

Germany as a Study Abroad Destination of U.S. Students in the Science, Technology, Engineering and Mathematics (STEM) Fields

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Of the 205,000 U.S. students abroad during the 2004–2005 academic year, only 6,557 or slightly more than 3% of them studied in Germany. The Ohio Alliance reports that only 13% of all U.S. students who studied abroad during the 2004–2005 academic year were from the STEM fields of study.¹ The Institute of International Education Open Doors Report, however, does not provide a breakdown of the number of American students per academic field of study in specific countries or regions. For this reason it is difficult to know how many U.S. students in the STEM fields are actually studying and/or researching in Germany each academic year.

This report maps patterns of study abroad in Germany by U.S. students in the Scientific, Technology, Engineering and Mathematics (STEM) fields and to learn what, if anything, Germany is doing to attract these students to its universities and research institutions. It will also look at the academic trends in the STEM fields in both the United States and German higher education systems in order to better understand the international educational opportunities for U.S. students to study these disciplines abroad in Germany. Finally, it will investigate if there are current developments or policies in Germany to attract U.S. students and in particular students in the STEM fields to study and/or research in German universities and institutes.

During the late nineteenth century a wave of elite institutions of higher education were being founded, such as The University of Chicago, Cornell University, Stanford University and The Johns Hopkins University. The Trustees of The Johns Hopkins University worked to establish a great graduate university built on the German model.² Further, the Trustees of The Johns Hopkins University wanted an institution which would “locate the apex of the American system of higher education within the nation, and so make studies abroad unnecessary.”³ The number of American students studying abroad in Europe and, in particular, Germany continued to increase slowly during the nineteenth century. A number of historians and scholars estimate that between 6,000 to 10,000 American students studied in Germany between 1815 and 1914.⁴ In addition to Ameri-

can students, students from all over the world sought a European education and enrolled in German universities. Data from 1835 indicates that approximately 4% of all students enrolled at German universities were international students from abroad and the number increased to 8% in 1904.⁵ Perhaps the most famous American to study in Germany during this period was W.E.B. Du Bois from 1882 to 1894.⁶ A description of the university experience in Germany for an American student during the 1800's follows:

He is usually a graduate of a college or polytechnic school, comes with the aim of perfecting himself in a line of study already chosen...foreign study which can be enjoyed as well at Paris or Edinburgh as at Leipzig or Berlin, there are certain definite opportunities associated with Germany, which the American will probably recognize as the most valuable things which his residence here offers him. First, the theoretical instruction in any department to which he may turn, is pushed to the very farthest point attainable by modern science; and, secondly, the student comes into close and inspiring contact with men who are devoting their lives, uninterruptedly and with the sacrifice of everything else, to original scientific investigation. The facilities for practical work very much with the university and with the department chosen. A student of physics, for instance, coming to Germany from Cornell University, finds the laboratories inferior to that which he left. For a medical student the opportunities for hospital practice vary exceedingly, and may not be better than he would find at home. A student of history, philosophy, or literature, on the other hand, has at his disposal libraries such as we can never hope to duplicate in America.⁷

This personal account on academic life in Germany from 1888 provides a glimpse into the thinking of the day about Germany as an academic destination for American students.

The account of German academic life in 1888 was rather critical about the physics laboratories and described them as inferior to those found at universities in the United States. German scholars, academic leaders and scientists were concerned about this negative perception of their scientific community and industrial products and began to take measures in the late 1800's and early 1900's to make improvements in these areas. In 1884, the American-German Association of Technical Engineers was founded and German theologian Adolf von Harnack, who in 1904 traveled to the United States to learn more about science education and was a leader in advancing science education in Germany, called for the establishment of German research

institutes in the natural sciences in an effort to prevent German scientists from leaving the motherland for research facilities in the United States.⁸

The early twentieth century saw continued growth of American students enrolling in German universities. In the summer of 1914, Dr. James Edwin Lough, Dean of New York University's Extramural Division, began to offer "university-grade" off-campus courses including one course in Cologne, Germany which focused on German methods of industrial education.⁹ The flow of American students to Germany and throughout Europe was discontinued from 1914 to 1918 during the First World War. While American students continued to directly enroll in German universities throughout the twentieth century just as they had been doing since the eighteenth century, the First World War serves as a transition point in how Americans approached studying abroad.

