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The Biggest Bang Theory

How to get the most out of the competitive search for STEMM employees

MAY 2013



PARTNERSHIP FOR PUBLIC SERVICE

Booz | Allen | Hamilton

The Partnership for Public Service is a nonpartisan, nonprofit organization that works to revitalize the federal government by inspiring a new generation to serve and by transforming the way government works.

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EXECUTIVE SUMMARY

Talent in the science, technology, engineering, mathematical and medical (STEMM) professions is mission-critical for government. The National Aeronautics and Space Administration (NASA) needs top scientists to land a mission on Mars. The Department of Veterans Affairs (VA) needs the best physicians to treat those who have served in Afghanistan, Iraq and other conflicts. And every agency seeks to hire first-class information technology experts who can enhance the way our country serves its citizens and also protect our networks from cyber attack.

But the federal government faces stiff competition from the private sector and academia in hiring top candidates for positions in the STEMM professions—an acronym expanded for this report from the more common “STEM” to include medical professionals, who also are in high demand and often short supply in the public sector.

With advances in many scientific and technological areas—think cancer treatments, genetics, Higgs boson particle research, supercomputing and other exciting innovations on the horizon—the limited number of STEMM employees with high-level skills are in great demand.

Federal agencies need to use creative and effective recruiting strategies and the government’s inherent and often unique advantages if they hope to win over the STEMM employees they covet. They must woo these professionals, with all the tools at their disposal, for jobs

ranging from rocket scientists, nuclear engineers, chemists, biologists and cryptanalysts to food scientists, architects and medical researchers.

If STEMM hiring is competitive now, it is likely to border on cutthroat in the forecasted hypercompetitive future.

Federal agencies often find it difficult to compete with companies on salary or workplace intangibles such as free food, Ping-Pong or a T-shirts-and-shorts culture. But the reverse is true, too. The federal government offers advantages that other employers cannot match, such as the chance to perform unique jobs for the country or to make a difference on a national or even international scale. To attract experienced STEMM professionals and students launching their careers, agencies must showcase the cutting-edge technologies, the “shiny toys” sometimes available only in government labs—such as particle accelerators, laser weapons or fusion chambers—and convince potential applicants why they should choose public service as the best place for them to apply their skills and creativity. In the STEMM portion of the labor market—a “sellers’ market” for these skilled employees—it is an imperative that federal agency “buyers” pay attention to the activities that will keep them a viable and desired option as an employer.

The Partnership for Public Service and Booz Allen Hamilton undertook this study to gain a better understanding of how the federal government and the private

sector recruit and hire STEMM talent, and to determine the best practices for doing so. Our interviews with agency officials and private-sector employers identified practices that can help agencies sharpen their game for STEMM hiring.

Based on our interviews, we found many positive, proactive steps agencies are taking to bring top STEMM talent on board, practices that in many cases can be replicated across government. These agencies operate under most of the same constraints as any other but they have worked within the system to maximize their hiring impact by marketing their strengths, counting on their current STEMM talent for help, making good use of the Internet and recruiting young talent, among other effective practices. Agencies can:

Use the mission as the magnet

Market the unique STEMM features that only your agency offers

Mine the diamonds as they are forming

Recruit “upstream” for a more powerful effect

Send out the Sheldons

Enlist peers to help recruit STEMM talent

Keep their eyes on an XPRIZE

Use competitions to open the door to talented people

Go virtual

Head online to promote and publicize exciting jobs and missions

Offer quantum-leap career paths

Give STEMM talent the opportunity for varied assignments throughout their careers

Start a chain reaction

Share lists of pre-screened candidates throughout your agency

Beta-test your talent

Give potential candidates substantial assignments to test their skills

Create a parallel universe

Offer a dual-track career trajectory

Find the prime numbers

Use data and dashboards to evaluate hiring, performance and job satisfaction

We also found that Congress, the administration and agency leadership each can play a role in enhancing the government’s ability to hire STEMM talent. In the final section of this report we recommend actions each should take to assist agencies in meeting their critical STEMM hiring needs. Among other activities, agencies should create scholarships so they can demonstrate their work and mission to high school and college students, encourage rotation assignments for all STEMM employees and offer employee-referral bonuses to motivate employees to help find and recruit top people.

The Office of Personnel Management (OPM) should provide direct-hire authority to agencies for all STEMM occupations, and use existing authority to create and sponsor a STEMM version of the Presidential Management Fellowship program to bring in a highly talented pool of applicants. Congress has a role to play as well. Many non-U.S. citizens contribute stellar research and other highly needed skills in STEMM fields but are unable to serve in full-time government positions. Congress should examine the necessity of the requirement for employees in STEMM fields to be U.S. citizens, or consider creating a citizenship path similar to the Department of Defense’s Citizenship for Service clause, which allows non-U.S. citizens serving in the U.S. Armed Forces, and certain veterans, to be eligible for full citizenship.

INTRODUCTION

THE STEMM CHALLENGE

About a quarter of the federal government is composed of people with STEMM skills who forecast the weather, research plant and crop health, analyze the economy, protect us against cyber attacks and much more. As the demand for STEMM talent increases—the Bureau of Labor Statistics’ Economics and Statistics Administration projects the need nationwide to increase by 24.1 percent between 2010 and 2020¹—and the supply shrinks, the ability of the government to fill critical STEMM positions is at risk.

In addition, there is a lack of awareness among the general public, and therefore among students in STEMM fields, about the many federal opportunities for qualified candidates. Someone who goes to veterinary school, for example, is well aware of the positions available at an animal hospital but may not think about the numerous veterinary science positions at 18 federal agencies, including the departments of Agriculture, Health and Human Services, and Interior. For instance, veterinarians might work to certify the health of animals and byproducts for import and export, oversee quarantine, help with the detection of agro-terrorism or bioterrorism threats, work on international teams and overseas programs, or monitor wildlife on federal lands.

¹ David Langdon et al, “STEM: Good Jobs Now and For the Future,” U.S. Department of Commerce, Economics & Statistics Administration, July 2011, <http://www.esa.doc.gov/sites/default/files/reports/documents/stemfinaljuly14.1.pdf> (accessed May 1, 2013).

