendix C.

on marine toxins, antibiotics in seafood, molecular biology/gene technology, and seafood/aquaculture bacteriology. Co-located with the center is FDA's Pacific Regional Laboratory–Northwest, which conducts a small amount of research on the safety and efficacy of human and animals drugs. Together these two federal units annually receive approximately \$1.5 million of federal R&D dollars and have about 20 FTEs directly involved in R&D activities.

Cook, Washington, is home to the Department of Interior's (DOI's) Columbia River Research Laboratory.

- The Columbia River Research Laboratory (CRRL) is a unit of the Western Fisheries Research Center inside DOI's U.S. Geological Survey (USGS). It conducts research on fish populations and aquatic ecosystems of the west. The CRRL has the facilities and resources to carry out research in behavioral and physiological ecology of salmonids, white sturgeons, and Pacific lampreys. Specific research activities of this unit include studying the effects of hydropower development on fish passage and population dynamics. This federal R&D unit annually receives approximately \$20,000 of federal R&D funds and has about two FTEs.

Keyport, Washington, is home to DOD's Naval Undersea Warfare Center Keyport Division.

- The Naval Undersea Warfare Center Keyport Division is a unit of DOD. It supports underwater research in both littoral and continental shelf environments. This federal unit annually receives approximately \$4.8 million in federal R&D dollars for in-house activities and has about 1,454 civilian personnel, only a fraction of whom are involved in R&D activities.

Manchester, Washington, is home to DOC's Manchester Facility.

- The Manchester Facility is a unit of the Northwest Fisheries Science Center inside DOC's National Oceanic and Atmospheric Administration (NOAA). The facility coordinates research with

the center in the areas of conservation biology, environmental conservation, fishery resources analysis and monitoring, fish ecology, and resource enhancement and utilization technologies. It also conducts research on salmon recovery, particularly endangered species. Specific research activities of this facility focus on Pacific salmon conservation, salmon reintroduction to rivers, and aquaculture. This federal unit annually receives approximately \$422,000 of federal R&D funds and has about five FTEs, only a portion of whom are involved in R&D activities.

Nordland, Washington, is home to DOI's Marrowstone Marine Field Laboratory.

- The Marrowstone Marine Field Laboratory is a unit of the Western Fisheries Research Center inside DOI's USGS. It conducts research on fish populations and aquatic ecosystems of the west. Because the station has access to exceptionally high-quality seawater and has USGS's only seawater laboratory, it constitutes a critical research asset nationwide. Specific research activities of this unit include experiments that depend on laboratory rearing of saltwater organisms, such as characterizing the effects of stress and disease on salmon and trout as they transform to a saltwater metabolism, and characterizing effects of contaminants on marine species and life stages, and marine species rearing technology. This federal R&D unit annually receives approximately \$52,000 of federal R&D funds and has about three FTEs.

Olympia, Washington, is home to USDA's Olympia Forestry Sciences Laboratory.

- The Olympia Forestry Sciences Laboratory is a unit of the Pacific Northwest Research Station inside USDA's Forest Service. It conducts research on developing cost-effective techniques for aquatic and riparian habitat restoration and management, understanding the interaction of wildlife associated with older forests, and the operational aspects of managing coniferous and mixed species stands. Specific research activities of this lab-

oratory include fish studies that will examine the migratory behavior adult and juvenile salmonids and managing the biological diversity of the Pacific Northwest. This federal R&D unit annually receives approximately \$3.8 million of federal R&D funds and has about 45 employees.

Port Angeles, Washington, is home to DOI's Olympic Field Station and DOC's Olympic Coast National Marine Sanctuary.