Post-war Germany was still highly regarded as a worthy academic destination for many American students. For this reason and based on the University of Delaware's successful Junior Year Abroad program in France, the university administration in cooperation with the Institute of International Education's (IIE) Committee on the Junior Year Abroad began planning with the Deutscher Akademischer Austauschdienst (DAAD) to create the "German Junior Year Group."¹⁰ Participants on the Delaware German Junior Year Group program studied at the University of Munich during the 1931–1932 academic year.¹¹ The University of Delaware continued their Junior Year Abroad programs through 1939, the year when Germany invaded Poland thus starting the Second World War. A variety of American colleges and universities began to set up academic programs abroad in Germany during the time period between the two world wars such as New York University's summer overseas courses in Germany, France, Italy, Greece, and England and Indiana University's summer school of music in Munich, both in 1929.¹² As happened during the First World War, the mobility of American students to Germany was halted during the years of the Second World War.

It would take another two full years after Germany's unconditional surrender in May of 1945 before formal academic exchanges between the United States and Germany would resume. The first participants of the renewed exchange priorities were German citizens coming to the United States. In the immediate years after the end of the Second World War, officials in the United States Office of Military Government (OMGUS) were charged with the task of re-educating German citizens. The Office of Military Government and the United States Department of State launched a foreign policy program in 1947 that was to bring close to 10,000 German citizens to the United States to learn about democratic principles.¹³ In 1945, as a direct response to the tragedy of the Second World War, freshman Senator

J. William Fulbright from Arkansas introduced legislation sponsoring exchange programs for students and faculty between the United States and foreign countries that was eventually signed into law by President Harry S. Truman on August 1, 1946. Senator Fulbright envisioned a world wide exchange program with the United States that “promoted international goodwill through the exchange of students in fields of education, culture, and science.”¹⁴ By 1948, the first American Fulbright students, teachers and faculty were heading to European ally countries and in 1952 German Chancellor Konrad Adenauer and U.S. High Commissioner John J. McCloy signed the Fulbright Agreement between the Federal Republic of Germany and the United States of America thus establishing the German-American Fulbright Commission.¹⁵ Similar to Senator Fulbright, German Chancellor Adenauer also had a vision to create a major international academic exchange program that Germany could call her own and in the years following the end of the Second World War he re-founded the DAAD, Deutscher Akademischer Austausch Dienst (German Academic Exchange Service). Part of the German Academic Exchange Service’s mission is “to enable young academic elites from around the world to become leaders in the fields of science, culture, economics, and politics—as well as friends and partners to Germany.”¹⁶ German Chancellor Adenauer was so engaged in this process that he actively took part in the signing of exchange agreements with a variety of partner institutions in the United States.¹⁷

While the governments of both the United States and the Federal Republic of Germany were creating large, international academic exchange funding programs during the late 1940’s and early 1950’s, colleges and universities in the United States began establishing and re-establishing their own study abroad programs across Europe and modeling them after the successful Junior Year Abroad programs of the University of Delaware. The first Junior Year Abroad program to be created in Germany after the Second World War was Wayne State University’s program in Munich in 1953. Study abroad programming options continued to expand during this decade and in 1958 institutions began establishing overseas centers/campuses such as Dartmouth College in Freiburg, Heidelberg College (Tiffin, Ohio) in Heidelberg, and Stanford University in Stuttgart.¹⁸ Additional types of study abroad programs were also being established during this time period such as the faculty-led study tour and short-term summer study programs, which originally surfaced prior to the start of the Second World War.¹⁹ The numbers of American students studying abroad in Germany during the 1960’s continued to rise each year. During the 1960–1961 academic year almost 9% or 24,000²⁰ of all students enrolled at German universities were international students from abroad and of these students approximately 1,575 were American.²¹ Within five years, during the 1965–1966 academic year,

the total number of American students enrolled at German universities increased approximately 52% to 2,392 students.²² While study abroad programming on campuses across the United States and American student participation rates continued to grow during the late 1940's through the 1960's, significant legislation related to education, science and national security was being debated and signed into law in the United States. In addition to the commitment to the Fulbright legislation of 1946, the United States federal government also focused significant attention and energy on increasing and funding scientific research.

