

NATIONAL FOUNDATION FOR AMERICAN POLICY
NFAP POLICY BRIEF » OCTOBER 2017

IMMIGRANTS AND NOBEL PRIZES: 1901-2017

EXECUTIVE SUMMARY

Immigrants have been awarded 39 percent, or 33 of 85, of the Nobel Prizes won by Americans in Chemistry, Medicine and Physics since 2000. In 2017, the sole American winner of the Nobel Prize in Chemistry was an immigrant, Joachim Frank, a Columbia University professor born in Germany. Immigrant Rainer Weiss, who was born in Germany and came to the United States as a teenager, was awarded the 2017 Nobel Prize in Physics, sharing it with two other Americans, Kip S. Thorne and Barry C. Barish. In 2016, all 6 American winners of the Nobel Prize in economics and scientific fields were immigrants.

These achievements by immigrants point to the gains to America of welcoming talent from across the globe. It does not mean America should welcome only Nobel Prize winners. Such a policy would be impossible to implement, since most immigrant Nobel Prize winners enter the United States many years before being awarded this honor. Most people immigrate to another country in their 20s, particularly employment-based immigrants, who either study in America or come here to work shortly after obtaining a degree abroad. The average of age of Nobel Prize winners at the time of the award is 59.5 years, according to economist Mark J. Perry.¹

Table 1
Immigrant Nobel Prize Winners in Chemistry, Medicine and Physics Since 2000

Immigrant Nobel Winners Since 2000	33 of 85 American winners have been immigrants
Percentage of Immigrant Winners Since 2000	39%

Source: Royal Swedish Academy of Sciences, National Foundation for American Policy, George Mason University Institute for Immigration Research. Numbers and percentage for chemistry, medicine and physics prizes.

Nobel Prize winners represent great individual achievement but also reflect the state of research, openness and scientific advancement within a society. American students, research colleagues and the U.S. economy gain from the work performed by outstanding scientists and researchers, including Nobel Prize winners.

The right immigration laws matter, particularly in determining whether the United States gains from increased globalization and rising educational achievement in India, China and elsewhere. The Immigration and Nationality Act of 1965 eliminated the discriminatory national origin quotas and opened the door to Asian immigrants, while the Immigration Act of 1990 increased employment-based green card numbers. Those two pieces of legislation have been important factors in drawing international students to the country and enhancing the ability of America to assimilate talented individuals into our culture and economy. While the rise in immigrant Nobel Prize winners reflects an overall increase in the reputation and capability of American institutions and researchers post-1960, a greater

¹ Mark J. Perry, "Looking back at the remarkable history of the Nobel Prize from 1901-2016 using maps, charts and tables," Carpe Diem, October 13, 2016.

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openness to immigration has helped make the United States the leading global destination for research in many different science and technology fields, including computers, cancer research and others.

Sir J. Fraser Stoddart, winner of the Nobel Prize in Chemistry in 2016 and an immigrant from the United Kingdom, noted that “his research group at Northwestern University has students and scientists from a dozen different countries.” Stoddart believes scientific research will remain strong in America “as long as we don’t enter an era where we turn our back on immigration.”

Among the key findings in this report:

- One can see the increasing influence and importance of immigrants on science in America over the past half century. Between 1901 and 1959, immigrants won 25 Nobel Prizes in Chemistry, Medicine and Physics but won 81 prizes in these fields – *more than three times as many* – between 1960 and 2017.²
- Between 1901 and 1959, only one immigrant to the United States (William Francis GIAUQUE) won the Nobel Prize in Chemistry, while between 1960 and 2017, 26 immigrants won the Nobel Prize for Chemistry.
- From 1901 to 1959, 9 immigrants to the United States won the Nobel Prize for Medicine, but 29 immigrants were awarded the Nobel Prize for Medicine from 1960 to 2017.
- In Physics, 15 immigrants won the Nobel Prize from 1901 to 1959, while 26 immigrants won the Nobel Prize for Physics between 1960 and 2017.

² The numbers and other information in this report have been updated and adapted from *Immigrants and Nobel Prizes*, NFAP Policy Brief, National Foundation for American Policy, October 2016. For more background on Nobel Prize winners see <https://www.nobelprize.org/>.