LARGE FEDERAL AGENCIES WITH THE HIGHEST PERCENTAGE OF STEM M EMPLOYEES

NASA
 % STEM **68%**
 TOTAL STEM 11,904
 TOTAL EMPLOYEES 17,386



NRC
 % STEM **63%**
 TOTAL STEM 2,317
 TOTAL EMPLOYEES 3,696



VA
 % STEM **56%**
 TOTAL STEM 157,883
 TOTAL EMPLOYEES 280,183

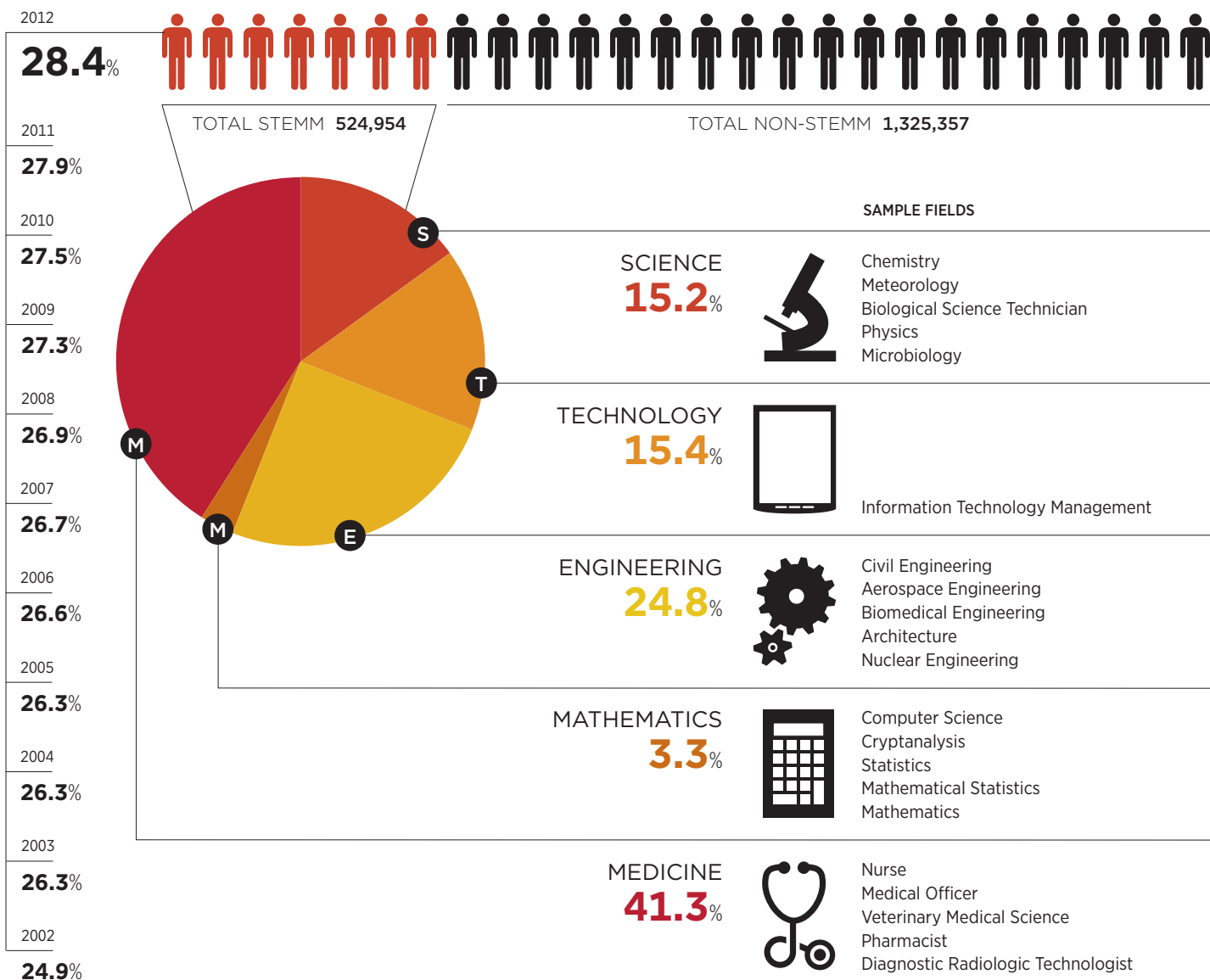


HHS
 % STEM **50%**
 TOTAL STEM 30,030
 TOTAL EMPLOYEES 60,209



Fed STEMM Stats

FEDERAL EMPLOYEES GOVERNMENT-WIDE



USDA

48%

36,997

77,056



EPA

44%

7,235

16,498



COMMERCE

42%

14,256

34,236



INTERIOR

37%

19,305

52,886



NAVY

35%

65,850

190,752



DOE

32%

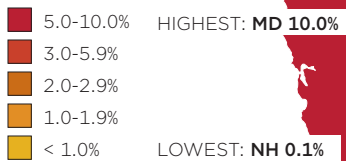
4,883

15,168

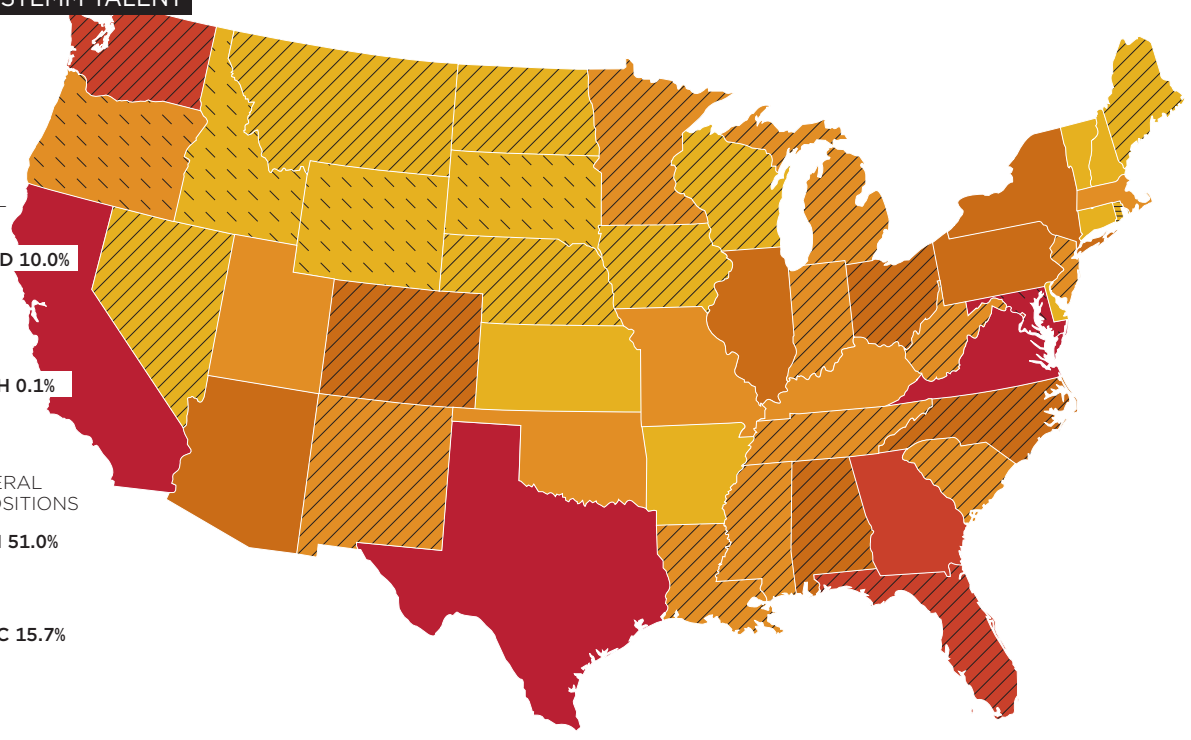
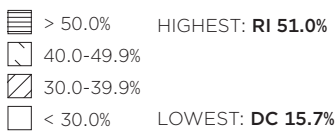


LOCATION OF FEDERAL STEMM TALENT

DISTRIBUTION OF FEDERAL STEMM WORKFORCE



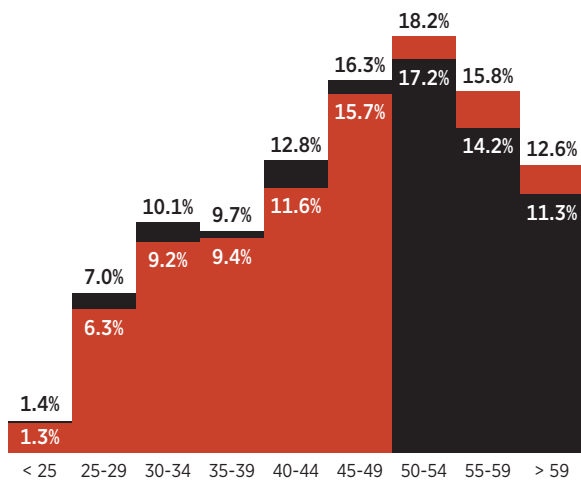
PERCENT OF STATE'S FEDERAL WORKFORCE IN STEMM POSITIONS



GOVERNMENT-WIDE COMPARISON OF STEMM VERSUS NON-STEMM EMPLOYEES

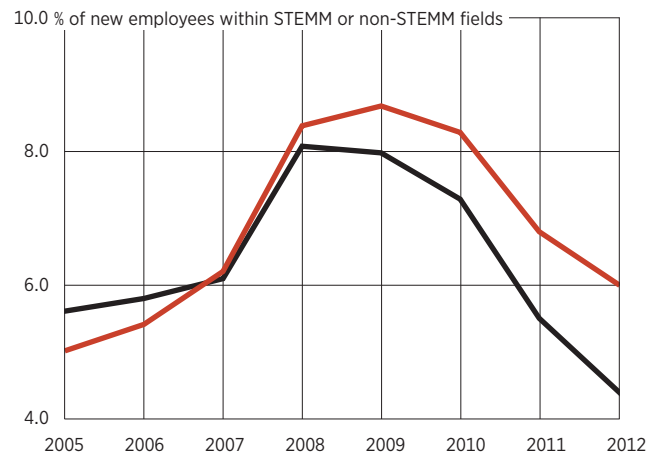
AGE DISTRIBUTION

■ TOTAL STEMM
■ TOTAL NON-STEMM



HIRING RATES

■ TOTAL STEMM
■ TOTAL NON-STEMM



In examining the STEMM hiring challenges for government, we interviewed officials from 11 federal agencies and subcomponents and five private-sector companies—selected for their wide-ranging needs for STEMM talent, the percentage of their workforce comprising STEMM occupations and their understanding of the best ways to recruit these employees—eliciting insights, success stories and innovative practices that are yielding good results. The government officials we interviewed represented:

Department of Agriculture (USDA)
Department of Energy (DOE)
Department of the Navy’s Naval Research Laboratory (NRL)
Department of the Navy’s Naval Surface Warfare Center Dahlgren Division (NSWCDD)
Department of Defense’s National Security Agency (NSA)
Department of Defense’s Defense Advanced Research Projects Agency (DARPA)
Department of Defense’s National Geospatial-Intelligence Agency (NGA)
National Aeronautics and Space Administration (NASA)
Department of Commerce’s National Institute of Standards and Technology (NIST)
Department of Health and Human Services’ National Institutes of Health (NIH)
Nuclear Regulatory Commission (NRC)
National Science Foundation (NSF)
Department of Veterans Affairs’ Veterans Health Administration (VHA)

We also interviewed five private-sector companies with STEMM talent needs:

Adventist HealthCare
Chevron
Micron Technology, Inc.
Palantir Technologies
United Technologies Corporation

Private- and public-sector hiring managers informed us about their recruiting methods, brand positioning, retention strategies, activities for improving employee satisfaction and other steps they take to enhance the hiring and retention of STEMM employees. We also learned about challenges the government faces with stepped-up

retirements, the inability to hire non-U.S. citizens, the lack of perks similar to those the private sector can provide, pay disparities between the public and private sectors, and the need to meet certain policy and objectives, such as diversity in hiring. Additionally, while many non-U.S. citizens make important contributions in STEMM fields, it is extremely rare that they are hired for full-time positions. Many interviewees said this is a major obstacle to recruiting the right STEMM talent. But any fix would require congressional action on citizenship requirements.

