

# DAY ONE PROJECT

Creating a National Fellowship for  
Entrepreneurial Scientists and  
Engineers

Ilan Gur

Cheryl Martin

Fernando Gómez-Baquero

November 2020

The Day One Project offers a platform for ideas that represent a broad range of perspectives across S&T disciplines. The views and opinions expressed in this proposal are those of the author(s) and do not reflect the views and opinions of the Day One Project or its S&T Leadership Council.

## Summary

The next administration should establish a national fellowship for scientists and engineers to accelerate the transformation of research discoveries into scalable, market-ready technologies.

Entrepreneurship is driving innovation across the U.S. economy—with the troubling exception of early-stage science. Transitioning scientific discoveries from the laboratory into prototypes remains too speculative and costly to garner significant support from industry or venture-capital firms.<sup>1</sup> This makes it difficult for many of our nation’s science innovators to translate their research into new products and puts the United States at risk of falling behind in the quickly evolving global economy.

Entrepreneurial fellowships for scientists and engineers (hereafter, simply “entrepreneurial fellowships”) have emerged as an effective strategy for translating research into new products and businesses, showing tremendous early impact and a readiness to scale. The next administration should advance this proven strategy at the federal level by creating a national entrepreneurial fellowship. Modeled on the highly regarded AAAS Science and Technology Policy Fellowship, this new entrepreneurial fellowship would leverage our nation’s investments in science to drive national prosperity, security, and global competitiveness.

## Challenge and Opportunity

Gaps in the U.S. innovation system are impeding commercialization of scientific research, with serious consequences. The United States is realizing fewer productivity and GDP gains from technology advances,<sup>2</sup> while foreign governments with misaligned interests are capitalizing on U.S. research investments.<sup>3</sup> We as a nation are missing opportunities to commercialize, scale, and benefit from our world-leading, federally-funded research in industries ranging from clean power to artificial intelligence.

Among the most serious issues, U.S. industry is playing a diminished role in scientific research,<sup>4</sup> leaving a void in the nation’s infrastructure for converting research into new products and industries. With limited avenues to translate research from lab to market, universities and national labs are increasingly producing two pools of stranded assets: nascent technology concepts and world-class scientific talent.

---

<sup>1</sup> DeepTech Investment Report, March 2020. Different Funds. Accessed October 15, 2020, <https://differentfunds.com/download-deeptech-investing-report>.

<sup>2</sup> Robert J. Gordon (2016). *The Rise and Fall of American Growth*. New Jersey: Princeton University Press.

<sup>3</sup> *Innovation and National Security: Keeping Our Edge*. Council on Foreign Relations. Accessed October 15, 2020. <https://www.cfr.org/report/keeping-our-edge>.

<sup>4</sup> Ashish Arora, Sharon Belenzon, Andrea Pataconi, and Jungkyu Suh (2019). *The Changing Structure of American Innovation: Some Cautionary Remarks for Economic Growth*. *Innovation Policy and the Economy*, ed. Josh Lerner and Scott Stern. Chicago: University of Chicago Press. 39-93.

Over 40,000 new science and engineering Ph.D. students graduate from U.S. universities each year.<sup>5</sup> This army of raw talent is an underutilized national asset<sup>6</sup> that should be activated to drive application and commercialization of research for the public benefit. However, individual scientists and engineers in the United States have no clear path for taking their skills and knowledge from the lab to the “real world”—i.e., to focus on developing market-ready solutions for critical challenges. Funding for such translational endeavors is generally seen as too applied for research universities but too risky for corporations or private investors. Federal programs like the National Science Foundation’s Innovation Corps (I-Corps)<sup>7</sup> and the Small Business Administration’s Small Business Innovation Research (SBIR)<sup>8</sup> grants do provide valuable early training for scientists and funding for American small businesses. Yet no federal program is structured to directly support scientists and engineers in transitioning concepts from early-stage research to commercial enterprises. The existing initiatives are optimized for either short educational exposure (NSF I-Corps runs for a maximum of 8 weeks) or for supporting existing small businesses (SBIR eligibility requires that a company already be established), and neither provides the mentorship, ecosystem, and infrastructure needed to directly support the transition from lab researcher to commercial enterprise.

