



Report to the Chair, Subcommittee on
Research and Technology, Committee
on Science, Space, and Technology,
House of Representatives

September 2018

NATIONAL SCIENCE FOUNDATION

A Workforce Strategy
and Evaluation of
Results Could
Improve Use of
Rotating Scientists,
Engineers, and
Educators

GAO Highlights

Highlights of [GAO-18-533](#), a report to the Chair, Subcommittee on Research and Technology, Committee on Science, Space, and Technology, House of Representatives

Why GAO Did This Study

NSF has identified potential benefits and challenges associated with its use of rotators. Benefits include fresh perspectives and close connections to the scientific community, while challenges include staffing turnover and higher costs for some rotators compared with permanent employees.

GAO was asked to review NSF's use and management of the IPA and VSEE rotator programs, among other things. This report examines (1) the number, costs, and uses of NSF rotators for fiscal year 2008 through fiscal year 2017; (2) the strategies NSF has used to manage rotator costs and the results of these efforts; and (3) the extent to which NSF has a workforce strategy for using rotators and has evaluated the results of its rotator programs. GAO analyzed summary-level data on NSF's rotators; reviewed key documents; interviewed NSF officials; conducted semistructured interviews with a nongeneralizable sample of rotators and permanent federal employees selected from different scientific directorates within NSF; and compared NSF's management of the program to key principles for effective strategic workforce planning.

What GAO Recommends

GAO recommends that NSF develop an agency-wide strategy for balancing the agency's use of rotators with permanent staff and evaluate the contributions of its rotator programs toward NSF's human capital goals and programmatic results. NSF agreed with GAO's recommendations.

View [GAO-18-533](#). For more information, contact John Neumann at (202) 512-3841 or neumannj@gao.gov.

September 2018

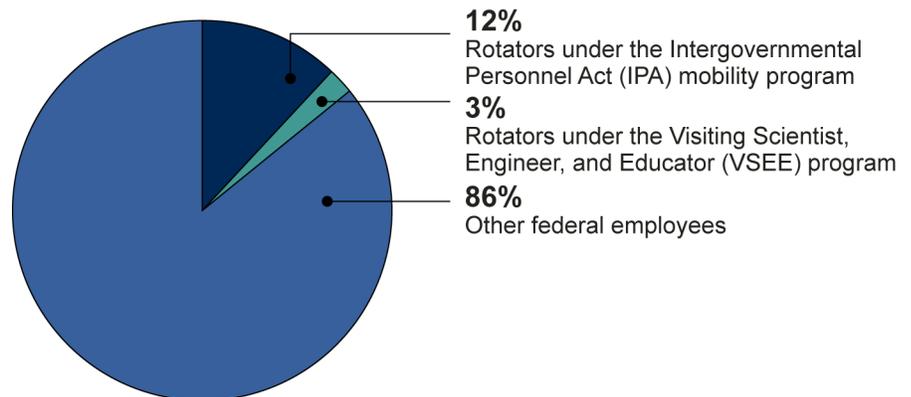
NATIONAL SCIENCE FOUNDATION

A Workforce Strategy and Evaluation of Results Could Improve Use of Rotating Scientists, Engineers, and Educators

What GAO Found

The numbers of rotators—outside scientists, engineers, and educators on temporary assignment—at the National Science Foundation (NSF) and their costs in proportion to other staff remained relatively stable in fiscal years 2008 through 2017. Most rotators joined NSF under its Intergovernmental Personnel Act (IPA) mobility program. IPA rotators comprised about 12 percent of NSF's workforce and 17 percent of staff costs on average and were not subject to a federal salary cap. They remain employees of their home institutions, with NSF reimbursing the institutions for most of their salaries and benefits. The remaining rotators are considered temporary federal employees under the Visiting Scientist, Engineer, and Educator (VSEE) program; their salaries could not exceed the federal maximum for their positions.

National Science Foundation (NSF) Average Workforce Composition, Fiscal Years 2008 through 2017



Source: GAO analysis of NSF data. | GAO-18-533

Note: Percentages do not sum to 100 percent due to rounding.

Beginning in fiscal year 2017, NSF adopted IPA rotator program cost management strategies expected to achieve the greatest savings with the least harm to recruitment, but NSF officials said it is too soon to determine the full results. For example, for new IPA rotators who had not yet begun negotiating their assignments, NSF began requiring their home institutions to pay for 10 percent of the rotators' salary and benefits. NSF officials told GAO they expect to issue a report evaluating the strategies in December 2018.

NSF's IPA program steering committee recommended developing a workforce strategy for balancing the agency's use of rotators with federal staff, but as of June 2018, NSF had not developed a strategy or fully evaluated the IPA and VSEE rotator programs' results, as called for by GAO's key principles for effective strategic workforce planning. NSF officials said they recognized the value of a workforce strategy but were focusing instead on other workforce planning efforts, and they had not fully evaluated program results in part because rotators are blended into the agency's permanent workforce, making a separate evaluation difficult. Without a workforce strategy and evaluation of results, NSF is limited in its ability to manage and, if warranted, adjust its use of rotators.

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Abbreviations

IPA	Intergovernmental Personnel Act
NSF	National Science Foundation
OMB	Office of Management and Budget
OPM	Office of Personnel Management
VSEE	Visiting Scientist, Engineer, and Educator

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September 5, 2018

The Honorable Barbara Comstock
Chair
Subcommittee on Research and Technology
Committee on Science, Space, and Technology
House of Representatives

Dear Madam Chair:

To advance its mission of supporting research and education in science and engineering, the National Science Foundation (NSF) brings in outside scientists, engineers, and educators on temporary assignments to work alongside its staff of permanent federal employees. NSF refers to these individuals as rotators. Rotators generally perform the same work and have the same responsibilities as permanent employees who fill similar positions within the agency. NSF's rationale in using rotators is that they bring fresh perspectives and up-to-date insights about the direction of science and engineering and help NSF maintain a close connection to the scientific community. However, NSF's use of rotators has also introduced management challenges. For example, according to the agency's Human Capital Strategic Plan, continual turnover resulting from the use of rotators has presented challenges in ensuring seamless staffing transitions.¹

NSF recruits its rotators primarily under the Intergovernmental Personnel Act (IPA) mobility program,² which allows for details of individuals from state and local governments, institutions of higher education, and other organizations.³ NSF refers to individuals detailed under this program as IPA rotators. Under NSF's IPA program, rotators remain employees of

¹National Science Foundation, *Human Capital Strategic Plan 2011-2014*. In December 2017, NSF officials told us that this document was the guiding document for human capital management at NSF until it adopted its *Human Capital Operating Plan* in April 2018.

²NSF uses the term "program" to describe its use of this federal hiring authority.

³5 U.S.C. §§ 3372, 3374 (2018). Other organizations include national, regional, state-wide, area-wide, or metropolitan organizations representing state or local governments; associations of state or local public officials; nonprofit organizations that have as one of their principal functions the offering of professional advisory, research, educational, or development services, or related services, to governments or universities concerned with public management; and federally funded research and development centers.

and continue to receive salaries and benefits from their home institutions. During rotators' assignments, NSF reimburses the majority of their salaries and benefits under cost-sharing agreements with the rotators' home institutions. Rotators may occasionally take NSF-funded trips to continue research and research-related activities at their home institutions. NSF can negotiate IPA rotator details for an initial assignment of up to 2 years and may extend the assignment for another 2 years—for a maximum of 4 years—if NSF, the rotator, and the rotator's home institution agree.

NSF also recruits rotators from research or educational institutions under its Visiting Scientist, Engineer, and Educator (VSEE) program and refers to these individuals as VSEE rotators.⁴ Under this program, VSEE rotators are considered temporary federal employees. They are on a nonpaid leave of absence from their home institution and receive their salaries directly from NSF. Assignments are usually made for up to 1 year and may be extended for an additional year.

The NSF Office of Inspector General has examined several management and oversight issues associated with NSF's use of IPA rotators. For example, the Inspector General identified the potential effect of the time that IPA rotators spend at their home institutions on the rotators' ability to fulfill their responsibilities at NSF.⁵ In addition, the Inspector General reported that in fiscal year 2012, NSF spent approximately \$6.7 million more by using rotators instead of hiring permanent federal employees.⁶ That report identified opportunities for NSF to reduce the cost of IPA rotators. In a follow-up report, the Inspector General found that both the number and cost of IPA rotators increased in fiscal year 2015 from fiscal year 2012.⁷

⁴NSF uses the term "program" to describe its use of this federal hiring authority.

⁵National Science Foundation, *FY 2019 Budget Request to Congress*, (Alexandria, VA: Feb. 28, 2018).

⁶National Science Foundation Office of Inspector General, *Audit of Cost Associated with NSF's Use of Intergovernmental Personnel Act Assignees*, Report No. 13-2-008 (Arlington, VA: Mar. 20, 2013).

⁷National Science Foundation Office of Inspector General, *Follow-Up Review of Cost Associated with NSF's Use of Executive Level Intergovernmental Personnel Act Assignees*, Report No. 16-6-001 (Arlington, VA: Jan. 29, 2016).

