



International

**Human Frontier  
Science Program**

Organization

**Getting  
to Know Us**



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# HFSP0's three decades of unparalleled success

The International Human Frontier Science Program Organization (HFSP0) is a story of extraordinary vision and a rare example of successful science diplomacy.

The beginnings lay in Japan in the 1980's and evolved from two governmental plans designed to stimulate collaboration with foreign research institutions and companies. HFSP0 was an experiment in more flexible program management allowing bottom-up initiatives that would be decided by an independent scientific structure and governed by an international board of trustees.

In 1986, a feasibility study for such an international endeavor was carried out by leading Japanese scientists under the auspices of the Japanese Prime Minister's Council for Science of Technology. This discussion was expanded in 1987 to include scientists from the G7 nations and the European Union, resulting in the «London Wise Men's Conference» in April 1987, which endorsed the suggestion. Prime Minister Nakasone of Japan proposed to implement HFSP0 as the operational entity for the organization, at the Venice Economic Summit of the G7 countries and the European Commission in June 1987. The Economic Summit partners and the Chairman of the European Community

welcomed the initiative. The newly created organization was charged with the mission.

“To promote and fund basic research focused on the elucidation of the sophisticated and complex mechanisms of living organisms for the benefit of all humankind, through international cooperation.”

HFSP0 is unique: it supports innovative, frontier research in the life sciences, encourages high-risk, high-reward research, and promotes international collaboration in the spirit of science without borders. Over the next two years, additional discussions among international leaders gave shape to the Human Frontier Science Program, and in 1989 an International Scientists Committee further defined the Human Frontier Science Program's organization, activities, research areas, and project selection procedures.

Later that year, the G7 governments agreed to implement HFSP0 for an experimental phase of three years. Following a general review of the initial phase, an international conference of the Members agreed on the desirability of continuing the HFSP0.

The administrative offices of the International Human Frontier Science



**The G7 Economic Summit in Venice 1987.** From left to right: Wilfried Martens, Belgium; Jacques Delors, European Commission; Yasuhiro Nakasone, Japan; Margaret Thatcher, United Kingdom; Ronald Reagan, United States; Amintore Fanfani, Italy; François Mitterrand, France; Helmut Kohl, Germany; and Brian Mulroney, Canada.

Program, known as the Secretariat of the Program, were established in October 1989 in Strasbourg upon the invitation of the Government of France. The first President of the Program was Ambassador Hiromichi Miyazaki of Japan, the first Chairman of the Council of Scientists was Edward Rall of the United States USA and the first Secretary-General was Sir James Gowans, former Secretary of the UK Medical Research Council. The original supporting HFSP Members were the countries of the G7 together with the European Commission. Switzerland joined in 1990. Australia, the Republic of Korea, India, New Zealand, Norway Singapore, and Israel have joined since 2004, and South Africa joined in 2023.

HFSP was designed to foster international collaboration among nations with shared values to pioneer the most innovative research in the life sciences and promote early career scientists who propose bold, uncharted research ideas. Today, HFSP provides opportunities for the global scientific community to support frontier research in areas for which there are no prior studies, no data, and no guarantee for the concept.

In fact, HFSP provides a critical opportunity for international life science research and has recently received important acclaim.

In May of 2023, in advance of the G7 Summit held in Hiroshima, Japan, the S7 science ministers met in Sendai to discuss the role of science and research in solving global challenges. Among their recommendations, the S7 identified HFSP as providing crucial leadership in the arena of frontier

life science and committed further support. Noted in their official joint communique, the S7 ministers stated: "... HFSP has promoted cutting-edge international joint research and human resource development, achieving significant results in the process.



**Science Ministers representing the G7 nations met 12-14 May 2023 in Sendai, Japan, to discuss the role of science in addressing global challenges.** Left to right:

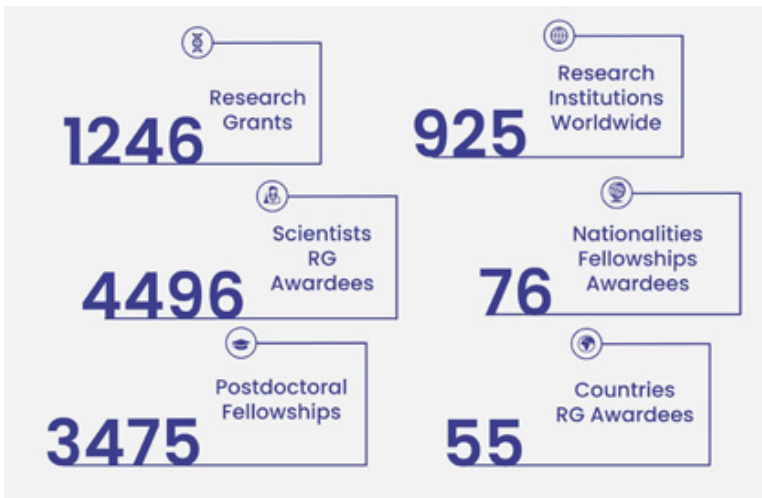
Maria Christina Russo, Director for Global Approach and International Cooperation in R & I in the Directorate-General Research and Innovation, European Commission; Arati Prabhakar, White House Office of Science and Technology Policy Director, USA; George Freeman, Minister of State for Science, Research and Innovation, UK; Bettina Stark-Watzinger, Federal Minister of Education and Research, Germany; Sanae Takaichi, Minister of State for Science and Technology Policy, Japan; Anna Maria Bernini, Minister of Universities and Research, Italy; Mona Nemer, Chief Science Advisor, Canada; and Sylvie Retailleau, Minister of Higher Education and Research, France.

Photo credit: Kyodo News via Getty Images.

# HFSP's unique niche and value proposition

HFSP occupies a unique niche and provides an exceptional value proposition for Member nations by supporting exploratory research that individual nations might not otherwise fund. Further, HFSP applies a “tried and true” model. It operates on a central budget provided by its Members that remains

under independent control, thereby removing the traditional ‘red tape’ common to bilateral or national programs. Research institutions receive international money from HFSP's annual budget, but the income does not carry a geographical tag.



HFSP supports collaborative, cross-border research projects conceived by leading investigators from around the world. HFSP puts a high value on basic life science at the frontiers of knowledge, on international scientific cooperation, and on basic research as a driver of economic and social benefit. International cooperation is a top priority to HFSP as it is both a practical necessity in opening up

scientific frontiers and also a way to promote mutual understanding between countries. The life sciences are one of the most complex fields of research and have become a true “frontier.” Some of the most groundbreaking work lies in the transdisciplinary approaches that HFSP applies to all its support programs.

HFSP implements a bottom-up approach without topical priorities and emphasizes themes that give rise to emerging fields that make use of novel approaches for example in biotechnology, material science, robotics, advanced computational methods, or nanotechnology.

The HFSP niche complements the research priorities of its Members by providing international collaborations in areas and at times not covered by existing international agreements and preferring high-risk, high-gain projects. Most HFSP-funded grant collaborations involve three or more countries and more than 95% of all grants involve intercontinental collaborations.

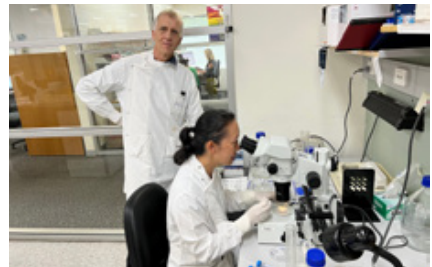
As a result, HFSP creates a network that transcends national borders and disciplines.

This is possible because HFSP Members share common values: They prize scientific integrity, excellence, bold innovation, and a willingness to think and work across disciplines through intercontinental collaboration. Members believe that co-operation and collaboration among diverse people, different points of view, and across disciplines builds creativity and capability into any effort. Together, they embrace basic frontier life science as highly valuable because these discoveries drive innovation. Another very important aspect of HFSP regarding innovation is that any intellectual property resulting from HFSP-supported research

remains with the inventors and is not released to HFSP as the funder. In every research study that HFSP supports, we accept the possibility of failure. But we also know that innovations come through our willingness to embrace high-risk inquiry in the hope of achieving high-reward results.

International collaboration on frontier topics also turns HFSP support into a global benchmarking exercise. Since the start, the programs for early career researchers have supported fellows from 71 different nationalities. The competition is truly global and receiving HFSP funding provides reassurance that an awardee belongs among the very best researchers in the world.