- The Olympic Field Station is a unit of the Forest and Rangeland Ecosystem Science Center inside DOI's USGS. It conducts research at the administrative headquarters of Olympic National Park. Specific research activities of this unit include resolving problems that arise from managing this park. The majority of the staff are former employees of the National Park Service. This federal R&D unit annually receives approximately \$318,000 of federal R&D funds and has about 14 FTEs.
- The Olympic Coast National Marine Sanctuary is a unit of DOC's NOAA. Such sanctuaries conduct research on the marine environment to identify areas of special national significance stemming from their resource or human-use values and on the conservation and management of these marine areas, including restoration of damaged ecosystems. Specific R&D activities of this unit include studying such resource management issues as vessel traffic, spill prevention and response, water quality, and the ecological impact of fishing in one of the most diverse marine mammal habitats in North America. This federal unit annually receives approximately \$50,000 of federal R&D funds and has about five FTEs.

Prosser, Washington, is home to USDA's Irrigated Agriculture Research and Extension Center.

- The Irrigated Agriculture Research and Extension Center is a unit of USDA's Agricultural Research Service (ARS). It is on the Prosser campus of Washington State University. It conducts research on the development of economically and technically feasible, integrated cropping systems for irrigated farming to im-

prove economic returns and food/forage quality, and minimize environmental impacts. Specific research activities of this unit include a project on potato variety development through gene transfer and virology and bean and pea germplasm enhancement for disease and environmental stress resistance. This federal R&D unit annually receives approximately \$2.5 million of federal R&D funds and has about 30 FTEs.

Pullman, Washington, is home to USDA's Palouse Conservation Field Station.

- The Palouse Conservation Field Station is a unit of USDA's ARS located on the Pullman campus of Washington State University. It consists of seven research divisions focusing on animal diseases; grain legumes genetics and physiology; land management and water conservation; nonirrigated agriculture weed science; plant germplasm introduction and testing; root disease and biological control; and wheat genetics, quality physiology, and disease. The research focus of these divisions includes developing methods for diagnosis, immune protection, and a detailed understanding of the disease processes; identifying germplasm for disease and insect resistance and for environmental adaptation; and improving germplasm for grain quality characteristics, environmental stress tolerance, and disease resistance. Specific research activities include investigating diseases in domestic animals, including anaplasmosis, scrapie bovine and equine babesiosis, and malignant catarrhal fever; determining the genetic diversity within specific crop collections to reduce redundancy; and developing wheat cultivars that ensure economic viability, reduction of pesticides, and conservation of natural resources. This federal R&D unit annually receives approximately \$8.3 million of federal R&D funds and has about 94 FTEs.

Richland, Washington, is home to DOE's Pacific Northwest National Laboratory.

- The Pacific Northwest National Laboratory is a federally funded research and development center (FFRDC) sponsored by DOE

and operated by the Battelle Memorial Institute. It conducts research focusing on developing fundamental knowledge of natural, engineered, and social systems that is the basis for both effective environmental technology and sound public policy. The laboratory addresses legacy environmental problems by developing technologies that remedy existing environmental hazards. The vast majority of the laboratory's work concerns environmental science, environmental technology, or both. The laboratory also does work on national security and energy missions. This federally owned and contractor-operated R&D unit annually receives approximately \$287 million of core funding, virtually all of which is spent on specific R&D projects, and has about 7,250 employees. A portion of the facility's funds is spent on the maintenance and operation of R&D equipment and facilities.

Seattle, Washington, is home to a unit of DOD's Office of Naval Research; DOC's Seattle Laboratory, Pacific Marine Environmental Laboratory, and research ship *Rainier*; DOI's Western Fisheries Research Center and Biological Resources Division Western Regional Office, Cascadia Field Station, and Washington Cooperative Fish and Wildlife Research Unit; USDA's Seattle Forestry Sciences Laboratory; and a Department of Veterans Affairs R&D unit.

- 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.