The American Innovation and Competitiveness Act of 2017 directs NSF to report to certain congressional committees on its efforts to control costs associated with employing rotators and on its progress in responding to the Inspector General’s findings and implementing its recommendations related to the employment of rotators. In addition, the act directs NSF to annually provide written justification for each rotator who it pays more than the maximum rate for the Senior Executive Service—which was \$187,000 in fiscal year 2017.⁸

NSF’s use of rotators is one of the agency’s strategies for managing its human capital. We have previously found that strategic human capital management addresses two critical needs: (1) aligning an organization’s human capital program with its current and emerging mission and programmatic goals and (2) developing long-term strategies for acquiring, developing, and retaining staff to achieve programmatic goals.⁹ Strategic human capital management is a pervasive challenge the federal government faces and is one of the areas we identified in our High Risk List. While agencies’ approaches to workforce planning will vary, we have previously identified key principles that strategic workforce planning should address irrespective of the context in which the planning is done, including:¹⁰

- Determine the critical skills and competencies that will be needed to achieve current and future programmatic results;
- Develop strategies that are tailored to address gaps in number, deployment, and alignment of human capital approaches for enabling and sustaining the contributions of all critical skills and competencies; and

⁸Pub. L. No. 114-329, § 111, 130 Stat. 2969, 2992 (2017) (codified at 42 USCS § 1862s-3 (2018)).

⁹GAO, *Key Principles for Effective Strategic Workforce Planning*, [GAO-04-39](#) (Washington, D.C.: Dec. 11, 2003).

¹⁰[GAO-04-39](#). In that report, we identified five key principles for effective strategic workforce planning, including the three we describe above. The remaining two key principles are (1) involve top management, employees, and other stakeholders in developing, communicating, and implementing the strategic workforce plan; and (2) build the capability needed to address administrative, educational, and other requirements important to support workforce planning strategies.

-
- Monitor and evaluate progress toward the human capital goals and the contribution that human capital results have made toward achieving programmatic results.

You asked us to review NSF's use and management of the rotator programs, among other things. This report examines (1) the number, costs, and uses of NSF rotators over time; (2) the strategies NSF has used to manage rotator costs and the results of these efforts; and (3) the extent to which NSF has a workforce strategy for using rotators and has evaluated the results of its rotator programs.

To examine the number, costs, and use of NSF rotators over time, we collected and analyzed summary-level data on NSF's rotators, permanent employees, and other temporary employees for fiscal years 2008 through 2017 so that we could observe any trends over the most recent 10-year period for which data were available. Data on the number of employees included the number of permanent federal employees, temporary federal employees, IPA rotators, and VSEE rotators; the number of each type of employee in executive positions; and counts of the types of home institutions that IPA rotators came from in fiscal year 2017. We collected data on the number of employees and rotators as of the last day for each fiscal year for fiscal years 2008 through 2017. We supplemented this summary-level data with data on executive-level positions held by IPA rotators or federal employees and executive-level vacancies as of November 2017—the most recent data available at the time of our review. Cost data included NSF's actual costs for IPA rotators from fiscal years 2008 through 2017, and actual costs for federal employees from fiscal years 2009 through 2017, and budgeted amounts for cost-sharing agreements.¹¹ To adjust costs for inflation, we converted them to constant 2017 dollars using a Gross Domestic Product price index. We focused our review on IPA rotators and reviewed VSEE rotators to a lesser extent, in part because NSF maintains cost data on VSEE rotators commingled with data on other federal employees and the aggregate data we obtained from NSF did not separate out most costs for VSEE rotators.

We assessed the reliability of the data we collected on the number and costs of NSF rotators and permanent and other temporary federal employees by performing manual testing for missing data or obvious

¹¹NSF officials told us that because of limitations in their budgeting system, they were unable to provide actual amounts for cost-share data or a breakout of costs for federal personnel for fiscal year 2008.

errors and conducting interviews with NSF officials knowledgeable about the data. In particular, we discussed the data sources—including NSF’s grant database, financial system, and human resources database—and methods used to provide the data. We determined that the data were sufficiently reliable for reporting summary-level data on the number of rotators and associated costs over time.

For further information on NSF’s use of rotators, we reviewed NSF’s personnel manual, public website, and other information provided by NSF officials on how IPA and VSEE rotators are compensated and the types of positions they fill. We reviewed all IPA rotator agreements made in fiscal year 2017; those agreements included information on rotator costs and cost-sharing amounts and the responsibilities of the positions filled by rotators. We also reviewed reports issued by the NSF Inspector General and the National Academy of Public Administration on NSF’s use of rotators.¹² Finally, we reviewed regulations and policies on the IPA program issued by the Office of Personnel Management (OPM).

To examine the strategies that NSF has used to manage IPA rotator costs and the results of these efforts, we reviewed key agency documentation, such as documents related to the establishment of cost-management strategies; NSF’s January 2018 report to Congress on NSF’s efforts to manage rotator costs; and NSF’s March 2018 preliminary evaluation of its cost-sharing pilot program.¹³ We also discussed with knowledgeable NSF officials NSF’s cost-management strategies and the extent to which the officials had identified any preliminary results.

To examine the extent to which NSF has a workforce strategy for using rotators and has evaluated the results of its rotator programs, we reviewed NSF’s workforce planning documents, including its human capital strategic plan for 2011 to 2014 (the latest plan available) and internal NSF documents issued in 2016 and 2017 on plans for developing an agency-wide workforce strategy that would include rotators. In

¹²National Academy of Public Administration, *National Science Foundation: Governance and Management for the Future*, Academy project number 2015-001 (Washington, D.C.: April 2004)

¹³National Science Foundation, *Report of the IPA Steering Committee Fiscal Oversight Task Force* (October 14, 2016); *Congressional Report in Compliance with Public Law 114-329 American Innovation and Competitiveness Act Section 111 - Personnel Oversight* (January 8, 2018); and *Preliminary Findings and Recommendations from an Evaluation of the Changes to the IPA Program* (March 2018).

addition, we interviewed NSF's chief human capital officer and other NSF officials regarding NSF's decision-making process for hiring rotators, its objectives for the rotator programs, its efforts to evaluate program results, and its plans for developing an agency-wide workforce strategy. We compared NSF's efforts with three of the five principles from GAO's *Key Principles for Effective Strategic Workforce Planning*, which we selected on the basis of their relevance to NSF's efforts.¹⁴

For further insight into NSF's rotator programs, we conducted semistructured interviews with a nongeneralizable sample of IPA rotators, VSEE rotators, and permanent federal employees. The sample included two individuals in executive positions (an IPA rotator and a permanent employee who followed an in-house career path) and four individuals in program director positions (an IPA rotator, a VSEE rotator, and two permanent employees). We selected the individuals from 5 of the 7 scientific directorates within NSF. In addition, our sample included a former NSF employee in an executive position. Our semistructured interviews included questions regarding the individuals' experiences and perspectives on their work activities, the benefits and challenges of NSF's use of rotators, and the effect of NSF's use of rotators on the in-house career paths of permanent employees. In addition, we asked individuals in executive positions about the effect of the NSF's use of rotators on (1) the ability to set directions for the agency and to achieve associated goals and objectives and (2) succession planning. The information provided through the interviews is anecdotal and cannot be generalized to a larger population, but it provides illustrative perspectives and opinions of different subgroups within NSF on NSF's rotator programs.

We conducted this performance audit from October 2017 to September 2018 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

¹⁴[GAO-04-39](#)

Background

NSF relies on two programs for bringing rotators into the agency: (1) the IPA program and (2) the VSEE program. The Office of Personnel Management develops policies on agencies' use of the IPA program and promulgates program regulations.

Rotators in NSF's IPA and VSEE programs differ in key respects, including their employment status and compensation.

- **IPA rotators.** NSF enters into written agreements with rotators' home institutions for all IPA assignments. The agreements detail rotators' salaries and health, retirement, and other fringe benefits at their home institutions, as well as the cost-sharing amounts NSF and home institutions are to pay during rotators' assignments. NSF reimburses its cost-sharing amounts to home institutions, which continue to pay rotators' full salaries and benefits. NSF does not cap the salaries of IPA rotators; as a result, IPA rotators may receive salaries that exceed the maximum federal salary for the position they hold at NSF.¹⁵ In contrast, if an IPA rotator's salary is less than the minimum federal salary for the position, NSF will supplement the salary to the minimum rate.
- **VSEE rotators.** NSF appoints VSEE rotators as federal employees on a nonpaid leave of absence from their home institutions. VSEE rotators receive their salaries directly from NSF but are not eligible for certain federal benefits, such as retirement; instead, NSF reimburses home institutions for the employer's share of retirement, life insurance, and health benefits that would otherwise be discontinued. NSF's policy is to set salaries for VSEE rotators that are generally comparable to the salaries the rotators would receive at their home institutions. In setting salaries, NSF also takes into account other sources of income, such as consulting, and allows for locality pay adjustments applicable to employees in the Washington, D.C., metropolitan area. However, because VSEE rotators are federal employees, NSF caps their salaries at the federal maximum for the position they hold at NSF.