Entrepreneurial fellowships have emerged as a compelling new model for supporting translational research and development (R&D) and science entrepreneurship. These paid, two-year fellowships provide postdoctoral scientists and engineers with (a) time to become familiar with commercialization processes, (b) access to labs and other technical resources, (c) immersive entrepreneurship training, education, and professional support, and (d) connections to experts across government, industry, and finance. As such, entrepreneurial fellowships help advance promising technologies from lab to market while also training a cohort of postdoctoral scientists and engineers with the entrepreneurial skills and experience to accelerate innovation in the United States. Indeed, entrepreneurial fellowship programs are designed to give participants the knowledge and connections needed to lead at the intersection of academia, government, and industry even their entrepreneurial ventures fail.

Entrepreneurial fellowships were first introduced in 2014 with the launch of Cyclotron Road at Lawrence Berkeley National Lab and the Runway Startup Postdoc Program at the Jacobs Technion-Cornell Institute at Cornell Tech, supporting innovators in the hard-science and digital domains, respectively. The fellowship model has since evolved and expanded in geography and scope. Fellowships at Cyclotron Road are managed in partnership with the non-profit Activate, which this year also began supporting entrepreneurial fellows in Boston in collaboration with the Defense Advanced Research Projects Agency (DARPA), MIT Lincoln Lab, the University of Massachusetts, and other local research partners. And the Department of Energy’s Lab

---

<sup>5</sup> National Science Foundation’s National Center for Science and Engineering Statistics Survey of Earned Doctorates. National Science Foundation. Accessed October 8, 2020. <https://nces.nsf.gov/pubs/nsf20301/report/u-s-doctorate-awards>.

<sup>6</sup> Gina Kolata (June 14, 2016). So Many Research Scientists, So Few Openings as Professors. The New York Times. <https://www.nytimes.com/2016/07/14/upshot/so-many-research-scientists-so-few-openings-as-professors.html>.

<sup>7</sup> For more on NSF’s I-Corps, see [https://www.nsf.gov/news/special\\_reports/i-corps/](https://www.nsf.gov/news/special_reports/i-corps/).

<sup>8</sup> For more on Small Business Innovation Research grants, see <https://www.sbir.gov/>.



Embedded Entrepreneurship Program (LEEP) now sponsors entrepreneurial fellowships at Argonne and Oak Ridge National Labs as well as Lawrence Berkeley National Lab.

Entrepreneurial fellowships have delivered promising early results. As an example, fellows supported by Activate since 2015 have created dozens of new startups that have attracted over \$200 million dollars in follow-on technology grants and private-sector funding from seed investors and early commercial partners. These startups have introduced a range of cutting-edge technologies to market, from 3-D printed materials tough enough to rival conventional materials to the world's most efficient semiconductor thermal-energy converters<sup>9</sup>. Fellows of the Runway Startup Postdoc Program have attracted over \$100 million in private venture investment and created over 200 high-wage jobs. 100% of companies created by fellows from both programs remain headquartered in the United States.

Alumni say that the programs were vital to their success. "The transition from academic scientist to entrepreneur is neither easy nor generalizable," said Activate fellow Sarah Richardson. "My company would not exist without the support of this fellowship." Runway Startup Postdoc Amir Reuveny commented: "We are bringing innovation to a huge market to impact the lives of many. This market can be sometimes conservative and reluctant to change. We need time, funds, and professional network that will help us leverage our expertise. This is exactly what the Runway program provides."<sup>10</sup>