OVERVIEW

Immigrants have been awarded 39 percent, or 33 of 85, of the Nobel Prizes won by Americans in Chemistry, Medicine and Physics since 2000. Approximately 13 percent of the U.S. population today is foreign-born.³ In 2017, 2 of the 7 American winners in Chemistry, Medicine and Physics were immigrants. Joachim Frank, a Columbia University professor born in Germany, was the sole American winner of the Nobel Prize in Chemistry. German-born immigrant Rainer Weiss shared the 2017 Nobel Prize in Physics with fellow Americans Kip S. Thorne and Barry C. Barish. In 2016, all 6 Americans who won the Nobel Prize in economics and scientific fields were immigrants.⁴ The 6 American winners were Sir J. Fraser Stoddart (Chemistry), F. Duncan M. Haldane (Physics), David Thouless (Physics), Michael Kosterlitz (Physics), Oliver Hart (Economics) and Bengt Holmström (Economics).

Table 2
Immigrant and Native-Born (U.S.) Nobel Prize Winners Since 2000

CHEMISTRY	MEDICINE	PHYSICS
Immigrant – 11 winners	Immigrant – 10 winners	Immigrant – 12 winners
Native-Born – 18 winners	Native-Born – 16 winners	Native-Born – 18 winners
Percentage Immigrant – 38%	Percentage Immigrant – 38%	Percentage Immigrant – 40%

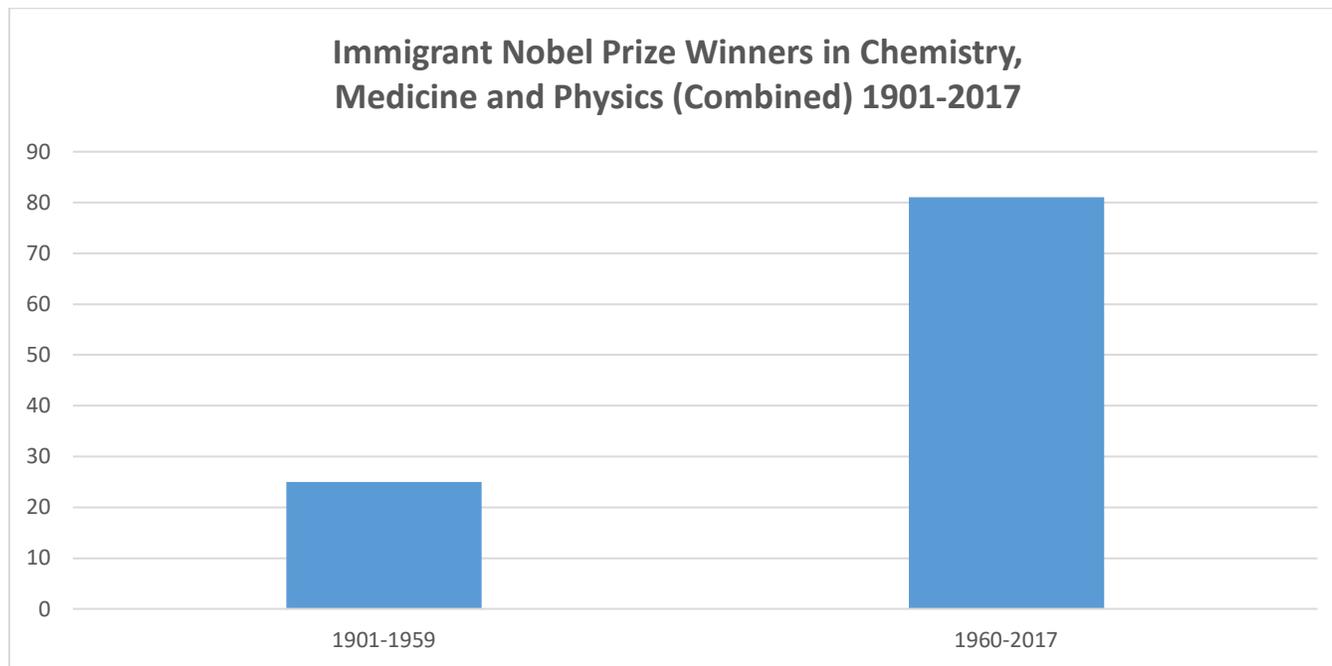
Source: Royal Swedish Academy of Sciences, National Foundation for American Policy, George Mason University Institute for Immigration Research.

