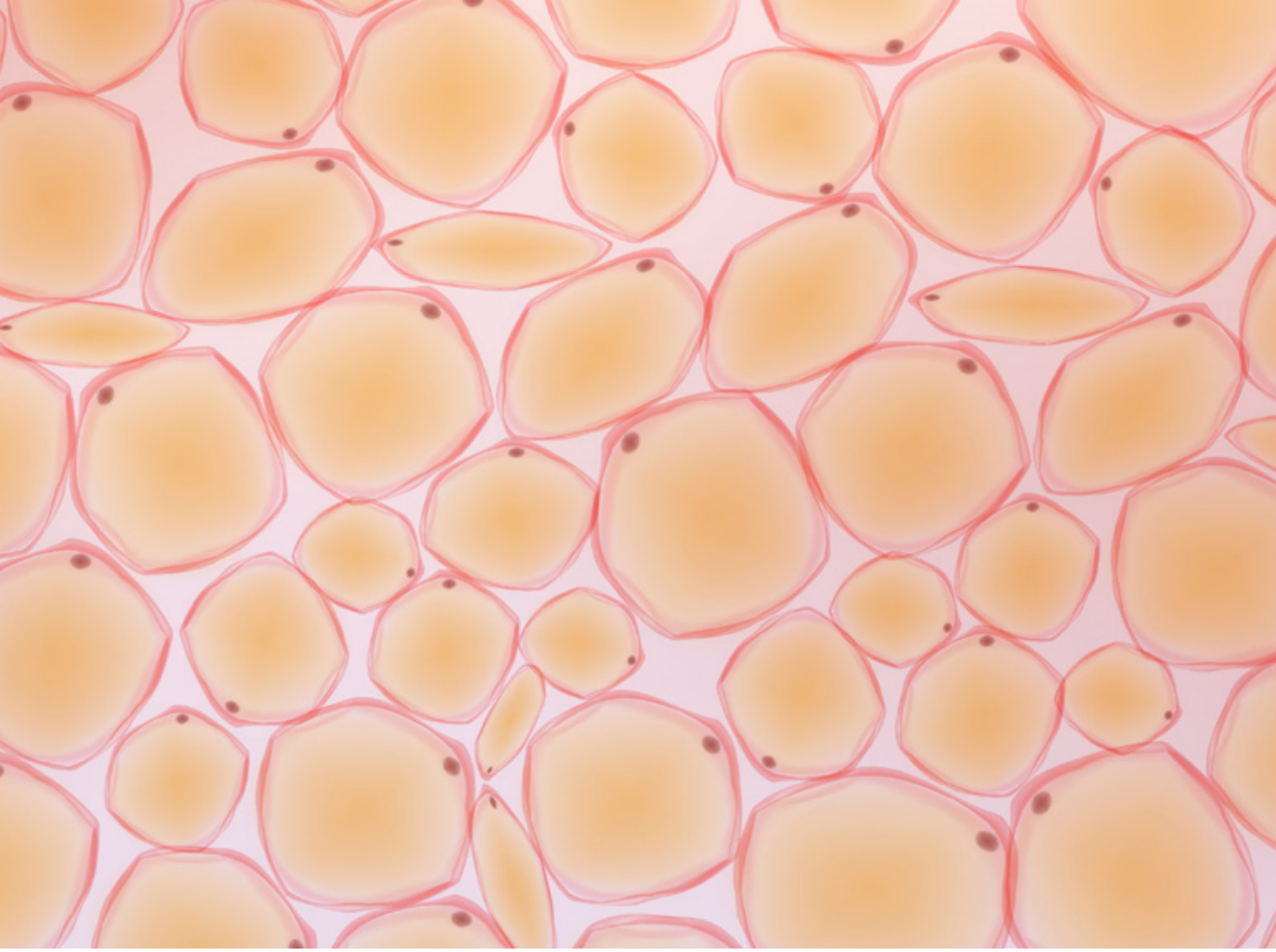
April 2019 — March 2020

ANNUAL REPORT FY 2019

International
Human Frontier
Science Program
Organization

INTERNATIONAL HUMAN FRONTIER SCIENCE PROGRAM ORGANIZATION

The Human Frontier Science Program (HFSP) is unique, supporting international collaboration to undertake innovative, risky, basic research at the frontier of the life sciences. Special emphasis is given to the support and training of independent young investigators, beginning at the postdoctoral level. The Program is implemented by the International Human Frontier Science Program Organization (HFSPO), supported financially by Australia, Canada, France, Germany, India, Israel, Italy, Japan, the Republic of Korea, New Zealand, Norway, Singapore, Switzerland, the United Kingdom of Great Britain and Northern Ireland, the United States of America, and the European Commission. Since 1990, over 7000 researchers from more than 70 countries have been supported. Of these, 28 HFSP awardees have gone on to receive the Nobel Prize.



The following documents are available on the HFSP website www.hfsp.org:

- Joint Communiqués (Tokyo 1992, Washington 1997, Berlin 2002, Bern 2004, Ottawa 2007, Canberra 2010, Brussels 2013, London 2016, Tokyo 2019): https://www.hfsp.org/about/governance/membership
- Statutes of the International Human Frontier Science Program Organization: https://www.hfsp.org/about/governance/hfspo-statutes
- Guidelines for the participation of new members in HFSPO: https://www.hfsp.org/about/governance/membership
- General reviews of HFSP (1996, 2001, 2006-2007, 2010, 2018): https://www.hfsp.org/about/strategy/reviews
- Lists of 2020 awards: https://www.hfsp.org/awardees/newly-awarded
- Previous lists of awards, including titles and abstracts: https://www.hfsp.org/awardees/awards

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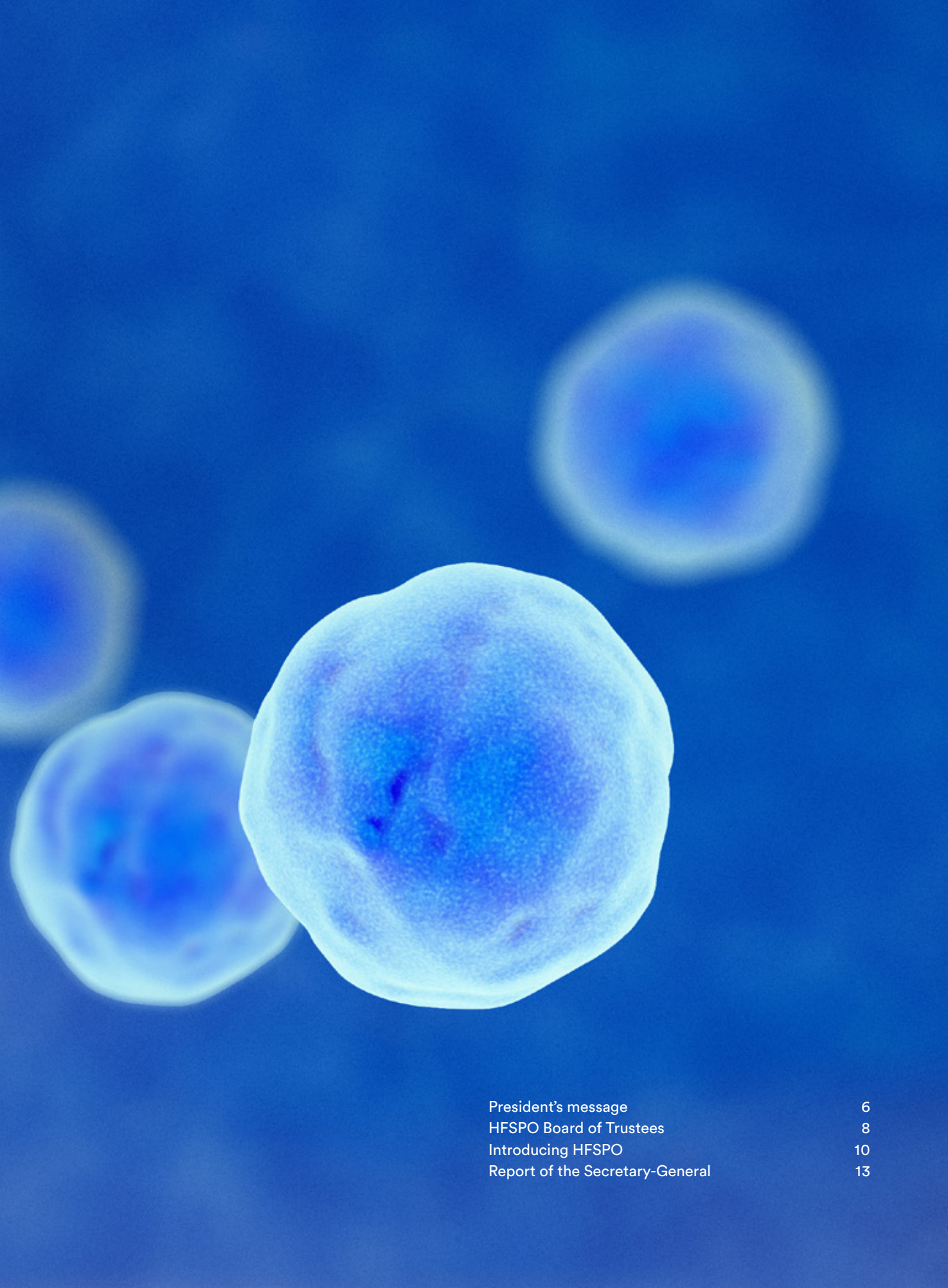
Introduction



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PRESIDENT'S MESSAGE

Shigekazu NAGATA
President of HFSPO

There's a song that goes 'Come so far, but still so far to go'. It could have been written for HFSP, which celebrated its 30th birthday in 2019. HFSP has been promoting basic science for 30 years. Bold frontier research across the spectrum of the life sciences from the molecular up to the whole ecosystem level, drawing on the expertise of an ever increasing range of neighbouring disciplines and scientific traditions around the world. We only need to think of the COVID-19 pandemic, which has strained our medical systems and shaken our economies, to confirm the critical importance of basic research to protect against future epidemics.

