

Written Testimony of
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Chairwoman Lofgren, Ranking Member McClintock, and Members of the Subcommittee, thank you very much for the opportunity to testify today. I am Sudip Parikh, chief executive officer of the American Association for the Advancement of Science. AAAS is the world's largest multidisciplinary scientific society and the publisher of the *Science* family of journals. Our mission is to advance science, engineering, and innovation throughout the world for the benefit of all people or – put more simply – to advance science and serve society.

We are a Nation of Immigrants

I am a scientist. I am an American. And I am the product of special expert visas and family migration—among the many types of legal immigration into the United States.

My uncle, a geologist, came to the United States in the 1960s to work at NASA. He then taught at Appalachian State University in North Carolina and later served as lead geochemist for the state of California. He sponsored my father to come to America in 1968. Leaving Mumbai, a city of millions, and arriving in Hickory, a town of thousands in North Carolina, my father came home to a place he had never been before. My parents worked in furniture factories and textile mills to put us through college and ensure we had opportunities. Today, my sister works at the U.S. Centers for Disease Control and Prevention, and I have the privilege of leading the American Association for the Advancement of Science. We exist because of the Immigration and Nationality Act of 1965 and our parents' belief in the vision of the United States as a shining city on a hill.

My family's story is repeated by thousands of American scientists. The U.S. S&T enterprise is also a story of immigration. Some stories are new, some old.

The U.S. S&T Enterprise is Also a Story of Immigration

The U.S. research and innovation system has been a critical driver of world-changing discoveries for much of the past century and enhances the everyday lives of Americans in both large and small ways. These discoveries shape how we connect with each other, how we navigate through the world, and how we understand and make choices about the health and safety of ourselves and of our loved ones.

Many of these are the result of the substantial contributions by immigrants and non-immigrants alike who were inspired to study and contribute to scientific and technological advancements.

Many of their stories are familiar to us. Albert Einstein, Nobel Prize winner, who developed the theories of special and general relativity. The physicist Enrico Fermi, a leader of the Manhattan Project and the production of the first controlled nuclear chain reaction. Thomas Edison, inventor of the phonograph, the motion picture camera, and early versions of the light bulb. Mario Molina, biochemist and Nobel Prize winner, known for his research on the effect of chlorofluorocarbons on the Earth's ozone layer and climate change. The Nobel Prize winner Gerti Cori, whose research contributed to our understanding of how hormones metabolize sugars. Elizabeth Stern, an epidemiologist who came to the U.S. from Canada and whose research contributed to breakthroughs on how healthy cells turn cancerous. Today the world is beginning to learn the story

of Katalin Karikó, a biochemist from Hungary whose research on mRNA technology and therapies has led to the development of COVID-19 vaccines.

This is just a snapshot. According to the National Science Foundation, more than 50% of postdocs and 28% of science and engineering faculty in the United States are immigrants. Of the Nobel Prizes in chemistry, medicine, and physics awarded to Americans since 2000, 38% were awarded to immigrants to the United States.

Their contribution goes beyond pushing the horizon of our scientific knowledge and understanding. They include entrepreneurs who leverage their education, creativity, risk-taking and inventiveness to launch small ideas that become giants – leading to economic growth and good jobs. Their names include Sergey Brin, co-founder of Google. Jan Koum, founder of WhatsApp. Rashmi Sinha, founder of SlideShare, which was purchased by LinkedIn. Andrew Grove, co-founder of Intel. Pierre Omidyar, creator and founder of eBay. Jeong Kim, founder of Yurie Systems, which was sold to Lucent Technologies. Andreas von Bechtolsheim and Vinod Khosla, co-founders of Sun Microsystems. Jerry Yang, co-founder of Yahoo!

They and other immigrants continue to contribute to our innovation ecosystem and our economy through research, education, and entrepreneurship. Some examples:

- The Association of International Educators conducted a study on the economic return of international students across multiple sectors and found that “students studying at U.S. colleges and universities contributed \$41 billion and supported 458,290 jobs to the U.S. economy during the 2018-2019 academic year.”ⁱ
- The Business Roundtable noted that a “1 percent increase in immigrant college graduates leads to a 15 percent increase in patents per capita.”ⁱⁱ
- Another study found that over 44 percent of Fortune 500 companies were founded by immigrants or by their children. These companies reflect a broad range of sectors of the U.S. economy accelerating invention and entrepreneurship.ⁱⁱⁱ

Science and Innovation is a Global Enterprise

Following World War II, the framework behind the U.S. innovation system was a partnership between government, academia, and industry to harness federal government investments in basic research. Research conducted at U.S. universities and colleges would provide the critical training ground for tomorrow’s scientists, engineers, innovators, and entrepreneurs. Scientific opportunity, funding, and human capital are the key inputs that make this ecosystem thrive and deliver technological advances and economic growth.