Reflected in the Nobel Prize winners, one can see the increasing influence and importance of immigrants on science in America. Between 1901 and 1959, immigrants won 25 Nobel Prizes in Chemistry, Medicine and Physics but won 81 prizes in these fields – *more than three times as many* – between 1960 and 2017. The pre-1960 immigrant (and U.S.) Nobel Prize total would have been lower if not for the many Jewish scientists who overcame significant restrictions against immigration in the 1930s and fled to the United States to escape European fascism.

The difference between the two periods over approximately the same number of years illustrates the importance of changes in U.S. immigration law, particularly the Immigration and Nationality Act of 1965 ending the restrictive “national origins” quotas that prevented people from much of the world, including Asia, from immigrating to the United States. The Immigration Act of 1990 increased immigration quotas for employment-based green cards. Becoming a more open place for international students from all over the world, and the overall increase in the reputation and capability of American institutions and researchers post-1960, combined to make the United States the leading global destination for research in many science and technology fields.

³ “Chapter 5: U.S. Foreign-Born Population Trends,” in *Modern Immigration Wave Brings 59 Million to U.S., Driving Population Growth and Change Through 2065*, Pew Research Center, September 28, 2015.

⁴ Bob Dylan, born in Minnesota, won the Nobel Prize for Literature in 2016.

Figure 1

Source: Royal Swedish Academy of Sciences, National Foundation for American Policy, George Mason University Institute for Immigration Research.

CHEMISTRY

The American winner of the 2017 Nobel Prize in Chemistry was Joachim Frank, who was born in Germany in 1940. Frank is a Professor of Biochemistry and Molecular Biophysics and of Biological Sciences at Columbia University in New York. He shared the award with Jacques Dubochet, an Honorary Professor of Biophysics at the University of Lausanne, Switzerland, and Richard Henderson, Programme Leader, MRC Laboratory of Molecular Biology, Cambridge, United Kingdom.

“The Nobel Prize in Chemistry 2017 is awarded to Jacques Dubochet, Joachim Frank and Richard Henderson for the development of cryo-electron microscopy, which both simplifies and improves the imaging of biomolecules,” announced the Royal Swedish Academy of Sciences. “This method has moved biochemistry into a new era.”⁵

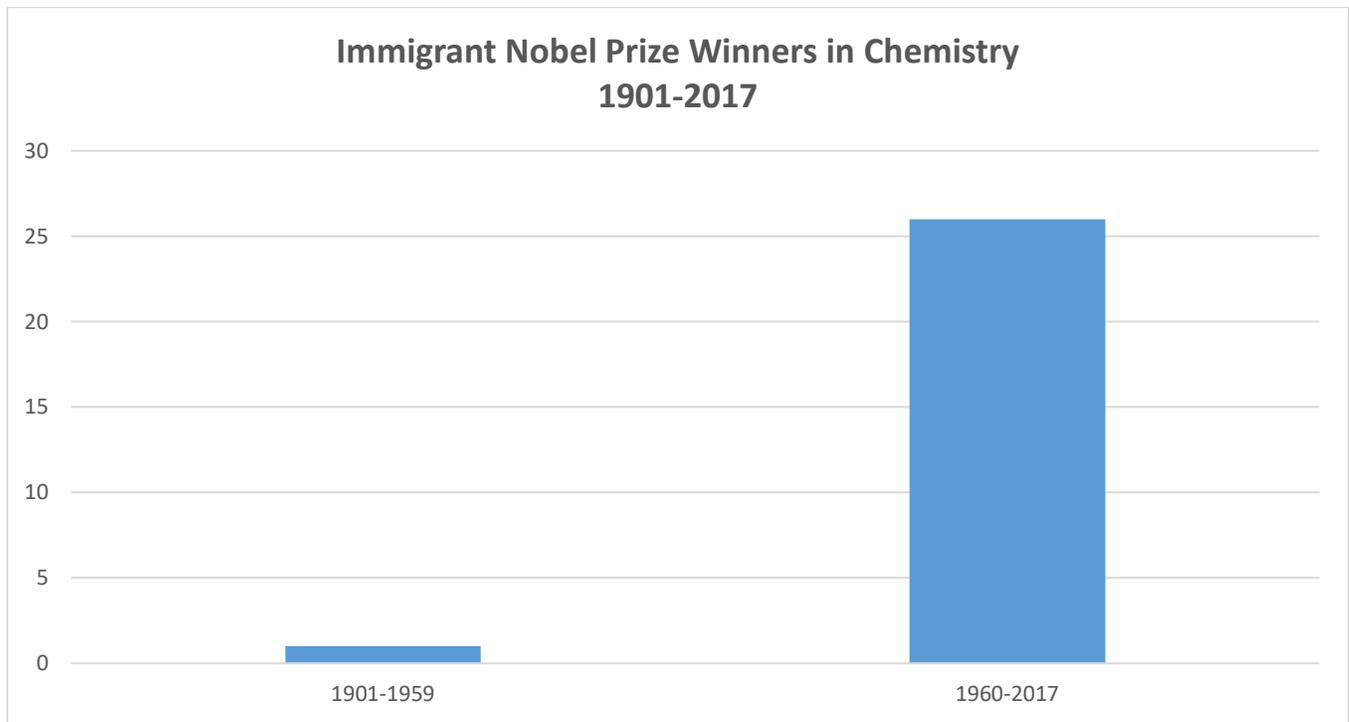
⁵ Press Release: The Nobel Prize in Chemistry 2017, The Royal Swedish Academy of Sciences, October 4, 2017.