- The Seattle Laboratory is the headquarters of the Northwest Fisheries Science Center inside DOC's NOAA. The overall center is responsible for providing scientific and technical support for the management, conservation, and development of the Pacific Northwest region's anadromous and marine fishery resources and their habitats. The Seattle Laboratory conducts research on the status of stocks and of fisheries and the specific management needs in habitat conservation, endangered and protected species, aquaculture, and full utilization of harvested fish. This federal unit annually receives approximately \$5.7 million of federal R&D funds and has about 92 FTEs, only a portion of whom are involved in R&D activities. The Seattle Laboratory is also the headquarters of the Alaska Fisheries Science Center. The center is responsible for fisheries research in the coastal oceans off Alaska and the west coast of the United States. The research of the center concentrates on five specific areas: conservation biology, environmental conservation, fishery resource analysis and monitoring, fish ecology, and resource enhancement and utilization technologies. Specific activities of the center include the conduct of field and laboratory research to help conserve and manage the fishery resources of the region in compliance with Magnuson-Stevens Fishery Conservation and Management Act (as amended through 1996). This federal unit annually receives approximately \$19.6 million of federal R&D funds and has about 207 FTEs, only a portion of whom are involved in R&D activities.
- The Pacific Marine Environmental Laboratory is a unit of DOC's NOAA. It conducts research on oceanography, marine meteorology, and related subjects. Specifically, it seeks to improve our understanding of the physical and geochemical processes operating in the world's oceans, to define the forcing functions and the processes driving ocean circulation and the global climate system, and to improve environmental forecasting capabilities and other supporting services for marine commerce and fisheries. This federal unit annually receives ap-

proximately \$13.8 of federal R&D funds and has about 91 FTEs.

- The research ship *Rainier* is a unit of DOC's NOAA that operates along the coastal waters of the Pacific coast of the U.S. and in the coastal waters of Alaska. It conducts hydrographic surveys and collects coastal assessment data in support of nautical charting. Specific research activities of this unit emphasize the gathering of the precise measurements and observations needed to promote safe navigation and sustain healthy coasts. It also provides days-at-sea for conducting research and supporting programs of significant national interest, including marine environmental quality, safe marine navigation, and the protection of life and property at sea and along the coasts. This federal unit annually receives approximately \$484,300 of federal R&D funds and has about nine FTEs involved to some extent in R&D activities.
- The Western Fisheries Research Center (WFRC) is a unit of DOI's USGS. It conducts research to support the best possible stewardship of the nation's natural resources, emphasizing fish populations and aquatic ecosystems of the west. Research at this center has provided critical research findings to managers of fish and aquatic resources in the west. Technologies and methods developed by WFRC scientists are in wide use at hatcheries and are applied to conservation of imperiled wild fish populations. Specific research activities of this unit include fish health, fish ecology, and aquatic ecosystems. The WFRC maintains facilities at five permanent locations and two or more seasonal sites. Three of the five facilities are in Washington—the Seattle Laboratory, the Columbia River Research Laboratory, and the Marrowstone Marine Field Station. The other two facilities—the Dixon Duty Station and the Reno Field Laboratory—are in California and Nevada, respectively. This federal R&D unit annually receives approximately \$586,000 of federal R&D funds and has about 27 FTEs.

- The Biological Resources Division Western Regional Office inside DOI's USGS has direct line authority over the five science centers in its region. The office coordinates science and operational activities among the Western Region's centers and integrates with the Eastern and Central Regions. The office also provides research expertise to other DOI bureaus and coordinates and integrates this activity within DOI as well. This federal R&D unit annually receives approximately \$625,000 of federal R&D funds and has about six FTEs.
- The Cascadia Field Station, known formerly as the University of Washington Field Station, is a unit of the Forest and Rangeland Ecosystem Science Center inside DOI's USGS. It conducts research on the biological and social aspects of resource management issues in national parks and other protected areas on public lands throughout the northwest and beyond. It also directs several long-term studies and assists federal agencies with scientific issues of immediate concern to resource management. The two major program of the unit, biology and social science, address various aspects of natural and human resource issues that occur in national parks and other public lands. This federal R&D unit annually receives approximately \$229,000 of federal R&D funds and employs about three people.
- The Washington Cooperative Fish and Wildlife Research Unit is part of DOI's USGS. It is on the campus of the University of Washington. It conducts research on management of aquatic habitats for shellfish and warm- and cold-water fish, including anadromous salmonids. Specific research activities of this unit include studies of the requirements of individual species, the effects of habitat alterations (physical and chemical) on populations and communities, and fish/wildlife interactions. The unit's wildlife research focuses on the habitat requirements of individual species as well as the aquatic wildlife within crop and forest lands, and wildlife in near-coastal communities. This federal R&D unit annually receives approximately \$178,000 of federal R&D funds and has about two FTEs.

