



Executive Summary: 2017 DOE CSGF Longitudinal Study

U.S. Department of Energy Computational Science Graduate Fellowship: 1991-2016
A follow-up study of recipients and programmatic outcomes

Method

Working with the Krell Institute, the research firm Westat surveyed all 414 recipients of the Department of Energy Computational Science Graduate Fellowship (DOE CSGF) for whom information was available. During the survey period of October through December 2016, 278 surveys were returned, with 211 of 345 alumni and 67 of 69 current fellows responding.

Data from respondents were divided into four cohorts based on year of entry into the program: 1991 to 2000, 2001 to 2006, 2007 to 2012 and since 2013 (current fellows).

In November and December 2016, Westat also interviewed a representative selection of 18 DOE CSGF alumni who completed the program between 2006 and 2013. Researchers chose this period to focus on recipients who have had time to see benefits from program participation but also could accurately reflect on and describe their experiences and activities since completion.

Krell also requested curricula vitae (CVs) from program participants and received 309: 243 from alumni and 66 from current fellows. The CVs were coded to capture statistics on recipients' accomplishments and productivity, including publications, awards, grants and contracts, and patents. CVs from 44 additional fellows who did not also respond to the survey were included. Additional information from these CVs that would have been obtained via survey (Ph.D. completion, employment and other details) was coded and included in the study's survey findings where relevant.

CV data from alumni and fellows were analyzed separately, given the current fellows' limited time to publish, receive awards and achieve other accomplishments.

Findings

The study drew several conclusions about who DOE CSGF recipients are, what and where they have studied, their experiences as fellows, their satisfaction and achievements. Data indicate an active alumni community has developed, with most recipients saying they had stayed in touch with colleagues after completion and recommended the program to others. Many also maintained contact with their supervisor and other staff they met during their DOE CSGF national laboratory practicum.

The population of fellowship recipients has become more diverse throughout the program's lifetime, with women comprising 35 percent of the 2013 entering class. Fellows have pursued a range of fields, with engineering the most common, followed by physical science, computer science and mathematics. The mix has shifted over the program's 25 years, moving from 50 percent engineering in the early years to just 20 percent of recipients since 2013. Nearly half of recipients over the past 10 years pursued physical sciences degrees.

The 436 program participants have attended 64 universities in 30 states, almost all R1 doctoral institutions as identified under the Carnegie Classification of Institutions of Higher Education. Nearly half of all fellows attended one of seven universities: Massachusetts Institute of Technology, Stanford, the University of California at Berkeley, the University of Illinois at Urbana-Champaign, Harvard, Princeton and the California Institute of Technology.

Most DOE CSGF recipients learned of the program from professors and academic advisors. The program's unique combination of benefits and financial support attracted them and many fellows picked it over other graduate fellowships. Alumni and fellows also cited the program's alignment with their research interests, the flexibility it afforded them to pursue varied interests and its prestige as reasons for their interest.

Alumni and fellows praised four key program components: the research practicum, program review meeting, high-performance computing (HPC) access and mentoring. Both groups were highly satisfied with the support they received on their practicums and with the opportunities to work with special equipment, generate research ideas and work with experienced staff. Many cited the program review for its intellectual stimulation and opportunities to network and present research. Around three out of four alumni said exposure to HPC had helped them grow in their career, helped them make an immediate impact on the job, and influenced their career choice. Nearly all recipients also said they received high levels of mentoring support.

A majority of alumni surveyed reported contributing to or leading development of scientific codes both as fellows and since leaving the program. Only a few reported having dedicated DOE supercomputing time before accepting the fellowship; more than half tapped this resource as fellows and nearly half had done so since completing the program.

More than 75 percent of alumni and fellows reported high satisfaction with the program, including access to facilities, equipment and other resources. A similar proportion also were

satisfied with the networking opportunities and research training they received. In interviews, alumni said the fellowship influenced their career goals and direction, including the desire to work at a DOE laboratory. They described the professional growth they experienced in their expertise in computing, computational research and related areas and in their communication skills and self-confidence. Some said the program led them to pursue specific computational science and engineering topics that interested them and encouraged them to develop interdisciplinary skills.