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Scientists believe the advances in microscopes will open up additional opportunities for discovery. “Electron microscopes were long believed to only be suitable for imaging dead matter, because the powerful electron beam destroys biological material. But in 1990, Richard Henderson succeeded in using an electron microscope to generate a three-dimensional image of a protein at atomic resolution. This breakthrough proved the technology’s potential,” according to Royal Swedish Academy of Sciences.⁶

“Joachim Frank made the technology generally applicable,” the Academy noted. “Between 1975 and 1986 he developed an image processing method in which the electron microscope’s fuzzy two-dimensional images are analysed and merged to reveal a sharp three-dimensional structure.”⁷ Jacques Dubochet carried these advances further after he “added water to electron microscopy.”⁸

Figure 2



Source: Royal Swedish Academy of Sciences, National Foundation for American Policy, George Mason University Institute for Immigration Research.

⁶ Ibid.

⁷ Ibid.

⁸ Ibid.

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Sir J. Fraser Stoddart was awarded the Nobel Prize in Chemistry in 2016. He was born and educated primarily in the United Kingdom and came to UCLA to teach nearly 20 years before winning the Nobel Prize. He currently is a professor of chemistry at Northwestern University in Illinois. "The laureate told *The Guardian* that his research group at Northwestern University has students and scientists from a dozen different countries and that bringing in international talent raises the bar overall."⁹ Stoddart said, "I think the resounding message that should go out all around the world is that science is global." He "credited American openness with bringing top scientists to the country" and told *The Hill* that that the American scientific establishment will only remain strong "as long as we don't enter an era where we turn our back on immigration."¹⁰

Between 1901 and 1959, only one immigrant to the United States (William Francis GIAUQUE) won the Nobel Prize in Chemistry, while between 1960 and 2017, 26 immigrants won the Nobel Prize for Chemistry.

Table 3
Immigrant Nobel Prize Winners in Chemistry Since 2000

YEAR	WINNER	PLACE OF BIRTH	U.S. AFFILIATION
2000	Alan G. MacDiarmid	New Zealand	University of Pennsylvania
2002	Kurt Wüthrich	Switzerland	The Scripps Research Institute
2008	Osamu Shimomura	Japan	Marine Biological Laboratory, Boston University Medical School
2010	Ei-ichi Negishi	China	Purdue University
2011	Dan Shechtman	Palestine	Iowa State
2013	Martin Karplus	Austria	Harvard University
2013	Michael Levitt	South Africa	Stanford University School of Medicine
2013	Arieh Warshel	Israel	University of Southern California
2015	Aziz Sancar	Turkey	University of North Carolina School of Medicine
2016	Sir J. Fraser Stoddart	UK	Northwestern University
2017	Joachim Frank	Germany	Columbia University

