Committee on Small Business Subcommittee on Economic Growth, Tax, and Capital Access
"Innovation as a Catalyst for New Jobs: SBA's Innovation Initiatives"

I am Dr. Gabriel R. Burks Vice-President and Head of Research & Development for FrostDefense Envirotech Incorporated and Postdoctoral Research Associate in the Department of Materials Science & Engineering at the University of Illinois at Champaign-Urbana and the Beckman Institute for Advanced Science and Technology.

I am delivering this testimony on behalf of FrostDefense Envirotech Inc. – a National Science Foundation SBIR Phase I funded startup company, where we specialize in the development of physical and computer-based solutions to mitigate early spring frost damage in vineyards and other fruit crops – in regards to Small Business Administration programs and federal investment to stimulate innovation at startups.

This testimony positions FOR more programs and federal investment that support innovation and entrepreneurship.

Innovation is expensive. In inflation-adjusted dollars, federal support for universities has increased from roughly $8 billion per year in the 1960s, where today the National Science Foundation reports total university-performed research & development has now surpassed $55 billion per year.

Success in tech startups is elusive. As of 2018, tech startups fail at a rate of 63% and this failure rate is reduced by about 20% when a startup has venture backing.

Pivoting equates to success. Startups that pivot 1-2 times have 3.6 times better growth and raise 2.5 times more money than startups that do not pivot at all or who pivot too much.

What most people do not realize is that all great ideas require refinement and polishing to become viable solutions for society, and that the problems that society face today tend to be extremely complex. For example, our company tackles this problem of minimizing the impact of frost on delicate fruit crops. First question, what crop? Every crop type has a unique nutritional requirement, growing topography, growth rate, growing season, and response to environmental stimuli. Even within a singular crop type – in our case, grapes – each varietal will also have great variance in those same factors. Second question, what frost? How does one know when and where a frost will occur? What constitutes a frost for the plants? Some crops may be more tolerant to frost events than others. Third question, what product addresses these issues? If it is a material solution, what is it made of, how long will it last on the shelf, how will you price it and deliver it to the customer, who will you manufacture it, does it meet regulatory requirements, and how does this materials react to different types of crops? If it is a digital solution, who will program it and how will we develop the necessary algorithms? Final question, who is going to answer all of these questions and where are they going to have the space and resources to answer them?

Perhaps the biggest difference between university-based R&D and startup R&D is that universities have the ability to share funds and human capital with other colleagues, whereas with startups there are a few founders who are all scrapping to learn new skills to fill gaps in knowledge and to acquire funding to see their idea through to the end. As a more concrete example, our team is composed of plant physiologists, a materials scientist & engineer, atmospheric scientists, statisticians, agronomists, systems engineer, civil engineer, data specialists, among others. Only five of those have been paid directly by our company to do this work. In many cases, we pay in company equity with the prospects of something bigger at the end of

the tunnel. To note, this list of science professionals does not include our awesome team of accountants, business managers, regulatory experts, attorneys, and other critical business experts.

These experiences are not unique to us. Many tech startups must undergo such developmental stages to reach their bigger goal. Solving these large and complex problems require interdisciplinary teams with diverse expertise, sufficient funding, and time. Regulations and federal funding should be organized in such a way as to accommodate the team formation and the need for new tech startups to pivot to better match their developed technology to the market need. Furthermore, the ability to hire appropriate team members early-on with the experience and technical background to develop the aforementioned technology could be a make or break factor in having a successful startup or reaching an early failure.

Funds from the University of Illinois EnterpriseWorks Incubator AWARE (Accelerating Women And underrepresented Entrepreneurs) Proof of Concept Award (SBA-funded initiative) allowed us the ability to pivot at a critical time during our company development – eventually resulting in a significant company success. At the time of the award, our company had recently completed an unsuccessful field trial where we did not obtain the results that we desired, but we did discover what we thought would be several key factors for our success going forward. AWARE funding allowed us to quickly test our new hypotheses over a three-month time period and to develop a new version of our product that would be field tested again shortly after and found to be a product success. This success would go on to serve as the backbone for our petition for new funding. The startup world moves fast, and this funding was available for us quickly and was sufficient for our necessary technology pivot. Without this funding we may not have been able to pivot and quickly test our new ideas. We have a viable product today because we were able to quickly change and test our product within a timeline synergistic with grape growing seasons.

If we successfully move on to Phase II of the NSF SBIR program, our business will entail the creation of upwards of 20 new tech jobs with nationally competitive salaries. During commercialization, this number will likely approach double.

Throughout the COVID-19 pandemic, government funds have given us the means to navigate this difficult space where forming new partnerships has been nearly impossible, just as many other moms and pops small businesses have had to do during this time. Unlike more traditional small businesses, we have been blessed with a supportive university/incubator infrastructure that has enabled us to conduct home business as usual. To the contrary, many businesses have been reluctant to meet with us to discuss new prospects given the uncertainty of the state of America, social distancing regulations, and their own company uncertainties.

Final thought: Technology startup companies experience a myriad of hurdles along the path towards successful commercialization. We are grateful and attribute our successes thus far to generous and timely support from the National Science Foundation, Small Business Administration, our business collaborators, Illinois EnterpriseWorks Incubator, University of Illinois, and the hardworking sweat equity of our team. We have had the ability to test our original ideas and pivot towards ideas that are more effective and in alignment with societal needs. Due to foundational federal support, we anticipate the creation of many new tech jobs to support the United States and global economies.

To conclude, technology innovation is expensive, but these costs frequently drop over time as the technology becomes better and more developed. Technology startup success is elusive, but it has been shown that with the proper supports the chances for success is greatly increased. Pivoting for technology

startups frequently equates to success, but funding and resources must be as flexible and the startup environment to serve the greatest benefit. Our major successes as a company have come as a result of timely funding and support from several sources – University of Illinois EnterpriseWorks Incubator AWARE (Accelerating Women And underrepresented Entrepreneurs) Proof of Concept Award (SBA-funded initiative) enabled our critical ability to pivot. Technology startups have traditionally been leaders in new job creation with competitive salaries and we project that FrostDefense Envirotech Inc. will sustain that standard. Finally, the COVID-19 pandemic has changed how we have had to conduct business, but our funding and infrastructural support have given us a means to adjust to the circumstances of potential new partners. With that, this testimony positions FOR more programs and federal investments that support innovation and entrepreneurship for the sake of successful tech startups and the prospects of new job creation.

Thank you all for your time and the opportunity to share with you.