Both IPA and VSEE rotators are eligible for certain other types of reimbursement. In particular, rotators have the option of having NSF pay their moving expenses to and from Washington, D.C., or receiving per

¹⁵In fiscal year 2017 this maximum was about \$175,000 annually.

diem allowances in accordance with federal travel regulations for up to 2 years.¹⁶ In addition, NSF may reimburse rotators for travel-related expenses related to their participation in NSF’s Independent Research and Development program, which enables NSF staff to maintain their involvement with their professional research and research-related activities at their home institutions. Table 1 shows additional information on IPA and VSEE rotator expenses.

Table 1: Types of Expenses for National Science Foundation (NSF) Rotators

Types of Expenses		Intergovernmental Personnel Act (IPA) rotators	Visiting Scientist, Engineer, and Educator (VSEE) rotators
Salary and benefits	Does NSF set the rotators’ salaries?	No, salaries are set by rotators’ home institutions.	Yes, NSF sets salaries based on those at rotators’ home institutions and other factors, including cost of living allowances and locality pay.
	Does NSF supplement rotators’ pay to match the minimum for the position if pay at the home institution is lower?	Yes	Yes
	Are there maximum salary limitations for rotators?	No	Yes, the federal maximum of the position rotators hold at NSF.
	Does NSF require cost-sharing agreements with the rotator’s home institution for salary and benefits?	Yes, a required 10 percent cost-share from rotators’ home institutions beginning in fiscal year 2017.	No
	Do rotators receive the same fringe benefits (e.g., retirement, health benefits, life insurance) they received from their home institution?	Yes	Yes
Compensation for lost consulting income	Does NSF compensate rotators for consulting income that they forgo while at NSF?	No, but prior to fiscal year 2017, NSF reimbursed rotators up to \$10,000 per year.	Yes, considered as a factor in salary adjustment.
Per diem allowance or moving expenses	Does NSF pay either a per diem—the allowance for lodging (excluding taxes), meals, and incidental expenses—or for a round-trip movement of household goods?	Yes	Yes

¹⁶According to NSF officials, if an IPA rotator’s appointment is extended, the per diem for the third and fourth years is subject to approval from the NSF Director.

Types of Expenses		Intergovernmental Personnel Act (IPA) rotators	Visiting Scientist, Engineer, and Educator (VSEE) rotators
Reimbursement for state income tax	Does NSF reimburse rotators for state tax paid on income earned at NSF?	Yes, if home state does not tax personal income.	No
Travel	Does NSF pay for rotators' trips to maintain involvement in their professional research under the Independent Research and Development Program?	Yes, rotators can take up to 12 agency-funded trips to their home institutions.	Yes

Source: GAO analysis of NSF information. | GAO 18-533

Note: Data on types of expenses are as of May 2018.

Rotators are generally assigned to one of NSF's seven directorates that support science and engineering research and education (see table 2). Each directorate is headed by an assistant director and deputy assistant director. Directorates are further subdivided into divisions, offices, or sections. Each division is headed by a division director and typically a deputy division director, and each office is headed by an office director and typically a deputy office director.¹⁷ All these positions are executive positions at NSF. At the staff level, NSF uses program directors—subject matter experts in the scientific areas they manage—to conduct reviews of proposals and recommend which projects the agency should fund. With an annual budget of about \$7.5 billion, NSF funds approximately 24 percent of all federally supported basic research conducted by colleges and universities in the United States.¹⁸

¹⁷The directorate for Geosciences does not use deputy division directors or deputy office directors, but instead, uses section heads. According to NSF officials, section heads serve the same function as deputy division directors and are executive positions.

¹⁸NSF's fiscal year 2019 budget request is \$7.47 billion. Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts without any particular application or use in view.

Table 2: National Science Foundation (NSF) Directorates and Their Divisions and Offices

Directorate	Divisions and offices
Biological Sciences	Biological Infrastructure Environmental Biology Emerging Frontiers Integrative Organismal Systems Molecular and Cellular Biosciences
Computer and Information Science and Engineering	Advanced Cyberinfrastructure Computing and Communication Foundations Computer and Network Systems Information and Intelligent Systems Information Technology Research
Education and Human Resources	Research on Learning in Formal and Informal Settings Graduate Education Human Resource Development Undergraduate Education
Engineering	Chemical, Bioengineering, Environmental, and Transport Systems Civil, Mechanical, and Manufacturing Innovation Electrical, Communications, and Cyber Systems Engineering Education and Centers Emerging Frontiers in Research and Innovation Industrial Innovation and Partnerships
Geosciences	Atmospheric and Geospace Sciences Earth Sciences Integrative and Collaborative Education and Research Ocean Sciences Polar Programs
Mathematical and Physical Sciences	Astronomical Sciences Chemistry Materials Research Mathematical Sciences Physics Multidisciplinary Activities
Social, Behavioral, and Economic Sciences	Social and Economic Sciences Behavioral and Cognitive Sciences Multidisciplinary Activities National Center for Science and Engineering Statistics

Source: GAO analysis of NSF data. | GAO 18-533

In 2016, NSF established the Steering Committee for Policy and Oversight of the IPA Program. The steering committee serves as the primary body for considering policy on NSF's use of IPA rotators and overseeing common approaches to budgeting and implementation of the IPA program. The committee's membership includes NSF's chief human capital officer, who serves as the chair, and several other NSF officials. The steering committee has established strategic principles for management of the IPA program. These principles include maintaining a balance between IPA rotators and federal staff and a commitment to ongoing improvement of the program. NSF officials told us that there is no similar steering committee for overseeing VSEE rotators. Instead, each VSEE rotator is individually overseen by his or her respective supervisor.

For the agency as a whole, NSF's Office of Information and Resource Management and its Division of Human Resource Management conduct human capital management. NSF officials stated that the head of the Office of Information and Resource Management serves as the Chief Human Capital Officer and develops and oversees NSF's human capital approaches and strategies. These officials also told us that the Deputy Chief Human Capital Officer serves as the division director of Human Resource Management and is responsible for administering the division's day-to-day operations. The Division of Human Resource Management administers the agency's human capital policies as set forth in NSF's personnel manual.

NSF Maintained a Relatively Stable Number and Cost of Rotators and Used Them in Executive and Program Director Positions

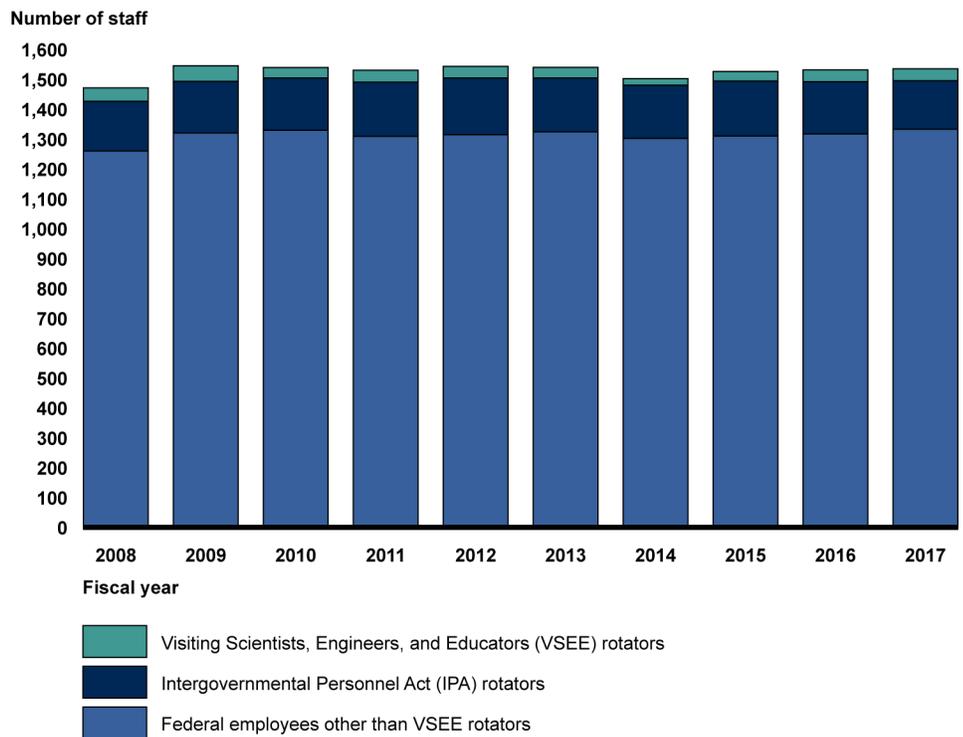
The numbers of rotators and their costs to NSF in proportion to other staff have remained relatively stable. Most rotators were IPA rotators, and were used in both executive and program director (staff-level) positions. NSF generally used VSEE rotators in program director positions.

Most Rotators Were IPA Rotators, Comprising About 12 Percent of NSF’s Workforce and 17 Percent of Staff Costs on Average in Fiscal Years 2008-2017

Most rotators at NSF were IPA rotators, and the proportion of rotators relative to other staff has remained relatively stable over time (see fig. 1). During the 10-year period we reviewed, from fiscal year 2008 through fiscal year 2017,

- IPA and VSEE rotators comprised about 12 percent and about 3 percent, respectively, of NSF’s total workforce; and
- the number of IPA rotators ranged from 162 to 190 (about 11 to 12 percent of total staff), and the number of VSEE rotators ranged from 22 to 52 (about 1 to 3 percent of total staff).