After 30 years, there are many measures of the Program's success. There are the HFSP awardees who have been rewarded for their breakthroughs and are the recipients of prestigious international prizes such as the Gairdner Award, the Kavli Prize or the Nobel Prize, to name but a few. In addition, many former awardees have become leaders in their field and others have taken up positions of strategic importance, driving science policy in a national context, in research agencies, leading

universities and institutes. There are also bold research projects that have resulted in benefits for medicine and industry. A recent example is the announcement by MIT this February that its researchers had used artificial intelligence to develop a powerful new antibiotic compound. A co-author in the resulting publication is 2016 Long-Term fellow Zohar Bloom-Ackerman.

For a basic science program, however, most important of all is HFSP's capacity to expand and deepen the base from which all discovery flows. In 2018, Science Metrix found that HFSP support contributed to 'an increase in the rate of international and intercontinental collaborations and the formation of new partnerships, providing awardees with critical access to novel ideas, methods, techniques as well as complementary expertise.' To achieve this, HFSP eligibility criteria are deliberately demanding, pushing the most creative scientists out of their comfort zone – a new collaboration and a new project for research grant teams; a project in a new country in a new field or discipline for fellows. On the other hand, no preliminary results are required, to encourage applicants with bold ideas to get off to a fast start. The aim is to seed ground-breaking innovative research, enabling the HFSPO Members to throw wider the net for high yield serendipitous results down the line.

Anniversaries are occasions to celebrate past achievements but also to look forward. It was fitting, therefore, that the 30th anniversary of the Program in Tokyo also coincided with the Triennial Conference of HFSPO Members at which representatives looked to the future, renewing their commitment for another three years of funding. The conference was also the opportunity to confirm the Board's Strategic Plan 2020-2022, setting out ambitious goals for HFSP programs into the twenty-first century. These include increasing the award amounts for both the grants and fellowships to consolidate competitiveness on the funding landscape and further fine-tuning the fellowship program to future needs. The plan also called for increased membership to enable HFSP to fulfil its mission to science worldwide. In this respect, an important milestone was reached in November 2019, when the Ministry of Science and Technology of Israel signed a Memorandum of Understanding with HFSPO and we were able to welcome its scientists to full participation in HFSP programs.

The vision for HFSP 30 years ago was that of former Prime Minister Yasuhiro Nakasone of Japan, who understood the synergies that could be created by scientists working together in an increasingly globalised world. In 1989, his initiative received the support of Japan's partners on the G7, who readily recognised the opportunity and have supported the Program financially ever since, now as 15 HFSPO Members. Sadly, Mr. Nakasone left us late in 2019 at the age of 101, entrusting his vision for the Program to my colleagues on the Board of Trustees and me.

A lasting memory of the 30th anniversary event in Tokyo was the presence of senior level high school students, a reminder that our future is in the hands of the young, with science one of our greatest legacies to them. Science itself is young, 'Come so far, but still so far to go'. After 30 years, HFSP is only at the beginning of the journey.

Warwick ANDERSON and Shigekazu NAGATA

HFSPO BOARD OF TRUSTEES

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- Shigekazu NAGATA, Osaka University, Japan

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- Two members under appointment

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INTRODUCING HFSPO

The International Human Frontier Science Program Organization (HFSPO) is an international cooperation in life science research supported by the world's leading scientific countries. It promotes fundamental research in the life sciences with special emphasis on novel and interdisciplinary research, international and, in particular, intercontinental collaboration, and support for young investigators.

HFSP funding complements national programs to enable collaborations in a scientific landscape that changes fast. Novel approaches coming from different disciplines hold great promise to address the most important problems in understanding complex life. The challenge for all scientists is to look beyond their original expertise and broaden their horizons by working with collaborators they have never interacted with before and by moving into new fields of research. HFSP is at the forefront of such interdisciplinary, collaborative research. Through its different funding schemes, it supports frontier, potentially transformative 'out-of-the-box' proposals and encourages applications for high-risk/high-reward projects. Successful projects challenge existing paradigms by using novel approaches and techniques; they address important problems and barriers to progress in the field.

HFSP supports research into the complex mechanisms of living organisms, ranging from the biomolecular level to the whole organism and its physiology and behavior. The life sciences have emerged as a leading scientific area in which there is a convergence of approaches from physics, mathematics, chemistry, computer science and engineering to solve biological questions. HFSP aims to support frontier research by involving scientists from outside the life sciences as part of research collaborations and as postdoctoral fellows. To this end, the Program and Early Career Grants are specifically geared to fostering interactions between scientists from different disciplines and this is a major factor in the review of applications in these programs. In this context, HFSP supports Cross-Disciplinary Fellowships to equip young scientists from outside biology with the skills needed to tackle problems in the life sciences. Since its establishment in 1989, HFSP has demonstrated the value of creating a framework for competitive, collaborative, international research of the highest calibre and for providing young scientists with the

HFSPO Executive Office (from left to right): **Masami WATANABE**, **Jill HUSSER** and **Warwick ANDERSON**

opportunity to emerge as talented researchers capable of shaping the science of the future.

HFSPO implements its Program through the following mechanisms of research support, details of which can be found in the subsequent chapters:

Postdoctoral Fellowships

- Long-Term Fellowships – for young life scientists within three years of obtaining their PhD who wish to broaden their scientific experience in a foreign laboratory.
- Cross-Disciplinary Fellowships – specifically for scientists with a PhD in non-biological disciplines to bring new perspectives to research in the life sciences.

Research Grants

- Early Career Grants – grants for interdisciplinary teams of young researchers who are within the first five years of their first independent positions and located in different countries.
- Program Grants – for interdisciplinary teams of researchers in different countries at any stage of their careers.

Since 1990, more than 1000 research grants involving some 4000 scientists, and more than 3000 fellowships have been awarded. Researchers from more than 70 countries have received HFSP funding so far.

HFSP supports the next generation of researchers, who are in the strongest position to open new avenues of research, through the fellowship program and the Early Career Grant. Program Grant teams are also encouraged to include young scientists with the result that a significant number of scientists under the age of 40 are included in awarded teams. Taken together, these early career researchers are awarded approximately 70% of annual HFSP funds.

HFSP is governed by the Board of Trustees composed of appointees from HFSPO Members, currently Australia, Canada, France, Germany, India, Israel, Italy, Japan, New Zealand, Norway, the Republic of Korea, Singapore, Switzerland, the United Kingdom of Great Britain and Northern Ireland, the United States of America and the European Commission. Members of the HFSPO Council of Scientists are nominated by the HFSPO Members. They provide scientific advice to the Board of Trustees and select the winners of the HFSP Nakasone Award.

The Board is supported by the HFSPO Secretariat, located in Strasbourg, France, and directed by the Secretary-General. Its legal status is a not-for profit association established in Alsace (Grand Est), France.
The Member countries support HFSP through voluntary contributions which are agreed at a Triennial Conference of HFSPO Members.

Members of the Board of Trustees and participants in the Triennial Conference of HFSPO Members in Tokyo, July 2019

REPORT OF THE SECRETARY-GENERAL

Warwick ANDERSON
Secretary-General of HFSPO

The importance of the International Human Frontier Science Program Organization (HFSPO), a unique international cooperation in science, has never been more apparent. The visionaries of the 1980s, the Presidents and Prime Ministers of the G7 and the outstanding scientists who advised them, formed an organisation with two major aims.

HFSP was to be truly international, 'science without borders', and it has remained so through the past 30 years. Scientists anywhere can apply for an HFSP award. HFSPO was formed to promote cooperation and 'internationality and intercontinentality' with our research grants supporting novel constellations of scientists from different countries working together. Similarly, our fellowships offer postdocs from anywhere an opportunity to move internationally.

The second aim of the founders was to fund research that would advance the understanding of the mechanisms of life or, more formally, in the words of our statutes '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.'

Perhaps it might seem to some that the phrases 'basic research' and 'benefit of all humankind' are fully contradictory; but not at all. The benefits to humankind of basic life sciences are manifold.