HFSP grant awards are made based on the frontier character, originality, scientific excellence, and the potential to advance knowledge. Often, HFSP awardees later succeed in gaining support from domestic funders based on the pioneering work they did under HFSP support.



**Rob Parton, Group Leader, Institute for Molecular Bioscience, and HFSP Awardee, and Harriet Lo, Research Fellow, both of University of Queensland, Australia.**

# The prestige and impact of HFSP-supported research

Since the inception of the program, more than 50,000 scientists have applied for HFSP research grants, and each year, HFSP receives some 700 applications, involving a total of 2,000 to 2,500 scientists in intercontinental teams. Likewise, since 1990, more than 22,000 early career scientists have applied for fellowships, and each year, 500-600 postdoctoral researchers apply for HFSP fellowships. Competition is rigorous and only the best, most exceptional frontier research proposals are supported. These numbers speak a clear language, the interest for international exchange remains high and highlights HFSP's reputation as a global program that puts shared value aspects into action.

HFSP-funded research ranks among the most impactful in the global scientific enterprise by advancing pure science and fueling the innovation economy. In the 30 plus years since HFSP's inception, research grantees have won 29 Nobel Prizes across physics, chemistry, and physiology/medicine. The breakthrough research of four out of the fourteen winners of the HFSP Nakasone Award was also recognized with Nobel Prizes, and since the inception of the Kavli Prize in Neuroscience, HFSP awardees have been among the winners every year. Likewise, HFSP grant investigators have won some of the most prestigious



prizes from the Breakthrough Foundation, the Lasker Foundation, and the Canada Gairdner Foundation. In addition, HFSP scientists are recognized with major sciences prizes in Asia and Europe, such that nearly every year an HFSP awardee is among the winners of the most recognized and prestigious prizes in science. These are extraordinary levels of success by any measure; HFSP-funded scientists are truly the pioneers of their fields pushing the frontiers of the life sciences to great insights and increased capability.

## Exceptionally productive and innovative

The quality and influence of HFSP-funded research is reflected well in the sheer number and prestige of the publishing record. Beginning in 2009, the year publishing companies introduced a funders field allowing authors to credit the organization that supported their research, HFSP scientific community has, on average, published 1,000 scientific articles per year. Bibliometric comparisons of HFSP to other national or international funding organizations — all much larger in size and operating budget

— demonstrate that HFSP scientific returns on investment are significantly higher. When looking at the share of HFSP papers cited by patents, as a proxy measure for uptake in innovation, the resulting data show that 9.6% of publications by HFSP fellows were cited between 2009-2011. This is by far and away higher than the world's share of papers in the life sciences (3.6%) and in research areas in the life sciences targeted by HFSP scholars (5.4%).



Karsten Kruse, physicist, University of Geneva, presented during “The Physics of Living Matter for Tomorrow,” a symposium in conjunction with the 17th HFSP Awardees Meeting held in Lisbon, Portugal in 2017.

## Basic frontier life science research leading to ground-breaking innovations

*HFSP-supported frontier basic science often breaks ground that leads to valuable innovations in the life sciences, new patents, and commercial enterprises.*



### **Hiroaki Suga, Department of Chemistry, Tokyo University**

*Developing RNA-based catalysts that revolutionize the discovery of bioactive peptides*

Suga's 2017 HFSP grant research isolated two types of tRNA-aminoacylating ribozymes from libraries based on an existing t-box riboswitch of *Bacillus subtilis* glyQS, which suggested a possible scenario of evolution of tRNA-aminoacylating ribozymes, primitive translation and T-box gene regulation systems. With this understanding, he was able to develop novel ribozymes, Flexizymes, that can charge tRNAs with amino acids, with the goal of reintroducing ribozymes into cellular metabolism, ultimately replacing protein enzymes. His discoveries have had major impacts in the biopharmaceutical industry, and he co-founded MiraBiologics.



### **Aviv Regev, The Broad Institute of MIT and Harvard**

*Single-cell genomics as the basis for personalized medicine*

In 2005, an HFSP Research Grant team led by Regev investigated novel high-throughput set-ups for gene sequencing at the cellular level. Knowing the complex properties and dynamic behaviors of a cell provides the means to understand the physiology of an entire organism. She developed systems for analyzing tens of thousands of cells in a single experiment, which enabled the commercialization of this technology and its adoption worldwide. Now researchers are using these techniques to study the human body at the single-cell level, revealing new cell types with implications for health and disease. For example, single-cell studies of cancer provide new insights into tumor composition and drug resistance. A 2018 analysis of the global single-cell genome sequencing market is to reach USD 2.49 billion by 2025 with a compound annual growth rate of more than 14% during the forecast period. She was awarded the 2022 HFSP Nakasone Award.



