

STATEMENT OF

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BEFORE THE UNITED STATES HOUSE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY

HEARING ON:

“SBIR TURNS 40: EVALUATING SUPPORT FOR SMALL BUSINESS INNOVATION”

APRIL 6, 2022

10:00 A.M.

ONLINE VIA VIDEOCONFERENCING AND 2318 RAYBURN

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INTRODUCTION

Chairwoman Stevens, Ranking Member Feenstra, and members of the United States House Committee on Science, Space, and Technology Subcommittee on Research and Technology, thank you for this opportunity to testify on such an important topic.

I am Dr. Nigel Reuel, Associate Professor, Jack R. And Carol A. Johnson Faculty Fellow, and Director of Graduate Education, in the Department of Chemical and Biological Engineering at Iowa State University and founder of three, SBIR funded companies.

Let me begin by saying that Small Business Innovation Research (SBIR) programs are well-known for their tagline “America’s seed fund.” Seed is an apt image that resonates well in an agriculture powerhouse state like Iowa, which was the first state in the nation to officially accept the provisions of the Morrill Act 160 years ago. That decision created our state’s land-grant institution, which later became known as Iowa State University.

A young tender plant can only emerge from a tiny seed if it is given the proper resources — soil, water, light, and nutrients — and time and expert care to grow. Only after the plant has emerged, deepened its roots and strengthened its stalk is it able to stand on its own against the daily hazards that threaten to dry it, drown it or knock it down.

In the last four years, I have seen this metaphor play out for each of the three companies that I have spun off from my research at Iowa State University. Each started as a seed of a business, a promising idea from my academic laboratory made possible by the longstanding foundational support our nation has provided to nurture fundamental research. My university has its own tagline — “Innovate at Iowa State” — that provides great resources across campus to support and encourage the promising ideas of faculty and student entrepreneurs. But my firsthand experience is that, without the \$1.8 million of SBIR funding my companies have received to date, these ideas would have remained dormant seeds. Without SBIR, these start-up companies may have limped along for a few months, then withered and died like a neglected plant. Without this critical funding, we would not have been able to grow the crop that these companies represent today – employing 11 individuals, attracting external investors and acquirers, and — most importantly — launching products and services that I believe will revolutionize the way cell therapies are manufactured, antibodies are discovered, and enzymes are optimized for the benefit of human health.

So, today my goal is relate to you three key aspects of the SBIR program that I have experienced in the past few years — and to encourage expansion of SBIR and of fundamental research funding that further strengthens our country’s competitive edge in innovation, science, and technology.

The three areas of SBIR support for science and technology-oriented start-ups are:

1. Unique, purposeful training
2. Funding to test feasibility
3. Validation to external stakeholders

1) SBIR TRAINING

Many SBIR programs purposefully support the nurturing and growth of the young start-up. Also, SBIR training programs offer a distinct complement to the training opportunities provided by my own innovation-minded university — opportunities that encourage creative thinking and the creation and “seeding” of new businesses.

Iowa State University provides me with an excellent innovation ecosystem. As I stated, we are a land-grant university whose motto, or tagline, historically has been “Science With Practice.” Iowa State currently is ranked 11th in the nation by the *Princeton Review* for student innovation and is in the top 100 worldwide universities granted U.S. patents for our science and technology achievements. Iowa State’s emphasis on innovation and entrepreneurship has earned the Association of Public and Land-Grant Universities (APLU) recognition with its 2020 Innovation and Economic Prosperity (IEP) Innovation Award and 2021 IEP Place Award. Iowa State’s passion for inspiring young people to explore innovation and entrepreneurship is illustrated by the recent dedication of the Student Innovation Center: 140,000 square feet of modern, open collaborative space for students from all majors and disciplines to work, learn, and be inspired by each other. The facility is equipped with the latest technology and provides students with access to nationally known business and industry professionals, who share personal stories and lessons from their entrepreneurial successes. Iowa State offers our students training programs, such as those provided by our Pappajohn Center for Entrepreneurship, that help prepare them with entrepreneurial skillsets and resources to help student teams distill their ideas into business plans. We have accelerator programs like the ISU Startup Factory, a 17-week incubator focused on helping researchers and inventors develop a roadmap to realize the societal and economic impact of their high-tech innovations, ideally stemming from university commercialization efforts. Additionally, “CyStarters” offers undergraduate to Ph.D. students, as well as recent graduates, the opportunity to participate in an immersive summer accelerator program to help kick start the launch of a new business venture. Combined, these two programs have jumpstarted more than 120 new companies over the past four years. Within our “Innovate at Iowa State” ecosystem, students learn the fundamentals of team building, accounting, fundraising, and perfecting their business plans and pitches.