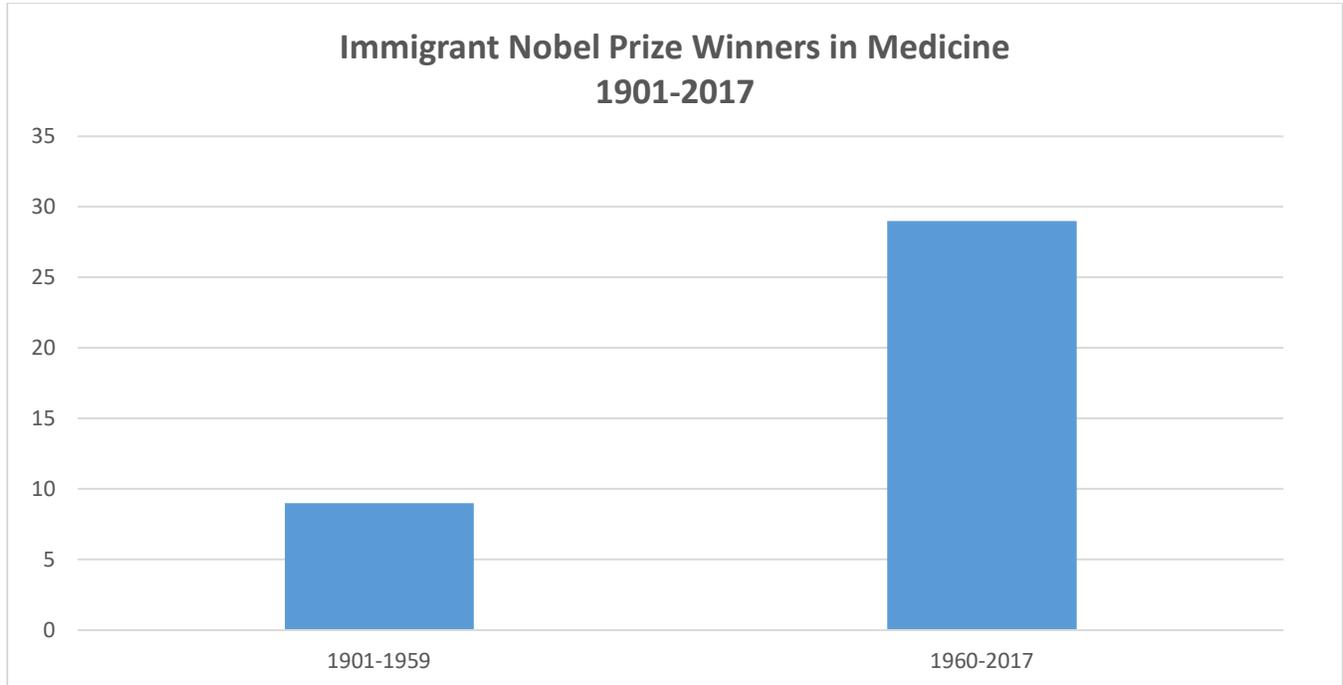
Source: Royal Swedish Academy of Sciences, National Foundation for American Policy, George Mason University Institute for Immigration Research.

⁹ Zhai Yun Tan, "Why Nobel-Winning Scientists Are Talking About Immigration Policy," *Christian Science Monitor*, October 11, 2016.

¹⁰ Rafael Bernal, "Amid debate, all 2016 American Nobel laureates are immigrants," *The Hill*, October 10, 2016.

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Figure 3



Source: Royal Swedish Academy of Sciences, National Foundation for American Policy, George Mason University Institute for Immigration Research.

MEDICINE

The most recent American winner of the Nobel Prize in Medicine was William C. Campbell, who was born in Ireland and is a professor at Drew University in New Jersey. He won the award in 2015 with Satoshi Ōmura of Japan and Youyou Tu of China.