Figure 1: National Science Foundation’s (NSF) Workforce Composition, Fiscal Years 2008 through 2017



Source: GAO analysis of NSF data. | GAO-18-533

Note: Counts of each type of staff are based on the last day of each fiscal year.

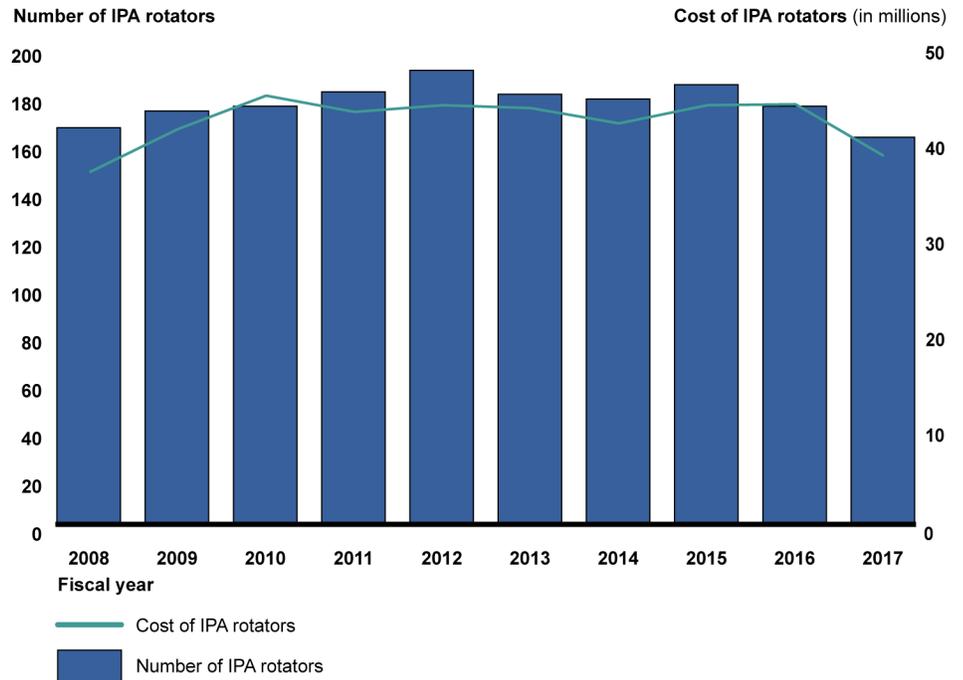
Most recently, the number of IPA rotators decreased by 13 from 175 in fiscal year 2016 to 162 in fiscal year 2017—its lowest point during the 10-

year period—and the number of VSEE rotators increased by 1 from 39 to 40 out of a total workforce of 1,535. According to NSF officials, the overall decrease in the number of IPA rotators in fiscal year 2017 did not reflect an agency-wide effort by NSF to reduce its reliance on rotators but rather resulted from the needs and hiring decisions for specific positions within the agency. NSF officials told us that vacant positions are generally open to be filled by IPA rotators or federal employees and that NSF seeks to hire the best candidates to fill its vacancies based on factors such as the candidate’s expertise, how his or her skills fit the agency’s needs, and whether the position is a short-term need.

In fiscal years 2008 through 2017, the total cost of IPA rotators ranged from a low of \$37.4 million to a high of \$45.4 million (see fig. 2).¹⁹ Costs included salary and fringe benefits, per diem allowances, travel-related expenses for participation in the Independent Research and Development Program, reimbursement for lost consulting income, and state tax reimbursement. A recent decline in the cost of the IPA program was associated with the decrease in the number of IPA rotators. During that same time frame, the total cost of IPA rotators decreased by about \$5.4 million (about 12 percent) from about \$44.5 million in fiscal year 2016 to \$39.1 million in fiscal year 2017. As we discuss later in this report this decrease was due in part to NSF’s cost-management strategies, in addition to the decrease in number of rotators.

¹⁹Unless otherwise noted, all costs in this report are in constant 2017 dollars.

Figure 2: Number and Cost of the National Science Foundation’s (NSF) Intergovernmental Personnel Act (IPA) Rotators, Fiscal Years 2008 through 2017



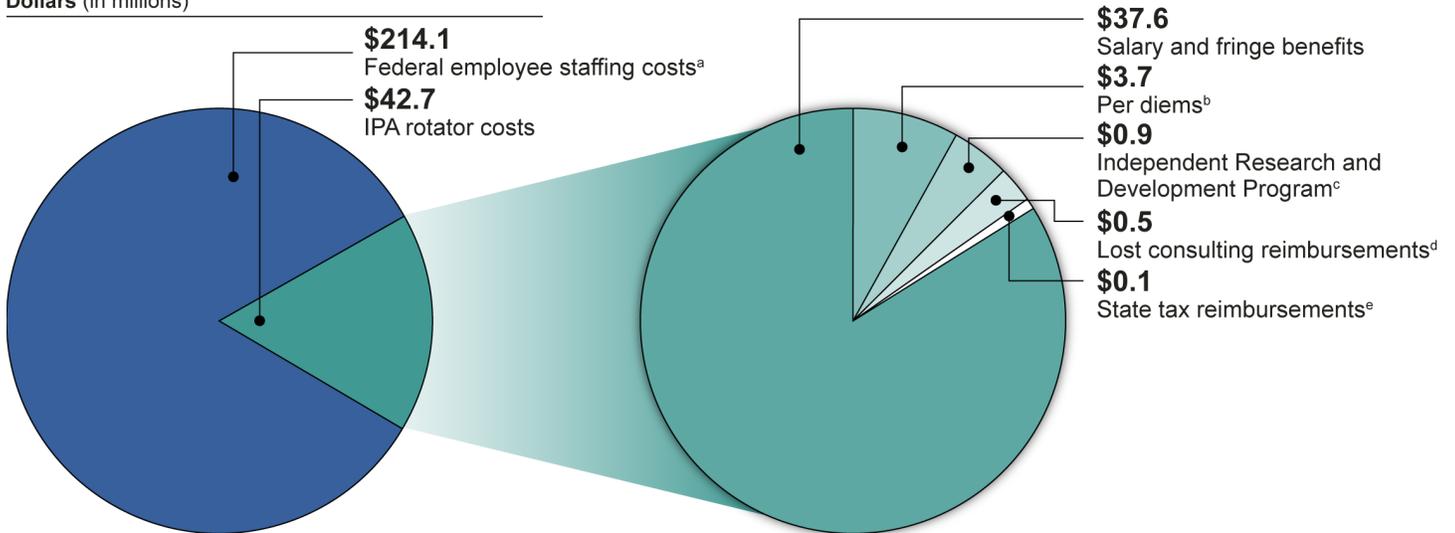
Source: GAO analysis of NSF data. | GAO-18-533

Notes: The number of IPA rotators each year is based on the last day of each fiscal year from 2008 through 2017. Costs are in constant 2017 dollars.

Over the 10-year period from fiscal year 2008 through fiscal year 2017, IPA rotators comprised an average annual cost of \$42.7 million—or about 17 percent of NSF’s average annual staffing costs of \$256.8 million (see fig. 3). The IPA rotators’ percentage of NSF’s annual staffing costs ranged from a low of about 15 percent in fiscal year 2017 to a high of about 17 percent in fiscal year 2015. During this time frame, salary and benefits constituted the largest portion of IPA rotator costs each year, averaging \$37.6 million per year—about 15 percent of NSF’s average annual staffing costs.

Figure 3: Average Annual Staffing Costs for National Science Foundation (NSF) Federal Employees and Intergovernmental Personnel Act (IPA) Rotators, Fiscal Years 2008 through 2017

Dollars (in millions)



Source: GAO analysis of NSF data. | GAO-18-533

Note: Costs are in constant 2017 dollars.

^aVisiting Scientists, Engineers, and Educators (VSEE) rotator costs are included in federal employee staffing costs.

^bPer diem is the allowance for lodging (excluding taxes), meals, and incidental expenses.

^cNSF's Independent Research and Development program pays for rotators' trips to their home institutions and other locations to maintain involvement in their professional research.

^dLost consulting reimbursements consist of payments to IPA rotators of up to \$10,000 annually for consulting income that they forgo while at NSF.

^eNSF reimburses IPA rotators for state tax paid on income earned while on assignment at NSF if they are from a state that does not have a personal state income tax.

Unlike NSF's cost data on IPA rotators, which NSF maintains separately from other data, NSF's cost data on VSEE rotators are partly commingled with data on other federal employees. In particular, NSF does not separate out data on the cost of VSEE salaries. Using the salary range for the type of position within NSF that VSEE rotators typically fill, we estimated that NSF's total cost for its 40 VSEE rotators' salaries in fiscal year 2017 was between \$5.0 million and \$7.0 million (about 2 to 3 percent of NSF's staffing costs).²⁰ NSF does separately track the cost of fringe

²⁰VSEE rotators typically fill program director positions within NSF. Those positions had a salary range of \$123,233 to \$174,569 from October, 2016 through May, 2017. In May 2017, the minimum salary increased to \$130,692.

benefits and retirement for VSEE rotators as these costs are set by the home institution and may be paid by NSF. These costs were about \$1.1 million in fiscal year 2017.