The American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellowship (STP Fellowship) provides a useful template for the next administration to follow in designing a national entrepreneurial fellowship. The STP Fellowship embeds top Ph.D.-level science and engineering talent (more than 200 individuals each year) in various government agencies and offices. Fellows bring their deep technical expertise to bear on numerous issues at the science-policy nexus, and in so doing gain the valuable public-sector experience needed to bridge the science and policy communities. Fellowship funding comes from the nearly 20 host government agencies as well as from private foundations and professional societies. AAAS, a third-party nonprofit, manages the program across fellowship applications, placements, and other logistics, as well as branding and stakeholder engagement. AAAS also provides STP Fellows with professional-development opportunities. Many former STP Fellows have gone on to play major roles in establishing and stewarding science and technology policy for the nation.<sup>11</sup>

The AAAS model—a federally funded, cost-shared, and externally managed fellowship that embeds top science and engineering talent at government-sponsored facilities—could easily be adapted for entrepreneurship. A national entrepreneurial fellowship modeled on the STP

---

<sup>9</sup> James Temple, "How a New Class of Startups are Working to Solve the Grid Storage Puzzle," MIT Technology Review, October 10, 2019, <https://www.technologyreview.com/2019/10/10/369/how-a-new-class-of-startups-are-working-to-solve-the-grid-storage-puzzle>.

<sup>10</sup> Cornell Tech (2018). Runaway Q&A: Tatch. <https://tech.cornell.edu/news/runway-qa-tatch/>

<sup>11</sup> Adam Cohen (2020). Science Policy Fellowship Has Durable Impact, Independent Evaluation Shows. American Association for the Advancement of Science. <https://www.aaas.org/news/science-policy-fellowship-has-durable-impact-independent-evaluation-shows>.

fellowship could bolster key areas of bipartisan interest such as economic growth, innovation, defense, and national security. By placing fellows at research, prototyping, and manufacturing facilities distributed nationwide, this fellowship would also drive regional economic development. The third-party organization engaged to manage the fellowship could work with regional partners to provide on-the-ground support, leverage local strengths, match the skill sets of individual fellows to local resources, and recruit fellowship candidates strategically in order to fill gaps in our nation's innovation ecosystem. And by helping commercialize research and scale up innovations in hard science and engineering, a national entrepreneurial fellowship will create advanced manufacturing jobs that benefit communities across the country.

## Plan of Action

For \$200 million per year, the next administration could establish a national fellowship that annually provides two-year support for 400 emerging entrepreneurial scientists and engineers (roughly 1% of graduating Ph.D. students in science and engineering). This modest additional amount of funding would multiply returns on our nation's vast federal investment in science education and research. The fellowship would be expected to generate hundreds of new technology enterprises each year and catalyze billions of dollars in additional private-sector funding for critical technologies and manufacturing-based industries that advance the prosperity and security of U.S. taxpayers.

Using existing SBIR authorizations and with the prestigious AAAS STP Fellowship as a template, the next administration could move to establish a national entrepreneurial fellowship via the following steps:

1. Work with Congress to (a) allow agencies to count expenditures for entrepreneurial fellowships toward required annual SBIR spending, and (b) make it easy for agencies to provide follow-on SBIR grants to new small businesses that emerge from these fellowships.
2. Designate a single agency to competitively partner with one or more qualified non-governmental organizations (NGOs) for coordinated contracting and administration of the fellowship program. As is currently true of the AAAS STP Fellowship, engaging a third party to lead on the national entrepreneurial fellowship program would facilitate efficient and effective program management, and would allow for a cohesive program community and experience for fellows with optimized support services, mentorship, professional development, and network exposure bridging academia and industry.
3. Encourage agencies across the government to support entrepreneurial fellows as a way to further their respective missions. The entrepreneurial fellowship should include a coordinated contracting and selection process that allows agencies to fund fellows consistent with their mission, while coordinating selections across common mission areas.

## Frequently Asked Questions

**Doesn't I-Corps already provide training for lab-to-market entrepreneurship? What would be the added value of a national entrepreneurial fellowship?**

Founded in 2011, I-Corps offers short educational courses that have been highly effective in exposing scientists to entrepreneurial concepts. But I-Corps does not provide scientists with the level of continued support needed to actually pursue the path to launch an entrepreneurial venture on a full-time basis. This is a missed opportunity. I-Corps is a federally funded program that inspires scientists to take their discoveries from the lab to the marketplace, but the Federal Government lacks a program that grants such scientists access to the funding, resources, and networks they need to do so effectively. A national entrepreneurial fellowship would provide talented scientists and engineers with two years of full-time support (i.e., a living stipend and health insurance) as they strive to commercialize their research. Most of the entrepreneurial fellows supported to date also took I-Corps training either before or during their fellowships, demonstrating the highly complementary nature of these two modes of support.