“William C. Campbell and Satoshi Ōmura discovered a new drug, Avermectin, the derivatives of which have radically lowered the incidence of River Blindness and Lymphatic Filariasis, as well as showing efficacy against an expanding number of other parasitic diseases,” according to the Royal Swedish Academy of Sciences. “Youyou Tu discovered Artemisinin, a drug that has significantly reduced the mortality rates for patients suffering from Malaria. These two discoveries have provided humankind with powerful new means to combat these debilitating diseases that affect hundreds of millions of people annually. The consequences in terms of improved human health and reduced suffering are immeasurable.”¹¹

¹¹ Press Release: The Nobel Prize in Physiology or Medicine 2015, The Royal Swedish Academy of Sciences, October 5, 2015.

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From 1901 to 1959, 9 immigrants to the United States won the Nobel Prize for Medicine, but 29 immigrants were awarded the Nobel Prize for Medicine from 1960 to 2017.

Table 4
Immigrant Nobel Prize Winners in Medicine Since 2000

YEAR	WINNER	PLACE OF BIRTH	U.S. AFFILIATION
2000	Eric R. Kandel	Austria	Columbia University
2002	Sydney Brenner	South Africa	The Molecular Sciences Institute
2007	Mario R. Capecchi	Italy	University of Utah, Howard Hughes Medical Institute
2007	Oliver Smithies	United Kingdom	Univ. of North Carolina Chapel Hill
2009	Elizabeth H. Blackburn	Australia	University of California, San Francisco
2009	Jack W. Szostak	United Kingdom	Harvard Medical School
2011	Ralph M. Steinman	Canada	Rockefeller University
2012	Shinya Yamanaka	Japan	Gladstone Institutes
2013	Thomas Südhof	Germany	Stanford University
2015	William C. Campbell	Ireland	Drew University

Source: Royal Swedish Academy of Sciences, National Foundation for American Policy, George Mason University Institute for Immigration Research.

Elizabeth Blackburn, born in Australia, shared the 2009 Nobel Prize for Medicine with Jack Szostak (Harvard Medical School), a British-born immigrant to the U.S., and American-born Carol Greider (Johns Hopkins University School of Medicine). Greider was Elizabeth Blackburn's student in 1985 when they "published a paper announcing the discovery of the enzyme telomerase."¹² Blackburn is a professor of Biology and Physiology at the University of California San Francisco (UCSF). She came to America in 1978, more than 30 years before she won the Nobel Prize, to teach at the University of California Berkeley, before joining the faculty at UCSF in 1990.¹³

Dr. Blackburn and Dr. Szostak were able to establish that "repeated DNA sequences make up the tips of each chromosome."¹⁴ Since the enzyme serves an important function in the health of cells, the discovery has helped launch research into cancer, cardiovascular disease and other age-related illnesses.¹⁵ In naming Elizabeth Blackburn "Scientist of the Year" in 2007, *Discover Magazine* wrote, "Imagine that this scientist kept a to-do list: On it would be a cure for cancer and, further down, understanding the diseases associated with aging. Elizabeth Blackburn is the 59-year-old Tasmanian-born scientist responsible for launching one of the hottest fields in the life

¹² Goutam Naik, "U.S. Cell-Aging Researchers Awarded Nobel," *The Wall Street Journal*, October 6, 2009, A5.

¹³ Dr. Elizabeth Blackburn, Blackburn Lab, University of California San Francisco.

¹⁴ *Ibid.*

¹⁵ *Ibid.* See also Stuart Anderson, *Immigration* (Greenwood, 2010).

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sciences, the study of telomeres. These tiny strips of DNA cap the ends of chromosomes, and her research promises to yield potent therapeutics for many of the scourges that plague humanity.”¹⁶

PHYSICS

Dr. Rainer Weiss, who was awarded a Nobel Prize in Physics in 2017, came to America as a teenager, many years before he began producing Nobel Prize-caliber research. “Dr. Weiss was born in Berlin in 1932 and came to New York by way of Czechoslovakia in 1939,” reported the *New York Times*. “As a high school student, he became an expert in building high-quality sound systems and entered M.I.T. intending to major in electrical engineering. He inadvertently dropped out when he went to Illinois to pursue a failing romance. After coming back, he went to work in a physics lab and wound up with a Ph.D. from M.I.T.”¹⁷

The winners received the 2017 Nobel Prize in Physics for their “decisive contributions to the LIGO detector and the observation of gravitational waves.”¹⁸