As we describe above, IPA rotators continue to receive their full salaries from their home institutions under cost-sharing agreements between NSF and the home institutions, and NSF does not subject these salaries to a cap. As a result, NSF can compensate IPA rotators at rates that exceed the federal maximum rate of pay for the positions that IPA rotators fill. However, the American Innovation and Competitiveness Act of 2017 requires NSF to annually submit a written justification for each rotator paid at a rate that exceeds the maximum Senior Executive Service rate.²¹ In fiscal year 2017, 63 of the 162 IPA rotators had salaries that exceeded the maximum.²² The salaries for these 63 individuals totaled about \$14.1 million and ranged from about \$188,000 to about \$311,000, with an average salary of about \$224,000.

According to NSF's January 2018 report, the agency considered various factors in hiring these 63 individuals—such as their past employment, accomplishments, and peer recognition—and weighed these factors against the scientific need for their expertise and the difficulty in filling the position, among other factors. NSF's report also stated that positions in certain fields of science, such as computer science and engineering, are difficult to fill in part because federal salaries are not necessarily competitive with the salaries for these types of positions in academia and industry. Under the IPA program, NSF can compensate rotators from such fields for the higher and potentially more competitive salaries that they receive from their home institutions. NSF officials told us that 36 of the 63 rotators whose salaries exceeded the maximum Senior Executive Service rate of pay in 2017 were in either the Directorate for Computer and Information Science and Engineering or the Directorate for Engineering. NSF officials also told us that the agency had the same

²¹Members of the Senior Executive Service serve in key positions just below the top Presidential appointees, and are the major link between these appointees and the rest of the federal workforce. The maximum Senior Executive Service rate of pay in 2017 was \$187,000 per year.

²²In January 2018, NSF reported that 64 IPA rotators had salaries that exceeded the maximum Senior Executive Service rate of pay. However, in April 2018 NSF officials told us that one of these reported IPA rotators ultimately did not come to NSF. Therefore, we excluded this individual from our analysis. National Science Foundation, *Congressional Report in Compliance with Public Law 114-329 American Innovation and Competitiveness Act Section 111 - Personnel Oversight* (Alexandria, VA: Jan. 8, 2018).

justification for hiring each of these IPA rotators at a rate that exceeded the maximum Senior Executive Service rate of pay: each rotator had exceptional expertise and experience and were the most highly qualified candidates.

NSF Primarily Used IPA Rotators in Executive and Program Director Positions and VSEE Rotators in Program Director Positions

NSF primarily used rotators across its seven scientific directorates, using IPA rotators in executive and program director positions and VSEE rotators in program director positions.²³ The agency used rotators in these positions alongside NSF's permanent staff to perform day-to-day agency operations, including managing the agency's merit review process for determining which projects to fund.

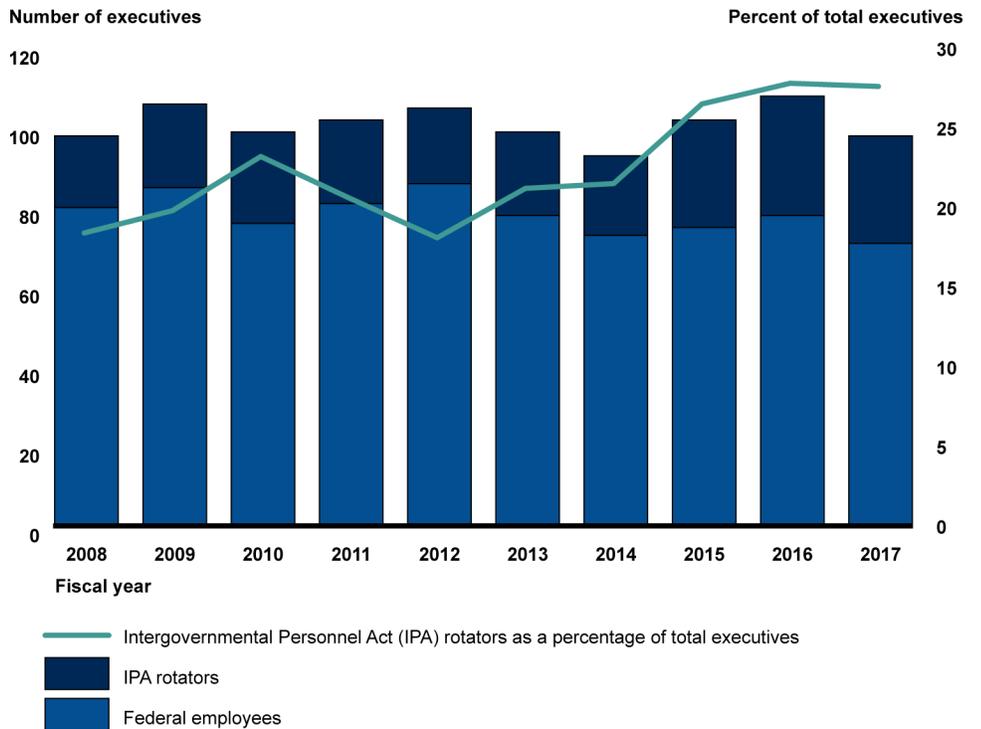
Use of IPA Rotators in Executive Positions

NSF used IPA rotators in executive positions such as assistant director. According to agency officials, individuals in executive positions at NSF are responsible for setting the direction for the scientific area they are assigned, leading scientific and technical matters, establishing an organizational culture, overseeing outreach and collaboration with NSF stakeholders, and contributing to NSF and national policy development and implementation. For example, an executive IPA rotator that we interviewed told us that he emphasized forming partnerships with industry when setting the direction for his directorate, including issuing joint solicitations for research proposals with industry partners. In addition, according to NSF officials, individuals in executive positions provide guidance and team management for staff.

The proportion of IPA rotators to federal employees in executive positions within NSF's seven scientific directorates and other staff offices has generally increased since fiscal year 2012. As shown in figure 4, from fiscal year 2008 through fiscal year 2017, the number and proportion of executive positions filled by IPA rotators ranged from 18 of 98 (about 18 percent) in 2008 to 30 of 108 (about 28 percent) in fiscal year 2016.

²³NSF officials told us that rotators are used less extensively in other NSF offices. For example, NSF officials told us in December 2017 that they had four rotators in the Office of Integrative Activities within NSF's Office of the Director and one rotator in the Large Facilities Office within the NSF's Office of Budget, Finance and Award Management.

Figure 4: National Science Foundation (NSF) Workforce Composition for Executives, Fiscal Years 2008 through 2017



Source: GAO analysis of NSF data. | GAO-18-533

Note: During this time frame, no Visiting Scientist, Engineer, and Educator rotators filled executive positions at NSF.

In November 2017, IPA rotators filled 29 of 88 (about 33 percent) executive positions within NSF’s seven scientific directorates.²⁴ At that time, the proportion of executive positions filled by IPA rotators varied among directorates, as shown in table 3. For example, IPA rotators filled 4 of 8 (50 percent) of the executive positions in the Directorate for Social, Behavioral, and Economic Sciences and 2 of 14 (about 14 percent) of the executive positions in the Directorate for Mathematical and Physical Sciences.

²⁴November 2017 was the date of the most recent data available at the time of our review.

Table 3: Executive Positions within the National Science Foundation’s (NSF) Scientific Directorates, November 2017

Directorate	Assistant director	Deputy assistant director	Other executives ^a
Biological Sciences	1 Intergovernmental Personnel Act (IPA) rotator	1 federal employee	2 IPA rotators 6 federal employees 1 vacancy
Computer and Information Science and Engineering	1 IPA rotator	1 federal employee	4 IPA rotators 4 federal employees 1 vacancy
Education and Human Resources	1 IPA rotator	1 federal employee	3 IPA rotators 6 federal employees
Engineering	1 IPA rotator	1 federal employee	4 IPA rotators 6 federal employees
Geosciences	1 IPA rotator	1 federal employee	5 IPA rotators 13 federal employees 1 vacancy
Mathematical and Physical Sciences	1 federal employee	1 federal employee	2 IPA rotators 9 federal employees 1 vacancy
Social, Behavioral, and Economic Sciences	1 IPA rotator	1 federal employee	3 IPA rotators 3 federal employees

Source: GAO analysis of NSF data. | GAO-18-533

Note: In November 2017, no Visiting Scientist, Engineer, and Educator rotators filled executive positions at NSF.

^a“Other executives” include division directors, office directors, deputy division directors, deputy office directors, section heads, and senior science advisors.