HOW TO INCREASE THE GOVERNMENT'S ODDS OF LANDING THE BEST STEMM TALENT

To stay competitive with the Googles and the Apples of the world, many federal managers and human resources officials have become creative with their recruiting techniques, coming up with innovative ways to compete for STEMM talent. On the following pages, we illustrate how agencies are marketing the unique advantages of government jobs: sending their STEMM talent to network and recruit at the high school and college levels, running science competitions to unearth talent and more. We found at least 10 innovations that agencies are using that other agencies can replicate.

Use the mission as the magnet



Market the unique STEMM features that only your agency offers

Many people aspire to serve their nation because they want to make a difference in the lives of others, and they draw a sense of pride from serving their country. This is government's unique asset. But not enough agencies use the appeal of their mission to impress potential employees. They must promote how their mission contributes to the protection, health and safety of the nation, and communicate how it is distinctively desirable to further that mission.

One good example of STEMM-specific mission branding can be found on the National Security Agency's (NSA) website. A recruiting video lets potential candidates listen to "Julie" explain that after attending a summer employment program at the agency, "I discovered that there was a whole network of people, all over the country, who love math as much as I do. So it gradually dawned on me: cracking foreign codes—what a cool idea." She adds, "Some of the toughest problems facing the nation come through NSA. Just look around. Wherever there is international conflict, terrorist threats or

drug trafficking, we are the ones getting the intelligence about it."

The U.S. Marine Corps and the U.S. Army are among the uniformed services that have done this well, portraying alluring and action-packed missions and activities.

STEMM agencies can and should be detailing and publicizing the frontline science and technology work they perform, focusing on the aspects of their mission that could excite potential STEMM employees and how they can brand and market these selling points. Many companies, nonprofits and military branches excel at branding their name and image so both are readily recalled in the minds of the public. People are known to say "I'm an IBM-er." The Army calls on future soldiers to "Be All You Can Be." Few government agencies have made marketing a priority, yet to stay competitive, they will need to focus on selling themselves and their advantages, according to our interviewees.

That focus is even more important for agencies without the name recognition or cachet of an organization such as National Aeronautics

and Space Administration (NASA) or that are located in less-than-desirable geographic locations. They must communicate the appeal of particular projects and the work environment, as well as the caliber of colleagues STEMM candidates would find there. Many Nobel laureates in STEMM fields have come from federal agencies—for example, John C. Mather of NASA Goddard Space Flight Center, who shared the 2006 Nobel Prize for Physics for collaborative work on understanding the theory of the Big Bang. Agencies need to publicize stories like these to spark excitement and ambition in others.

Without large sums of marketing money, agencies use other ways to focus branding or marketing efforts on STEMM talent in specific occupations and the employment prospects for them. "You have to find a compelling story and tell it to the community that cares," said a NASA interviewee. At the National Institute of Standards and Technology (NIST), for example, many scientists think of their work as their life's passion and are excited to dive



into it each day, said a hiring manager. NIST highlights its respected reputation by, among other things, by sending its scientists to present at conferences aimed at members of the physics community. NIH kindles interest in its mission of ensuring the health of American citizens through research on AIDS, cancer and other diseases. Other agencies do intelligence work that takes down terrorists, provide solutions to the energy crisis or develop technology that saves lives.

Sometimes, longtime strategies for marketing need to be updated due to a change in an agency's circumstances, interviewees said. For example, NASA had to rebrand its mission after the space shuttle program was terminated. People were wondering what the agency would do next. NASA did not want questions and doubts to linger, particularly among potential job applicants. "We reinvented ourselves in a really short time window," said a NASA official. "Until we landed the [Curiosity] Rover on Mars, people thought we were gone." The rebranding allowed the agency to ground itself

within the scientific community and introduce the public and potential STEMM employees to its evolving mission. Even with the shift, NASA's brand remains so strong, a top agency official said, that many contract employees say they work for NASA rather than for the contracting corporation that signs their paychecks.

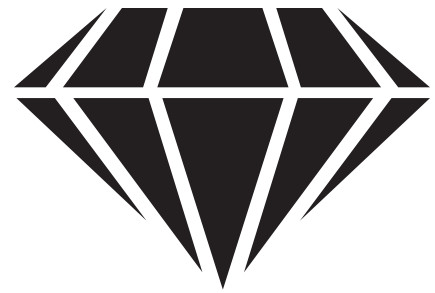
Student work programs have proven to be effective tools for recruiting and hiring STEMM talent. "Unless a candidate can experience the work here for a summer, it really doesn't resonate," said one interviewee. Agencies are able to show off and market their strengths directly to these student interns or graduate fellows by bringing them in to work on intriguing projects, cutting-edge research or interesting laboratory facilities. NSA hires about 400 students in the summer, sometimes even having them try to solve math problems that are giving the agency's mathematicians trouble, and somewhere between 85 and 90 percent of them come back and work for the agency when they are finished with school.

Internships not only are effec-

tive for testing out STEMM talent, but also provide a cost-effective method for agencies to meet their STEMM workforce needs. Many agencies we spoke with stressed the quality and importance of the work interns did; one said his agency "would have a hard time reaching research goals without students."

The message about the valuable work that agency employees perform also should be conveyed to existing employees, interviewees said, so they hear inspiring stories about the mission and remain aware of the agency's core message. Emphasizing employees' impact helps them remain passionate about their work and fosters dedication, helping with employee retention at a time when the federal government has been the target of a barrage of negative publicity.

Mine the diamonds while they are still forming



Recruit “upstream” for a more powerful effect

Agencies successful at STEM hiring cast their nets early to bring in high-quality young people. Many focus on recruiting college students, but determined agencies often start even younger. National Institutes of Health (NIH) broadens the student pool in this way, offering summer internships at some of its 27 institutes to STEM students as young as their mid-teens up through the college level. Students work with leading scientists in biomedical research and are encouraged to participate in professional development workshops and attend lectures from NIH scientists. For example, NIH’s Office of Research on Women’s Health runs a summer program for high school students from Maryland, Virginia and Washington, D.C., to learn how to design and perform experiments and present research findings. These NIH opportunities have the potential to spark interest in government careers among students unfamiliar with STEM opportuni-

ties at federal agencies and laboratories, capturing their imaginations by demonstrating how their school studies translate into exciting, real-life projects and experiences.

NSA helps sponsor a high school mathematics summer camp and runs a summer employment program in STEM fields during which students have a chance to meet others like them and learn about what NSA work might interest them. The agency’s numerous summer STEM opportunities for high school, undergraduate and graduate students include: the Gifted and Talented Program designed for high school students who have demonstrated an aptitude for engineering, math and science; the highly competitive Director’s Summer Program for undergraduate mathematics majors who have distinguished themselves in national mathematics and other competitions, or in undergraduate research; and the Cryptanalysis and Exploitation Ser-

vices Summer Program (exploitation refers to computer hacking) for undergraduate students majoring in mathematics or computer science. The agency also works closely with colleges, getting involved in curriculum development.

Several other agencies have found value in exposing students to their missions and programs. For example, the Intelligence Community (IC) gives to colleges and universities competitive grants of up to five years in duration that fund the development and delivery of courses in skills that are in demand in the IC, including the sciences, engineering, technology and mathematics. The grant program, run by the IC’s Centers for Academic Excellence, was established in 2005 under the Office of the Director of National Intelligence (ODNI) in response to the increasing need for highly trained analysts with the skills to carry out the country’s national security objectives. The grants also foster long-

term partnerships with the universities that receive the grants, which increases the chances that their students will apply for federal jobs upon graduation.

Interviewees also underscored the need for better outreach so student programs can reach their full potential. For instance, NIH brings elementary and high school children on tours of its facilities as part of its mission is “to expand the knowledge base in medical and associated sciences.” The agency hopes that young science students will remember their visit and consider NIH for their career.

Scholarship programs are another effective way to open agency doors to talented students. Intelligence agencies such as NSA offer the Stokes Educational Scholarship Program, which offers up to four-year scholarships to promising high school seniors, particularly women and minority students, who have demonstrated the potential to learn skills critical to the agencies. For example, NSA scholarship winners attend college full time, receive up to \$30,000 a year for tuition and fees and work at the agency for 12 weeks during the summers, in areas related to their studies. Computer scientists might apply their skills in areas such as applications programming, computer security and graphics, or the design and implementation of systems software. Computer and electrical engineers might work in pure and applied research, design, development and testing, project management or systems analysis. For each year of their participation in the program, students must agree to serve at the agency for at least a year and a half after they graduate. Similarly, the Pat Roberts Intelligence Scholars program authorizes most intelligence agencies to offer, among other things, two-year scholarships and post-employment graduate fellow-

ships to candidates, or employees, in mission-critical occupations, both in exchange for a comparable post-program service commitment.

