

FACT SHEET

Research Partnerships

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U.S.-JAPAN HIGHER EDUCATION ENGAGEMENT STUDY (USJP HEES)

This fact sheet is part of a larger study by the American Council on Education (ACE). This fact sheet and the accompanying live, interactive database, real-time analysis, case studies, and infographics provide a foundation to capture U.S.-Japan higher education institutional partnership activities.

The goals of USJP HEES are to improve mutual understanding and cooperation within the U.S.-Japan higher education community and to capitalize on its strengths within the global higher education context.

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Visit www.acenet.edu/usjp-hees to learn more about the project.

Background

In spite of major differences between the U.S. and Japanese higher education systems, research collaboration and exchange are a growing source of partnership activity for U.S. and Japanese higher education institutions.

The strength of the U.S.-Japan higher education is led by shared values in research collaboration, including the COVID-19 response, the digital economy, national security-focused investment screening, quantum sciences, artificial intelligence, space exploration, biosciences, and a wide range of emerging technologies.

Universities account for 62.0 percent of national basic research in the U.S., whereas in Japan they account for 46.5 percent (Atkinson and Foote 2019). The Japanese higher education system's declining university-age population has considerably influenced Japan's higher education ability to advance research and development (R&D) in domestic and global industries. Facing the pressures of both demographic change and the global economy, the Japanese government and higher education institutions are making concerted efforts to attract global talent, particularly from neighboring countries as well as the United States, to help advance Japan's knowledge economy (Yonezawa 2019).

University- Government Consortiums

Inter-governmental programs have played an active role in facilitating cooperation and research exchange between the U.S. and Japan, especially in the medical sciences and STEM fields. In the U.S., total R&D expenditures at U.S. academic institutions reached \$83.7 billion in FY 2019. Federal funding accounts for about 52 percent of all U.S. academic R&D, with industrial funding providing 11 percent of the funds and other state sources providing 5 percent (National Center for Science and Engineering Statistics 2021). In contrast, Japan's private universities until recently were expected to raise their own funding for R&D through industry partnerships. Government grants were competitively available only to national universities in order to grow their doctoral programs (Yamamoto 2004). Starting in 2022, the government of Japan will commit JPY10 trillion (US \$95 billion) over time toward a university endowment fund that, if achieved, would make it one of the world's largest endowment funds to support scientific research.

Whenever joint funding agreements—or memorandums of cooperation—between U.S. government agencies and Japanese counterparts are reached or renewed, the participating organizations issue a public call for joint proposals to U.S. and Japanese higher education institutions seeking specific areas of research to be conducted under the review of both governments.

Table 1. U.S.-Japan Bilateral Joint-Research Grant Funding Agencies

National Science Foundation	Japan Society for the Promotion of Science and Japan Science and Technology Agency
National Institutes for Health	Japan Agency for Medical Research (AMED)
Department of Energy	Ministry of Economy, Trade and Industry's New Energy Development Organization
National Aeronautics and Space Administration (NASA)	Japan Aerospace Exploration Agency (JAXA)

Medical Sciences and Public Health

Since 1965, the two countries have coordinated on biomedical research through the U.S.-Japan Cooperative Medical Science Program (CMSP), founded under President Lyndon B. Johnson and Prime Minister Eisaku Sato. The Medical Science Program fosters the exchange of scientists as well as training of young scientists with the goal of increasing joint-collaborative research in the following medical science areas:

- Acute respiratory infections
- AIDS
- Cholera and other bacterial enteric infections
- Genes, environment, and diseases
- Hepatitis
- Immunology
- Nutrition and metabolism
- Parasitic diseases
- Tuberculosis and leprosy
- Viral diseases

The U.S.-Japan CMSP also seeks research collaborations with developing countries in Southeast Asia. Bilateral support comes from the Japan Agency for Medical Research and Development, the Ministry of Foreign Affairs; the Ministry of Health, Labor, and Welfare; and the Ministry of Education, Culture, Sports, Science, and Technology (MEXT), the National Institutes of Health, and the U.S. Department of State.