According to NSF officials, NSF often pairs IPA rotators and federal employees at the executive level so that each can benefit from the other’s experience and perspective. For example, in all but one directorate, an IPA rotator filled the assistant director position and a federal employee filled the corresponding deputy assistant director position.²⁵ Two NSF executives we interviewed, including an IPA rotator and a federal employee, commented positively on the pairing of IPA rotators and federal employees at the executive level. For example, they said that rotators maintain close ties to the research community and federal employees may have more experience with NSF’s institutional history. One NSF executive told us that IPA rotators help keep the agency at the

²⁵In November 2017, the Directorate for Mathematical and Physical Sciences had federal employees serving as the assistant director and the deputy assistant director.

forefront of science because they have deep ties with the research community and regularly publish their own research. Additionally, a federal program director we interviewed told us that in one previous instance in which an IPA rotator filled an executive position without being paired with a federal employee, the rotator's lack of institutional knowledge of NSF and the steep learning curve for the position caused inefficiencies during the rotator's first year at NSF. The agency, however, does not require pairing IPA rotators and federal employees at the executive level, according to NSF officials. For example, in November 2017, IPA rotators filled both the division director and deputy division director positions in the Division of Behavioral and Cognitive Science and Division of Undergraduate Education.

In our interviews with a nongeneralizable sample of NSF employees and rotators, we found mixed perceptions about the effect of NSF's use of IPA rotators on opportunities for advancement for permanent employees. For example, in response to a question about this effect, one permanent NSF employee told us that she advanced to an executive position and that opportunities exist for advancement within the agency. In contrast, another NSF employee we interviewed told us that she did not feel there were opportunities for advancement because, in her view, executive vacancies created by the departure of rotators were exclusively filled with other rotators. NSF officials said that the agency has no policy that restricts repeatedly filling certain executive positions with rotators and that such a situation is a common practice. Nevertheless, NSF officials told us 32 of the 88 executives (about 36 percent) in NSF's seven scientific directorates in November 2017 had held staff-level positions within the agency before becoming executives.

Use of IPA and VSEE Rotators as Program Directors

NSF uses both IPA and VSEE rotators in program director positions, which are staff-level positions. In fiscal year 2016, NSF had a total of 506 program directors, including 139 IPA rotators (about 27 percent) and 39 VSEE rotators (about 8 percent). According to NSF officials, program directors are responsible for conducting long-range planning and developing budgets for the areas of science represented by their program and for administering the merit review process. In particular, IPA and VSEE rotators who serve as program directors help determine the projects that NSF funds. To do so, they review proposals, identify experts in their field to serve as external reviewers, and make funding recommendations to their respective division directors.

NSF officials told us that, similar to the pairing of IPA rotators and federal employees at the executive level, permanent and rotating program

directors frequently work together on a shared program so that each can benefit from the other's experience and perspective. For example, a rotating program director we interviewed told us that she worked under the guidance of a program lead, who is typically a permanent employee. Another rotating program director told us that NSF's permanent federal employees are good at training incoming rotators.

NSF Adopted Rotator Program Cost-Management Strategies to Achieve the Greatest Savings with the Least Harm to Recruitment, but Results Are Unknown

Beginning in fiscal year 2017, NSF adopted rotator program cost-management strategies expected to achieve the greatest savings with the least harm to recruitment, but NSF officials said it is too soon to determine the full results because these new strategies are being phased in for new IPA agreements only. NSF considered other strategies to manage rotator costs, but it did not adopt them, generally because NSF anticipated negative effects on rotator recruitment or because it estimated the resulting cost savings would be small.

NSF Adopted Three Strategies to Manage IPA Rotator Costs in Fiscal Year 2017 and Has Not Yet Determined Their Full Results

NSF has adopted three strategies to manage rotators' costs in fiscal year 2017, but, NSF officials said it is too soon to determine the full results because these new strategies are being phased in for new IPA agreements only. All three of these strategies relate to IPA rotators; NSF officials told us that they have not considered or adopted any cost-management strategies related to VSEE rotators. The officials explained that any such strategies could affect NSF's entire federal workforce because VSEE rotators are federal employees. The three strategies are: (1) obtaining a minimum 10 percent cost-share from each IPA rotator's home institution, (2) limiting IPA rotators' paid trips to their home institutions to 12 per year, and (3) no longer reimbursing IPA rotators for consulting income that they forgo while at NSF. NSF officials told us they expect to issue a report with the results of evaluations of all three strategies in December 2018.

Cost-Sharing Pilot Program

In October 2016, NSF implemented a cost-sharing pilot program that requires institutions covered by the program—those who entered into negotiations for new IPA agreements in fiscal year 2017—to pay for at least 10 percent of the IPA rotators' salaries and fringe benefits. Implementing this cost-management strategy, and the other strategies that NSF adopted, was consistent with recommendations from NSF's

steering committee for oversight of IPA rotators.²⁶ This cost-management strategy targeted NSF's costs for IPA rotators' salary and fringe benefits, which constitute the largest component of IPA rotators' costs. For example, these costs were about \$34.7 million, or about 89 percent of IPA rotator costs in fiscal year 2017.

Previously, according to NSF officials, the agency requested an optional cost-share amount of 15 percent from rotators' home institutions, but it typically received less because of variations in the amounts that home institutions provided. According to an October 2016 report from the task force on fiscal oversight, NSF decided on 10 percent for the cost-sharing pilot program because, historically, few home institutions provided the full 15 percent and NSF believed a requirement of 10 percent would not significantly affect its ability to recruit and hire IPA rotators. If a home institution is unable to provide the full 10 percent, the institution may request that NSF waive the cost-sharing requirement. According to NSF officials, such requests must be signed by a senior administrator at the rotator's home institution and include the rationale for not being able to provide the required amount, the financial impact on the institution if it were to provide the full 10 percent, and associated documentation, among other things.

Changes made in implementing this strategy, and the other strategies that NSF adopted, applied to new IPA agreements made in fiscal year 2017. These changes did not apply to IPA rotators with agreements made prior to 2017—even if those agreements are subsequently extended or renewed—or that were being negotiated at the time of the policy change, provided that the rotators' appointment memoranda were already being reviewed by NSF's Division of Human Resource Management.

NSF officials told us that as of March 2018, the agency had not conducted full evaluations of this strategy or the other strategies because it was too soon to determine their full effects and NSF had not yet collected enough data to do so. Instead, NSF issued reports in January

²⁶NSF's steering committee for oversight of IPA rotators issued a report in August 2016 that included an analysis of various approaches for managing IPA rotator costs. The steering committee's task force on fiscal oversight issued an additional report with recommendations related to the cost-management strategies in October 2016.

and March 2018 containing its preliminary analyses.²⁷ In general, these preliminary reports found that the cost-management strategies resulted in savings to NSF. Similarly, our analysis of data from NSF found that cost sharing as a percentage of IPA rotators' salary and fringe benefits increased from about 7 percent in fiscal year 2016 to about 8 percent in fiscal year 2017.

NSF officials told us that of the 55 IPA rotators who were subject to the cost-sharing requirement in fiscal year 2017:

- the home institutions for 54 rotators met or exceeded the 10 percent cost-share requirement, and of those, 16 exceeded the cost-share requirement; and
- the home institution for 1 rotator did not cost-share because the rotator was from a Federally Funded Research and Development Center and NSF waived the cost-share requirement because cost-sharing would not decrease the overall federal cost.²⁸

In November 2017, NSF decided to extend the cost-sharing pilot through at least the end of fiscal year 2018, to ensure a full evaluation could be conducted. In particular, NSF officials told us that they need more data and experience with this pilot program to better understand its effects, such as the ability to recruit potential IPA rotators. For example, one IPA rotator that we interviewed expressed concern with the cost-sharing requirement's potential effect on small or publicly funded universities, which may lack funds to contribute to the cost of an IPA assignment. According to NSF officials, their evaluation will include an analysis of the cost of IPA rotators under the cost-sharing requirement and its effect on the IPA program, including recruitment.

²⁷National Science Foundation, *Congressional Report in Compliance with Public Law 114-329 American Innovation and Competitiveness Act Section 111 - Personnel Oversight*, (Alexandria, VA: Jan 8, 2018); and *Preliminary Findings and Recommendations from an Evaluation of the Changes to the IPA Program* (Alexandria, VA: March 2018).

²⁸Federally funded research and development centers are government-funded entities operated by nongovernmental organizations to meet long-term research or development needs that cannot be met as effectively by existing governmental or contractor resources. These entities typically assist government agencies with scientific research and analysis, systems development, and system acquisition.

Limitation on NSF-Funded Trips to IPA Rotators' Home Institutions

Beginning in fiscal year 2017, for IPA rotators who entered into negotiations for new agreements in that fiscal year, NSF placed a limit of 12 agency-funded trips per year that rotators may take to their home institutions under the Independent Research and Development program.²⁹ In our analysis of data from NSF, we found that NSF's costs for IPA rotators under this program decreased from about \$1.5 million (about 3 percent of IPA rotator costs) in fiscal year 2016 to \$1.1 million (about 3 percent of IPA rotator costs) in fiscal year 2017.

NSF officials told us that the new limit applies only to an IPA rotator's trips to their home institution and does not limit travel to other locations for fieldwork or scientific conferences, among other things. These officials explained that NSF chose not to limit trips to these other locations because they are considered fundamental to IPA rotators' research and are infrequent—occurring one to three times per year, on average, per IPA rotator. Additionally, rotators are permitted to use annual leave, leave without pay, or flexitime to take trips using non-NSF funds for activities performed on a rotator's own time.