“On 14 September 2015, the universe’s gravitational waves were observed for the very first time,” explained the Royal Swedish Academy of Sciences. “Gravitational waves are an entirely new way of observing the most violent events in space and testing the limits of our knowledge.”¹⁹

Today, science often requires a global effort. “LIGO, the Laser Interferometer Gravitational-Wave Observatory, is a collaborative project with over one thousand researchers from more than twenty countries,” reported the Royal Swedish Academy of Sciences. “Together, they have realised a vision that is almost fifty years old. The 2017 Nobel Laureates have, with their enthusiasm and determination, each been invaluable to the success of LIGO. Pioneers Rainer Weiss and Kip S. Thorne, together with Barry C. Barish, the scientist and leader who brought the project to completion, ensured that four decades of effort led to gravitational waves finally being observed.”²⁰

The Academy detailed the efforts of this year’s Physics prize winners: “In the mid-1970s, Rainer Weiss had already analysed possible sources of background noise that would disturb measurements, and had also designed a detector, a laser-based interferometer, which would overcome this noise. Early on, both Kip Thorne and Rainer Weiss were firmly convinced that gravitational waves could be detected and bring about a revolution in our knowledge of the universe . . . gravitational waves are direct testimony to disruptions in spacetime itself. This is

¹⁶ Linda Marsa, “Scientist of the Year Notable: Elizabeth Blackburn,” *Discover Magazine*, December 6, 2007.

¹⁷ Dennis Overbye, “2017 Nobel Prize in Physics Awarded to LIGO Black Hole Researchers,” *New York Times*, October 3, 2017.

¹⁸ Press Release: The Nobel Prize in Physics 2017, The Royal Swedish Academy of Sciences, October 3, 2017.

¹⁹ *Ibid.*

²⁰ *Ibid.*

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something completely new and different, opening up unseen worlds. A wealth of discoveries awaits those who succeed in capturing the waves and interpreting their message.”²¹

Three immigrants born in the United Kingdom shared the Nobel Prize for Physics in 2016 – David J. Thouless (University of Washington), F. Duncan M. Haldane (Princeton University) and J. Michael Kosterlitz (Brown University). In 2016, the Royal Swedish Academy of Sciences wrote of the winners: “They have used advanced mathematical methods to study unusual phases, or states, of matter, such as superconductors, superfluids or thin magnetic films. Thanks to their pioneering work, the hunt is now on for new and exotic phases of matter. Many people are hopeful of future applications in both materials science and electronics.”²²