Of the 84,483 American students abroad during the 1994–1995 academic year a total of 52,388 were in Europe with 3,504 studying in Germany, representing 4.3% of the total American study abroad population that academic year.²³ While the numbers of American students studying abroad continues to rapidly increase to a total 205,983 during the 2004–2005 academic year, for which the most current data is available, the percentage of these students selecting Europe continues a slow and steady decline to 60.4% or 124,414 students.²⁴ Germany was again a top destination of American students during the 2004–2005 academic year ranking seventh behind the United Kingdom, Italy, Spain, France, Australia and Mexico with a total of 6,557 students equating to 4.5% of the total population of American students abroad that year.²⁵

During the late 1980's and on through to today, the scientific, academic and industrial communities in the United States has been paying more attention to the importance of sending young American students in the STEM fields abroad to study in an effort to add an important international component to their studies and, more importantly, for the United States to maintain a competitive edge in a rapidly changing world. Evidence of this changing perspective occurred in 1987 when the University of Rhode Island applied for FIPSE (Fund for the Improvement of Postsecondary Education) monies to pilot the development of the International Engineering Program in Germany under the direction of John Grandin, Professor of German in the Department of Languages. This pioneering effort at the University of Rhode Island created a German language program for undergraduate students to receive both a Bachelor of Science degree in an engineering field and a Bachelor of Arts degree in German. The German language courses provided participants the opportunity to learn the vocabulary of technical fields with a senior-level engineering seminar taught entirely in German by German speaking engineering faculty.²⁶ The International Engineering Program in Germany at the University of Rhode Island remains to this day. Another, more recent, academic opportunity for American engineering undergraduate students that started in the 2000's is the Institute of International Education's Global

Engineering Education Exchange (Global E³) program. This academic overseas opportunity was originally funded by the National Science Foundation, the AT&T Foundation, and the United States Department of Education and allows students attending member institutions to receive academic credit for courses taken abroad in one of the seventeen participating countries, including Germany, and to receive practical work experience in post-program internships.²⁷ Another promising collaboration between the United States and Germany, for which the planning started in 2002, is the National Science Foundation funded VaNTH Engineering Research Center in Bioengineering Educational Technologies and an alliance of universities and trade organizations in Niedersachsen, Germany for the exchange of industrial student interns and academic expertise in biotechnology and bioengineering education.²⁸ The Institute of International Education also launched two new programs in 2005 to increase the international academic mobility of American students in the STEM fields. The first program is the Whitaker International Fellows and Scholars Program which provides funding for young American biomedical engineers to study and conduct research across the globe with Germany being an active participant in the program. The second initiative is the Central Europe Summer Research Institute funded by the National Science Foundation. The Central Europe Summer Research Institute program description provides “opportunities for American graduate students to conduct collaborative, hands-on laboratory research with colleagues in Austria, the Czech Republic, Germany, Hungary, Poland, and Slovakia.”²⁹ Germany’s participation in both the Whitaker International Fellows and Scholars Program and the Central Europe Summer Research Institute demonstrate her keen interest in attracting American STEM students for research and study opportunities.

A number of scientific and academic conferences/colloquiums have taken place since the late 1990’s that are worth mentioning as their primary focus is on the internationalization of the STEM fields and the academic mobility of STEM students and scholars. Perhaps the most significant meeting to take place in recent years was the National Science Foundation Workshop on *Graduate Education Reform in Europe, Asia and the Americas and International Mobility of Scientists and Engineers*. The information from this workshop and published proceedings was “intended to assist NSF in its continuing efforts to promote the education of scientists and engineers in a changing global environment. Recent changes in that environment have included the reported expansion of graduate science and engineering programs abroad, as well as changes in patterns of international mobility of scientists and engineers.”³⁰ The American Society for Engineering Education (ASEE) has held an annual Global Colloquium on Engineering Education for

the past five years with the first meetings held in Berlin, Germany in October, 2002.³¹ In November, 2007 the University of Rhode Island's International Engineering Program will hold its tenth annual International Colloquium on International Engineering Education.³² The NSF, ASEE and University of Rhode Island conferences/colloquiums are but a few examples of the attention and scholarship focused on the internationalizing the STEM fields in the United States.