NASA also has the authority to offer scholarships to promising STEM students, as does NIH. For example, the NIH Undergraduate Scholarship Program provides competitive scholarships to students from disadvantaged backgrounds who commit to careers in biomedical, behavioral and social science health-related research. In addition to scholarship support of up to \$20,000 tuition per year plus educational expenses, they receive paid research training at NIH during the summer and paid employment and training after graduation. Another program, Scholarship for Service, which is managed by the National Science Foundation (NSF), gives scholarships to students in the computer sciences, computer engineering, and information security fields—also requiring a post-graduate service commitment—to increase the pool of candidates available to federal agencies in these critical areas. The scholarships cover the cost of books, tuition and room and board, as well as up to \$8,000 in stipends for undergraduates and up to \$12,000 for graduate students.

STEM professionals often want to go back to school but keep their job, interviewees said. To accommodate them, NSA offers the “After Hours” program, which provides full tuition reimbursement, and a “20/20” program that allows high-performing STEM employees to work 20 hours a week and maintain their salaries while spending half the week pursuing a higher degree.

As part of its PALACE Acquire Program in science and engineering, the U.S. Air Force offers applicants who have at least a B.S. degree for civilian positions in the sciences

and engineering a three-year development and training program that includes a year of graduate studies relating to state-of-the-art technology. Recipients receive work experience during the first and third years and are paid their salary while they do graduate studies the second year, with tuition, fees and books all covered. At the end of the development period, they are promoted to journeyman-level engineer or scientist. For other PALACE Acquire positions, students finishing their last year of a four-year college degree receive a full-time position while they complete a two- to four-year formal training plan at the agency. When the training is complete, individuals are offered a permanent position with AFCS. The agency seeks students in science, engineering, intelligence, meteorology and medicine, among other fields.

All federal scholarship programs go a long way toward winning over STEM students, who get to experience real-world STEM challenges and are excited by the opportunities to work at those agencies when they graduate. Most of the scholarships come with an obligation to serve at an agency for a certain period of time as a way of paying back for the scholarship.



Send out the Sheldons

Enlist peers to help recruit STEMM talent

Surveys of college students have shown that peers are the most effective recruiters of college students. The officials we interviewed also underscored the value of sending scientists and engineers to recruit their peers at colleges and universities, either accompanied by human-resources professionals or on their own.

Personal contact allows agencies to explain their needs to potential candidates and answer questions in a way that is not always possible in a USAJOBS posting. “The students don’t want to talk to me,” said a hiring specialist at the Naval Surface Warfare Center Dahlgren Division. “I don’t have the expertise. We have our technical folks recruit, conduct the interviews and decide who they want to hire.” The scientists and engineers say they enjoy choosing potential colleagues and bringing in the next generation of STEMM employees to serve their agency’s mission.

To deepen these campus relationships, or to establish new ones, agencies are using an innovative and effective recruiting approach

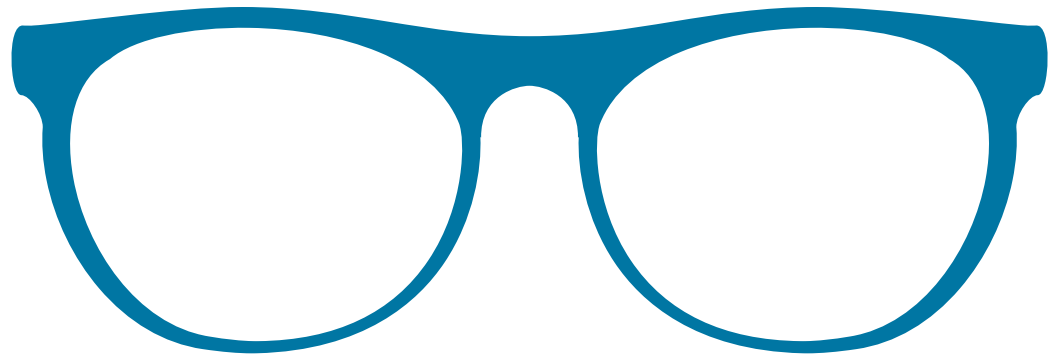
through on-campus “ambassadors.” To capitalize on those connections, six agencies use the Partnership’s *Federal Student Ambassadors* program to establish an on-campus presence during the academic year, enlisting students who have successfully completed an agency internship to be emissaries for that agency when they return to campus. These ambassadors host workshops and presentations, promote job opportunities to classmates and share their intern experience with key staff and faculty.

The U.S. Patent and Trademark Office (USPTO) uses the ambassadors to recruit hundreds of patent examiners with skills in engineering and other hard sciences. They target priority populations such as women in engineering, student veterans and students with disabilities, although they promote USPTO positions to all students. These ambassadors also form strong ties with the career services office on campus for continued collaboration and communication between their university and the agency after USPTO’s recruiters leave campus.

Many private-sector employers use an effective practice that rewards employees with a small bonus for referring good job candidates, if those candidates are hired and remain on the job for a certain period of time. This encourages employees to think about people they know who would be a good fit for the organization and urge them to apply, to the benefit of everyone involved.

Effective agencies also tap STEMM practitioners to write qualifications and job announcements that require technical competencies and experience, and to keep hiring managers apprised of hiring needs. “Program managers are our best advocates,” said a Department of Energy (DOE) interviewee.

Another innovative means of finding and recruiting qualified STEMM talent is to maximize the personal and professional networks and connections that existing staff maintain. After all, the government has produced 18 Nobel laureates since 1901, and many other esteemed professionals in STEMM fields who have valuable connections in their fields. “The way to get good people



is to have good people,” one interviewee said. Agencies seeking to hire experienced STEM staff get their scientists to contact and recruit connections they have in their scientific communities. They keep in touch through letters, phone calls, emails and other means to identify candidates who would benefit the agency and let them know about positions that open.

Once relationships with colleges and universities are cemented, it is easier for agencies to find STEM talent without having to make multiple recruiting trips each year. Many find that professors often refer their best and brightest students to federal colleagues they’ve come

to know. And connections with professors and university staff often allow an agency’s STEM experts to give campus lectures or participate in other activities to familiarize and excite students about their agency’s work.

A solid university partnership can take about three years to establish, one interviewee said, so organizations need to measure the return on investment carefully and over the long term. Agencies should ask if they are getting their money’s worth in terms of the number of students who graduate and accept jobs after being recruited on campus.

Several federal agencies draw from universities’ research commu-

nities through programs that can involve multiyear contracts. NIST has strong relationships with the University of Colorado, which provides for academics and scientists to work at the agency through limited-term contracts that can last up to four years. These individuals work closely with their colleagues back at the university and tap their academic networks to help NIST recruit top talent to join the agency. At NSF, academic scholars serve in program-management positions at the agency for a few years, getting the chance to evaluate whether they would like to continue in program management and apply for long-term positions.

Keep their eyes on an XPRIZE

Use competitions to open the door to talented people

One of the more intriguing practices innovative agencies deploy is offering people a chance to solve a challenging puzzle or problem. One such technique is a competition that involves collaborating on software projects. Agencies and private-sector companies use these competitions, which can be run at minimal cost, as a way to put candidates to the test and witness them in action. They then become a form of recruiting, with the participant pool a source of potential candidates.

For example, NASA ran a two-day International Space Apps Challenge in 2012 to bring software developers together to solve challenges posed by the agency and nonprofit partners. More than 2,000 people joined virtual and in-person teams to tackle more than 70 challenges in the areas of open-source software, open hardware, citizen-science platforms, and data visualization related to space exploration, astronomy and lunar module hardware. Along with getting ideas or answers to scientific questions, NASA learned about 2,000 people with science skills, some of

whom could be tapped for STEMM positions.