First, there are the practical benefits. Almost every advance in the prevention and treatment of human disease is built on top of research that gave us an understanding of basic biology, whether it was of a molecular and cellular mechanism, of the physiology of the complexity and sophistication of biological systems of life and their interaction, or of the biophysics and biochemistry of life.

Many people would argue that, of equal value, is the understanding that comes with scientific enquiry; how basic science helps us to banish superstition and misunderstanding as science sheds more and more light on the marvels of living beings. The substitution of knowledge and insight for myth and superstition is one of the top achievements of the life sciences in general.

Third, collaboration and cooperation in science as promoted by HFSP is the hallmark of basic life science research. Openness and free international collaboration have been and continue to be essential to the success of basic science.

The year was one of many HFSP achievements in all these benefits. Visit the IMPACT section of the HFSP website to read many descriptions of exciting new developments from HFSP funded research. Read also of HFSP research that changed the science, leading to paradigm shifts in the field. Read too the list of successful research grants showing the wide scope of international collaboration that this scheme supports.

After the 30 years' celebrations in 2019, the last weeks of this financial year were upended by the pandemic created by the coronavirus, SARS-CoV-2. The reliance of the world on science was suddenly put into unparalleled stark relief. The world needed science to develop reliable diagnostic tests, to begin a hunt for a vaccine and to study which therapeutics might be effective or not. A moment's thought will lead to the realisation that humankind's work to overcome the devastating effects will rely on science. All the work now being done to produce vaccines is built on a century of basic science in immunology, virology and the sciences that will allow, hopefully, much greater and faster production of the vaccines. So too basic research in epidemiology, modelling, clinical research (barriers, intensive care, respiratory care) and health policy has already shown how crucial these areas are to successful responses. Without this science in place, the world would have been overwhelmed. This seems to have been widely recognised with public officials almost everywhere making it clear that they are 'following the science'.

The pandemic has also shown us that there is still so much to learn about the 'sophisticated and complex mechanisms of living organisms'. Research into the fundamental mechanisms of life is needed to give humankind a better understanding of life, of the biology of the millions of viruses, of the human immune system or of effective disease surveillance, just to name three priority areas. Here too, the benefits to humankind of this basic science are much wider than just to better withstand a human pandemic. International collaboration in the highest quality research, without barriers, is needed to achieve this understanding and that is the spirit of the Human Frontier Science Program. As the leading countries in basic life sciences, the HFSPO Members' support demonstrates their commitment to this spirit, 'for the benefit of all humankind'.

Chapter 1

Fellowship Program

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1.1
HIGHLIGHTS

In the competition that ended in March 2020, over 20% of the total applications were submitted for the Cross-Disciplinary Fellowship program.

An awardee from Malaysia received a Cross-Disciplinary Fellowship to investigate the physical determinants of mitotic spindle organisation at the Centre for Genomic Regulation, Barcelona, Spain.

An awardee from the Ukraine will move to New York to study the fascinating question on how the brain remodels and how the aging clock slows down to extend lifespan when a worker ant transitions to become a queen upon the death or removal of the former queen.

A Cross-Disciplinary fellow from Sweden will use her background in particle physics and advanced statistics to develop mathematical models of consciousness in her new host laboratory at Harvard University.

1.2

THE AIMS OF THE HFSP FELLOWSHIP PROGRAM

HFSP offers two types of postdoctoral fellowships

- **Long-Term Fellowships (LTF)** are for applicants with a PhD in a biological discipline who will broaden their expertise by proposing a project in the life sciences which is significantly different from their previous PhD or postdoctoral work.
- **Cross-Disciplinary Fellowships (CDF)** are for applicants with a PhD from outside the life sciences (e.g. in physics, chemistry, mathematics, engineering or computer sciences) who want to apply their knowledge to a biological problem.

All HFSP fellowships are for three years and provide an annual living allowance as well as a modest research and travel allowance. In addition, child, parental leave and relocation allowances are provided where appropriate.

All HFSP fellowships must be taken up in a laboratory in a different country to the one where the PhD degree was conferred. Applicants from a country that is not a member of HFSPO, must hold their fellowship in a HFSPO Member.

HFSP fellowships are flexible, for example, awardees can defer the third year of their fellowship for up to two years and can also use the third year in a different country or in their home country. At the end of the fellowship, the awardees can request a six-month no-cost extension to spend any remaining funds in their host lab. At HFSPO we believe that such flexibility is crucial for allowing fellows to make the most of their postdoctoral training.

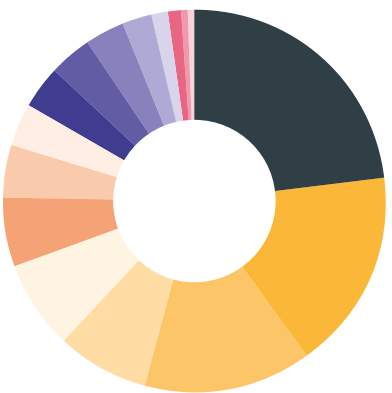
For the competition launched in summer 2019, 597 applications from 54 countries were received. In March 2020, the Board approved 65 fellowships – 50 Long-Term and 15 Cross-Disciplinary Fellowships – which were taken up in 15 different host countries.

1.3

SELECTION OF HFSP FELLOWSHIPS AWARDED IN MARCH 2020

The competition for 2019/2020 was launched with a call for applications in summer 2019. The largest group of applications (23%) came from non-member countries, illustrating the worldwide reach of HFSPO (Figure 1.1 and Table 1.1), followed by candidates from Europe, India, France and Germany. In total 597 applications were submitted by the deadline in August 2019, out of which 544 were eligible applications and thus reviewed.

Figure 1.1
Number of fellowship applicants by nationality



126	Other	20	United Kingdom
93	Europe	20	USA
76	India	17	Korea
42	France	14	Canada
41	Germany	8	Australia
32	Japan	5	Switzerland
24	Israel	4	Singapore
20	Italy	2	New Zealand

In March 2020, HFSPO announced fellowship awards to scientists of 25 different nationalities (see Table 1.1). 50 young researchers were awarded Long-Term Fellowships and 15 were awarded Cross-Disciplinary Fellowships.

HFSP fellows chose host labs in 15 countries, with 54% of fellows going to labs in the United States of America (Figure 1.2).

Since 1990, HFSP fellows have been hosted in 23 countries.

Table 1.1

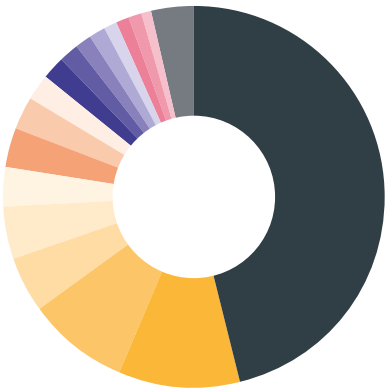
Nationalities of Long-Term (LTF) and Cross-Disciplinary (CDF) Fellowship applicants and awardees awarded in March 2020

Nationality	LTF applicants	LTF awardees	CDF applicants	CDF awardees	Total awardees
Australia	7	2	1	0	2
Canada	10	1	4	1	2
Europe	87	4	6	2	6
France	36	5	6	3	8
Germany	36	5	5	2	7
India	62	1	14	0	1
Israel	19	9	5	0	9
Italy	15	2	5	1	3
Japan	27	3	5	0	3
Korea	14	0	3	1	1
New Zealand	2	0	0	0	0
Norway	0	0	0	0	0
Singapore	2	0	2	0	0
Switzerland	5	1	0	0	1
United Kingdom	13	3	7	1	4
United States of America	13	2	7	1	3
Other*	102	12	24	3	15
TOTAL	450	50	94	15	65

*Other: dual nationalities and non-HFSPO countries (Argentina, Bangladesh, Brazil, Chile, China, Egypt, Iran, Iraq, Lebanon, Malaysia, Mauritius, Mexico, Nigeria, Pakistan, Peru, Russia, Serbia, Taiwan, Tunisia, Turkey, Ukraine, Uzbekistan, Vietnam). Please note that in 2020 four awardees from HFSPO Members hold dual nationalities, including one awardee each from France, Germany, the UK and the US. Two awardees from Israel hold dual nationalities.

