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THE IMPACT OF THE CHILDREN OF IMMIGRANTS ON SCIENTIFIC ACHIEVEMENT IN AMERICA

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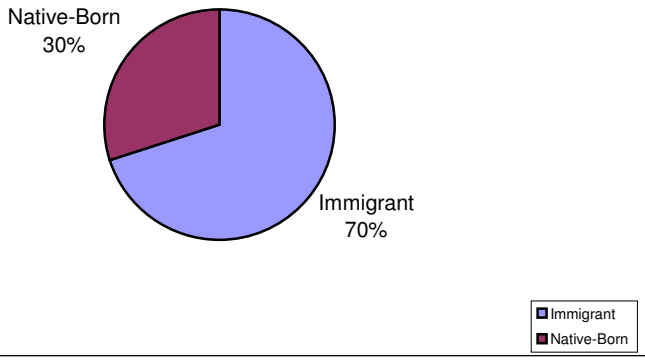
EXECUTIVE SUMMARY

One surprising characteristic unites the majority of America's top high school science and math students – their parents are immigrants. While only 12 percent of the U.S. population is foreign-born, 70 percent of the finalists in the 2011 Intel Science Talent Search competition were the children of immigrants, according to a National Foundation for American Policy analysis. Just 12 of the 40 finalists at this year's competition of the nation's top high school science students had native-born parents. While former H-1B visa holders comprise less than 1 percent of the U.S. population, 60 percent of the finalists had parents who entered the U.S. on H-1B visas, which are generally the only practical way to hire skilled foreign nationals. Finalists' parents sponsored through a family preference category represented 7.5 percent of the total, about four times higher than their proportion in the U.S.

Many immigrant parents place a heavy emphasis on education, particularly in math and science, viewing this as a path to success in America. An important implication of the study is that preventing the entry of H-1B visa holders skilled immigrants, and family-sponsored immigrants would shut off the flow of a key segment of America's next generation of scientists and engineers – the children of immigrants – because we would not have allowed in their parents. The benefit America derives from the children of immigrants in science and math is an additional advantage the country reaps from being open to talent from around the world. Americans should take pride in our openness to individuals and their children who can succeed in the United States without regard to class or place of birth. Liberalizing our nation's immigration laws will likely yield even greater rewards for America in the future.

Figure 1
Parents of 2011 Intel Science Talent Search Finalists



Source: National Foundation for American Policy. Based on interviews conducted with finalists and parents.

AN AREA WITH LITTLE PRIOR RESEARCH

While researchers have documented achievements by immigrants in science, business and other fields, little research has been done on the contributions made by the children of immigrants. I discovered this when researching the 2004 Intel Science Talent Search and other contests of student achievement. That earlier research supports the findings in this study that the children of immigrants are a vital part of America's future in science and mathematics.

The findings in the 2011 Intel Science Talent Search show that the importance of the children of immigrants in science may be increasing. In 2004, I found that 60 percent of the top science students in the United States and 65 percent of the top math students were the children of immigrants. These conclusions were reached through interviews and data obtained on both the Intel Science Talent Search and the 2004 U.S. Math Olympiad's top scorers.[1]

To conduct the research, I interviewed both students and parents at the 2011 Intel Science Talent Search finals in March 2011, in Washington, D.C., and later conducted follow up interviews as necessary. Previously known as the Westinghouse talent search or the "Junior Nobel Prize," more than 95 percent of winners of the Intel Science Talent Search (STS) traditionally have pursued science as a career, with 70 percent earning Ph.D.s or M.D.s. Alumni of the competition "have made extraordinary contributions to science and hold more than 100 of the world's most distinguished science and math honors, including 7 Nobel Prizes and four National Medals of Science."[2] More than 1,700 high school seniors entered the contest in 2011 by completing a detailed entry form. In addition, the student submits a research paper that documents his or her findings, including possible laboratory results. The project should display evidence of "research ability, scientific originality, and creative thinking."[3] The top 40 finalists gathered in Washington, D.C., in March for the last phase of the competition.

THE IMMIGRATION BACKGROUND OF THE PARENTS

The primary distinction between the students at the 2011 Intel Science Talent Search was not intelligence or creativity but the immigration status of their parents. While all of the students were remarkable young people, 28 of the 40 finalists, or 70 percent, had parents who immigrated to America, compared to 12, or 30 percent, whose parents were born in the United States. (See Figure 1.) Note that only 12 percent of the U.S. population is foreign-born.[4]

Skilled professionals hired in America on H-1B visas represent a surprisingly important source of outstanding children in science. Many of these parents first came to the United States as international students, then were

hired on H-1B visas (or its precursor H-1) and were sponsored for permanent residence (a green card) by an employer. Generally good for 6 years, an H-1B temporary visa is often the only practical way to hire an international student graduating from a U.S. university or a professional or researcher from abroad.