Table 5
Immigrant Nobel Prize Winners in Physics Since 2000

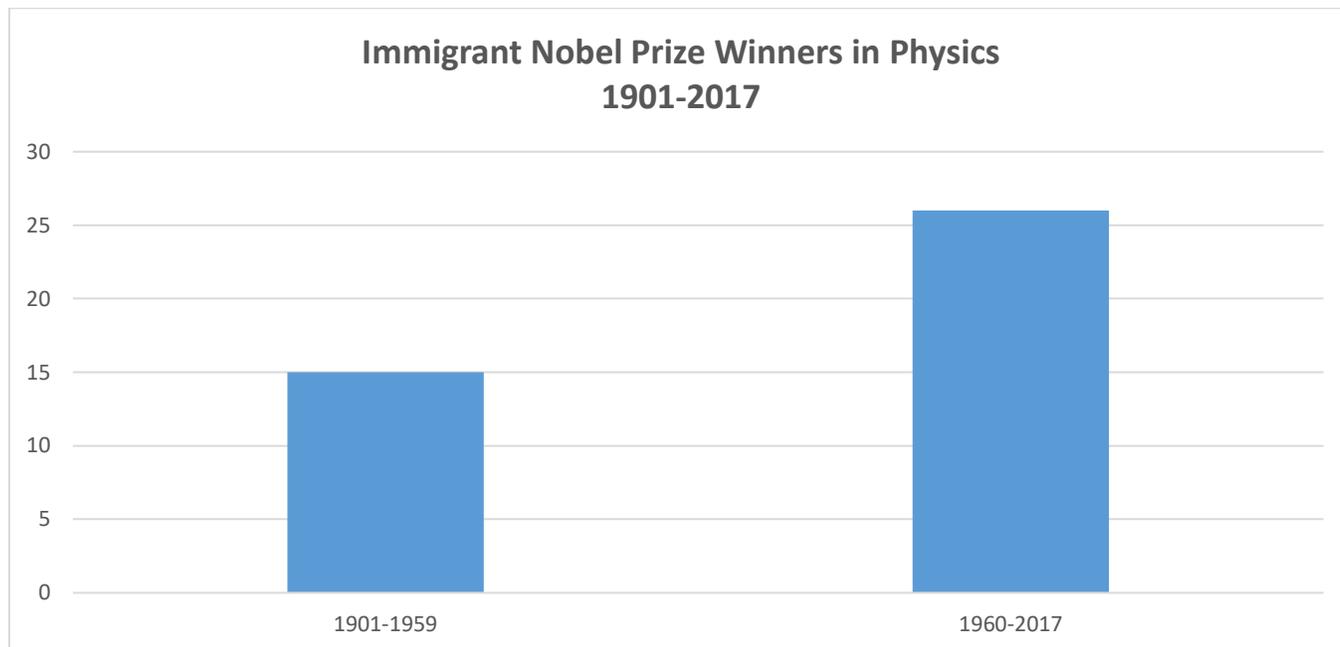
YEAR	WINNER	PLACE OF BIRTH	U.S. AFFILIATION
2000	Herbert Kroemer	Germany	University of California, Santa Barbara
2001	Wolfgang Ketterle	West Germany	Massachusetts Institute of Technology (MIT)
2002	Riccardo Giacconi	Italy	Associated Universities Inc.
2003	Anthony J. Leggett	United Kingdom	University of Illinois, Urbana
2003	Alexei A. Abrikosov	USSR/Russia	Argonne National Laboratory
2008	Yoichiro Nambu	Japan	University of Chicago
2009	Willard S. Boyle	Canada	Bell Laboratories
2014	Shuji Nakamura	Japan	University of California, Santa Barbara
2016	David J. Thouless	United Kingdom	University of Washington
2016	F. Duncan M. Haldane	United Kingdom	Princeton University
2016	J. Michael Kosterlitz	United Kingdom	Brown University
2017	Rainer Weiss	Germany	Massachusetts Institute of Technology (MIT)

Source: Royal Swedish Academy of Sciences, National Foundation for American Policy, George Mason University Institute for Immigration Research.

²¹ Ibid.

²² Press Release: The Nobel Prize in Physics 2016, The Royal Swedish Academy of Sciences, October 5, 2016.

Figure 4



Source: Royal Swedish Academy of Sciences, National Foundation for American Policy, George Mason University Institute for Immigration Research.

In Physics, 15 immigrants won the Nobel Prize from 1901 to 1959, while 26 immigrants won the Nobel Prize for Physics between 1960 and 2017.

A number of the earliest U.S. winners of the Nobel Prize in Physics were Jewish scientists who fled Europe after the rise of Hitler and Mussolini. These scientists were crucial in America becoming the first nation to develop the atomic bomb. In 1954 the Atomic Energy Act established an award to recognize scientific achievements in the field of atomic energy. The first winner of the award was the Italian-born Enrico Fermi. After his death, the award became known as the Enrico Fermi Award and 5 of the first 8 winners were immigrants. Four of the nuclear scientists who came to the United States from Europe in the 1930s and later received a Nobel Prize for physics were Felix Bloch (1952), born in Switzerland, Emilio Segre (1959), born in Italy, Maria Mayer (1963), born in Poland, and Eugene Wigner (1963), born in Hungary.

CONCLUSION

The achievements of so many immigrants as seen in the form of Nobel Prizes, successful businesses, and contributions in sports, the arts and many other fields are a testament to the American Dream. To reap the most benefits of scientific and technological innovation, America must remain open to immigration. When one asks successful entrepreneurs and scientists conducting groundbreaking research whether they favor liberalized policies on immigration, the answer they usually give is that more immigration and greater openness to international students, researchers and immigrants across the skill spectrum will help America grow and prosper.

ABOUT THE NATIONAL FOUNDATION FOR AMERICAN POLICY

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