Figure 1.2

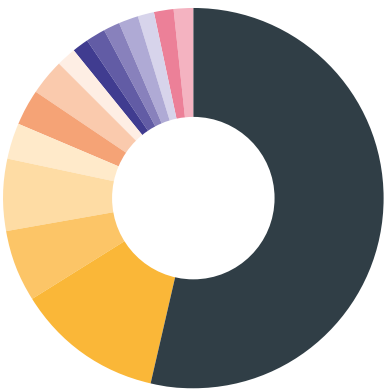
Host country of Long-Term and Cross-Disciplinary Fellowship applicants and awardees awarded in March 2020



Host country of 2020 applicants

251	USA		11	Sweden	
56	Switzerland		9	Austria	
47	United Kingdom		8	Australia	
26	France		7	Belgium	
24	Germany		7	Israel	
18	The Netherlands		6	Italy	
18	Spain		5	Singapore	
16	Canada		5	Denmark	
11	Japan		19	Other	

The 19 applications for other host countries are:
Portugal 4, New Zealand 4, Ireland 4, Czech Republic 2, Slovenia 2, Luxembourg 1, Finland 1, Brazil 1



Host country of 2020 awardees

35	USA		1	Canada	
8	Switzerland		1	Ireland	
4	Austria		1	Italy	
4	United Kingdom		1	Japan	
2	Australia		1	Portugal	
2	Germany		1	Singapore	
2	Sweden		1	Spain	
1	Belgium				

Table 1.2

Gender of Long-Term (LTF) and Cross-Disciplinary (CDF) Fellowship applicants and awardees awarded in March 2020

	Applications		Awards	
	LTF	CDF	LTF	CDF
Number of female scientists	208	31	25	5
	46.2%	33.0%	50.0%	33.3%
Number of male scientists	239	62	24	9
	53.1%	66.0%	48.0%	60.0%
No gender information	3	1	1	1
	0.7%	1.1%	2.0%	6.7%
Total number of scientists	**450**	**94**	**50**	**15**

1.4

THE HFSP FELLOWSHIP REVIEW COMMITTEE

NON-REVIEWING CHAIR
- **Peter KOOPMAN**, The University of Queensland, Brisbane, Australia

AUSTRALIA
- **Michelle DUNSTONE**, Monash University, Melbourne
- **Peter KOOPMAN**, The University of Queensland, Brisbane

CANADA
- **Anja GEITMANN**, McGill University, Ste-Anne-De-Bellevue
- **Tania WATTS**, University of Toronto

EUROPEAN COMMISSION
- **Kirstine BERG-SORENSEN**, Technical University of Denmark, Lyngby, Denmark
- **Cayetano GONZALEZ**, Institute for Research in Biomedicine - IRB Barcelona, Spain
- **Roland KANAAR**, Erasmus Medical Center, Rotterdam, The Netherlands
- **Vera VAN NOORT**, KU Leuven, Belgium

FRANCE
- **Daniel RIVELINE**, IGBMC/Strasbourg University
- **Pierre SENS**, Institut Curie, Paris

GERMANY
- **Patrik KRIEGER**, Ruhr-University Bochum
- **Robert RUSSELL**, University of Heidelberg

INDIA
- **Nagasuma CHANDRA**, Indian Institute of Science, Bangalore
- **Shubha TOLE**, Tata Institute of Fundamental Research, Mumbai

ITALY
- **Cecilia LASCHI**, Scuola Superiore Sant'Anna, Pisa

Peter KOOPMAN

Chair of the Fellowship Review Committee

JAPAN
- **Takashi TSUCHIMATSU**, Chiba University

NEW ZEALAND
- **Peter FINERAN**, University of Otago, Dunedin

NORWAY
- **Jonathan WHITLOCK**, Norwegian University of Science and Technology (NTNU), Trondheim

REPUBLIC OF KOREA
- **Sungjune JUNG**, POSTECH, Pohang

SINGAPORE
- **Walter HUNZIKER**, National University of Singapore
- **Shyam PRABHAKAR**, Genome Institute of Singapore

SWITZERLAND
- **Marcos GONZALEZ-GAITAN**, University of Geneva
- **Thomas NEVIAN**, University of Bern

UNITED KINGDOM
- **Mariann BIENZ**, MRC Laboratory of Molecular Biology, Cambridge

UNITED STATES OF AMERICA
- **Marina PICCIOTTO**, Yale University School of Medicine, New Haven
- **Joseph PUGLISI**, Stanford University

DELEGATE FROM THE COUNCIL OF SCIENTISTS, January 2020

The HFSPO Council of Scientists is responsible for overseeing the peer review process of HFSP funding programs. Each year a Council member participates in the review committee meetings as an observer with the role to monitor due diligence of the proceedings.

Beverley GLOVER, University of Cambridge, UK

1.5

AWARDEES LISTS

Fellowships awarded in March 2020 (to be initiated during FY 2020)

Nationality of awardees in brackets, followed by the location of the research laboratory.

1.5.1 CROSS-DISCIPLINARY FELLOWSHIPS

Mycobacterium tuberculosis modulation of host, elucidated by super-resolution imaging and proteomics
ASHDOWN George (UK)
Walter and Eliza Hall Institute of Medical Research, Melbourne, Australia

Global Neuronal Network theory vs Integrated Information Theory
BENDTZ Katarina (Sweden)
Harvard University, Boston, USA

Pathways of neural information transfer along the gut-brain axis
BOYS Alexander (USA)
University of Cambridge, UK

Physical determinants for the coexistence of nematic and polar network states in mitotic spindles
CHEW Wei Xiang (Malaysia)
Centre for Genomic Regulation, Barcelona, Spain

Electrochemical biosensors for minimally invasive continuous small molecule monitoring
DAMRY Adam (Canada)
Australian National University, Canberra, Australia

Reproducing affinity maturation dynamics in vitro
DUPIC Thomas (France)
Harvard University, Boston, USA

Data-driven discovery of decentralised control mechanisms of action selection
GOSZTOLAI Adam (Hungary)
Brain Mind Institute and Interfaculty Bioengineering Institute, EPFL, Lausanne, Switzerland

Miniaturized two-photon microscope capable of deep brain imaging in freely behaving animals
JEONG Seungwon (Korea)
Johns Hopkins University, Baltimore, USA

Investigating mechanotransduction at a single molecule level
KASHCHUK Anatolii (Ukraine)
University of Florence, Italy

Elucidating the acute cellular sensing and response pathways to severe hypoxia
LI Li (China)
University of California, San Francisco, USA

De novo design of autocatalytic formation of isopeptide bonds
MILLES Lukas (Germany)
University of Washington, Seattle, USA

Whole-brain acoustic tracking of calcium and hemodynamics (WATCH)
RABUT Claire (France)
California Institute of Technology, Pasadena, USA

Investigating the role of non-equilibrium pathways to liquid-liquid phase separation in vitro
RINALDIN Melissa (Italy)
Brandeis University, Waltham, USA

Characterization of the sorting platform's assembly in bacteria using 4Pi microscopy and DNA-PAINT
SCHUEDER Florian (Germany)
Yale University, New Haven, USA

Biomechanical induction of a primitive streak in a synthetic human embryo
VALET Manon (France)
The Rockefeller University, New York, USA

1.5.2 LONG-TERM FELLOWSHIPS

Clonal dynamics and architecture of the blood stem cell niche
BARON Chloe (France)
Boston Children's Hospital, USA

Unraveling the molecular mechanics of mitotic chromosome assembly
BENNABI Isma (France)
IMBA - Institute of Molecular Biotechnology, Vienna, Austria

Uncovering the molecular link between regeneration and aging in Hydra
CAMPOS RODRIGUEZ Sergio Esteban (Mexico)
University of California, Davis, USA

Characterizing the translation-initiation modes of operons in bacteria
CHEMLA Yonatan (Israel/France)
MIT, Cambridge, USA

Engram epigenetics – A CRISPR-based approach to identify genes for the treatment of fear memories
CODA Davide (Italy)
Brain and Mind Institute, Lausanne, EPFL, Switzerland

Molecular and physical mechanisms of gamete binding and fusion in zebrafish
DENEKE Victoria (El Salvador/Germany)
Research Institute of Molecular Pathology, Vienna, Austria

From vision to camouflage: behavioural computations in the cuttlefish
EVANS Dominic (UK)
Max Planck Institute for Brain Research, Frankfurt am Main, Germany

In situ characterization of eukaryotic sodium channels using cryoEM
FAN Xiao (China)
Princeton University, USA

Using visual proteomics to understand membrane dynamics in the malaria parasite P. falciparum
FERREIRA Josie (UK/South Africa)
University of Hamburg, Germany

From social networks to neural networks: imaging social memory in the bat hippocampus
FORLI Angelo (Italy)
University of California, Berkeley, USA

Genomic characterization of regulatory elements associated with human breast milk production
GOLAN MAOR Yarden (Israel)
University of California, San Francisco, USA

A radical approach to histidine bioconjugation
GREEN Ori (Israel)
ETH Zurich, Switzerland

Exploring nuclear-independent transcription and the distribution of mRNAs during OXPHOS adaptation
HANSEN Katja (Germany)
Harvard Medical School, Boston, USA

Cryo-EM visualization of sister chromatid cohesion establishment at the replication fork
HENRIKUS Sarah (Germany)
The Francis Crick Institute, London, UK

Charting the evolutionary history of a sex-specific innovation at the single-cell level
HOPKINS Benjamin (UK)
University of California, Davis, USA

Mechanisms of a lifetime of behavior in Aedes aegypti mosquito females
HOURI ZEEVI Leah (Israel)
Rockefeller University, New York, USA

The molecular mechanism of sex determination in a malaria parasite
HUNZIKER Mirjam (Switzerland)
Umea University, Sweden

Mapping the biogeography of the gut microbiome: from spatial ecology to disease resistance
JAHN Martin (Germany)
University of Oxford, UK