In adopting this cost-management strategy, NSF sought to balance the benefits of IPA rotators' travel with the travel costs. According to the Task Force on Fiscal Oversight's October 2016 report, NSF's support for travel benefits the agency by providing a way for program directors and executives to stay current in their scientific fields, conduct outreach with scientific communities, and provide oversight and stewardship of NSF's programs and awards. NSF officials told us that the agency sought to control travel costs under the Independent Research and Development program by setting a reasonable limit to NSF-funded trips that would cause the least harm to rotators' research so as not to discourage them from coming to NSF. As a result, NSF decided on a maximum of 12 trips per year under this program because, historically, more than 80 percent of the IPA rotator participants traveled to their home institution less than once per month.

Elimination of Reimbursement for Lost Consulting Income

In fiscal year 2017, for IPA rotators who entered into new agreements in that fiscal year, NSF ended reimbursements for consulting income that the rotators forgo as a result of their assignment to NSF. Previously, when an IPA rotator discontinued consulting activities during an IPA

²⁹The program allows rotators with approved plans to maintain their involvement with their professional research and research-related activities, and NSF may reimburse them for associated travel expenses.

assignment, NSF would reimburse the rotator up to \$10,000 a year.³⁰ IPA rotators who entered into negotiations or agreements with NSF prior to this change may still receive this reimbursement. In fiscal year 2017, NSF's cost for lost consulting reimbursements to IPA rotators was \$150,000. This amount represented a decrease of about \$160,000, or about 52 percent, from fiscal year 2016. NSF made this change because it determined that doing so would not negatively affect the IPA program. In particular, NSF found that other federal science agencies typically did not reimburse IPA rotators for lost consulting income and it concluded that IPA rotators typically do not expect NSF to offer reimbursement.

NSF Did Not Adopt Certain Cost-Management Strategies It Considered Because of Small Cost Savings or Potential Negative Effects

In addition to the three adopted strategies, NSF's Task Force on Fiscal Oversight identified other potential cost management strategies for the IPA program. The task force reviewed various data on the costs that make up the IPA program, such as the number of IPA rotators who received a particular form of compensation or who would be affected by the potential strategies. In addition, the task force took into account anecdotal and other evidence on how IPA rotators might react to the strategies. Using input from the task force, NSF opted against the other potential strategies because it either (1) expected the resulting cost savings to be small or (2) anticipated potential negative effects from implementing them, such as increased difficulty in hiring IPA rotators. These potential cost-management strategies primarily related to IPA rotator compensation, as described below.

- **Capping IPA rotators' salaries.** NSF decided against establishing a salary cap for IPA rotators at various levels between about \$185,000 and \$240,000 annually. The task force found that salary caps at lower levels would have greater cost savings because of the higher number of individuals covered by the cap, but that the caps would also pose a significant risk to NSF's ability to recruit IPA rotators. In particular, the task force found that salary caps at lower levels would disproportionately affect IPA rotators in two of its directorates—the Directorate for Computer and Information Science and Engineering and the

³⁰According to NSF officials, IPA rotators may conduct consulting activities while on assignment to NSF, but must do so on their own time and independent of their NSF assignment. In addition, consulting activities need to be cleared by NSF's Office of General Counsel to ensure they are not in conflict with the IPA rotator's NSF duties or more general activities of NSF.

Directorate for Engineering—because of the higher salaries of individuals in positions associated with those fields. As a result, the task force recommended that NSF first assess the effects of its cost-sharing pilot program before proceeding with any cap on IPA rotators' salaries.

- **Reducing or eliminating IPA rotators' supplemental pay.** NSF decided against reducing or eliminating the supplemental pay that IPA rotators receive when their salary at their home institution is below the minimum for their NSF position. In fiscal year 2017, NSF's cost for IPA rotators' supplemental pay was \$1.0 million (about 3 percent of IPA rotator costs). The task force recommended against this potential cost-management strategy because it would disproportionately affect IPA rotators in two of its directorates—the Directorate for Biological Sciences and the Directorate for Geosciences. In addition, the task force expected that any cost savings associated with this strategy would be small.³¹
- **Reducing IPA rotators' per diem payments.** NSF decided against reducing or eliminating per diem payments for lodging (excluding taxes), meals, and incidental expenses incurred during the length of rotators' assignments. In fiscal year 2017, NSF's cost for per diem payments was \$3.1 million (about 8 percent of IPA costs).³² The task force concluded, based on its analysis of per diem costs and anecdotal evidence, that many IPA rotators would opt to depart NSF if NSF did not provide per diem payments. As a result, the task force recommended against this strategy.

³¹We further note that supplemental pay is required by the Intergovernmental Personnel Act.

³²IPA rotators may have the option of choosing either per diem payments, or a round-trip movement of household goods. NSF officials told us that only one individual choose the latter option in fiscal year 2017.

NSF Has Not Developed a Workforce Strategy for Using Rotators or Fully Evaluated Rotator Program Results

As of June 2018, NSF had not developed an agency-wide workforce strategy for using rotators, as its IPA program steering committee recommended. In addition, NSF has not fully evaluated or developed plans to evaluate both IPA and VSEE rotator program results in terms of progress toward NSF's human capital goals or programmatic results.

NSF Has Not Developed an Agency-Wide Workforce Strategy for Balancing Rotators and Federal Staff

As of June 2018, NSF had not developed an agency-wide workforce strategy that includes use of rotators, as NSF's IPA program steering committee had recommended. In an August 2016 report on the IPA program, the steering committee stated that NSF did not have an agency-wide workforce strategy; instead, each directorate made decisions on its own about when and how to use IPA rotators in executive and program director positions. According to the report, an agency-wide framework would enable NSF to ensure an optimal balance of federal and rotator executives and program directors, which is a strategic principle that the steering committee developed for the IPA program.

In February 2017, the committee issued an internal report to agency leadership that recommended expanding what was originally envisioned as a workforce strategy for the IPA program into a comprehensive agency-wide workforce strategy. The report stated that expanding the scope of the workforce strategy would have the greatest impact across the agency and would help NSF leadership in making strategic human capital decisions. The report outlined a process for developing a workforce strategy with various steps, including the following:

- **Job analyses.** The report recommended job analyses to review the roles and responsibilities of executive and staff-level positions and to identify the skills and capabilities required for successful performance of the work. According to the report, the steering committee's working group for developing a workforce strategy found, based on its initial efforts to review position descriptions and roles and responsibilities, that some functions may be better served if performed by permanent federal employees and other functions by rotators. However, the working group concluded that NSF should obtain additional input and evidence before initiating large-scale changes in its workforce.

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- **Analysis of workforce gaps and surpluses.** The report stated that identifying gaps and surpluses in the demand and supply for federal and rotator scientific staff would inform opportunities to optimize recruitment and retention efforts. The report recommended separate analyses for executive and scientific staff-level positions.
 - **Development of strategies to close workforce gaps and address surpluses.** According to the steering committee's report, examples of strategies include succession planning and rebalancing the mix of permanent federal staff and rotators to ensure an optimal workforce with the skills, experience, and capabilities to accomplish NSF's science-related work.

According to NSF officials, the agency's Division of Human Resource Management was responsible for implementing the steering committee's recommendation. In particular, it undertook an effort to work with senior leadership to develop a broad strategic workforce plan for the agency.³³ However, in June 2018, NSF officials told us that they shifted their focus from developing a separate workforce strategy in order to focus instead on (1) development of a human capital operating plan, which agencies are required to develop and approve annually, and update as needed, under OPM regulations that went into effect on April 11, 2017; and (2) an Office of Management and Budget (OMB) memorandum issued in April 2017 directing agency heads to develop reform plans that identify ways to improve the efficiency, effectiveness, and accountability of their respective agencies. The NSF officials explained that they recognized the value in having a workforce strategy, but they did not consider it appropriate for the Division of Human Resource Management to develop a workforce strategy at the same time that the agency was completing the OPM and OMB plans.

NSF did not specify how its efforts to complete the OPM and OMB plans would address the need the steering committee identified for an agency-wide framework that would enable NSF to ensure an optimal balance of federal and rotator executives and program directors. In particular, NSF's human capital operating plan, which it approved in April 2018, does not discuss NSF's use of rotators or include information on balancing the

³³NSF officials told us that the agency's Chief Human Capital Officer and the Division of Human Resources, rather than the steering committee for the IPA program, are responsible for implementing the agency's strategic human capital planning. According to agency officials, the Director of the Division of Human Resources—who is also the Chief Human Capital Officer—participates in the steering committee's meetings.

agency's use of rotators with permanent staff. Furthermore, NSF has not yet determined how it will address its use of rotators as part of its agency reform plan. In particular, NSF officials told us in June 2018 that they may address the agency's use of rotators under the workforce focus area of its reform plan, but that they were only just beginning to identify and select initiatives under this focus area and that these initiatives have not yet been finalized.

The process the NSF steering committee laid out in its internal report, when implemented, would align with two key principles GAO has identified for effective strategic workforce planning.³⁴ Specifically, it would align with the principles of (1) determining the skills and competencies that are critical to successfully achieving missions and goals, and (2) developing human capital strategies to address gaps and enable the contribution of critical skills and competencies needed for mission success. By incorporating the NSF's steering committee's recommendation for a workforce strategy—and the process outlined by the steering committee for developing this strategy—into its human capital operating plan or agency reform plan, NSF could better manage its use of rotators and balance them with its permanent staff.