Our global competitors understand the value of this system. They have seen the success of the U.S. research and innovation system and have paid it the highest compliment: They are copying it. The 2020 State of U.S. Science and Engineering report – part of the Science and Engineering Indicators released by the National Science Board – indicates that other nations are catching up.^{iv} Since 2000, the American share of global R&D has declined from 37% to 25%. China has accounted for nearly a third of the total growth in global R&D in that time.

We all know the China story and how other nations are gaining on the United States. But this is not just about China or how we invest in research. It is also about Canada and the United Kingdom and how other nations are investing in that key ingredient, human capital.

Canada is committed to increasing the number of immigrants to its country and is increasingly drawing talent from the U.S. through its Express Entry program and an economic immigration process that targets high-skilled workers. According to a study by the Georgetown Center for Security and Emerging Technology, Canada saw an increase of 75% between 2017-2019 of highly skilled immigrants.^v Of critical concern is that the increase was driven primarily by applications from U.S. noncitizens, which rose approximately 128% during that same period. Of the first 25 awardees of Canada's 150 Research Chairs program launched in 2017, fourteen came from U.S. research institutions. There is nothing nefarious or malevolent about Canada's intentions. They are doing what any good competitor would do.

While the pandemic may have paused global migration patterns, it has not stopped countries like Canada from looking to the future and setting goals to increase their immigration numbers.^{vi}

The same holds for the United Kingdom. Last year, the United Kingdom released a roadmap for research and development.^{vii} It's a visionary plan for investing in world-class research, fostering talent, enhancing productivity, and pursuing a place-based approach to ensure all U.K. regions can share in the prosperity. A critical component to this roadmap is visa and immigration reforms to create new paths for highly skilled scientists and researchers to study and work.

The U.K. roadmap reflects an important formula for technological innovation: funding, opportunity, and human capital. We need all three to compete in the global economy. It means investing in research, building domestic talent, and providing opportunities, and expanding our human capital to reflect a diversity of talent from around the world. We should be answering our own innovation challenges with the same vision and ambition.

First, we must ensure that we are doing everything we can to develop our homegrown talent from every part of the United States. We are fortunate to have talent across every race, ethnicity, gender, and geography in the country. Second, we must attract the best students and R&D talent from around the world.

Internationally mobile students still pick the U.S. more than any other country for their higher education degrees, and early data is showing promising signs that applications from foreign nationals to study in the U.S. is again on the rise after years of declining rates. The Institute of International Education (IIE) recently released the results of its fourth survey in IIE's COVID-19 Snapshot Survey Series.^{viii} One of the key findings of the survey was that institutions of higher education reported a 43% increase in the number of applications from foreign national students for the 2021/2022 academic year. In the U.S. a considerable proportion of U.S. S&E degrees – especially at the doctorate level (34%) – go to international students, many of whom remain in the U.S. after graduating.

This is great news, especially as our nation reopens in a post-pandemic world. But students today have more choices than ever before as nations actively court globally mobile talent. Our laws and policies threaten this key ingredient to our innovation ecosystem if we do not keep pace with our international competitors.

Earlier this year, the journal *Science* published a science policy paper on the challenges that our visa and immigration policies bring to STEM students and high-skilled workers. It noted that “Much attention has centered on entry-level IT workers, but less consideration has been given to the visa pathways of STEM doctorates who, unlike entry-level IT workers, can bring firms advanced training at the frontiers of science and technology.” It presents an analysis of inefficiencies and delays in the visa and immigration process for foreign-born STEM talent with

advanced degrees. The authors recommend that streamlining a path from doctorate to permanent residency or changes to the H-1B visa program should be considered by policymakers.

I am not an immigration specialist and I know that matters of immigration can be challenging for many reasons, but it is critical that our immigration policies reflect a 21st Century approach in the same way that Congress is now working on legislation to advance research and innovation in critical technologies to compete with China.