Table 1
Immigration Category for Immigrant Parents of 2011 Intel Science Talent Search Finalists

Employment (H-1B and Later Employer-Sponsorship)	24
International Student*	14
Family-Sponsored	3
Refugee	1

Source: National Foundation for American Policy. Based on interviews conducted with finalists and parents. *Note: International students who stayed in the United States after graduation did so on H-1 or H-1B visas.

According to the interviews, 24 of the 28 immigrant parents started working in the United States on H-1B visas and later received an employer-sponsored green card. Fourteen of those 24 were first international students.[5]

To appreciate how remarkable it is that twice as many of the students had parents who received H-1B visas as were native-born, consider that native-born Americans comprise approximately 88 percent of the population and H-1B recipients (past and present) make up less than 1 percent of the U.S. population.[6] In other words, even if twice as many of the 40 finalists had native-born parents as parents who had received an H-1B visa, rather than the other way around, it would still represent a significant finding of the added benefit provided to America by skilled foreign nationals.

Three of the parents were sponsored through a family preference category; one received refugee status after applying for asylum. Eight of the children were themselves born outside the United States.[7] Finalists' parents sponsored through a family preference category represented 7.5 percent of the total, about four times higher than their proportion in the U.S. population.[8]

COUNTRY OF ORIGIN

China and India were the leading countries of origin for the immigrant parents of the student finalists. Sixteen of the children had parents born in China, 10 had parents born in India, one student's parents were born in South Korea and another was born in Iran. As noted earlier, 12 of the student finalists had native-born parents. To place these numbers in perspective, in 2009, Indians comprised only 0.8 percent of the U.S. population and Chinese made up only 1 percent, according to the Pew Hispanic Center.[9] In proportion to their presence in the U.S.

population, one would expect only one child of an Indian (or Chinese) immigrant parent every two and a half years to be an Intel Science Talent Search finalist, not 10 in a year.

Table 2
Country of Birth for Parents of 40 Finalists of 2011 Intel Science Talent Search Competition

China	16
United States	12
India	10
Iran	1
South Korea	1

Source: National Foundation for American Policy. Based on interviews conducted with finalists and parents.

SEEKING FREEDOM AND OPPORTUNITY

The stories and motivations of the families of the student finalists provide insight into the world of these high-achieving young people. Michelle Abi Hackman and her family overcame more obstacles than any at the 2011 Intel Science Talent Search competition. Daniel Hackman studied in America in the 1960s, but returned to Iran to work. Then, in the 1970s, an Islamic revolution took place in Iran. As a Jew in an Islamic state, Daniel feared for his family's safety. The family made it to New York and applied for asylum. "The process took time and our case encountered a glitch," recalled Daniel Hackman.[10] Ultimately, the application for asylum was approved.

The tribulations of the family were not over. Michelle was born with vision in only one eye. Eventually, when she was still in grammar school, she lost sight in her second eye. "It happened on September 11," recalled Daniel Hackman. "I was watching television footage of the Twin Towers and I received a call from my daughter's school."

Michelle's health problems and subsequent events in Iran convinced Daniel he made the right decision to come to America. "Michelle was really blessed to be born in this country," said Daniel Hackman. "There are so many facilities and technology available. We are really grateful to this country for giving our daughter these opportunities."

Michelle placed second in the 2011 Intel Science Talent Search competition for an experiment measuring alertness and anxiety among teenagers separated from their cell phones. The experiment involved 150 high school students. Michelle trained 10 assistants to conduct the tests. She has been accepted to study at Yale in the fall.