**Isn't SBIR already an established mechanism to fund commercially-oriented R&D? Why isn't that effective in supporting the lab-to-market transition?**

SBIR grants are effectively the only federal funding support mechanism for early stage startup research and are thus critically important to the nation's innovation ecosystem. SBIR grants do not, however, support lab-to-market transition. A company must already be established, have existing lab resources, and a market-product fit in order to be eligible for an SBIR grant. This creates an untenable "chicken-and-egg" scenario for most scientists looking to transition to commercial research. Entrepreneurial fellowships give scientists an opportunity to further develop their startup concepts, establish a company, and gain access to appropriate lab facilities so that they can access SBIR and similar grants. Many of the entrepreneurial fellows supported to date have been awarded SBIR grants during or after their fellowships. As with I-Corps, this demonstrates the highly complementary nature of these two modes of support.

**Isn't it the role of the free market to commercialize federally funded research? Why do we need the government to fund entrepreneurial fellowships when we have venture-capital firms?**

Venture capital plays an important role in bringing speculative concepts to market, but its purview is limited to companies with a clear product vision and a well-understood technology-risk profile. These criteria are easier to meet in some areas than in others. Many innovators can leverage the nimble and low-cost development cycles available in software to transition an idea

to the level of maturity needed for private investment. But innovators focused on chemistry, biology, manufacturing, advanced computing and many other “hard science” disciplines often need years of expensive, applied R&D to get to the same stage. Even the most risk-tolerant private investors have limited appetite to fund that work given highly uncertain rates of return.<sup>12</sup> The government does not need to fund commercial products—the free market can handle that. But the government should address market failures in entrepreneurial science and technology by funding scientific talent and applied research. Investment in applied R&D leads to advancements that deliver widespread public benefits and ultimately catalyze new private-sector funding for critical areas (e.g., microelectronics, transportation, materials, and infrastructure).

### **Is it possible to quantify the success of the entrepreneurial fellowship model to date?**

Activate has supported 84 entrepreneurial fellows to date, selected from over a thousand Ph.D.-level applicants from around the country. These fellows have already created 56 new manufacturing and infrastructure companies and have attracted over \$200 million in follow-on funding to support technology development and early productization. In addition, they have filed over 100 patent applications (with 19 already granted), established more than 70 corporate partnerships, and created hundreds of jobs. The Runway Startup Postdoc Program has supported 32 fellows, who have attracted over \$100 million in funding, created over 200 jobs and a combined valuation of a quarter billion dollars.

### **What federal agencies would be good candidates for funding a national entrepreneurial fellowship?**

A powerful aspect of the AAAS STP Fellowship model is that the agency funding for fellows is allocated as needed within the context of existing authorizations and appropriations, so no agency-specific budget or program is needed for the STP Fellowship overall. If the national entrepreneurial fellowship were similarly structured and leveraged SBIR allocations (as proposed above), any federal agency that funds extramural R&D could fund entrepreneurial fellowships to advance its mission. The National Science Foundation would be a logical choice to oversee coordinated contracting and administration of the national program given its broad science and engineering mandate and combined track record in supporting scientific research, workforce development, and science commercialization.

---

<sup>12</sup> DeepTech Investment Report, March 2020. Different Funds. Accessed October 15, 2020. <https://differentfunds.com/download-deeptech-investing-report>.