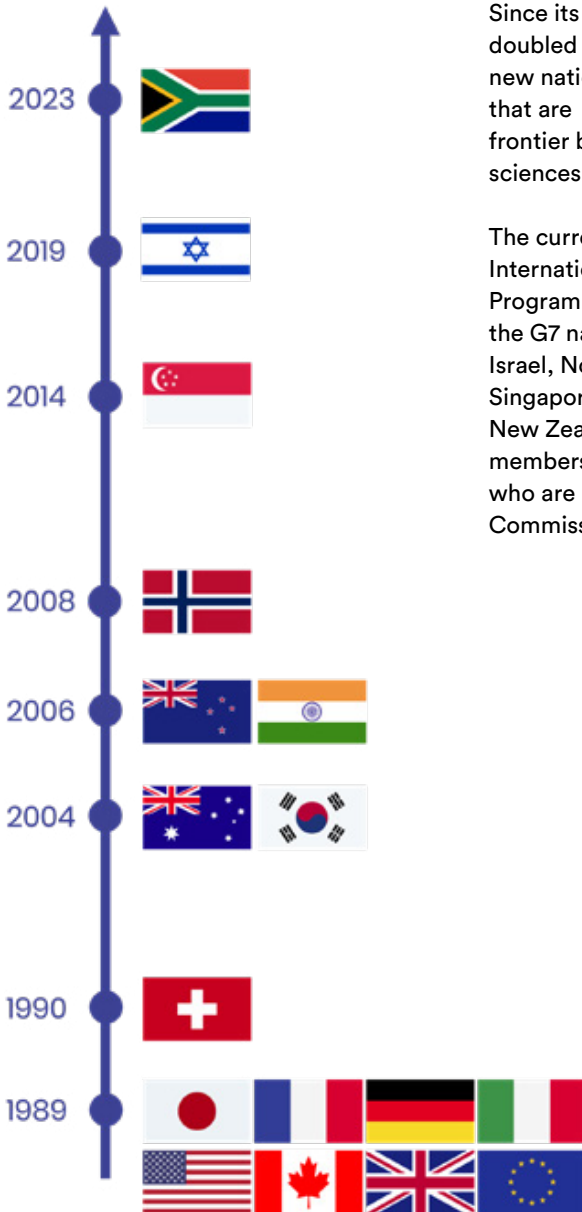
**Stefan Hell, Max-Planck-Institute for Biophysical Chemistry, Goettingen, and Jonas Ries, European Molecular Biology Laboratory, Heidelberg**

*Super-Resolution Microscopy That Can Image Actions in Living Cells*

Nobel laureate Stefan Hell (HFSP Research Grant in 2017) developed a revolutionary super-resolution microscopy method called MINFLUX that allows imaging at a resolution the size of a small molecule and revealing unprecedented detail in imaging cellular structures. To demonstrate the power of these new developments, a precise cellular structure was needed, thus the Hell group teamed up with 2017 HFSP Young Investigator Jonas Ries, who had established super-resolution reference standards as part of his HFSP grant. These reference structures consisted of nuclear pore complexes, channels that regulate transport between the nucleus and cytoplasm of cells, which the Ries group had labeled with super resolution-compatible fluorophores using the CRISPR/Cas9 technology. The MINFLUX microscope revealed the structure of these complex protein machines with unprecedented optical resolution. They demonstrated this was even possible in living cells, which paves the way for imaging molecular machines during their action.



# HFSPo Member Countries



Since its inception in 1989, HFSPo has doubled its Membership, welcoming new nations from around the world that are committed to advancing frontier basic research in the life sciences.

The current Members of the International Human Frontier Science Program Organization (HFSPo) are the G7 nations, Australia, India, Israel, Norway, Republic of Korea, Singapore, South Africa, Switzerland, New Zealand and the non-G7 members of the European Union, who are represented by the European Commission.