Male-male competition and host range evolution in an herbivorous leaf-footed bug
JARRETT Benjamin (UK)
University of Lund, Sweden

Investigating the CNS lymphatic system and immune cell trafficking in brain metastasis
JORDAO Marta Joana Costa (Portugal)
University of Lausanne / Ludwig Institute for Cancer Research, Switzerland

Investigating the effects of sleep on neural computations in the olfactory system
KIRSZENBLAT Leonie (Australia)
RIKEN Center for Brain Science, Wako, Japan

Role of post-translational modifications of mSWI/SNF chromatin remodeling complexes in human disease
KOREN-HAUER Shany (Germany)
Dana-Farber Cancer Institute / Harvard Medical School, Boston, USA

Role of cholesterol metabolism in aging model of neuronal recovery
KUK Alvin Chun Yin (Australia)
Duke-NUS Medical School, Singapore

Structural and biochemical investigation of Xist-mediated X-chromosome inactivation
KUMAR Ananthanarayanan (India)
Yale University, New Haven, USA

Deciphering the functions and mechanisms of brain-wide motor representations
LEV Itamar (Israel)
University of Vienna, Austria

The ontogeny of behavior
LEVY Dana Rubi (Israel)
Harvard Medical School, Boston, USA

Recording and programming human retina cell fates
LIN Hsiu-Chuan (Taiwan)
Institute of Molecular and Clinical Ophthalmology Basel, Switzerland

Deciphering the principles of enhancer cooperativity
LOUBIERE Vincent (France)
Research Institute of Molecular Pathology, Vienna, Austria

Macrophage – intestinal epithelial cell crosstalk in the integration of cell death and tissue repair
MELI Alexandre (Canada)
Yale University, New Haven, USA

Chromatin dynamics in the sensitivity and robustness tradeoff of differentiating stem cells
METZL RAZ Eyal (Israel)
Stanford University, Palo Alto, USA

Synaptic immune molecules and neuronal circuits regulation
MINZEL Waleed (Israel)
University of Virginia, Charlottesville, USA

Spatially resolved single cell profiling of plant transcriptome and microbiota
NOBORI Tatsuya (Japan)
The Salk Institute for Biological Studies, La Jolla, USA

Deep learning to discover D-amino acids in protein backbones from microbial dark matter superphyla
ROBINSON Serina (USA)
ETH Zurich, Switzerland

Assembly and function of heterogeneous human ribosomal DNA variants across populations and tissues
ROTHSCHILD BUP Daphna (Israel)
Stanford University, USA

Investigating adult dLGN reinnervation using a biohybrid retinal ganglion cell multielectrode array
RUFF Tobias (Germany)
ETH Zurich, Switzerland

Investigating archaeal horizontal gene transfer systems towards universal delivery tools
SAITO Makoto (Japan)
Broad Institute of MIT and Harvard, Cambridge, USA

Mechanisms of cellular dedifferentiation in regeneration
SALINAS SAAVEDRA Miguel (Chile)
National University of Ireland Galway, Ireland

Interplay of morphogen gradients and cerebrospinal fluid pressure in the embryonic brain
SÁNCHEZ VÁSQUEZ Estefanía (Peru)
Columbia University, New York, USA

Brain remodeling and deceleration of aging upon caste transition in the ant Harpegnathos saltator
SIERIEBRIENNIKOV Bogdan (Ukraine)
New York University Langone School of Medicine, USA

A chemical biology approach to unravel phosphatidylethanolamine transport and metabolism
SIMON Clémence (France)
University of Geneva, Switzerland

Force generation and sensation in rapid plant movement
SLEBODA David (USA)
McGill University, Montreal, Canada

Role of cardiac neural crest in lamprey and axolotl heart development and regeneration
ŠTUNDL Jan (Czech Republic)
California Institute of Technology, Pasadena, USA

Dissection of the relationship between folding stability and biological lifetime of proteins
TSUBOYAMA Kotaro (Japan)
Northwestern University, Chicago, USA

Horizontal gene transfer in the gut microbiome and its therapeutic potential
VANDEPUTTE Doris (Belgium)
Cornell University, Ithaca, USA

The influence of the pulmonary microbiome on the immune memory of endothelial cells
VEIGA Nuphar (Israel)
KU Leuven, Belgium

Epigenetic plasticity and imprinting dynamics during development
WEINBERG-SHUKRON Ariella (Israel/USA)
University of Cambridge, UK

Investigation of sleep stage-dependent synaptic plasticity in the living brain
WEINHARD Laetitia (France)
New York University School of Medicine, USA

The central role of c-di-AMP and of its synthesising enzyme CdaA in bacterial physiology
WEINHÄUPL Katharina (Austria)
University of Porto, Portugal

Dissecting the molecular basis of human muscle stem cell heterogeneity and quiescence
YAN Lu (China)
Brigham and Women's Hospital, Boston, USA

Dissecting the function of temporal variation of gene expression in limb morphogenesis
ZHU Meng (China)
Harvard University, Boston, USA

1.6

FELLOWSHIP PROFILE

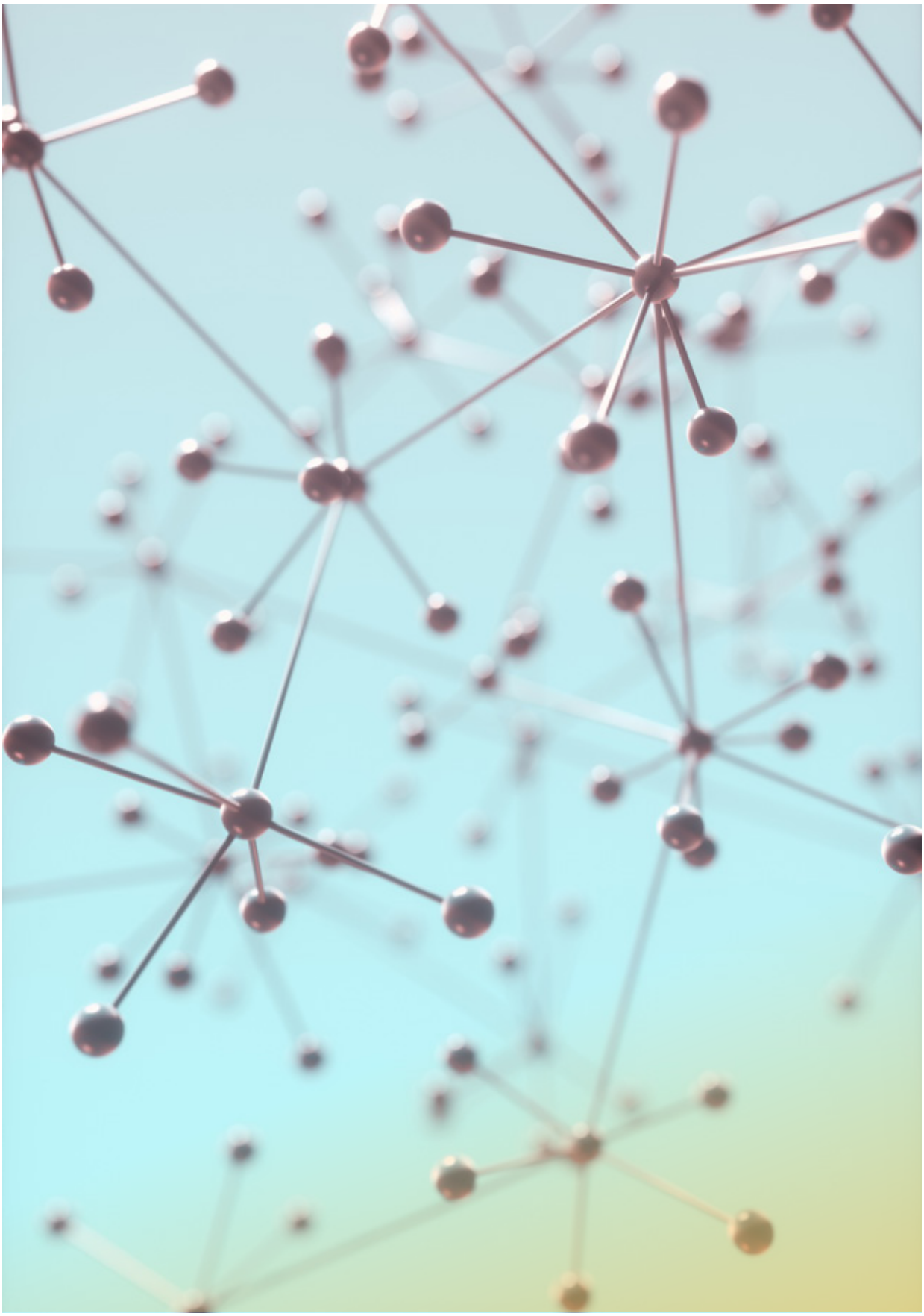
2019 Cross-Disciplinary Fellowship

Mary WOOD (UK),
Laboratory of Nanobiotechnology,
EPFL, Lausanne, Switzerland

Exploring bacterial solar panels as an energy supply of the future

Biophotovoltaic (BPV) technology uses biofilms of photosynthetic bacteria grown onto electrode surfaces to harvest solar energy – a kind of bacteria-based solar panel. However, such devices are currently limited by unexpectedly slow electron transfer between the bacteria and the electrode, and this interface remains poorly understood. It is unclear even which species are responsible for this crucial electron-transfer process.