- The Seattle Forestry Sciences Laboratory is a unit of the Pacific Northwest Research Station inside USDA's Forest Service. It conducts research to improve the accuracy of terrain and vegetation measurements, understand the structural change in rural communities' economies that are dependent on natural resources, and integrate and evaluate how people relate to forests. Specific research activities of this laboratory include landscape planning to help scientists and the public visualize what stands and landscapes would look like under certain patterns of tree removal and the development of models for air pollutant emissions that enable managers in the West to compare alternatives to achieve the best ecological effect of fire with the least risk of air pollution. This federal R&D unit annually receives approximately \$2.3 million of federal R&D funds and has about 30 employees.
- While the principal focus of the VA Puget Sound Health Care System facility, the VA Medical Center in Seattle, 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 454 projects with total funding of approximately \$10 million. These R&D activities focus on a wide range of topics, including Alzheimer's disease, diabetes, dementia, aging, depression, and spinal cord injuries.

Spokane, Washington, is home to HHS's Spokane Research Center.

- The Spokane Research Center is a unit of the National Institute for Occupational Safety and Health inside HHS's Centers for Disease Control and Prevention (CDC). It conducts research to prevent injuries and fatalities related to vertical movement of personnel and materials in mine shafts and ore passes. Specific research activities of this lab include developing ways to improve monitoring, inspection, and operating procedures; increasing awareness of the proper functioning of mine hoists, ore passes, and chutes; developing means of warning of potentially dangerous situations; and studying ways to improve the design of

mine shaft and ore pass structures. This federal R&D unit annually receives approximately \$6.6 million of federal R&D funds and has about 65 FTEs.

Tacoma, Washington, is home to DOI's Washington District Office of Water Resources.

- The Washington 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 \$3.6 million in federal R&D funds.

Wenatchee, Washington, is home to USDA's Tree Fruit Research Laboratory and the Wenatchee Forestry Sciences Laboratory.

- The Tree Fruit Research Laboratory is a unit of USDA's ARS located on the campus of Washington State University. It conducts basic and applied research that is regional, national, and international in scope, which will ensure the long-term competitiveness of the tree fruit industry in domestic and international markets. Specific research activities of this lab include the development of new methods and technologies for the identification, detection, management, and control of pre- and posthar-

vest pathogens, diseases, and disorders of tree fruit, including those that are currently controlled by use of methyl bromide as preplant soil fumigant. This federal R&D unit annually receives approximately \$1.4 million of federal R&D funds and has about 25 FTEs.

- The Wenatchee Forestry Sciences Laboratory is a unit of the Pacific Northwest Research Station inside USDA's Forest Service. It is on the campuses of Washington State University and the University of Washington. It conducts research on protecting and restoring forest health, resource sustainability, and biodiversity with an emphasis on a landscape approach. In addition to insects and diseases, fire as a natural disturbance is emphasized. Specific research activities of this laboratory include approaches to restore damaged landscapes and to develop future vegetation patterns that will be more resilient in the face of natural and human-caused disturbances. This federal R&D unit annually receives approximately \$1.3 million of federal R&D funds and has about 20 employees.

Yakima, Washington, is home to USDA's Yakima Agricultural Research Laboratory.

- The Yakima Agricultural Research Laboratory is a unit of USDA's ARS. It conducts research on a wide variety of insect problems affecting fruit and vegetable production and marketing. Specific research activities of this unit include developing a conceptual plan for implementing an areawide pest management program for pome fruits in the western United States with emphasis on replacing broad-spectrum insecticides with selective, environmentally friendly control tactics, and developing methods for efficiently combining biological and plant resistance to manage insect pests in potatoes. This federal R&D unit annually receives approximately \$4.2 million of federal R&D funds and has about 72 FTEs.