Table 3
2011 Intel Science Talent Search Finalists With Immigrant Parents

Name	Parents Birthplace	Hometown, State
Aggarwal, Amol	India	Saratoga, California
Arora, Shubhangi*	India	Novi, Michigan
Atolia, Eta*	India	Tallahassee, Florida
Cao, Wenyu	China	Belle Mead, New Jersey
Cao, Xiaoyu*	China	San Diego, California
Chen, Emily Li	China	Omaha, Nebraska
Cho, Sung Won	South Korea	Lexington, Massachusetts
Gong, Jan Jiawei	China	Garden City, New York
Hackman, Michelle Abi	Iran	Great Neck, New York
He, Bryan Dawei	China	Williamsville, New York
Joardar, Rounok	India	Plano, Texas
Lam, Matthew	China	Old Westbury, New York
Lee, Si-Yi Ryan*	China	Charlotte, North Carolina
Lei, Bonnie Rae*	China	Walnut, California
Leung, Krystle M.	China	Naperville, Illinois
Li, Jonathan F.	China	Laguna Niguel, California
Li, Selena Shi-Yao	China	Fair Oaks, California
Liu, Andrew Bo	China	Palo Alto, California
Liu, Jenny Jiaqi*	China	Orange, Connecticut
Mahajan, Rohan	India	Cupertino, California
Mukhopadhyay, Prithwis Kumar*	India	Woodbury, Minnesota
Pai, Sunil Kochikar	India	Houston, Texas
Parthasarathy, Nikhil	India	Mountain View, California
Rangwala, Alydaar	India	Loudonville, New York
Saha, Shubhro	India	Avon, Connecticut
Tang-Quan, David Kenneth	China	Rancho Palos Verdes, CA
Wang, Yushi*	China	Portland, Oregon
Zhou, Elaine	China	Winter Park, Florida

Source: National Foundation for American Policy, Society for Science & the Public. *Born abroad.

THE CHOICES MADE BY PARENTS

Adults often choose to immigrate with an eye towards their children's future. Some parents choose to leave so they can make their own choices on how to raise their children – and how many children they could have. Selena Shi-Yao Li's parents left China because of the country's strict population policy. "They wanted to have more than one child," said Selena, who, along with her sister, was born in Alabama.

The mother of Jenny Jiaqi Liu took a job at Yale University. A primary reason for taking the job and moving to America was concern that Jenny's asthma was worsening while living amidst China's pollution problems. Jenny, who was born in China, conducted an experiment to determine human responses to robots programmed to display believable emotional responses. "She expects her findings will help engineers design robots with which people are comfortable interacting," according to the Society for Science & the Public.[11]

Samar Saha, father of Shubhro Saha, came to America on an H-1B visa to work in information technology. His son Shubhro, 17, from Avon, Connecticut, worked with a super computer to identify a possible mechanism for the interaction of the catalyst in hydrogen production. The goal is to make hydrogen easier to use as an alternative energy source. He has presented his research at General Electric. Born in Calcutta, Mr. Saha said, "We came to America for the opportunity and quality of life. I am grateful that my son has been able to take advantage of the opportunities this country offers."

Having a foot in more than one culture may help inspire new ideas and interests in young people. The father of Rohan Mahajan came to America from India as a graduate student and today works for Cisco in Silicon Valley. Rohan said, "I got interested in energy production because whenever we went to India the power always went out." For the 2011 Intel Science Talent Search competition he researched methods of improving the efficiency of photoelectrochemical cells and found a way that increased light absorption of the photoelectrodes, which could have applicability to photovoltaic (solar) cells.[12]

EMPHASIS ON EDUCATION STARTS WITH PARENTS

The influence of parents could be seen and heard directly from the Intel Science Talent Search finalists. "Our parents brought us up with love of science as a value," said David Kenneth Tang-Quan, whose parents emigrated from China. David's father, who is now a pastor in a Baptist church in Palos Verdes, California, was sponsored for immigration by a family member. David plans to continue his research on pathogens that can affect the bloodstream of "immuno compromised" patients.[13]

Jan Jiawei Gong, whose parents came to America on an employment visa from China, is direct about the impact of family. "I think any child gets their work ethic from their parents," she said. Jan, who achieved perfect SAT scores, performed research indicating sugar can be addictive.[14] She believes the findings can someday influence the treatment of diabetes patients.

Bonnie Rae Lei, whose parents came to America from China first as students and then became employer-sponsored immigrants, may have discovered a new species. In a remarkable bit of research that involved receiving samples of sea slugs from different parts of the Western hemisphere. Bonnie utilized both DNA and analysis of the anatomy of sea slugs. She found that a population of sea slugs in the Bahamas "was genetically distinct enough to be a separate species."[15]

LOOKING TO MAKE ADVANCES IN MEDICINE

Several of the 2011 Intel Science Talent Search finalists plan to pursue careers in medical fields. Emily Li Chen grew up in Nebraska after her father came from China to study at the New Jersey Institute of Technology and was later hired by Union Pacific. Emily has researched drug therapies to combat Alzheimer's and Parkinson's. Neuro degenerative disorders can result from a lack of essential neurons. "Her findings indicate that this can be counteracted by blocking the protein STAT3, and thereby inhibiting astrocyte formation and promoting neurogenesis," according to the Society for Science & the Public. "She believes drugs that target the STAT3 pathway may help alleviate neuro degenerative damage."[16] Emily hopes her findings can be tested in mice. She will study neuroscience in college.