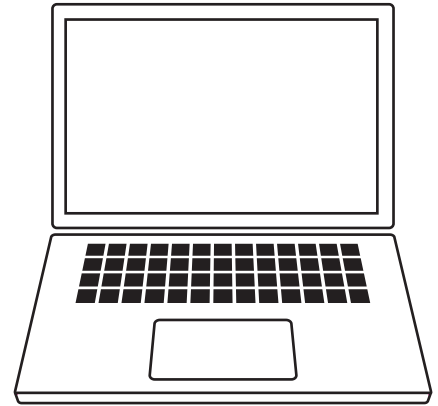
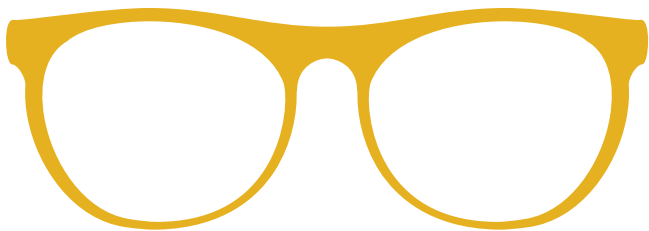
Similarly, the Environmental Protection Agency runs the P3 Program—People, Prosperity and Planet—a two-phase team contest during which college students design solutions that move the country toward a sustainable future. In the first phase, interdisciplinary student teams compete for \$15,000 grants. Recipients use the money to research and develop design projects during the academic year. The final projects include a project report and a proposal, which are judged in Washington, D.C., by a panel of experts convened by the American Association for the Advancement of Science. The best student designs are awarded grant funding of up to \$90,000 to further project design, implement the project in the field and move it to the marketplace.

Several other competitions attract STEMM talent. DOE runs the National Science Bowl, a nationwide academic competition that tests students' knowledge in all areas of science. The National Institute of Biomedical Imaging and Bioengi-

neering has one called the Design by Biomedical Undergraduate Teams (DEBUT) Challenge, open to teams of undergraduate students who are working on innovative solutions to unmet health and clinical problems. And the Army runs eCYBERMISSION, a web-based science, technology, engineering and mathematics competition for teams in grades six through nine. Teams propose solutions to real problems in their community and compete for state, regional and national awards.

Agencies also can use the U.S. Cyber Challenge (USCC) to find technology-savvy employees. Run by the National Board of Information Security Examiners, a privately funded organization, USCC works with industry, government and academic institutions across the country to promote and sponsor competitions and cyber camps to identify, attract, recruit and place the next generation of cybersecurity professionals. The program's goal is to find 10,000 of the best cybersecurity practitioners and help them find the right professional workplace.

Go virtual



Head online to promote and publicize exciting jobs and missions

In our increasingly mobile society, many federal agencies are harnessing social media to reach out to the public, an activity that has the potential to capture STEMM talent exploring job options. Potential STEMM applicants in technology and other STEMM fields can be particularly conversant on the web, and as “digital natives” prefer to spend a good bit of their waking hours there. Most private- and public-sector job applications now are handled through electronic job boards and applications processes.

But the Intelligence Community (IC) has added an extra element to the equation. Instead of holding a career fair in a hotel ballroom and having employers set up curtained tables full of paper pamphlets, the IC conducts an annual free virtual career fair to attract the type of candidates who are so adept in cyberspace that they can help an intelligence agency in that domain. The fairs have attracted tens of thousands of participants.

By conducting its job fair virtually, the IC attracts the “digital natives” and other technology afficio-

nados who live and breathe online and who are desired for that tech savvy and outlook. Agencies set up virtual appointments, videos and interviews for potential employees, who can attend easily no matter where they live. The event, which has been held each February for the past four years, is a model for how agencies can work together to brand, market and explain their mission and what they have to offer a potential employee. Participants create avatars of themselves in a 3D environment, upload and manage documents in virtual briefcases, watch video presentations and chat live with recruiters who also appear as avatars, demonstrating government’s ability to converse in a 21st-century world. In 2013, the six-hour event highlighted hundreds of career opportunities in cybersecurity, intelligence analysis and engineering, among other areas, and gave potential recruits a chance to speak with subject-matter professionals from the participating intelligence agencies to learn about how to apply for open positions.

Virtual career fairs clearly have

enough merit that at least one company has made a business out of setting them up for organizations, including the federal government, so agencies can reach audiences outside their area. Such a company can take care of the logistics of setting up a virtual career fair, including tracking metrics on the return on investment and complying with Section 508 of the Americans with Disabilities Act, which requires that federal agencies make electronic and information technology accessible to people with disabilities. Another private business, which serves the military, offers a virtual event that lists dozens of possibilities in STEMM fields, many of them in federal government. For a virtual career fair to be efficient for agencies and valuable to applicants, agencies likely would need to partner with others that have STEMM needs, as the agencies of the IC have done.

Offer quantum-leap career paths

Give STEM talent the opportunity for varied assignments throughout their careers

Allowing STEM professionals to take assignments in other departments, agencies or STEM fields provides new challenges and opportunities for learning different approaches or concepts, and can offer a desirable change of pace that can refresh STEM talent's outlook and energy. Many rotational assignments are excellent opportunities to offer STEM employees educational experiences and mobility.

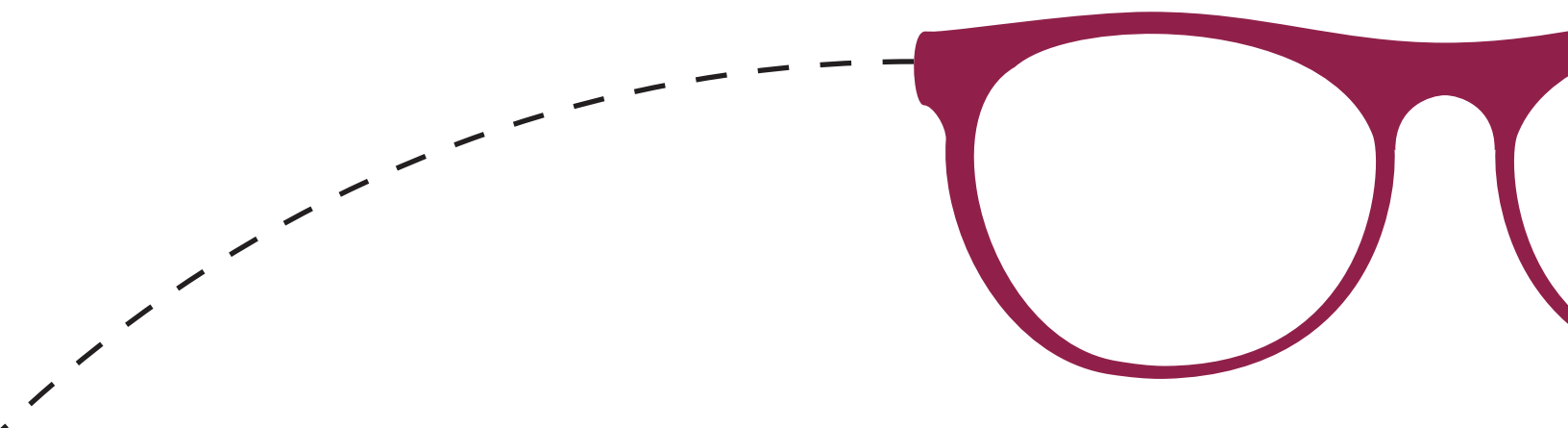
Agencies we interviewed enhance their desirability as employers by offering employees rotations or details and the chance to work in other scientific settings. STEM professionals value the chance to further their knowledge and field expertise without having to leave their current agency or give up salary or benefits. It is essential that these inter- and intra-agency rotations offer employees opportunities to practice their skills or learn new ones and do not simply expose them to other offices and departments or divert scientists, engineers and others from their career focus.

The two Navy labs we interviewed echoed the importance of rotations and said they encourage employees to move within their organizations and try new types of STEM duties. Interviewees said these rotations are valuable for employees, who learn new disciplines and refresh their skills and interest in their work. One hiring manager said the lab hires "people, not positions," and allowing rotations helps retain good talent. In fact, it is almost expected at these laboratories that employees will have multiple jobs during their careers there.

The National Science Foundation (NSF) also allows staff to move among different areas of science within the agency and to other agencies. Academics also rotate into the agency, paid by their home universities, bringing in fresh ideas and information about opportunities for independent research and development. NSF employees might also rotate into the academic arena for a brief period to maintain their research capabilities. Encouraging

employees' skill development is part of NSF's long-term development approach and energizes employees who want to be involved in the most up-to-date science in their field. It also benefits NSF when they return and apply what they learned. "We use the rotator population to target specific areas of information and cutting-edge science that fill our needs," said an interviewee.

The Intelligence Community's (IC) civilian joint-duty program requires intelligence professionals to complete a one- to three-year career-broadening assignment in another intelligence agency as a condition of promotion to senior levels, including the IC's most senior technical posi-



tions. To date, more than 12,000 IC professionals have taken advantage of the program, which enables them to sharpen their skills in another agency and, at the same time, gain a broader, “enterprise-wide” perspective of their profession. It also opens more career opportunities for talented STEMM and other professionals, who don’t have to leave the IC to find them.

Good managers learn how to keep STEMM employees fresh and interested in their work through a variety of different jobs and experiences, whether they are delving more deeply into their area of expertise or developing into leaders and moving into management roles.

Many want an array of outside experiences to learn about other areas of science or experience different work settings. Effective managers take into account these variations in career aspirations and desires or changes in what their STEMM employees choose to pursue, interviewees said. “Never assume what anyone wants,” said one.