In Germany, up until the beginning of the 1990's, very few universities and institutes actively marketed the academic programs and opportunities they offered to foreign students.³³ An exception to this is the Goethe-Institute which has been actively promoting cultural exchanges between Germany and the rest of the world for over fifty years.³⁴ Foreign students were more than welcome to pursue academic studies and/or to conduct research at German universities and institutes but there was no formal national effort to promote the high quality of German higher education and research centers, particularly in the STEM fields, to the outside world. A 1996 report by the National Science Foundation found that while Asia and the United States produced more "first" university degrees, Europe lead both the United States and Asia in conferring Ph.D. degrees in science and engineering.³⁵ While this report doesn't provide country specific data it demonstrates a strong and high level of scientific and engineering research in Europe. Also in 1996, the *Hochschulrektorenkonferenz* (HRK, the Association of Universities and Other Higher Education Institutions in Germany) began to develop framework agreements with partner organizations in other countries to assist in the exchange of both undergraduate and doctoral and post-doctoral students and scholars.³⁶ The following year HRK recommended that the members of the Association adopt a new system of credits so that the credit transfer process for American students and foreign students from other credit bearing systems would be more efficient and become a more attractive offer to studying in Germany. In the summer of 1998, the German Parliament passed a new Federal Higher Education Framework Act which among many things authorized the introduction of bachelor's and master's degrees at German universities to attract more foreign students to Germany.³⁷ The DAAD offers a vast number and types of funding opportunities and programs to foreign students so they can study, research and gain practical experience in Germany. DAAD Grant opportunities for undergraduate students in the STEM fields include the RISE—Research Internships in Science and Engineering summertime internship grants where undergraduate students are paired with German doctoral students at German universities and research institutes and it is open to non-German speakers, the RISE professional grants where DAAD alumni can hold summer internships with German com-

panies where expertise in STEM fields is required and the High Tech in Old Munich grant which is a month-long course taught in English with specialized workshops and seminars at the Technische Universität München.³⁸ These are just some of the numerous examples of changes to higher education and the STEM fields in both the United States and Germany. Academic scientific mobility and exchange between these two nations is at its highest peak with no sight in end.

The United States and Germany have had a long history together of both war and peace and it is education that has helped tie these two countries together in the shape of exchanges and the academic mobility of students, scholars, faculty, researchers, teachers, and civic leaders. Higher education academic mobility between the United States and Germany has been occurring since the eighteenth century. The types of educational opportunities in Germany for American students has changed over time and the variety of opportunities that exist today are too numerous to list. Germany's recent restructuring of her higher education system to introduce both bachelor's and master's degrees as well as the development of highly funded scientific and engineering research and internship opportunities for international students demonstrates Germany's interest and effort to attract more American students, including those in the STEM fields.

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Notes

- ¹ According to The Ohio Alliance, which is a coalition of fifteen universities working to double the number of underrepresented minority students in the STEM fields, the National Science Foundation has designated and lists 150 majors that fall under the four STEM categories. More information is available online at <http://www.ohiosea.org/stemfields.htm>.
- ² Frederick Rudolph, *The American College & University: A History* (Athens, Georgia: The University of Georgia Press, 1990), 269.
- ³ James Bowen, *A History of Western Education: Volume III: The Modern West* (London: Methuen, 1981), 357.
- ⁴ Irwin Abrams, *The Evolution of Undergraduate Study Abroad Programs* (Washington, D.C., U.S. Advisory Commission on International Educational and Cultural Affairs, 1968), 17; Carl Diehl, "Innocents Abroad: American Students in German Universities, 1810–1870." *History of Education Quarterly*, 16 no. 3

(Autumn, 1976), 321; Dietrich, 15; William P. Bray and Susan Stevenson (Eds.). *Study Abroad: Handbook for Advisers and Administrators* (Washington, D.C., National Association for Foreign Student Affairs), 1.

⁵ Hoffa, William W. *A History of US Study Abroad: Beginnings to 1965* (Carlisle, PA: Frontiers Journal and the Forum on Education Abroad, 2007)33.

⁶ Hamilton Beck, "W.E.B. Du Bois as a Study Abroad Student in Germany, 1892–1894." *Frontiers: The International Journal of Study Abroad* 2 (1996): 45–63,

⁷ Bliss Perry, "University Life in Germany," *Christian Union*, August, 23, 1888; 38, 8. APS Online Christian Union (1870–1893), page 191.

⁸ Dietrich, 17–18.

⁹ Hoffa, 87.

¹⁰ Also referred to as "the Munich Junior Year" or the "Junior Year in Munich."