The study found DOE CSGF fellows go on to significant accomplishments. Of the 211 alumni surveyed, 89 percent said they have been employed since finishing the program; nearly half said their first position was in academia while a third said it was with a DOE laboratory. Nearly four out of five survey respondents said that in a job search, their experience in the program gave them an advantage over others with similar qualifications.

The vast majority (84 percent) of alumni surveyed are employed in computational science and engineering. Some 35 percent work in industry, 29 percent in academia and 14 percent at a DOE laboratory. More than three quarters of alumni say they're satisfied with their current position and report having a leadership role in their organization. A huge majority of those surveyed said they had achieved overall career goals, contributed to innovative ideas and addressed key knowledge gaps in their field, and advanced in their organization.

Alumni have received a multitude of professional awards and patents and have published research at an impressive and compounding rate, the data showed. Of the 243 alumni submitting CVs, 165 listed at least one award received; the average per alumnus was 3.6 awards. Fifty-one alumni listed one or more grants or contracts; the average was 6.5. A total of 211 patents were listed by 35 alumni – with 96 on a single CV. Excluding this outlier, the average alumnus had 3.4 pending or issued patents.

CV analysis found 217 alumni listed at least one publication, including journal articles, books, book chapters, presentations and conference presentations, papers and proceedings. Some 217 alumni for whom CV data were available listed a total of 6,419 publications, more than half of them journal articles. The average per alumnus was 16.3.

Analysis found most of these articles appeared in highly influential journals, as measured by Eigenfactor (EF) and Article Influence scores. Scores were obtained for 2,132 of the 3,283 articles for which they were available; 83 percent of them were published in journals with above-average EF scores, with an average of 24. This means that, on average, alumni published articles between 1997 and 2014 in journals with 24 times the influence of the average journal during that time. Nearly three-quarters of the articles DOE CSGF alumni published were in journals with EF scores in the top 10 percent. Another 13 percent were in journals scoring between the 81st and 90th percentile.

Conclusions

The study data indicate that the DOE CSGF is an important contributor to the development of America's advanced technological workforce. It appears to be addressing its principal objectives: 1) Helping ensure an adequate supply of appropriately trained scientists; 2) making DOE laboratories available for practical work experiences; 3) helping strengthen ties between the academic community and DOE laboratories to enhance the national community of scientists; and 4) raising the visibility of careers in the computational sciences and encouraging talented students to pursue such careers.

The study data indicate the DOE CSGF is a prestigious program that attracts promising students from top universities. Effective outreach helps attract these excellent students and many choose the DOE CSGF over other fellowships.

Alumni praised the program's benefits and reported a high level of satisfaction. They credited the fellowship with deepening their interest in computational science and engineering and said many of the program's features were critical in helping them obtain jobs in the field. The data suggest the DOE CSGF is a successful model that offers a broad scope of training and development.

Many alumni remain involved in the program by recruiting new fellows, providing guidance and professional development for current recipients, and developing relationships and collaborations that extend well beyond their enrollment. Many of these relationships are forged during the annual program review, which helps build a sense of community among current and former fellows.

The study confirmed that a substantial number of alumni move directly to permanent employment at DOE laboratories, while others work in specialized positions in industry or academia. Many alumni have achieved leadership positions in these settings, helping spread the program's influence.

The findings on the program's perceived impact corroborate many of those found in a 2012 study of the DOE CSGF. Interview data found the program influenced recipients' career goals and direction, including the desire to work at a DOE laboratory.

Finally, objective measures found DOE CSGF recipients have been prolific participants in advancing the nation's science and technology goals. The large number of professional awards, patents and published research articles they've generated is evidence of the program's contribution to the broader scientific community.