Most STEMM employees have a strong interest in practicing in their fields for their entire careers, but some may decide to shift to a more administrative role, for example, by working to manage science grants at NSF. Rotations are important for NSF because not only do they provide the agency with a constant

flow of new concepts and scientific expertise, but they also offer a way for the agency and the visiting academics to get a feel for working together before either commits to a permanent arrangement. NSF also can make sure scientists understand the type of work they will do at the agency. “Our work is unique because we are not looking for scientists to do science. We are looking for scientists to administer an investment bank,” said an interviewee. Some scientists will be drawn to the mission, but others who prefer “hands-on science” will be deterred, helping to make certain that only scientists who will be fulfilled by doing grant work accept NSF positions.

Start a chain reaction

Share lists of pre-screened candidates throughout your agency

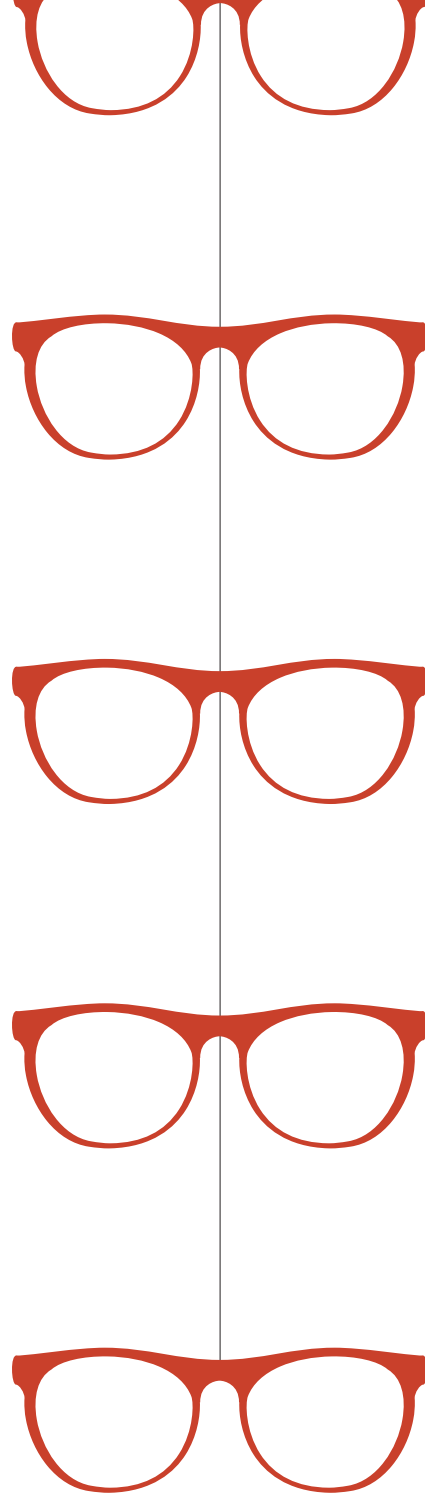
Applying for government jobs can be frustrating and bewildering for STEMM job seekers, who must wade through dozens of vacancy announcements and start the application process anew with each job opening. NASA found a way to streamline the process for people applying to its many centers and facilities by allowing applicants to apply once to the agency but considering them for additional positions. The agency's 10 centers around the country coordinate with one another in reviewing applications, which also has made it easier for NASA to vet candidates. The application will be considered three times in the course of a year—fall, spring and summer—without applicants having to reapply. NASA now is spreading the word that there is “one application, 10 centers and three bites at the meatball” for those applying for STEMM jobs.

Simplifying the application process would help bring in STEMM employees. Another way to do so

would require congressional action to allow agencies to hire from other agencies' “cert lists,” that is, the list of candidates that an agency already has screened for a position and who might be qualified for a job in another agency.

Once STEMM employees are in government, agencies should be promoting the variety of opportunities they can pursue. For example, the Intelligence Community (IC), comprising 17 agencies, markets itself as one intelligence family. ODNI has included a way for candidates who apply to one of these agencies to give permission for their application to be shared with any of the other agencies within the intelligence community, and it maintains a searchable database of those applications.

This message resonates with prospective STEMM candidates, who can be thwarted by the prospect of applying to multiple vacancy announcements, especially within the same agency; many of them just give up. Also, a STEMM applicant



may not know much about a particular agency, especially since in many cases IC agencies cannot discuss the classified work STEMM candidates would be doing. Emphasizing the considerable interagency opportunities IC enterprise can provide that will allow STEMM employees to find the best fit can be an enticing aspect of a job offer.

Beta-test your talent

Give potential candidates substantial assignments to test their skills

Agencies must use internships wisely and well, taking the approach that they are testing out future employees and helping to shape and encourage them during their short time in government. Internships give agencies the opportunity to see how STEMM interns perform on the job and to assess these candidates for both skills and fit. Agencies also should be converting qualified interns to permanent employees, but in 2011, only 8.7 percent of interns in all fields were hired once their assignment was completed. This is an improvement over 2010's 6.2 percent conversion rate,² but that should be viewed as a measure of success for agencies' internship programs and continue to rise.

Many agency employees we interviewed highlighted the advantages of testing out potential hires. DOE uses an innovative practice to get its staff familiar with job applicants, inviting finalists for positions to give a presentation to DOE staff in the division or department where they would be working. This gives cur-

rent STEMM employees a chance to assess candidates' ability to express themselves in their area of science and both STEMM and support staff a chance to interact with a potential future colleague through question-and-answer sessions following the presentation. Relevant department employees from senior scientists to administrative assistants are included in this informal "panel interview," and immediately afterward the deputy director solicits feedback from them. This allows colleagues at all levels to evaluate whether the applicant has the technical skills to become part of the agency. The process helps DOE staff members feel their input has value, and everyone has an opportunity to make their own assessment of the candidates' competence and get a feel for their personal style.

Now that agencies have new hiring flexibilities through the recently implemented Pathways Programs, they should be considering similar ways to "test" STEMM interns and fellows they bring in to make sure they are suitable as permanent employees. The internship program allows agencies to hire current students and, once they meet certain

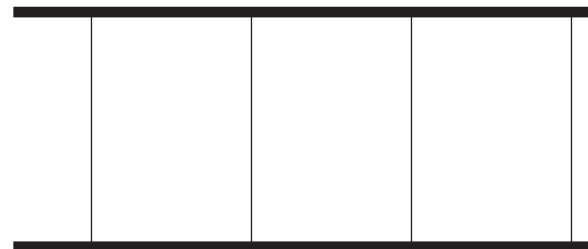
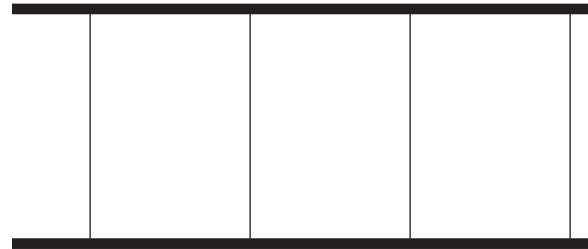
conditions and have graduated, convert them to a permanent employee without their having to compete with others seeking the job. The internship period gives agencies the opportunity to assess the overall qualifications of their interns, and they should be giving them assignments that allow a range of STEMM staff to learn about and evaluate their skills.

The same holds true for the fellowship program that is part of Pathways, which allows agencies to restrict consideration for some jobs to those candidates who have graduated in the previous two years. They are hired for an entry-level developmental experience that may last for one to two years, after which they may be converted to permanent employees if they are successful. That success should involve presentations or other demonstrations of their skills, and interactions with agency STEMM staff.

The Pathways Programs became effective in July 2012 and the jury is still out on how useful they will be in the competition for highly qualified STEMM talent, but agency representatives we interviewed recognized their potential value.

2 Intern conversion rates are based on employee data from the Office of Personnel Management's Central Personnel Data File (CPDF)/EHRI-SDM database.