¹¹ Hoffa, 73–74.

¹² Hoffa, 87.

¹³ James F. Trent, *A Brief History of the German-American Fulbright Program, 1952–2002* (German-American Fulbright Commission, date unknown).

¹⁴ Walter Johnson and Francis J. Colligan, *The Fulbright Program: A History* (Chicago, The University of Chicago Press, 1967).

¹⁵ The German-American Fulbright Commission is typically referred to as the "Fulbright-Kommission."

¹⁶ *DAAD Background* (DAAD, German Academic Exchange Service, date unknown), Further, the "DAAD currently awards more than 65,000 fellowships a year and is the largest grantor of international academic mobility support in the world. Based in Bonn, the DAAD now plays important roles in furthering the international aspects of German academic, cultural, and scientific policies and supporting the international relations of German colleges and universities through international exchange and programs."

¹⁷ Chancellor Adenauer's active participation in the signing of partner institution exchange agreements is evidenced at the University of Chicago where the original DAAD-University of Chicago exchange agreement from 1953 is housed at the Office of International Affairs. This exchange agreement between the University of Chicago and the DAAD contains Chancellor Adenauer's original signature and on the agreement it is evident that he crossed out the word "eins" (meaning "one" in German) and wrote in the word "zwei" (meaning "two" in German) for the number of guaranteed exchange students from the University of Chicago.

¹⁸ Schwaneger, 156.

¹⁹ Hoffa, 70 and 74–86.

²⁰ James M. Davis, "Some Trends in International Educational Exchange" *Comparative Education Review*, 8 no. 1, (June, 1964), 48–57.

²¹ John A. Garraty et al. *The New Guide to Study Abroad* (New York: Harper & Row, Publishers, 1969), 7.

²² *Ibid.*

²³ *Ibid.* During the 1994–1995 academic year Germany was the sixth most popular destination for American students falling behind the United Kingdom, France, Spain, Italy and Mexico, respectively.

²⁴ Institute of International Education.

²⁵ *Ibid.*

²⁶ John M. Grandin. *A Pilot Program in International Engineering*. Fund for the Improvement of Postsecondary Education Report. (August, 1991).

²⁷ NAFSA Strategic Task Force on Education Abroad. *Securing America's Future: Global Education for a Global Age*, Report of the Strategic Task Force on Education Abroad. (Washington, D.C., NAFSA, 2003), 9; Additional program information available on the Global E³ website at <http://www.iie.org/programs/global-e3/>.

²⁸ Description of the program copied from J. Collins et al. *A German-US Faculty/Intern Exchange Program in Biotechnology*. Conference paper presented at the 2002 ASEE/SEFI/TUB International Colloquium "Global Changes in Engineering Education" on October 1–4, 2002, Berlin, Germany.

²⁹ Descriptions for both the Whitaker International Fellows and Scholars Program the Central Europe Summer Research Institute are provided in: Institute of International Education. *2005 Annual Report*. (New York, IIE, 2005), 10.

³⁰ National Science Foundation, Division of Science Research Studies, Graduate Education Reform in Europe, Asia, and the Americas and International Mobility of Scientists and Engineers: Proceedings of an NSF Workshop, NSF 00–318, Project Officer, Jean M. Johnson (Arlington, VA 2000).

³¹ Further information and published papers (many related to the mobility of American and German students) from the five ASEE meetings is available at <https://www.asee.org/conferences/international.cfm>

³² Further information about the International Colloquium on International Engineering Education is available at <<http://www.uri.edu/iep/colloquia/index.html>>.

³³ Christian Tauch, "Changes and Challenges in German Higher Education" *International Educator*, 7 no. 4, (Fall, 1998), 36–37.

³⁴ The Goethe-Institute is Germany's cultural institution that operates 142 institutes in 81 countries worldwide <<http://www.goethe.de/ins/enindex.htm>>.

³⁵ Jean M. Johnson, “Western Europe Leads the United States and Asia in Science and Engineering Ph.D. Degree Production” *National Science Foundation, Science Resources Studies Division, Data Brief*, 12 no. 27, (1996), 2.

³⁶ Tauch, 37.

³⁷ Tauch, 37–38.

³⁸ Description of the various DAAD grant opportunities for students in the STEM fields available at <http://www.daad.org/?p=50407>.