U.S. and Japanese higher education have made strong efforts to expose medical students to each other's different health care systems, clinical practices, and diverse cultures. Over the past 15 years (2005–2020), the Japan Society for the Promotion of Science (JSPS) under MEXT has supported 220 Japanese PhDs at NIH and provides a parallel opportunity for American researchers to collaborate with their counterparts in Japan. Last year alone, about 375 postdoctoral fellows and senior researchers from the U.S. traveled to Japan through various JSPS programs (National Institutes of Health 2021). The Nagoya University School of Medicine currently has student exchange agreements with six U.S. higher education institutions: University of North Carolina at Chapel Hill, School of Medicine; Harvard Medical School; Tulane University, School of Medicine (LA); University of Pennsylvania, School of Medicine; Duke University, School of Medicine (NC); and Johns Hopkins University, School of Medicine (MD). Through these agreements, senior medical students from these U.S. higher education institutions undertake clerkships in the Japanese health system.

The bi-national as well as global impact of U.S.-Japan collaborative medical research cannot be understated and is best understood by a sampling of its results including two joint-Nobel prizes in medicine awarded in:

- 2018: Immunologists James P. Allison (United States) and Tasuku Honjo (Japan) awarded in medicine for groundbreaking immunotherapy research;
- 2015: William Campbell (United States), Satoshi Ōmura (Japan), and Youyou Tu (China) received the Nobel Prize for their joint research on combating parasitic disease.

In addition, major advancements in medical sciences through CMSP include the following (Lu et al. 2020):

- Early recognition and response to SARS-CoV-2 entry into Thailand and Cambodia
- Pathogenesis of HIV, rabies, Lassa, chikungunya, coronavirus, and paramyxovirus
- Improved diagnosis and treatment for norovirus, HBV, and EBV infections
- Vaccine development for influenza, dengue, HIV, HCV, and mosquito-borne pathogens
- Successful control of human papillomavirus infection through vaccination

Science and Technology

Another major policy driver of U.S.-Japan higher education research activity is the U.S.-Japan Science and Technology Agreement. The agreement includes cooperation in space research in areas such as new energy technologies, supercomputing, and critical materials. In Japan, a large portion of funding for individual science and technology research in Japan flows from the Ministry of Education, Culture, Sports, Science and Technology (MEXT) through two agencies: the Japan Science and Technology Agency (JST) and the Japan Society for the Promotion of Science (JSPS).

In the U.S., grant funding for science and technology research comes from multiple federal government agencies, including the Department of Defense, Department of Energy, National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), and the National Institutes for Health.

In 2019, the U.S. National Science Foundation (NSF) and the Japan Science and Technology Agency (JST) signed a Memorandum of Cooperation (MOC) on Research Cooperation. The MOC provides an overarching framework to encourage collaborative research between the US and Japanese research communities aligned with the goals of the NSF Smart and Connected Communities (S&CC) Program.

The overarching framework of the U.S.-Japan Science and Technology Agreement is set to expire in 2024.

University-Industry Consortium Partnerships

Although there is a long tradition of university-industry collaboration in Japan at the individual professor level, Japanese universities had provided limited institutional support for such collaboration until recently. Japanese businesses are known historically for their heavy reliance on government funding and protectionist barriers with patenting, preferring to host their own R&D units rather than outsource projects to institutions of higher education. Corporations in Japan had been reluctant to collaborate with higher education institutions citing issues with lengthy administrative process involved in finalizing contracts, and what they perceive to be a lax attitude of researchers to commitments and deadlines (Fuyuno 2017).

Throughout the 1990s and 2000s, the government of Japan directed several waves of higher education reform to increase Japan's universities' R&D capacity with domestic corporate partnerships as well as to raise Japan's international profile. By 2005, the Japan Science and Technology Agency started producing a scholarly journal called *The Journal of Industry, Academia and Government Connections* (*Sangakukan renkei jōnarū*), which features articles and case studies on current and potential university-industry partnerships within Japan.

According to a National Institute of Science and Technology Policy (NISTEP) 2015 survey of Japanese firms, one of the main reasons stated for doing collaborative research with universities outside of Japan was to

source knowledge and technologies that domestic universities did not possess. Of the 679 Japanese firms that responded to the survey, 93 had some type of research engagement with a higher education institution abroad, including 34 partnerships with U.S. universities.

NISTEP conducted a follow-up to the original survey in 2019 that indicated the number of joint research projects implemented by Japanese universities in partnership with the private sector is increasing (National Institute for Science and Technology Policy 2019). Among various types of university-industry collaborations, the amount of funds received for “joint research” was the largest, reaching 62.3 billion yen as a whole, with 26,000 joint research projects implemented. A large amount of such funds provided by large enterprises, amounted to 49.7 billion yen in the 2019. The amount of funds received for “joint research” in total has increased by 10 percent or more each year since FY 2015.