## **Why are you proposing that SBIR allocations be used to fund entrepreneurial fellowships?**

Entrepreneurial fellowships align strongly with SBIR's goals. Entrepreneurial fellowships provide a mechanism to support the earliest stages of small-business innovation research (i.e. before the small business has been formally created). Support for these nascent stages is critical for but excluded from the current SBIR program. SBIR funding allocations already exists for every federal agency that funds extramural research. Leveraging these allocations would make it possible to establish a national, cross-agency entrepreneurial fellowship without the need for new appropriations. Finally, a successful national entrepreneurial fellowship would dramatically expand the opportunity for scientists and engineers to create new, science-based and engineering-based small businesses. These businesses would feed into and enhance the impact of the SBIR program as a whole.

## **Why should a national entrepreneurial fellowship be managed in partnership with an NGO?**

As is true for the AAAS STP Fellowship, an NGO administrator can provide programmatic and operational benefits. These include the following:

- Focused professional development for fellows.
- Shared support services that can be leveraged by all fellows, regardless of placement.
- Coordinated fellow recruitment, communications, selection, and matching.
- The ability to fund fellows without encumbering their intellectual property.
- Systems and methodologies to increase efficiency and effectiveness.
- A program-wide community of practice/learning.
- Shared frameworks for data collection and evaluation.
- A strong alumni network that extends program impact beyond program duration.
- An ability to engage with national educational institutions.
- Engagement and outreach to bring in private-sector partners as well as philanthropic, corporate, and state or local government funders.

## **How would a national entrepreneurial fellowship differ from the AAAS STP Fellowship?**

While the AAAS STP Fellowship provides an excellent template, the proposed national entrepreneurial fellowship differs in several ways. The most obvious difference is that AAAS fellows work within and under the guidance of the federal agencies sponsoring them, in an intern-like capacity. In the proposed entrepreneurial fellowship program, agencies would still fund fellows and participate in selection, but the fellows would work full-time to advance their ideas entrepreneurially in the field. The benefit to the sponsoring federal agencies would not be



internal workforce support, but rather the opportunity to advance their mission through research-to-market transitions and creating a stronger entrepreneurial innovation workforce.

### **Where would entrepreneurial fellows work and in what kinds of research facilities can they be hosted?**

Access to costly research infrastructure and facilities is a key barrier to science entrepreneurship and is thus an important aspect of the entrepreneurial fellowship model. Ideally, a national cohort of entrepreneurial fellows would have the opportunity to conduct their fellowships in partnership with local and regional institutions whose facilities are best equipped to support their research. Existing programs embed fellows within research facilities at universities and national labs, using contract mechanisms that both protect the fellows' intellectual property and preserve the research-driven missions of those institutions. Technology incubators, manufacturing institutes, and various other independent research facilities may also serve as host institutions within a national program. The NGO program administrator would be responsible for maintaining a network of institutional partnerships and identifying appropriate contracting mechanisms for each.

### **How much would it cost to fund entrepreneurial fellowships?**

At scale, we estimate that each two-year fellowship and associated research expenses would cost approximately \$500,000. Roughly \$250,000 of this amount would be expended directly to the funded individual to cover cost of living, health insurance, and travel stipends for two years. This is comparable to other prestigious post-doc fellowship programs. Roughly \$150,000 would be expended as direct program-support costs, including both lab access and expert staff for program delivery and fellow support. The remainder would cover shared infrastructure for curriculum development and delivery, communications and outreach, recruiting and selection, and fellowship administration. Overall, a national entrepreneurial fellowship can be cost-efficient since lab access is provided through partnerships with existing facilities (i.e., no new capital infrastructure expenditures are required). The track records of existing programs suggest that the economic benefits and catalytic funding impacts of entrepreneurial fellowships more than justify their expense.

**Should a national entrepreneurial fellowship focus on a specific technology or impact area?**

A national entrepreneurial fellowship program should focus on key national priorities. The fellowship model is particularly impactful for hard-science innovation, especially in sectors where technology development and exploration of commercial viability can be prohibitively costly and time intensive for private investors. One example is climate change. Massive industrial and infrastructure innovation is needed for the United States to lead the transition to a carbon-free global economy. Since climate innovation spans all areas of science and engineering and addresses market needs in nearly all sectors, it could be a strategic focus that attracts entrepreneurial scientists from all disciplines. As the fellowship program expands, it could target other key national innovation priorities as well.