**In June 2023, HFSPo hosted “Fundamental Life Science Meets Climate, Environment and Sustainability,” a High-Level Summit and International Scientific Symposium at the Académie des sciences in Paris. On the dais: Pavel Kabat, Secretary-General, HFSPo, Alain Fischer, President, Académie des sciences, and Shigekazu Nagata, President, HFSPo, listen to the opening remarks delivered by Sylvie Retailleau, French Minister of Higher Education and Research.**

Photo credit: Christophe Peus.

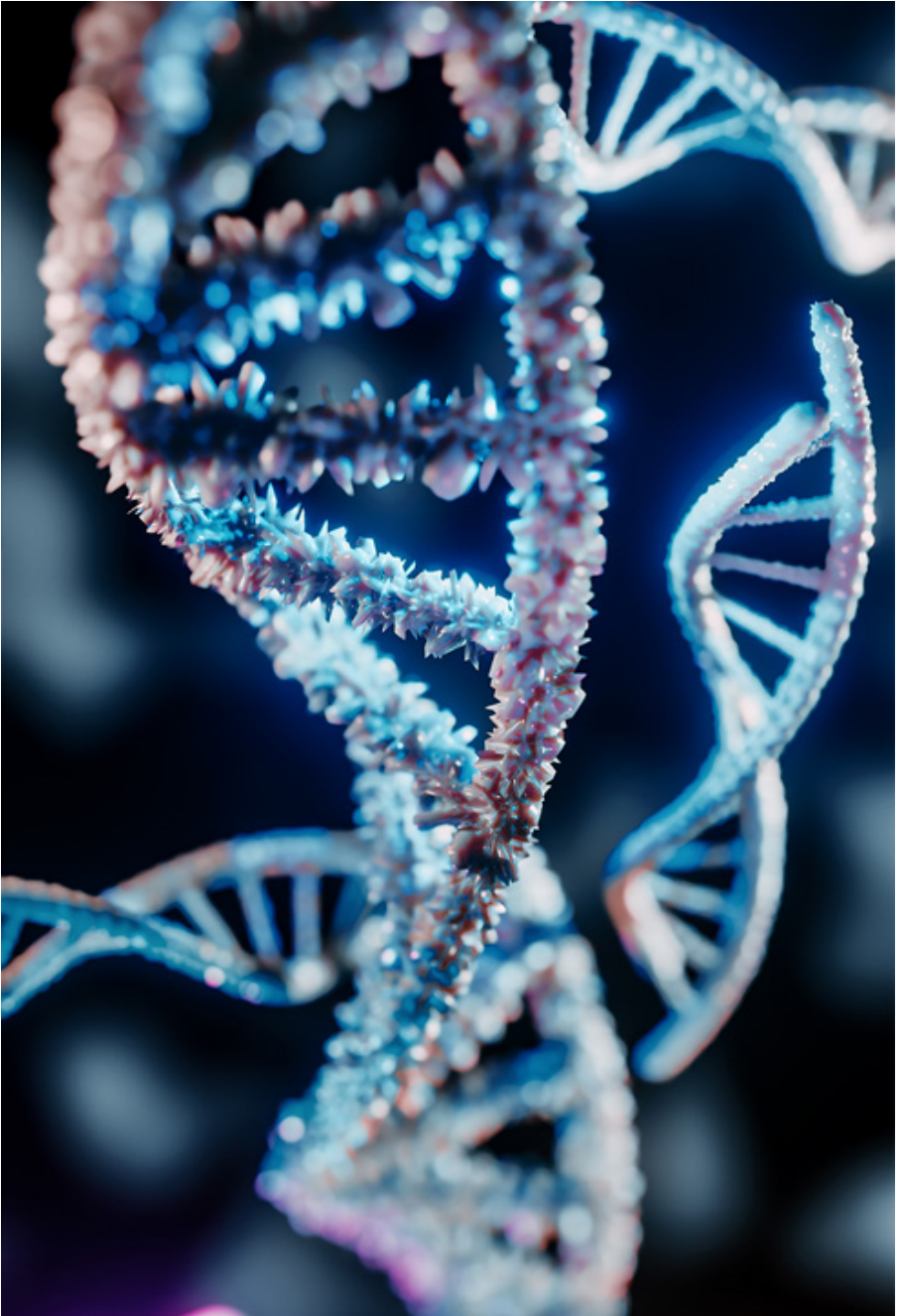


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