Despite these efforts, the United States is still the destination of choice for Japanese companies establishing research branches, with 40 percent of the 53 companies running some sort of collaborative research in the U.S. indicating that they have research facilities in partnership with U.S. universities. About \$1.3 billion in foreign funds supported R&D at higher education institutions in FY 2019 (National Center for Science and Engineering Statistics 2021). For 2020, U.S. academic researchers will have at their disposal about \$90.1 billion-worth of research funds or about 14.8 percent of the total U.S. R&D expenditure.

Since the Bayh-Dole Act was introduced in 1980 in the U.S., American universities are allowed to own intellectual property (IP) resulting from government funded research. The Act created a uniform public patent policy allowing publicly funded research to be patented by universities, and brought U.S. universities the rights to own and license patents. Japan in the last 15 years introduced similar legal rights, so that Japanese universities can now own intellectual property created through their government-funded research.

Recent efforts to promote research on a greater scale, reducing barriers to trade, investment, and supply chain development amid harmonized multilateral standards are showing promising effects on Japanese higher education R&D (Schoff 2020). For example, Takeda Pharmaceuticals, Japan’s top global pharmaceutical manufacturers, has reduced its internal R&D to utilize the potential of external R&D from higher education. The company recently announced a collaboration with the Tri-Institutional Therapeutics Discovery Institute (TDI) in New York, which is a consortium of three institutions (Cornell University, Rockefeller University, and Memorial Sloan Kettering Cancer Center), to support target research (Takeda 2016).

This example demonstrates how access to world-class science can be facilitated by agreeing on a long-term partnership with academic institutions. The further advantages of innovation centers are:

- They bypass tedious long-lasting licensee-licensor negotiations in subsequent drug licensing.
- They allow access to internal scientific resources within the remit of the arrangement, which is an important flexibility given the risks of pharmaceutical R&D.
- They allow R&D to familiarize themselves with new technologies or therapeutic indications without the need to make significant investments upfront.
- They give access to potential new drug candidates.

It is important to state that any kind of collaboration, alliance or partnership also creates a set of specific challenges. Among the latter are increased management complexity, coordination costs and the risk of IP failure.

Academic research is often early-stage with respect to commercialization, and substantial additional work and financial investment is needed before there is any return on investment. There is the constant challenge of early result publication since academia expects and needs findings to be published, while companies need to protect their assets via IP. These conflicts are not easy to solve and require tactful maneuvering and mutual understanding of the different priorities (Schulmacher et al. 2018).

With the Japanese government increasingly recognizing corporations as an important partner for academia, the relationship might soon grow closer institutional support for collaborative research; licensing and high-tech startups would strengthen technology transfer from university to industry. However, there is a long way to go before both U.S. and Japanese universities are jointly engaged in research consortia with U.S. or Japanese private multinational corporations.

Definitions and Data Collection

Given there are varied nomenclatures (i.e., memorandums of understanding, memorandums of agreement, etc.) to characterize the nature of a higher education research partnerships, ACE and JACUIE/JANU agreed to invoke only two general classifications for the research data within USJP HEES:

1. **Collaborative research partnerships** between two or more higher education institutions that are cooperating in the conduct of research and sharing outcomes.
2. **Consortium research partnerships** between two or more higher education institutions that are cooperating with non-higher education institutional actors (government, NGO, and industry) usually in the form of a sponsorship to conduct research and to share outcomes.

To determine whether a U.S.-Japan higher education research partnership activity is at the institutional level, various forms of outputs generally associated with high-volume or frequent research collaboration are investigated. These outputs included an examination of the following:

1. Institution only research grant awards programs from U.S. and Japanese government agencies and private foundations
2. Intellectual exchange of administration and scholars through government and nongovernmental programs
3. Joint human resource development with industry (based on regional foreign direct investment employment rates by industry)
4. Co-authored journal publications and patent licensing (with priority given to the STEM fields)

USJP HEES contains aggregated data from:

- USASpending.Gov (2017–20), which is the official source for spending data for the entire U.S. government
- Japan Society for the Promotion of Science (JSPS) (2017–20), which plays a pivotal role in the administration of a wide spectrum of Japan's scientific and academic programs
- Nature Index (2019–20), which is a database of author affiliation information collated from research articles published in an independently selected group of 82 high-quality science journals in real-time proxy at the institutional, national and regional level

- Universities Research Association, a consortium of 90+ leading research-oriented universities primarily in the United States with members also in Japan
- Inter-University Research Institutes Corporation and the U.S.-Japan Cooperative Medical Science Program (U.S.-Japan CMSP)
- U.S. and Japan higher education institution websites (2019–20)

This form of investigation provides one of numerous ways to detect where there are formalized institution-level research agreements. This method is not intended to be definitive, and is used in concert with other partnership activity measures, including student exchanges, degree programs, online/distance learning programs, workforce development training programs, and institutional outposts.