I am heartened by the bipartisan efforts in both the House and Senate to address ways to catalyze the U.S. research innovation system to tackle the growing global competition we face. The recent vote by all members of the House Science, Space, and Technology Committee to pass the NSF for the Future Act and the DOE Science for the Future Act is a testament to the recognition that science and innovation is critical to our country and our economy. When funded, the frameworks provided by these pieces of legislation will help to develop our homegrown talent.

Make no mistake, we remain in a global race for innovation advantage, and we've been allowing ourselves to slip. Postdocs and early-career researchers will go where the opportunities are. The U.S. has always been that place and must continue to be that place. If not, we risk losing this talent at great detriment to our nation.

Keep our Eyes on the Horizon

Science and engineering research have an essential role to play in addressing a host of ongoing challenges that we face, including economic competitiveness, agriculture productivity, food and water security, energy security, and climate change.

The creativity and innovation boost that comes from diverse teams is critical in competing with the sheer numbers of scientists and engineers being produced by our global competitors such as China. Our greatest asset is scientific and technological excellence coupled with the diversity of thought derived from the diversity of the experiences on our teams.

Take the following observation of serial inventor and innovator Joseph DeSimone:

“There is no more fertile ground for innovation than a diversity of experience. And that diversity of experience arises from a difference of cultures, ethnicities, and life backgrounds. A successful scientific endeavor is one that attracts a diversity of experience, and cultivates those differences, acknowledging the creativity they spark.”^{ix}

For the United States to develop treatments and vaccines for COVID-19, cure cancers, go to Mars, understand the fundamental laws of the universe and human behavior, develop artificial intelligence, and to build a better future, we need the brain power of the not just the descendants of Native Americans, Pilgrims, Founding Mothers and Fathers, Enslaved People, Ellis Island arrivals, but of those that dream of coming to this country whether as immigrants or nonimmigrants to contribute to the U.S. research enterprise. The United States has thrived as a crossroads where people are joined together by ideas and contribute by choice to the freedom and opportunity provided by this wonderful, inspiring, and flawed country that is always striving to live up to its aspirations.

I encourage members of the subcommittee to look to the array of recommendations that higher-education groups such as AAU and NAFSA and professional scientific societies—many of them

affiliates of AAAS—have offered to ensure that our nation remains a welcoming one for students and scholars alike.^{x xi} This is not an exhaustive list, but some examples include:

- Expand dual intent visas to include foreign student visas (e.g., F-1 visas) to allow them the option to apply for permanent residency.
- Adjust post-graduation immigration law to ease entry to work for skilled graduates. Some organizations have recommended proposals to “staple a green card” to international students graduating with a diploma in specific, targeted fields of study to meet U.S. demands.
- Continue to exempt higher education and research institutions from the H-1B visa caps.
- Preserve the duration of status policy that provides flexibility for foreign students and exchange visitors to complete their studies. We appreciate the bipartisan and bicameral support from Congress in expressing concerns over proposed changes to this policy during the last administration. We are supportive of the announcement by the Department of Homeland Security to withdraw the proposed rule.

Implementing even some of these suggestions will ensure that we continue to be a beacon for science and technology talent from around the world. I thank the subcommittee for the opportunity to testify today and look forward to your questions.

ⁱ <https://www.nafsa.org/policy-and-advocacy/policy-resources/nafsa-international-student-economic-value-tool-v2>

ⁱⁱ <https://www.businessroundtable.org/policy-perspectives/immigration/economic-impact-curbing-optional-practical-training-program>

ⁱⁱⁱ <https://data.newamericaneconomy.org/en/fortune500-2019/>

^{iv} <https://nces.nsf.gov/pubs/nsb20201/global-r-d>

^v <https://cset.georgetown.edu/publication/canadas-immigration-system-increasingly-draws-talent-from-the-united-states/>

^{vi} <https://www.cfr.org/backgrounder/what-canadas-immigration-policy>

^{vii} <https://www.gov.uk/government/publications/uk-research-and-development-roadmap>

^{viii} <https://www.iie.org/en/Why-IIE/Announcements/2021/06/IIE-Survey-Universities-Indicate-Optimism,-Confidence-on-International-Educational-Exchange>

^{ix} <https://press.princeton.edu/books/hardcover/9780691176888/the-diversity-bonus>

^x <https://www.nafsa.org/policy-and-advocacy/what-we-stand-for/issue-brief-welcoming-international-students-and-scholars>

^{xi} <https://www.aau.edu/sites/default/files/AAU-Files/Key-Issues/Immigration/Final-031921-Higher-Ed-immigration-priorities.pdf>