Create a parallel universe



Offer a dual-track career trajectory

In creating non-supervisory GS-14 and GS-15 positions, as well as scientific and professional positions (referred to as ST positions) for senior, scientific and professional jobs categories, STEMM agencies recognized the need for a dual-track career path for certain employees. Agencies successful at hiring and retaining highly specialized STEMM employees typically utilize this dual-track program, allowing senior employees to hold non-managerial/non-executive positions with compensation up to and above the GS-15 level commensurate with their high-performance level in STEMM fields. Not everyone has set a goal of entering the Senior Executive Service (SES) or taking on senior managerial duties, leading government

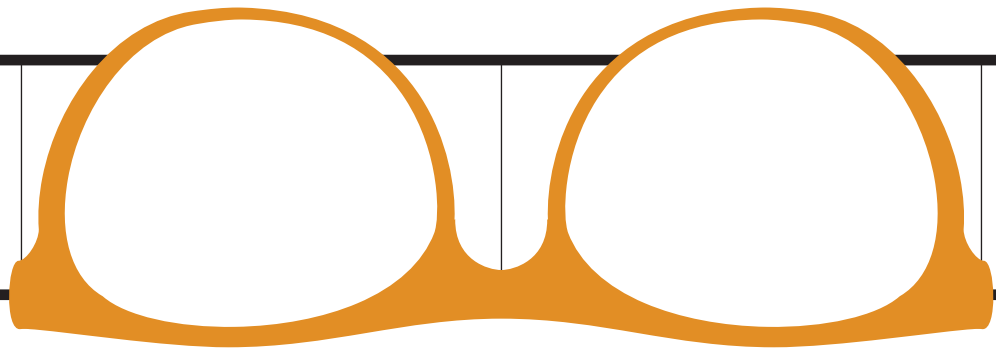
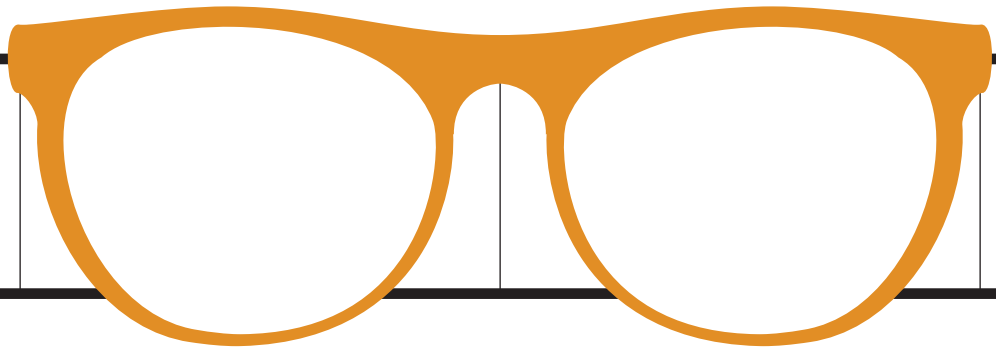
agencies to offer another option for those with technical skills. The DOE, NASA and NIST are among the agencies that rely on the dual-track option of senior level positions (referred to as SL positions) and ST positions to keep top talent and attract future candidates who prefer to advance further into their area of expertise without managing others.

Agencies and STEMM talent both benefit when STEMM practitioners have the choice of growing in their careers by either moving into managerial positions or becoming deep subject-matter experts in their field. Potential employees who are uncertain about whether a management career track is right for them have the option of continuing to practice in their field, often

an attractive option. Creating non-supervisory positions at higher pay grades allows STEMM practitioners to continue to grow without having to follow the traditional government trajectory.

Offering the two alternatives can be a powerful incentive when recruiting, particularly if candidates haven't decided what their preference is and want the flexibility to determine their career path down the road.

Creating dual tracks for STEMM talent is standard practice in many private-sector companies. "It stops people from thinking that management is the only way they can advance," said an interviewee from Chevron. A STEMM practitioner can grow as a subject-mat-



ter expert or take a role as a team leader, he added. At one of United Technologies Corporation's signature companies, more than half the workforce is composed of engineers, but they aren't always working in engineering positions. "We actually have the opposite issue, where we have to create career paths that are not leadership related, a means of having them progress that is not in management," an interviewee said. Employees value the greater earning potential and being able to specialize in their chosen field in a way that runs parallel to a senior-leader track, he added.

NASA offers an excellent example of this dual-track approach in the federal government. The agency's STEM employees can

spend an entire career in a particular technical field and rise all the way to a non-supervisory senior-level scientific or technical position—a special classification that is higher than the GS-15 level for those who perform high-level research and development in STEM fields. "Engineers don't want to watch people work, they want to do it," a NASA interviewee said. "We saw a relatively high attrition (of NASA engineers) to the commercial industry with SpaceX recently. They were the ones building new rockets, and [our] people wanted to be involved." But, if paid at SL or ST levels, available STEM talent might be willing to forgo a private-sector position in favor of a non-supervisory government position.

Find the prime numbers

Use data and dashboards to evaluate hiring, performance and job satisfaction

Collecting, analyzing and monitoring workforce data is important for maintaining the “health” of an agency’s workforce, and this is particularly important for STEMM talent. Several agencies we interviewed, including NSA and the Naval Research Laboratory (NRL), take that axiom to the next level, closely tracking a variety of sophisticated human capital metrics that focus on the state of their STEMM employees. For example, they make it a practice to link hiring, turnover and other measures to mission performance, and they also leverage the data to project future requirements. STEMM employee engagement and job satisfaction, as measured by such things as the Office of Personnel Management’s Employee Viewpoint Survey, are also important barometers and can inform both recruiting and retention strategies.

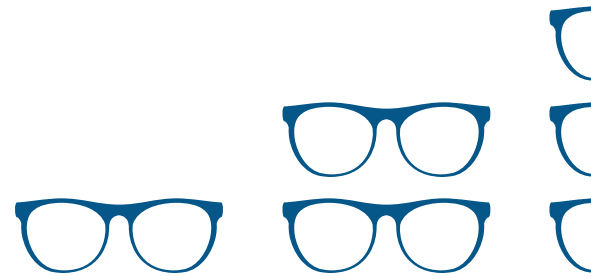
As to be expected from an agen-

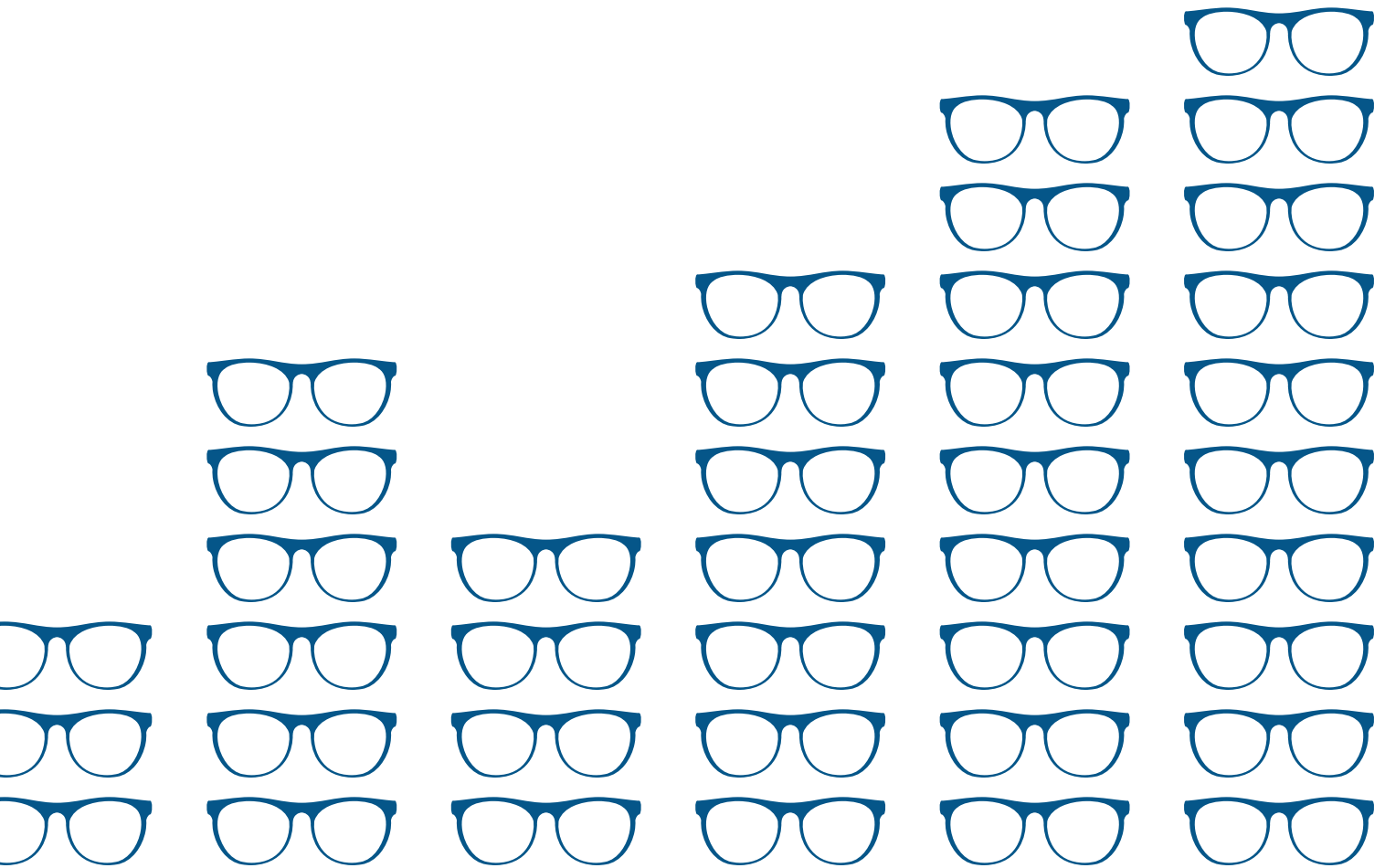
cy that is one of the nation’s largest employers of mathematicians, NSA’s human resources office places a premium on workforce data, collecting as much information as possible about applicants and employees, and following workers through their agency careers. By amassing and analyzing detailed information on individual skills, training and education, assignments and promotions, performance assessments, attrition and retirement patterns, and other data, the agency develops quantitative demand-and-supply models to predict the number and types of skill sets they will need to hire, not just to meet immediate needs but also to ensure a strong long-term human capital pipeline. The data also allow the agency to make the business case to take action, whether that means more staff, retention bonuses or special salary rates in a given STEMM field to make sure NSA stays com-

petitive. “We track attrition carefully, and if there is a problematic instance where attrition spikes, we are able to intervene,” said one human resources manager.