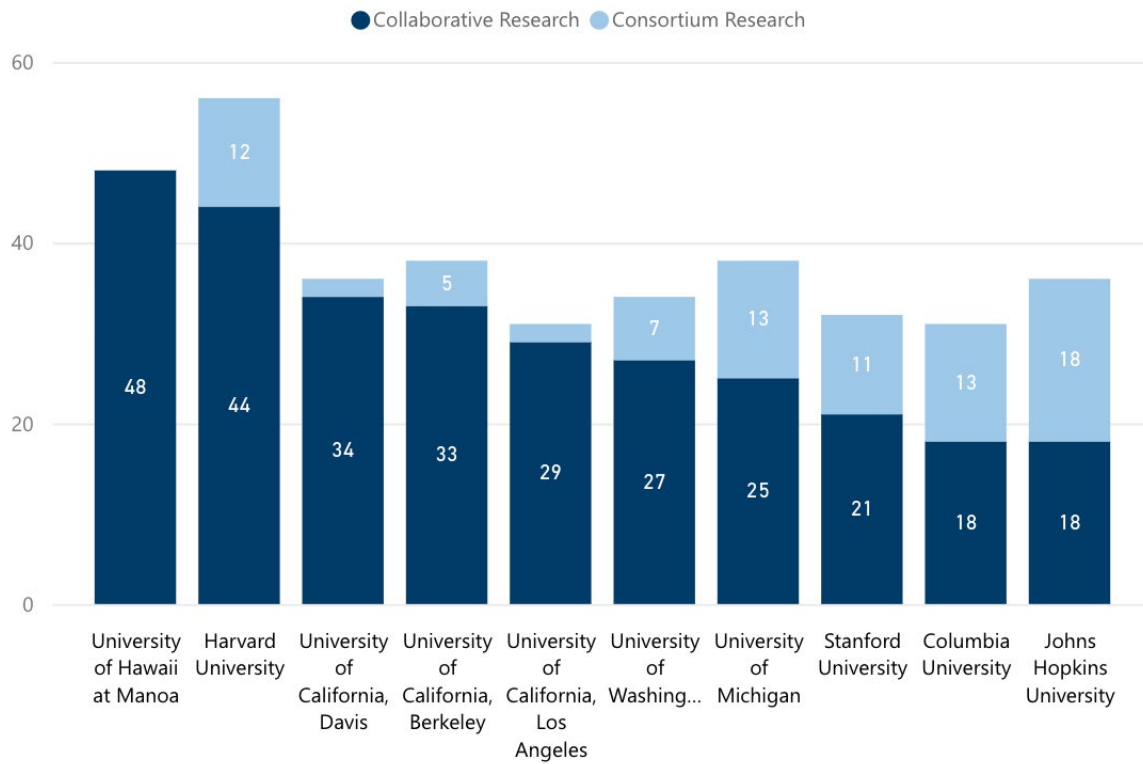
Findings

Twenty years ago, student exchanges for cultural and language studies may have been the most common activity happening amongst U.S. and Japanese higher education institutions, but these days, the scene is clearly more diverse and complex. Although there is a long tradition of research collaboration between the U.S. and Japan at the individual professor level, the data collected to date indicates these relationships have expanded to take on formalized institution level activity at a greater scale.

As of March 2021, the USJP HEES database is housing information on a total of 2,345 formalized collaborative and consortium-based research agreements between U.S. and Japanese universities and colleges. To reiterate, this is by no means exhaustive, as it does not include faculty-to-faculty research collaboration or the rising number of formalized unilateral research agreements happening particularly between Japanese government/ industry and U.S. higher education institutions or private research institutes.