My project aims to use a combination of several sophisticated and highly specialised surface-study techniques alongside bioelectrochemistry, synthetic biology and electrode design to study the key species (including redox proteins and mediator complexes) at this interface, both individually and *in situ* within model lipid bilayers and finally within the biofilms themselves. The techniques I use include neutron reflectometry, which allows *in situ* structural characterisation of buried interfaces with an angstrom-level resolution, sum-frequency generation (SFG) spectroscopy, a very powerful surface-specific infrared technique that provides a wealth of information about the chemical nature of the interfacial species, electrochemical Raman spectroscopy and various other complementary methods. Importantly, these will allow us to build up a mechanistic picture of each aspect of these complex buried biointerfaces and hence distinguish between different electron-transfer mechanisms (e.g. via pili aromatic amino acids, outer-membrane redox proteins or diffusional shuttles) that are currently proposed.



Chapter 2

Research Grant Program

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2.1
HIGHLIGHTS

28 grants, including 20 Program and 8 Early Career were awarded in March 2020 from 702 letters of intent submitted in March 2019, indicating a 4% success rate.

5 teams are led by a female principal investigator, including the top-ranked project.

40% of all awarded teams have members working on three continents.

The average age of research grant awardees is 48, and 38 for Early Career grants.

Teams study, among other topics, bud dormancy and heat stress in plants, material in giant basking sharks, single cell evolution, biological protein springs, optically-communicating neural networks and mechanics of ant herbivory.

2.2

THE AIMS OF THE HFSP RESEARCH GRANT PROGRAM

HFSP research grants support innovative basic research into fundamental biological problems with emphasis on novel collaborations crossing national – often continental – and disciplinary boundaries. As biological research has become increasingly quantitative, major progress in answering basic questions requires interdisciplinary approaches, novel ways to use new technologies and innovative theoretical approaches. This is seen in the strong participation of scientists from disciplines outside the traditional life sciences, such as biophysics, chemistry, computational biology, computer science, engineering, mathematics, nanoscience or physics, in awarded HFSP research grants. HFSP projects are based on the outstanding competence of the scientists, their innovative ways of thinking, and their willingness to take the risk to step outside the limits of their traditional research area and build new teams. These interdisciplinary collaborations have opened up new approaches for understanding the complex structures and regulatory networks that characterize living organisms, their evolution and interactions.

HFSP supports frontier research through two types of research grants:

Program Grants are awarded to teams of 2 to 4 scientists at any stage of their careers who embark upon a new project.

Early Career (previously **Young Investigator**) **Grants** require that team members are within 5 years of obtaining an independent position and not more than 10 years after completing their PhD.

Both are made up of interdisciplinary teams of two to four scientists having their laboratories in different countries and preferably different continents.

For the competition launched in March 2019, 702 eligible letters of intent were submitted. In March 2020, the HFSPO Board of Trustees approved 28 awards, of which 20 went to Program Grant teams and 8 to Early Career teams.

2.3

SELECTION OF HFSP RESEARCH GRANTS AWARDED IN MARCH 2020

Table 2.1
The breakdown of the two-step review process for the HFSP research grants is shown in the table below

	Program Grants	Early Career Grants	Total
Number of eligible letters of intent	549	153	**702**
Number of full applications	60	25	**85**
Number of awarded projects	20	8	**28**
% of awarded projects, based on letters of intent	3.64%	5.23%	**3.99%**
% of awarded projects, based on full applications	33.33%	32.00%	**32.94%**
Number of members per awarded team, mean (range)	3.15 (2-4)	2.87 (2-4)	**3.07 (2-4)**
Cumulative total per year, mUSD	7.2	2.65	**9.85**

Figure 2.1

The figure shows the development of eligible submitted letters of intent and success rate over the last 10 years

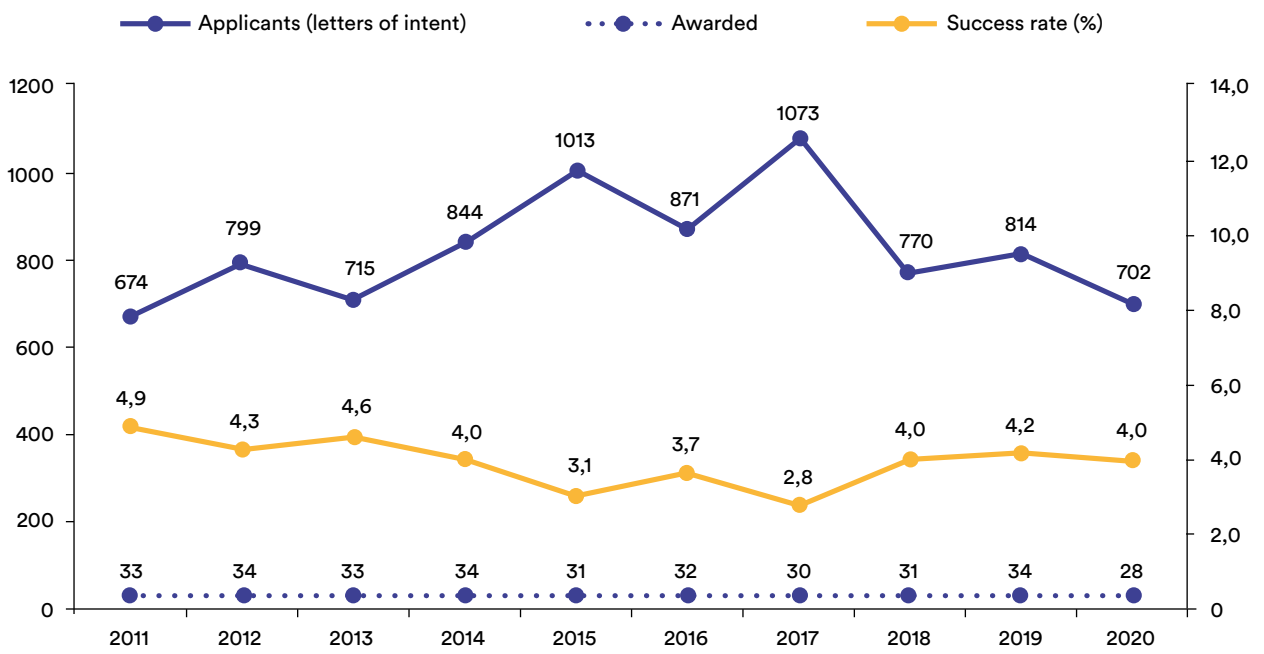


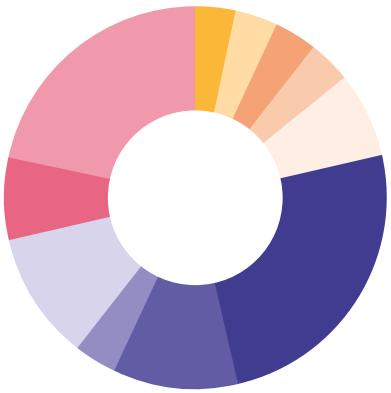
Table 2.2

The gender distribution among applying and awarded teams differs between the Program and Early Career Grants

	Letter of intent		Awarded grants	
	Program	**Early Career**	**Program**	**Early Career**
Number of female scientists	429	116	15	8
	26.2%	27.9%	23.8%	34.8%
Number of male scientists	1203	297	48	15
	73.6%	71.4%	76.2%	65.2%
Total number of scientists	**1635***	**416***	**63**	**23****

*Gender not provided by 3 applicants for the Program Grants and Early Career Grants
**Gender not provided by 2 awardees among the Early Career Grants

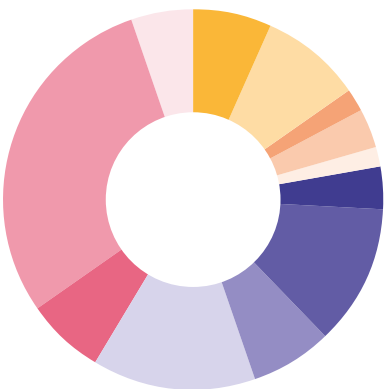
Figure 2.2
Countries in which awardees are working



Principal Investigators

1	Australia	3	France
1	India	1	Italy
1	Japan	3	United Kingdom
1	Switzerland	2	Canada
2	Germany	6	USA
7	Europe		

The principal investigators located in other countries of Europe have their laboratories in the following countries:
Denmark 1, Finland 1, Greece 1, The Netherlands 1, Slovenia 1, Spain 2



Co-Investigators

4	Australia	7	Europe
5	Japan	4	France
1	Korea	8	United Kingdom
2	Israel	4	Canada
1	Switzerland	17	USA
2	Germany	3	Non-members