FEDERAL R&D GRANTS TO WASHINGTON ENTITIES

Every major institution of higher education in Washington 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, DOD, and DOE to individual faculty members and therefore ultimately inure to the benefit of such institutions as the University of Washington, Washington State University (WSU), and Western Washington University (WWU). The table below shows the number of R&D grants active in FY 1998, highlighting those made by HHS, NSF, DOD, and DOE 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 the University of Washington are ones from NASA (\$8 million), DOC (\$5 million), EPA (\$4 million), and USDA (\$3 million). The comparable grants going to WSU include \$7 million from USDA, with most of the remainder coming from NASA and EPA.

Table 49.1 – Sources of Federal R&D Grants to Higher Education in Washington

Institution	HHS		NSF		DOD		DOE		Other Agencies		Total	
	Amount	#	Amount	#	Amount	#	Amount	#	Amount	#	Amount	#
U of Wash	\$242M	958	\$33M	487	\$18M	123	\$12M	49	\$21M	244	\$326M	1,861
WSU	\$12M	100	\$5M	101	\$2M	21	\$5M	33	\$8M	376	\$32M	631
WWU	<\$1M	2	\$1M	22	\$1M	1	0	0	0	0	\$2M	25
Other	<\$1M	4	\$1M	29	<\$1M	2	0	0	\$1M	17	\$2M	52
Total	\$254M	1,064	\$40M	639	\$21M	147	\$17M	82	\$30M	637	\$362M	2,569

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 Physics Department at the University of Washington.

Several other nonacademic institutions in Washington 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 the Fred Hutchinson Cancer Research Center in Seattle (\$104 million), the Seattle Biomedical Research Institute (\$5 million), Mathsoft, Inc., in Seattle (\$3 million), Group Health Cooperative of Puget Sound in Seattle (\$3 million), and Children's Orthopedic Hospital and Medical Center in Seattle (\$3 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 Washington received 110 SBIR awards totaling \$29 million. Examples include a \$600,000 award from DOD (Air Force) to Microvision, Inc., in Seattle to develop wide field of view display technology for C4I applications and a \$700,000 award from HHS to Progenesis, Inc., in Mercer Island for work on a triggered suggestion device to treat nicotine dependence.

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 Washington are ones valued at more than \$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 DOI's USGS to the Water Resources Research Institute in Washington every year to foster research in water and water-related problems.

OTHER FEDERAL R&D ACTIVITIES IN WASHINGTON

Several entities in Washington 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 the funds go from DOD to the Boeing Company, which in FY 1998 received close to \$796 million in R&D contracts for work on such efforts as the Joint Strike Fighter Program and the Airborne Laser (ABL) weapon system. In addition, the Fred Hutchinson Cancer Research Center (\$25 million), Battelle Memorial Institute (\$18 million), Alliant Techsystems, Inc. (\$8 million), and Northwest Research Associates (\$4 million) received large R&D contracts from federal agencies in FY 1998. Note that these amounts are in addition to the federal R&D grants also received by the Fred Hutchinson Cancer Research Center. The University of Washington (\$14 million) and WSU (\$4 million) also received contracts from various federal agencies to conduct R&D for the federal government. 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 \$24 million of federal R&D dollars was also received in FY 1998 by entities located in Washington in the form of cooperative agreements. The largest of these cooperative agreements (\$6 million in FY 1998) came from DOC to the University of Washington to operate the Joint Institute for the Study of Atmosphere and Ocean (JISAO). Other federal agencies awarding cooperative agreements to Washington-based entities include the Department of Justice, DOD, DOE, and NSF. Among these latter cooperative agreements is an award supporting one of NSF's Science and Technology Centers—the Center for Molecular Biotechnology at the University of Washington.