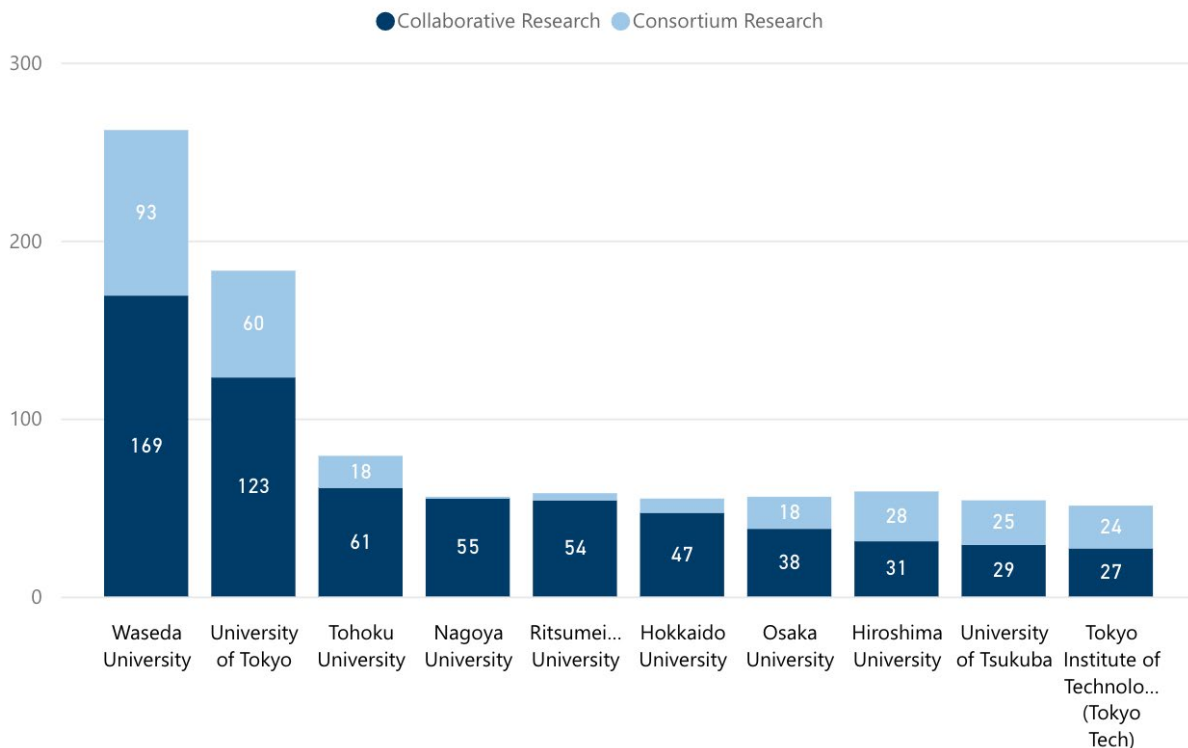
Many of the formalized research activities collected from 2017 to 2020 involve large, interdisciplinary, international clusters of researchers and predominantly large, research-intensive universities (those with enrollments of 10,000 or more) in both the U.S. and Japan. The majority of these U.S. and Japanese institutions also represent institutions with the highest level of investments in R&D (National Center for Science and Engineering Statistics 2021; National Institute of Science and Technology Policy 2020) and alignment of institutional internationalization goals (Helms and Brajkovic 2017; Top Global University Japan 2021). Consortium research agreements seem to prevail within doctoral-granting higher education institution with STEM-focused departments, colleges, and institutes.