NSF Has Not Fully Evaluated the Rotator Program's Progress toward Human Capital Goals or Their Programmatic Results

We have previously found that high-performing organizations recognize the fundamental importance of measuring both the outcomes of human capital strategies and how these outcomes have helped the organizations accomplish their missions and programmatic goals.³⁵ However, as of May 2018, NSF had not fully evaluated and did not have plans to evaluate the results of its IPA and VSEE rotator programs in terms of progress toward human capital goals and the contributions the programs made toward achieving programmatic results. One of GAO's key principles for effective strategic workforce planning states that agencies should monitor and evaluate progress toward the agencies' human capital goals and the contribution that human capital results have made toward achieving programmatic results. In particular, we previously found that evaluation activities can improve the effectiveness of workforce strategies by identifying shortfalls in performance and other improvement opportunities.

³⁴[GAO-04-39](#).

³⁵[GAO-04-39](#).

OPM also requires agencies to develop a human capital operating plan that will support the evaluation of the agency's human capital strategies.³⁶

In March 2014, NSF published a summary of the results of focus groups with IPA rotators and their supervisors. This summary outlined benefits and challenges of the program from the perspectives of both groups, such as the benefit of bringing fresh perspective and new ideas to NSF and the challenge of recruiting and retaining qualified IPA rotators.³⁷ However, the summary did not provide the agency's assessment of progress towards programmatic results and human capital goals. For example, it summarized the benefits of the program from the standpoint of rotators and did not provide NSF's assessment of how individual IPA rotators or the program as a whole contributed to NSF's scientific mission. In addition, the summary did not provide an assessment of the extent to which the current workforce balance of federal and rotator executives and program directors is aligned with NSF's work. In our semistructured interviews with federal staff and rotators in executive and staff-level positions at NSF, most were comfortable with the current balance, but three individuals raised concerns about the use of rotators in executive positions, suggesting that NSF could benefit from further analysis of its balance of rotators and federal staff.

In April 2018, NSF adopted its human capital operating plan which identifies specific, short-term actions that the agency will take to achieve its human capital goals. In its plan, NSF identified strategies derived from NSF's commitment to ongoing improvement, such as reviewing and realigning its workforce to meet future needs. Also, NSF's process for developing a workforce strategy, outlined in the steering committee's February 2017 internal report, included recommendations to conduct an assessment of the outcomes of workforce strategies and the impact of these outcomes on helping NSF accomplish its scientific mission and related programmatic goals. However, plans for this assessment did not include an evaluation of the agency's rotator programs. Moreover, neither the steering committee's February 2017 internal report nor NSF's April 2018 report committed to conducting such an evaluation or specified how assessments described in its reports would address NSF's rotator programs. For example, neither report specified how NSF would evaluate

³⁶5 C.F.R. § 250.205(d) (2018).

³⁷National Science Foundation, *IPA Assessment Report – Summary of Focus Group Findings* (March 2014).

the extent to which the rotator programs have achieved NSF's objectives, which we identified through our review of NSF documentation and interviews with NSF officials. These objectives include:

- bringing fresh perspectives from across the country and across all fields of science and engineering supported by NSF;
- helping influence new directions for research in science, engineering, and education, including emerging interdisciplinary fields;
- providing scientific leadership and management of NSF's research and education programs; and
- providing opportunities for researchers to gain first-hand knowledge of the philosophy and mechanisms of federal support for research and bring this knowledge back to their home institutions.

According to NSF officials, the agency has not separately evaluated the results of its rotator programs in part because rotators are blended into its permanent federal workforce, making it difficult to evaluate the results of its rotator programs separately from those of its overall workforce. In our December 2003 report on key principles for effective strategic workforce planning, we found that federal agencies in general have experienced difficulties in defining practical and meaningful measures that assess the effects human capital strategies have on programmatic results. However, without an evaluation of the extent of the rotator programs' contributions toward NSF's human capital goals or programmatic results, NSF is limited in its ability to demonstrate the programs' benefits to external stakeholders, such as the Congress, and to adjust the programs, if warranted. Such adjustments could include increasing or decreasing the use of rotators overall or in certain types of positions, such as executive or staff-level positions.

Conclusions

In recent years, NSF has recognized the need to think more strategically about its use of rotators and has taken positive steps to manage its rotator programs. For example, beginning in fiscal year 2017, NSF adopted several strategies to manage the cost of rotators. However, as of June 2018, NSF had decided against developing a separate agency-wide strategy for balancing its use of IPA rotators and federal staff, as NSF's steering committee for the IPA program recommended in February 2017. NSF officials said that they recognized the value in having a workforce strategy but wanted to focus instead on addressing OPM and OMB

requirements related to workforce planning. By following through on the steering committee's recommendation for a workforce strategy, NSF could better manage its use of rotators and balance them with its permanent staff.

Moreover, as of June 2018, NSF had not fully evaluated the results of the rotator programs, as called for by key principles for effective strategic workforce planning. NSF officials told us they have not done so, in part, because rotators are blended into NSF's permanent federal workforce, making it difficult to evaluate the results of its rotator program separately from those of its overall workforce. However, without an evaluation of the extent of the rotator programs' contributions toward NSF's human capital goals or programmatic results, NSF is limited in its ability to demonstrate the programs' benefits to external stakeholders, such as the Congress, and to adjust the programs, if warranted.

Recommendations for Executive Action

We are making the following two recommendations to NSF:

The NSF Director of Human Resource Management should complete the development of an agency-wide workforce strategy for balancing the agency's use of IPA and VSEE rotators with permanent staff as part of NSF's current agency reform planning efforts or updates to its human capital operating plan. (Recommendation 1)

The NSF Director of Human Resource Management should evaluate the contributions of the IPA and VSEE rotator programs toward NSF's human capital goals and the contributions the programs have made toward achieving programmatic results. (Recommendation 2)

Agency Comments

We provided a draft of this report to NSF for comment. In its written comments, which are reproduced in appendix I, NSF concurred with our recommendations and stated that implementation of the recommendations will enhance efforts to fulfill the agency's mission and strengthen its workforce. NSF also provided technical comments, which we incorporated as appropriate.

We are sending copies to the appropriate Congressional Committees, the Director of the National Science Foundation, and other interested parties. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or neumannj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix II.

Sincerely yours,

A handwritten signature in black ink, appearing to read "John Neumann", with a long horizontal flourish extending to the right.

John Neumann
Director
Natural Resources and Environment

Appendix I: Comments from the National Science Foundation



OFFICE OF THE
DIRECTOR

NATIONAL SCIENCE FOUNDATION
2415 EISENHOWER AVENUE
ALEXANDRIA, VIRGINIA 22314

August 14, 2018

John Neumann
Director
Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, NW
Washington, D.C. 20548

Dear Mr. Neumann:

The National Science Foundation (NSF) appreciates the opportunity to review and provide comments on the Government Accountability Office (GAO) draft report, *NATIONAL SCIENCE FOUNDATION: A Workforce Strategy and Evaluation of Results Could Improve Use of Rotating Scientists, Engineers, and Educators (GAO-18-533)*. This assessment provides NSF with an independent perspective on the agency's use of the Intergovernmental Personnel Act (IPA) and Visiting Scientists, Engineers, and Educators (VSEE) rotators program at the Foundation.

The agency's IPA and VSEE rotators program is a vital component of the Foundation's human capital strategy, and one of the central ways NSF maintains a strong connection to the research community. As discussed throughout GAO's review of the agency's IPA and VSEE rotators program, NSF is dedicated to continuing the robust management and ongoing improvements of this program. The Foundation recognizes the importance of having a workforce strategy and has historically practiced an agency-wide approach of applying directorate-level allocations for IPA and VSEE rotator slots to complement its workforce.

NSF concurs with the recommendations made by GAO for additional actions the agency should take to improve the IPA and VSEE rotators program. With the implementation of these recommendations, NSF will enhance the efforts already committed to fulfilling the agency's mission and strengthening its workforce. Additionally, NSF greatly values the contributions of IPA and VSEE rotators and recognizes the importance of periodically conducting an evaluation to measure and document the impact.

On behalf of the NSF staff participating in the GAO review, I would like to acknowledge the GAO team for their diligence and commitment to enhancing NSF's oversight policies and practices. Please contact Veronica Shelley at (703) 292-4384, if you have any questions or require additional information.

Sincerely,

A handwritten signature in cursive script, appearing to read 'France A. Córdoba'.

France A. Córdoba
Director

2415 Eisenhower Avenue, Suite 19100 Alexandria, VA 22314

Appendix II: GAO Contact and Staff Acknowledgments

GAO Contact

John Neumann, (202) 512-3841 or neumannj@gao.gov

Staff Acknowledgments

In addition to the individual named above, Joseph Cook (Assistant Director), Nkenge Gibson, Kathryn Smith, and Douglas Hunker made key contributions to this report. Also contributing to this report were Antoinette Capaccio, Serena Lo, Timothy Guinane, Cynthia Norris, and Sara Sullivan.

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