These kinds of programs and facilities are extremely useful in planting the seed of a business, and in our experience at Iowa State, germinating viable businesses — especially those with proven business models and low capital needs. I am giving you this background on our campus’s innovation environment because it’s important to understand that, in addition to these excellent programs, there is a need for specialized support for companies like mine that, at their core, are creating practical applications for new, cutting-edge science and technology. I saw this firsthand in my first start-up experience right out of graduate school, a company that was launched in one

of the premier business accelerators in Boston. I had great visibility and general training, but my company needed more than a desk and phone — it needed a specialized lab to prove the promise of the technology and it needed training specific to a strongly science-oriented start-up.

That's where SBIR plays a critically important role. Many SBIR programs, such as those that I have been a part of supported by the National Science Foundation (NSF), provide such training and resources. At the start of the SBIR program, entrepreneurial scientists go through a boot camp that provides a condensed version of the I-Corps training; NSF's Innovation Corps (I-Corps™) program provides experiential education to help researchers gain valuable insight into entrepreneurship and how to start a new business. As evidence of this programs impact, the Iowa State's University's local I-Corps Site program embeds a stronger and more pervasive culture of entrepreneurship and innovation across the entire campus community and provides a great starting point for validating the business potential of the technology or basic research idea. Since becoming an I-Corps site in the fall of 2017, the I-Corps program at Iowa State has generated roughly \$6 million in commercialization grants and investment funding and has provided training to over 100 teams involving 300 students, postdocs, faculty, and staff, launched 14 new companies; and advanced 12 teams to the national program. This training at the SBIR kick off meeting pushes the team to put lectures on these topics into practice. It requires us to meet established metrics and cohort reporting. It forces us to get out of our labs and out of our buildings to learn about real challenges voiced by real people in target markets. Innovation truly is the seed, but at the start we put that aside briefly to understand the environment and real conditions to determine where the seed will best thrive.

In many cases, including my own start-ups, this critical training reveals the need to pivot from a perceived initial problem to something more pressing. The NSF SBIR program also pairs the founder team up with a consulting group to provide market research and weekly trainings. The program highlights the unique aspects of intellectual property, or IP, required for high tech firms. It emphasizes how to put together a commercialization plan or an enhanced business plan supported by real data, interviews, IP analysis, and technical findings. The program directors that my team and I have worked with are also an incredible resource for practical training. These professionals bring with them a wealth of experience and are accessible for discussion or review of current results. At some agencies, like the NSF, there are also supplemental awards that encourage the team to secure external investments. Finally, in most SBIR programs, the companies are part of a cohort. Being part of a cohort is incredibly important because you can provide practical advice to each other — advice that is aligned with the unique needs of growing that seed of a technology and science-oriented company.

2) FUNDING TO TEST FEASIBILITY

As I briefly mentioned, my first start-up company needed more funding and resources than the modest support offered by business plan competitions and accelerators. We needed a different level of support to gather critical feasibility data. My needs were obviously different from others in the accelerator cohort. Some members of my cohort simply needed a little space and some high-speed connectivity to enable the launching of an online or digital service or product. But this was not the case for my product or my innovation. 3D printers and maker spaces could help

me mockup my scientific invention, but not to test its functionality. The initial development and proof of concept for these inventions are often done in academic labs, where fundamental research funding makes possible bringing the idea to life and conducting the very first tests of viability.