Figure 1: Research Programs by US Campus



Source: USJPS HEES

Figure 2: Research Programs by Japanese Campus

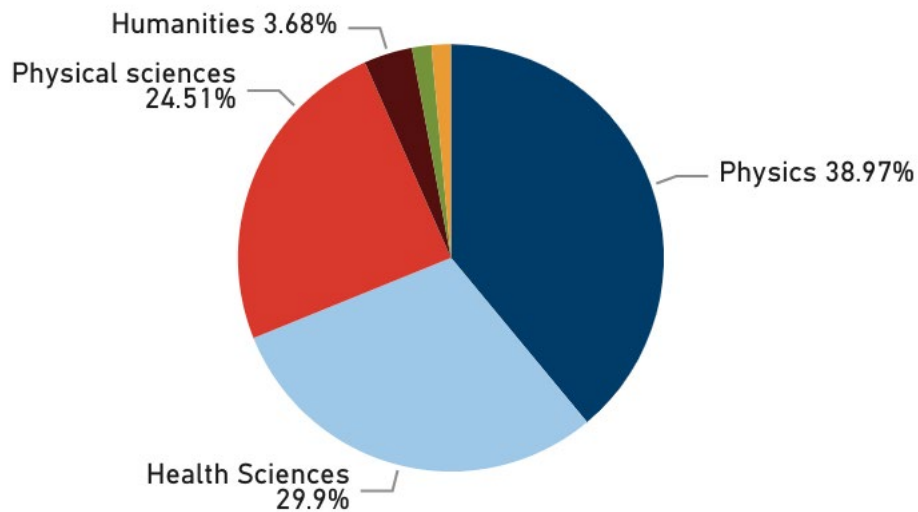


Source: USJPS HEES

Overall, the collection of institution-level research collaboration dominated in the STEM and health/medical sciences. USJP HEES found fewer secondary sources collecting data on joint- grants and publications in the humanities and social sciences. There is likely a significant amount of missing data within USJP HEES in these fields. Evidence of growing research activities are being found but not limited to:

- Disaster response and emergency management
- Precision agriculture
- Data sciences/informatics (Internet of things)
- Cybersecurity
- Smart technology
- AI robotics

Figure 3: Consortium Research by Discipline



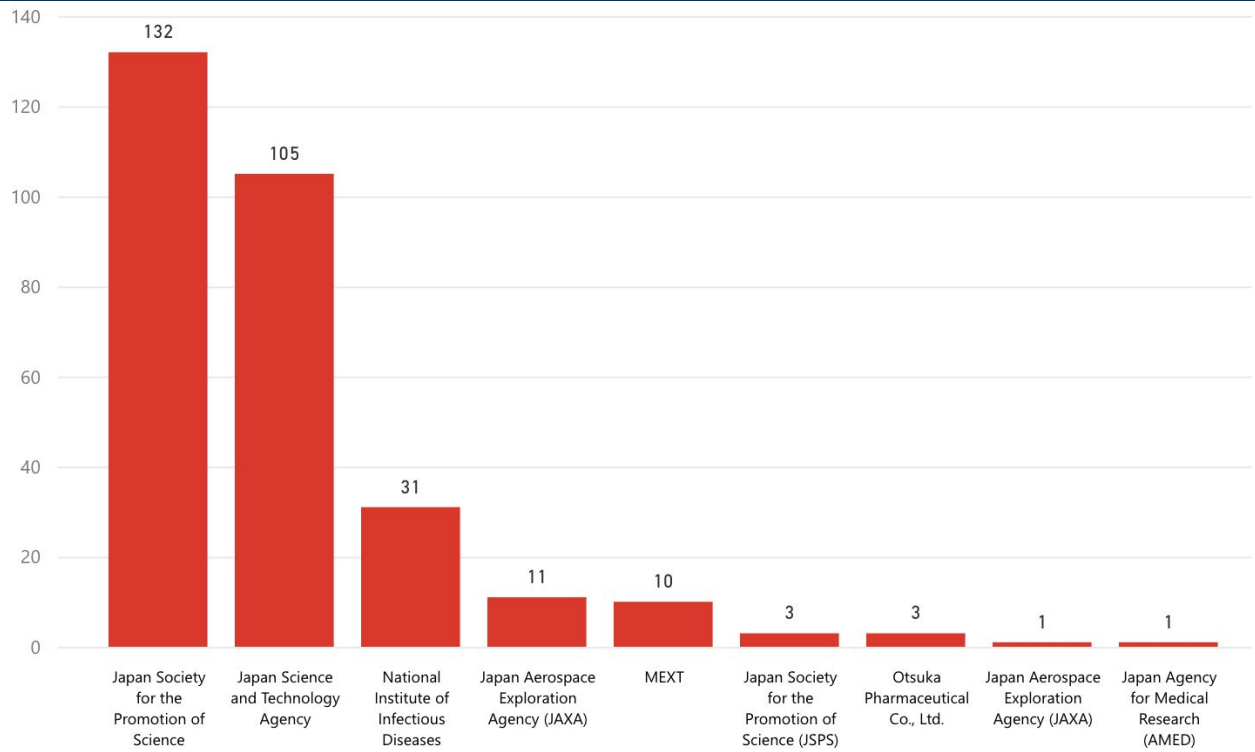
Source: USJPS HEES

A good portion of the collected research programs involve collaboration with multiple institutions within both countries and have a focus on current global research challenges—clean energy, health and wellness, sustainable development, and natural disaster prevention.