Many of the students are motivated to cure diseases afflicting thousands of people annually. Jonathan F. Li, whose parents came from China to study at the University of Southern California, conducted a two-year project on destroying cancer cells. He developed a computer model on the growth of tumor cell clusters and delivered a paper on his findings in Rio de Janeiro at a meeting of the Society for Mathematical Biology.[17] Selena Shi-Yao Li, whose parents are both physicians from China, developed a new potential treatment for liver cancer. She found that combining a new drug, arginine deiminase (ADI), with chloroquine, a malaria treatment, made treatment with ADI four times more effective.[18]

Alydaar Rangwala, whose parents were born in India, found that long wave UV light might work as a treatment for various afflictions. He found promising results in tests on mouse tissue. The research carries implications for treatment of lupus, as well as LCH and scleroderma.[19] Prithwis Kumar Mukhopadhyay, who was born in India, has researched whether carrageenan, a food additive, may be linked to malignant cancers.[20] Andrew Bo Liu, whose parents were born in China, researched methods to prevent transplant rejections, focusing on data and immune pathways related to kidney transplants.[21]

CONCLUSION

We can draw a number of conclusions from the finding that 70 percent of the finalists at the 2011 Intel Science Talent Search competition were the children of immigrants. First, we can observe that the immigrant parents place a heavy emphasis on education, particularly in math and science, viewing this as a path to success in America. Second, America can be proud that its society remains so open that individuals only a decade or two in the country can raise children poised to assume a leadership role in science and related competitive fields. Third, it is important to maintain open policies on international students, as many outstanding children of immigrants have parents who first entered the country as foreign students.

Finally, the results also should serve as a warning against new restrictions on legal immigration, both family and employment-based immigration, since such restrictions are likely to prevent many of the next generation of outstanding scientists and researchers from emerging in America. The talents possessed by these children of immigrants are a wonderful gift to America, a gift we can all benefit from in the future so long as we can allow talented foreign nationals to come to the United States and pursue their American dreams.

END NOTES

[1] Stuart Anderson, "The Multiplier Effect," *International Educator*, Summer 2004.

[2] Intel Science Talent Search, *Finalists* booklet for 2011 and 2004, Society for Science & the Public; website for Society for Science & the Public.

[3] Ibid.

[4] U.S. Census Bureau, March 2009. http://www.census.gov/compendia/statab/2011/tables/11s0040.pdf.

[5] Daniel Hackman also studied in America, then returned to Iran and later came to America seeking asylum.

[6] U.S. Census Bureau; NFAP estimates of past H-1B visa holders in the U.S. relative to size of U.S. population.

[7] The 2011 Intel Science Talent Search finalists born outside the United States were Xiaoyu Cao (China), Bonnie Rae Lei (China), Jenny Jiaqi Liu (China), Eta Atolia (India), Shubhangi Arora (India), Prithwis Kumar Mukhopadhyay (India), Si-Yi Ryan Lee (China), Yushi Wang (China).

[8] Family preference categories referenced here (and estimated for population purposes) are the unmarried sons and daughters and married sons and daughters of U.S. citizens, the siblings of U.S. citizens, and the unmarried sons and daughters of lawful permanent residents.

[9] Pew Hispanic Center compilation from American FactFinder; 2009 American Community Survey. Thank you to Jeffery Passel for pointing out the data. The Census numbers on Chinese include people from Taiwan, however, no parents of the 2011 Intel Science Talent Search finalists were born in Taiwan.

[10] All quotations appearing here are from interviews conducted with students and parents. Thank you to Allison Kubota for assistance in arranging the interviews.

[11] *2011 Finalists*, Intel Science Talent Search, Society for Science & the Public, p. 16.

[12] Ibid., p. 21.

[13] Ibid., p. 22.

[14] Ibid., p. 10.

[15] Ibid., p. 13.

[16] Ibid., p. 8.

[17] Ibid., p. 14.

[18] Ibid., p. 15.

[19] Ibid., p. 20.

[20] Ibid., p. 18.

[21] Ibid., p. 15.

ABOUT THE AUTHOR

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