## About the Authors



**Ilan Gur** is the CEO of Activate, whose fellowship program enables entrepreneurial scientists and engineers to transform their research into world-changing products and businesses. Activate's entrepreneurial fellowship model originated at Cyclotron Road, a division of Lawrence Berkeley National Lab that Gur founded in 2014. As an entrepreneur, Gur founded two science-based startups including Seeo, an advanced battery startup acquired by Bosch. He then served as Program Director at the U.S. Department of Energy's Advanced Research Projects Agency–Energy. Gur holds Ph.D., M.S., and B.S. degrees in Materials Science and Engineering from the University of California, Berkeley. He is an advisor to the Gordon and Betty Moore Foundation in support of the Moore Inventor Fellowship and serves as a judge for MIT Technology Review's TR35 award.



**Cheryl Martin** leads Harwich Partners, a consulting firm she founded to engage public and private sector entities on implementation of solutions for complex problems, especially those related to energy, sustainability, urban development and technology adoption. Until November 2018 she was a member of the Managing Board at the World Economic Forum where she was responsible for a range of business and innovation initiatives. Previously Dr. Martin served as the Acting Director of the U.S. Department of Energy's Advanced Research Projects Agency–Energy (ARPA-E). In addition, she was the Deputy Director for Commercialization at the agency where she developed the Technology-to-Market program, which helps breakthrough energy technologies succeed in the marketplace. Prior to joining ARPA-E, Dr. Martin was an Executive in Residence with the venture capital firm Kleiner Perkins Caufield and Byers, and was the interim CEO of Renmatix, a start-up company focused on renewable materials. She also spent 20 years with Rohm and Haas Company in roles ranging from technology development to finance and business management and where, most recently, she had been the General Manager for the Paint and Coatings business in Europe, Middle East and Africa. Dr. Martin earned a B.A. in chemistry from the College of the Holy Cross, where she currently serves on the Board of Trustees, and went on to earn a Ph.D. in organic chemistry from MIT. Dr. Martin serves as the chair of the Board of Directors for Sound Agriculture, an early stage sustainable agriculture

# DAY ONE PROJECT

technology company, as well as on the Boards for the Clean Energy Trust and Elemental Excelsior.



**Fernando Gómez-Baquero** holds a Ph.D. in Nanoscale Science and Engineering from the College of Nanoscale Science and Engineering at the University at Albany, SUNY. His research has focused on advanced nanomaterials for energy storage applications, on the economic impact of pervasive nanotechnologies, and on technology entrepreneurship. Dr. Gómez-Baquero has more than 20 years of experience in the nanotechnology industry, starting with production and characterization of carbon nanotubes and developing of polymer/nanotube composite materials. Dr. Gómez-Baquero is recognized as a leader in the fabrication of nanoengineered electrodes for lithium-ion batteries using semiconductor processes and using nanotechnology to improve the performance of lithium-ion batteries. Dr. Gómez-Baquero has several publications in nanomaterials research and on the economic impact of nanotechnologies and number of patent applications in diverse applications of nanomaterials. Dr. Gómez-Baquero has been a co-founder and early technology lead of variety of companies such as Besstech, NanoColombia Ltd., Innovate Prefabricate, Dendron Nanomed, Midstate, Revela Medical, FlashCharge Batteries among others. He is also the Director of Runway and Spinouts at the Jacobs Technion–Cornell Institute at Cornell Tech, where he is mentoring postdoctoral entrepreneurs and propelling them to build companies out of deep digital technologies in diverse fields such as digital health, telecommunications, education, cybersecurity, and IoT.



## About the Day One Project

The Day One Project is dedicated to democratizing the policymaking process by working with new and expert voices across the science and technology community, helping to develop actionable policies that can improve the lives of all Americans, and readying them for Day One of a future presidential term. For more about the Day One Project, visit [dayoneproject.org](http://dayoneproject.org).