University Government Consortiums

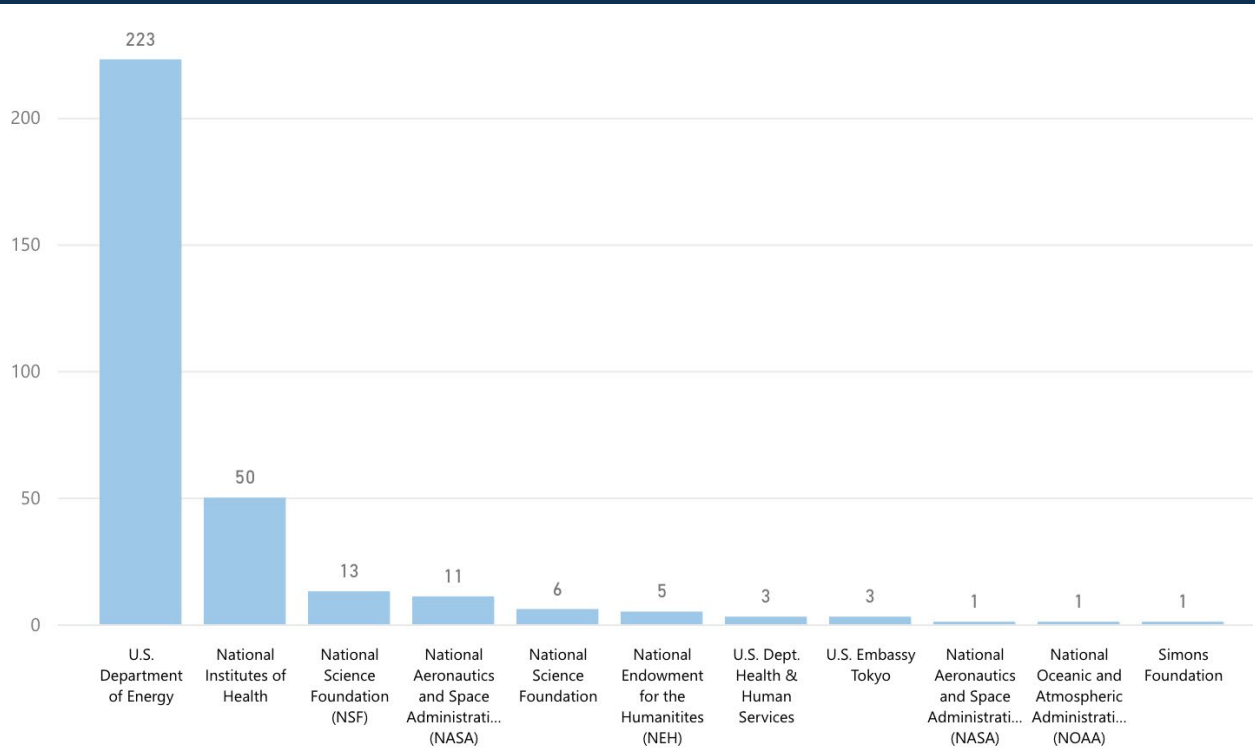
The USJP HEES also corroborates how influential certain government policies can be to the relative success of research endeavors. In the three-year period investigated, the USJP HEES found several major U.S. and Japanese governmental consortiums with ties to several Japanese universities.

Figure 4: Consortium Research Programs by Japanese Government or Industry Partner



Source: USJPS HEES

Figure 5: Count of Consortium Research Program by US Government or Industry Partner



Source: USJPS HEES

In particular, the U.S. Department of Energy yielded the highest level of collaboration with Japanese universities for research in high-energy physics, including work with the Brookhaven National Laboratory's Relativistic Heavy Ion Collider based in Upton, New York. Most recently in October 2020, the U.S. Department of Energy provided \$6 million for expanded research collaboration with Japanese universities to take place over a three-year period (2020–23) (Office of Science 2020).

Conclusion

In the process of analyzing the USJP HEES data collected from 2017 to 2020, the data suggests there are strong external factors influencing the internationalization of higher education research between the U.S. and Japan, predominantly related to funding. USJP HEES only captures the start of what will be a positive future for the U.S.-Japan higher education landscape. Looking deeper at the data, the infusion of new innovative funding streams, liberalizing of academic-industry R&D regulation, and greater sense of unity and cooperation among institution types in both respective countries are factors that will likely have a positive effect on both the U.S. and Japan's level of engagement and contributions to the global knowledge economy.

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