But while these first steps are appropriately accomplished in a controlled environment like a campus lab, the next steps of growth require much more testing and building before an innovation can be customer-facing in the real, end-use world. This is where the SBIR support has maximum impact. SBIR funds help make possible the research necessary to produce feasibility data and, eventually, to place the invention in the hands of the end user. The SBIR support is at the funding level and duration where it can really start to make a difference.

I want to tell you the impact this kind of support has had on one of my companies — Skroot Laboratory, Inc. This company strives to be a lead process analytical technology or sensor developer for manufacturers of cell and protein therapies. The seed of Skroot Laboratory started as a project in my Iowa State laboratory in 2018. The initial tests looked promising, so we filed for a patent through the Iowa State University Research Foundation. We then founded the company and applied for SBIR support. When the SBIR Phase I award arrived in 2019, we moved into a small research space in the Iowa State University Research Park. The Iowa State University Research Park is a key asset in the “Innovate at Iowa State” ecosystem. It is home to 119 companies — an incubator for start-ups and a collaborative space for multinationals — plus research centers, and affiliates. At the Research Park, we used the Phase I award to test feasibility and do early-stage testing with end-users. The result was successful, strengthening the validation of market need through our boot camp training and commercialization plan preparation. Armed with these results, we applied for and earned an SBIR Phase II award. This has allowed us to expand customer-facing and internal testing of the product, make a few pivots, and move closer to full launch. Without SBIR funding, we might have been able to attract a few brave angels to invest in us, but it would not have been sufficient to take the idea through feasibility testing to end users. SBIR funding provided the validation and funding package necessary to attract stakeholders, which I will address next.

3) VALIDATION TO EXTERNAL STAKEHOLDERS

Receiving SBIR funds has emerged as one key vetting attribute by external stakeholders. It reflects a stamp of approval that a company’s approach has been peer-reviewed in a competitive selection and found meritorious. In the experience of my companies, this has enabled us to get the necessary angel investor attention and ability to attract and retain qualified talent. For example, the SBIR-supported customer discovery we did for one of my companies, Frugi Biotechnology Inc., enabled us to get on the radar of a rapidly accelerating antibody engineering company. The result was that my firm was acquired by this company, and our innovation continues to accelerate to meet customer needs. None of this would have happened without the support and validation that comes from the SBIR program.

CONCLUSION

The 40-year track record of the SBIR program makes it clear: SBIR is a support mechanism enabling the growth of new technology-based firms that would otherwise struggle to survive past the initial innovation stages. SBIR has been key to the success of my companies. The growth of new technology and science companies directly impacts economic development and competitiveness in my state of Iowa, in our nation and in our world. Can the SBIR program be improved? Like all programs, there are numerous opportunities to improve implementation and efficient operations. I believe that specific SBIR trainings and resources for companies like mine can certainly be continuously improved and standardized across funding agencies. I believe that continuing to incrementally increase award amounts will allow companies like mine to maintain their economic impact and further the application of science and technology to pressing challenges we face. Increasing the overall investment in SBIR awards will allow new companies to grow. That is important; however, this must not come at the risk of minimizing investment in fundamental research. This brings me back to my seed analogy: It is not prudent to provide more soil and nutrients and care if there are no viable seeds to nurture. As a nation, we must continue our commitment and further increase our support to funding fundamental research, account for regional disparities and promote a more equitable and diverse pool of talent. Every day at Iowa State University I see how that fundamental support for innovative research produces viable seeds. These fundamental projects are the innovation pipeline – they are the crop — that, by applying SBIR funding, can produce an abundant harvest for us all.

Let me close with my own personal message of gratitude for the many members of Congress who, over the past 40 years, have had the foresight to set up and support this unique SBIR program and who have communicated to their constituents the importance of using public funds to support the growth of new companies. It is an investment that benefits our nation. New companies are formed. Jobs are created. Life-changing products are introduced to the marketplace. The return on investment is amazing; we are able to expand a new, robust tax base and we are able to create new, enduring industries. I am excited to see what the next 40 years of the SBIR program brings. I am excited to see how SBIR nurtures the future companies I will get to create with my talented students at Iowa State University.