The co-investigators located in other countries of Europe have their laboratories in the following countries: Austria 2, Denmark 1, Portugal 2, Spain 1 and Sweden 1 and in countries that are not members of the Organization: Argentina 1, China 1 and Taiwan 1

2.4

THE HFSP RESEARCH GRANT REVIEW COMMITTEE

Vic ARCUS
Chair of the HFSP Research Grant Review Committee

NON-REVIEWING CHAIR
- **Vic ARCUS**, University of Waikato, Hamilton, New Zealand

VICE CHAIR
- **Diane LIDKE**, University of New Mexico, Albuquerque, USA

AUSTRALIA
- **Elizabeth HARTLAND**, Monash University, Clayton
- **Michael T. RYAN**, Monash University, Melbourne/Clayton

CANADA
- **Belinda S.W. CHANG**, University of Toronto
- **Penney GILBERT**, University of Toronto

EUROPEAN COMMISSION
- **Sebastian HAESLER**, KU Leuven, Belgium
- **Marja-Leena LINNE**, Tampere University, Finland

FRANCE
- **Valentina EMILIANI**, Vision Institute, UMR 8250 CNRS, University Paris Descartes
- **Marie-France SAGOT**, University Claude Bernard, Lyon

GERMANY
- **Friedrich C. SIMMEL**, Technical University Munich, Garching

INDIA
- **Upinder BHALLA**, NCBS - Tata Institute of Fundamental Research, Bangalore

ITALY
- **Antonio CELANI**, The Abdus Salam International Center for Theoretical Physics (ICTP), Trieste
- **Mathew DIAMOND**, International School for Advanced Studies (SISSA), Trieste

JAPAN
- **Tomomi SHIMOGORI**, RIKEN Center for Brain Science – BSI, Wako

REPUBLIC OF KOREA
- **Tae-Young ROH**, Pohang University of Science and Technology (POSTECH)

NEW ZEALAND
- **Jasna RAKONJAC**, Massey University, Palmerston North

NORWAY
- **Nathalie REUTER**, University of Bergen

SINGAPORE
- **Timothy SAUNDERS**, National University of Singapore

SWITZERLAND
- **Brigitte GALLIOT**, University of Geneva
- **Kentaro SHIMIZU**, University of Zurich

UNITED KINGDOM
- **Peter SWAIN**, University of Edinburgh

UNITED STATES OF AMERICA
- **Cliff BRANGWYNNE**, Princeton University
- **Raghu PARTHASARATHY**, The University of Oregon, Eugene

DELEGATE FROM THE COUNCIL OF SCIENTISTS

The HFSPO Council of Scientists is responsible for overseeing the peer review process of HFSP funding programs. Each year a Council member participates in the review committee meetings as an observer with the role to monitor due diligence of the proceedings.

Hendrik STUNNENBERG, Radboud University, Nijmegen, the Netherlands, EU

2.5

AWARDEES LISTS

Research grants awarded in March 2020 (to be initiated in FY 2020)

Nationality is in parentheses when different from the country in which the lab is located.

2.5.1 PROGRAM GRANTS

Uncovering the OS of trees: Environmental information processing and the control of bud dormancy

BASSEL **George**	School of Biosciences University of Warwick Coventry	UK (GREECE)
BAYER **Emmanuelle**	Laboratory of Membrane Biogenesis UMR5200 University of Bordeaux, CNRS Villenave d'Ornon	FRANCE
BHALERAO **Rishikesh**	Dept. of Forest Genetics and Plant Physiology The Swedish University of Agricultural Sciences Umea	SWEDEN
WALKER **Sara**	School of Earth and Space Exploration Arizona State University Tempe	USA

Sounds and pheromones: neural networks merging olfactory and acoustic cues in sexual imprinting

BOVETTI **Serena**	Dept. of Life Sciences and Systems Biology University of Turin	ITALY
GIGAN **Sylvain**	Laboratoire Kastler-Brossel Sorbonne Université, Ecole Normale Supérieure Paris	FRANCE
PENN **Dustin**	Konrad Lorenz Institute of Ethology Veterinary Medicine University Vienna	AUSTRIA (USA)

Integrating materials, behavior, robotics and architecture in giant filter-feeding sharks

DEAN **Mason**	Dept. of Biomaterials Max Planck Institute for Colloids & Interfaces Potsdam	GERMANY (USA)
GOLDBOGEN **Jeremy**	Hopkins Marine Station, Dept. of Biology Stanford University Pacific grove	USA
HANNA **Sean**	Bartlett School of Architecture University College London	UK
HAUERT **Sabine**	Bristol Robotics Lab. University of Bristol	UK (SWITZERLAND)

How plant heat stress will influence global warming this century

FRANKS **Peter**	School of Life and Environmental Sciences University of Sydney Eveleigh	AUSTRALIA
COX **Peter**	College of Engineering Mathematics and Physical Sciences University of Exeter	UK
SCHROEDER **Julian**	Division of Biological Sciences Cell and Developmental Biology Section University of California, San Diego La Jolla	USA

Time-resolving the mechanism of exocytosis in situ

GALLEGO **Oriol**	Dept. of Experimental and Health Sciences Pompeu Fabra university Barcelona	SPAIN
CASTANO-DIEZ **Daniel**	BioEM Lab, Biozentrum University of Basel	SWITZERLAND (SPAIN)
DE MARCO **Alex**	Dept. of Biochemistry and Molecular Biology Monash University Clayton	AUSTRALIA (ITALY)

Self-organisation and biomechanical properties of the endosomal membrane

GIZELI **Electra**	Institute of Molecular Biology & Biotechnology Foundation for Research and Technology, Hellas Heraklion	GREECE
ANDO **Toshio**	WPI Nano Life Science Institute Kanazawa University	JAPAN
SPAKOWITZ **Andrew J.**	Dept. of Chemical Engineering Stanford University	USA
ZERIAL **Marino**	Zerial Lab, Principles of cell and tissue organisation Max Planck Institute of Molecular Cell Biology and Genetics Dresden	GERMANY (ITALY)

High-throughput single-molecule evolution

GRIFFITHS **Andrew David**	Laboratoire de Biochimie - CBI - UMR 8231 ESPCI Paris Tech	FRANCE
VAN OIJEN **Antoine**	School of Chemistry and Molecular Bioscience University of Wollongong	AUSTRALIA (THE NETHERLANDS)

Developing a method for rapid disassembly of neurodegenerative biomolecular condensates

INOUE **Takanari**	Dept. of Cell Biology / Center for Cell Dynamics Johns Hopkins University Baltimore	USA (JAPAN)
PERLSON **Eran**	Dept. of Physiology and Pharmacology Tel Aviv University	ISRAEL
SYKES **Cécile**	Dept. of Biomimetism of cellular movement UMR168 Physical Chemistry Curie Lab., Curie Institute, CNRS Paris	FRANCE

Biological protein springs as allosteric modulators

ITZHAKI **Laura**	Dept. of Pharmacology University of Cambridge	UK
BAHAR **Ivet**	Dept. of Computational & Systems Biology University of Pittsburgh	USA
GORDON **Reuven**	Dept. of Electrical and Computer Engineering University of Victoria	CANADA
YANG **Shang-Hua**	Dept. of Electrical Engineering National Tsing Hua University Hsinchu	TAIWAN

Stable propagation of a minimal synthetic cell

KURUMA **Yutetsu**	X-star Japan Agency for Marine-Earth Science and Technology Kanagawa	JAPAN (KOREA)
ROGERS **W. Benjamin**	Martin A Fisher School of Physics Brandeis University Waltham	USA
WANG **Anna**	Dept. of Chemistry University of New South Wales, Sydney Kensington	AUSTRALIA

Does Evolution Repeat Itself? Genome Evolution and Phenotypic Convergence in Island Lizards

LOSOS **Jonathan**	Dept. of Biology Washington University Saint Louis	USA
KAWATA **Masakado**	Graduate School of Life Sciences Tohoku University Sendai	JAPAN
MENKE **Douglas**	Dept. of Genetics University of Georgia Athens	USA
WHITING **Martin**	Dept. of Biological Sciences Macquarie University Sydney	AUSTRALIA (USA)

Cell death, fluctuating asymmetry, and the precise specification of Drosophila organ sizes

LUBENSKY **David K.**	Dept. of Physics University of Michigan Ann Arbor	USA
LEOPOLD **Pierre**	Genetics and Developmental Biology Unit Institut Curie – Centre de Recherche Paris	FRANCE

Deconstructing neurobiology of settlement decision-making in coral larvae

MATZ **Mikhail**	Dept. of Integrative Biology The University of Texas at Austin	USA
JEKELY **Gaspar**	Living Systems Institute University of Exeter	UK (GERMANY)

Cell-specific, photocontrollable neuropharmacology in the behaving mouse

MOUROT **Alexandre**	Neuroscience Paris Seine Sorbonne Université - UPMC Paris	FRANCE
ELLIS-DAVIES **Graham**	Dept of Neuroscience Mount Sinai School of Medicine New York	USA

The extracellular space of the brain: a multi-modal analysis from nano-structure to in vivo function