At the NRL, where 63 percent of the workforce is in a scientific or engineering profession and more than half hold doctorates, they make sure that workforce planning is not just “by the numbers” but also incorporates metrics on employee satisfaction. Everyone who joins the lab takes a survey six months into their tenure to give managers feedback. “We really study how people feel,” said an NRL interviewee. “That’s important to us. We want to be your employer of choice.” That includes making sure that good employees stay long term, so the survey results help management find ways to keep job satisfaction up.

Employees take a second survey on satisfaction a year into the job.





The feedback from both surveys is used to adjust future onboarding activities and employee training. Hiring personnel also watch metrics such as attrition. Attrition happens to be fairly low for STEMM jobs at NRL, as it is for STEMM jobs at the other agencies we interviewed. Attrition rates for all NRL employees is 10.1 percent, while the rate for science and engineering employees at the lab is 6.7 percent.

Some agencies create data dashboards to capture a workforce overview and track human capital and workforce information. NASA uses a dashboard that has various data sections for executives and managers, which track workforce alignment, readiness, sustainability, diversity and demographics. Under “employment lifecycle,” for instance, users can access sections on attrition, including attrition triggered by buyouts. The data show actual at-

trition versus expected attrition for non-retirement and retirement-eligible employees, with buyout-based attrition further broken out by competency, education level, ethnicity, occupation and more. In a section of the dashboard targeting NASA managers, various data display employee performance and awards, workforce demographics, training and development, and other measures that help managers track important data and make decisions.

These dashboards, usually developed collaboratively with leaders and stakeholders, simplify the practice of examining human capital data across the agency and help with decision-making. The agencies that use them typically allow supervisors, managers and HR professionals to access them so everyone can get the same clear picture of the agency’s workforce.

CONCLUSION AND RECOMMENDATIONS

The number of federal jobs in STEM fields will continue to grow while the supply of STEM graduates available and interested in federal jobs stays flat or tightens, challenging the government's ability to recruit and retain top STEM talent. It is imperative that agencies position themselves as STEM employers of choice over private-sector companies.

The challenge of hiring high-caliber STEM talent, which is likely to be exacerbated as the need for STEM talent grows, should serve to steer the government toward a coordinated approach for hiring. Numerous federal agencies aggressively pursue professionals and students with specialized skills in STEM areas the government needs, and many more agencies can and should capitalize on the creative approaches they have devised.

The Office of Personnel Management (OPM) and the White House Office of Science and Technology Policy (OSTP) can play an important role by highlighting the direct-hire authorities that exist, developing administrative mechanisms to enable things such as resume-sharing, and taking other collaborative approaches for recruiting and hiring the best STEM talent. It is important to tackle the impending talent shortage before government faces a hiring crisis, by planning ahead for a workforce composed of these highly qualified employees.

The following recommendations offer ways to increase the odds that government can bring on board the best STEM employees.

AGENCIES SHOULD:

- Absent direct-hire authority, find ways to simplify and speed up the hiring process by streamlining internal processes, for instance, using OPM-provided flexibilities and authorities liberally; help individual candidates navigate the system by providing a point of contact, apprising them of which documents they need and which are unnecessary, and keeping potential employees informed about the status of their application.
- Work collaboratively to share the applications of qualified STEM candidates with other parts of the agency or department and, where possible, with other agencies or departments, so those who aren't selected for one vacancy can be considered for other agency STEM positions.
- Offer employees modest referral bonuses to encourage current STEM workers and other employees to find and recruit good STEM talent.
- Provide hiring bonuses for top-of-the-line STEM talent if that's what it takes to bring them in.
- Develop and advertise a meaningful career path for STEM employees, including dual-track options that give them the opportunity to progress to senior, non-supervisory technical positions or become managers. Where authorized, expand and fund the use of STEM scholarships, even as budgets shrink.

OPM SHOULD:

- Use authority in the Executive Order authorizing the Presidential Management Fellows Program to establish a variant that is focused on STEM graduates.
- Review the legality of establishing a way to share resumes among agencies looking for specialized STEM talent and seek legislation if not; also, work with agencies to establish their STEM-hiring needs and a proper group of people to vet this process of establishing a system for sharing resumes.
- Revise, modernize and simplify existing classification guidance to make it easier for agencies to establish non-supervisory "technical expert" STEM positions at the GS-14, GS-15 and scientific and professional (or ST) levels, to provide dual-track opportunities for STEM employees.
- Ensure the STEM occupational series and classification standards are relevant and up to date, taking into account advances in STEM fields such as cybersecurity.

OPM, OSTP AND AGENCIES WITH LARGE STEM HIRING NEEDS SHOULD:

- Create a government-wide STEM human-capital strategy to project future needs government-wide and develop a list of actions that can address STEM hiring challenges, without diluting the ability of agencies to tailor and innovate on their own.
- As part of that government-wide strategy, develop an integrated, interagency set of special STEM salary rates that keep the government competitive for STEM talent.

CONGRESS SHOULD:

- Consider either waiving the requirement that employees in STEM fields be U.S. citizens or offer a citizenship path similar to the Department of Defense's Citizenship for Service clause, which allows non-U.S. citizens serving in the U.S. Armed Forces, and certain veterans, to be eligible for full citizenship. Lawmakers would need to examine who should be eligible, how long they would need to work in government to qualify and many other issues surrounding a change in law.
- Give legal authority to agencies to offer relocation incentives to newly hired STEM employees, particularly in cases where agencies are experiencing shortages in the applicant pool (expanding the existing law that provides such incentives to current employees).
- Absent OPM approval of direct-hire authority for all STEM jobs, provide that authority by legislation.
- Pass legislation extending NASA's scholarship authority to other STEM agencies.

It is important to tackle the impending STEM talent shortage before government faces a hiring crisis by planning ahead for a workforce composed of highly qualified employees. With agencies, OPM and Congress all working toward this important end, our country can continue to effectively meet its mission-critical goals.

METHODOLOGY

The Partnership for Public Service and Booz Allen Hamilton examined how the federal government currently recruits and hires its science, technology, engineering, mathematical and medical (STEMM) professionals. In so doing, we sought to understand how the most successful of those federal agencies and private companies approach the process of hiring the best STEMM employees, highlighting the progress they have made with the goal of sharing that information broadly so other agencies may learn from them.

We performed an extensive literature review of private and public STEMM occupational needs and capabilities at large private companies and specific federal agencies, reviewing agency documents, technical government reports, congressional testimony and independent scientific papers. We also conducted a data analysis of occupational codes in OPM's Central Personnel Data File as well as FedScope, the Bureau of Labor Statistics, the Federal Employee Viewpoint Survey and the National Association of Colleges and Employers, in order to define STEMM occupations and analyze STEMM occupations and the pipelines of STEMM students feeding the private and public sector.

In addition, we interviewed federal agencies and private-sector corporations on STEMM hiring successes and innovative practices that were yielding good results. Between October 2012 and January 2013, we conducted 43 in-depth interviews with a cross-section of STEMM hiring managers who helped identify programmatic needs within their organization. We also interviewed line supervisors and lab directors charged with recruitment, hiring and training STEMM talent at 11 federal agencies or agency subcomponents and five private-sector companies—selected for their wide-ranging needs for STEMM talent, the percentage of their workforce comprised of STEMM occupations and their understanding of the best ways to recruit these employees.

The federal government officials and employees we interviewed represented:

- Department of Agriculture (USDA)
- Department of Energy (DOE)
- Department of the Navy's Naval Research Laboratory (NRL)
- Department of the Navy's Naval Surface Warfare Center Dahlgren Division (NSWCDD)
- Department of Defense's National Security Agency (NSA)
- Department of Defense's Defense Advanced Research Projects Agency (DARPA)
- Department of Defense's National Geospatial-Intelligence Agency (NGA)
- National Aeronautics and Space Administration (NASA)
- Department of Commerce's National Institute of Standards and Technology (NIST)
- Department of Health and Human Services' National Institutes of Health (NIH)
- Nuclear Regulatory Commission (NRC)
- National Science Foundation (NSF)
- Department of Veterans Affairs' Veterans Health Administration (VHA)

We also interviewed five private-sector companies with STEMM talent needs:

- Adventist HealthCare
- Chevron
- Micron Technology, Inc.
- Palantir Technologies
- United Technologies Corporation

APPENDIX A
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