NÄGERL **Valentin**	Interdisciplinary Institute for Neuroscience University of Bordeaux, CNRS	FRANCE (GERMANY)
HRABETOVA **Sabina**	Dept. of Cell Biology SUNY Downstate Medical Center Brooklyn	USA
NEDERGAARD **Maiken**	Center for Translational Neuromedicine University of Copenhagen, Panum	DENMARK
NISHIZAWA **Seiichi**	Dept. of Chemistry, Graduate School of Science Tohoku University Sendai	JAPAN

Adaptive asexual evolution in cancer, corals and seagrasses – ADAPTASEX

REUSCH **Thorsten**	Dept. of Marine Evolutionary Ecology GEOMAR Helmholtz Centre for Ocean Research University of Kiel	GERMANY
BAUMS **Iliana**	Dept. of Biology Pennsylvania State University University Park	USA (GERMANY)
WERNER **Benjamin**	Barts Cancer Institute QMUL London	UK (GERMANY)

Elucidating the mechanism of membrane fusion using DNA nanostructures

ROY **Rahul**	Lab. for Nanobiology, Dept. of Chemical Engineering Indian Institute of Science Bangalore	INDIA
AKSIMENTIEV **Aleksei**	Dept. of Physics University of Illinois at Urbana-Champaign Urbana	USA
HOWORKA **Stefan**	Dept. of Chemistry Institute of Structural Molecular Biology University College London	UK (AUSTRIA)

T cell crowd control

TEXTOR **Johannes**	Dept. of Tumour Immunology Radboud University Medical Center Nijmegen	THE NETHERLANDS (GERMANY)
MANDL **Judith**	Dept. of Physiology and Complex Traits Group McGill University Montreal	CANADA (AUSTRIA)
PARISI **Daniel**	Computer Engineering Dept. Buenos Aires Institute of Technology	ARGENTINA

Evolution of conformational and kinetic ensembles during functional transitions

TOKURIKI **Nobuhiko**	Michael Smith Laboratories University of British Columbia Vancouver	CANADA (JAPAN)
FRASER **James S.**	Bioengineering and Therapeutic Sciences University of California San Francisco	USA
NOJI **Hiroyuki**	Dept. of Applied Chemistry University of Tokyo	JAPAN
OSUNA **Silvia**	CompBioLab group Institute of Computational Chemistry and Catalysis (IQCC) University of Girona, ICREA	SPAIN

Covalent modification and regulation of proteins by CO2 using Chlamydomonas as a model system

VOCADLO **David**	Depts. of Molecular Biology & Biochemistry and Chemistry Simon Fraser University Burnaby	CANADA
CAMPBELL **Robert E.**	Dept. of Chemistry, School of Science The University of Tokyo	JAPAN (CANADA)
SMITH **Alison G.**	Dept. of Plant Sciences University of Cambridge	UK

2.5.2 EARLY CAREER GRANTS

A living optically-communicating neural network

HUMAR **Matjaž**	Condensed Matter Physics Dept. Humar Lab for Bio-integrated Photonics Jožef Stefan Institute, University of Ljubljana	SLOVENIA
CHOI **Myunghwan**	Dept. of Biomedical Engineering / Neurophotonics Lab Sungkyunkwan University Suwon	KOREA
IM **Hyungsoon**	Center for Systems Biology Massachusetts General Hospital Harvard Medical School Boston	USA (KOREA)

Large-scale mapping of intracellular dendritic dynamics during memory formation and replay

JAYANT **Krishna**	Dept. of Biomedical Engineering Purdue University West Lafayette	USA (INDIA)
EWELL **Laura**	Institute for Experimental Epileptology and Cognition Research University of Bonn-Medical Center	GERMANY (USA)

The mechanics and energetics of insect herbivory: from cutting 'machines' to ecosystem structure

LABONTE **David**	Dept. of Bioengineering The Imperial College of Science, Technology and Medicine London	UK (GERMANY)
BACCA **Mattia**	Dept. of Mechanical Engineering University of British Columbia Vancouver	CANADA (ITALY)
HOLT **Natalie**	Dept. of Biology University of California, Riverside	USA (UK)

Hormone delivery in plants: mechanisms and physiological roles of gibberellic acid transporters - RENEWAL APPLICATION

NOUR-ELDIN **Hussam Hassan**	Dept. of Dynamic Molecular Interactions Institute of Plant and Environmental Sciences Copenhagen University Frederiksberg	DENMARK
BAND **Leah**	Division of Plant and Crop Science, School of Biosciences University of Nottingham Loughborough	UK
KAWATE **Toshimitsu**	Dept. of Molecular Medicine Cornell University Ithaca	USA (JAPAN)
SHANI **Eilon**	School of Plant Sciences and Food Security Tel Aviv University	ISRAEL

Ménage a trois: balancing predator-prey interactions in a host-microbiome-phageome ecosystem

PERSAT **Alexandre**	School of life sciences EPFL Lausanne	SWITZERLAND (FRANCE)
NADELL **Carey**	Dept. of Biological Sciences Dartmouth College Hanover	USA

Mechanosensitive dynamics at the fertilisation synapse

RUPRECHT **Verena**	Cell and Tissue Dynamics Group Centre for Genomic Regulation (CRG) University Pompeu Fabra (UPF) Barcelona	SPAIN (AUSTRIA)
LIU **Yan-Jun**	Shanghai Institute of Cardiovascular Diseases, and Institutes of biomedical sciences Fudan University Shanghai	CHINA
PAULI **Andrea**	Pauli Lab. IMP Vienna	AUSTRIA (GERMANY)

A new role for aging: origin of cellular differentiation and the evolution of complex life

SAARIKANGAS **Juha**	Helsinki Institute of Life Science HiLIFE Molecular and Integrative Biosciences Research Program University of Helsinki	FINLAND
RATCLIFF **William**	Dept. of Biology, School of Biological Sciences Georgia Institute of Technology Atlanta	USA

Chance or curse? The consequences of hybridization in a changing world

SCHUMER **Molly**	Dept. of Biology Stanford University	USA
BANK **Claudia**	Evolutionary Dynamics Group Instituto Gulbenkian de Ciência Oeiras	PORTUGAL (GERMANY)
ROCHMAN **Chelsea**	Dept. of Ecology and Evolutionary Biology University of Toronto	CANADA (USA)
SOUSA **Vitor C**	Centre for Ecology, Evolution and Environmental changes University of Lisbon	PORTUGAL

2.6

RESEARCH GRANT PROFILES

2019 EARLY CAREER GRANT

Principal Investigator

Christine CHEUNG

- **Christine CHEUNG** (Singapore), Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore
- **Kyle LOH** (USA), Dept. of Developmental Biology, Institute for Stem Cell Biology & Regenerative Medicine, Stanford, USA

HFSP project: Conversations between brain and vasculature: studying and mimicking their intertwined development

The brain comprises billions of neural cells interwoven in a highly precise way and it is ultimately responsible for how we perceive, react to, and remember the world around us. We are fascinated by how the intricate structure of the brain is assembled step-by-step at an early stage of life ('embryonic development'), starting as a relatively shapeless mass within the nascent embryo and culminating in a highly complex organ in an adult. Specifically, we hypothesize that the blood vessels that permeate the early brain have important roles in fostering brain assembly, and we further predict that they produce important cues that actively shape a specific early step of brain development. This is of great significance, because blood vessels were once thought to only passively supply oxygen and nutrients to various organs. We instead suggest an active role in which blood vessels function as a 'signaling center' to actively control the arrangement of neural cells during brain assembly.

The teams in Singapore and the USA tackle this question via a three-part, integrated effort. First, we will create a map of where and when arteries and veins (two major types of blood vessels) first enter the nascent brain. Second, we will intermingle neural and blood vessel cells in a Petri dish and study their interactions. Third, we will block specific functions exerted by blood vessel cells and propose that this will have a commensurate impact on the spatial arrangement of nearby neural cells.

Taken together, we propose to explore how the brain is assembled during embryonic development and we will test whether blood vessels act not as passive support for, but rather as active executors of, this intricate process during early steps. If true, this has important ramifications. Not only will it shed light on how the early brain is assembled, but it adds to the emerging idea that neural cells and blood vessels share an intimate functional and spatial relationship, starting from the embryo and lasting into the adult — an idea pertinent to early brain assembly; our efforts to engineer this process in a Petri dish for regenerative medicine; and finally, the origin of certain neurological disorders that are caused in part by blood vessel dysfunction.

2019 PROGRAM GRANT

Principal Investigator

Maria Ina ARNONE

- **Maria Ina ARNONE** (Italy), Dept. of Biology and Evolution of Marine Organisms, Stazione Zoologica Anton Dohrn, Napoli, Italy
- **Dan-Eric NILSSON** (Sweden), Lund Vision Group, Dept. of Biology, Lund University, Sweden
- **Carsten LUETER** (Germany), Dept. of Evolutionary Morphology (FB1), Museum für Naturkunde, Berlin, Germany
- **Giancarlo LA CAMERA** (Italy), Dept. of Neurobiology and Behaviour, Stony Brook University, USA

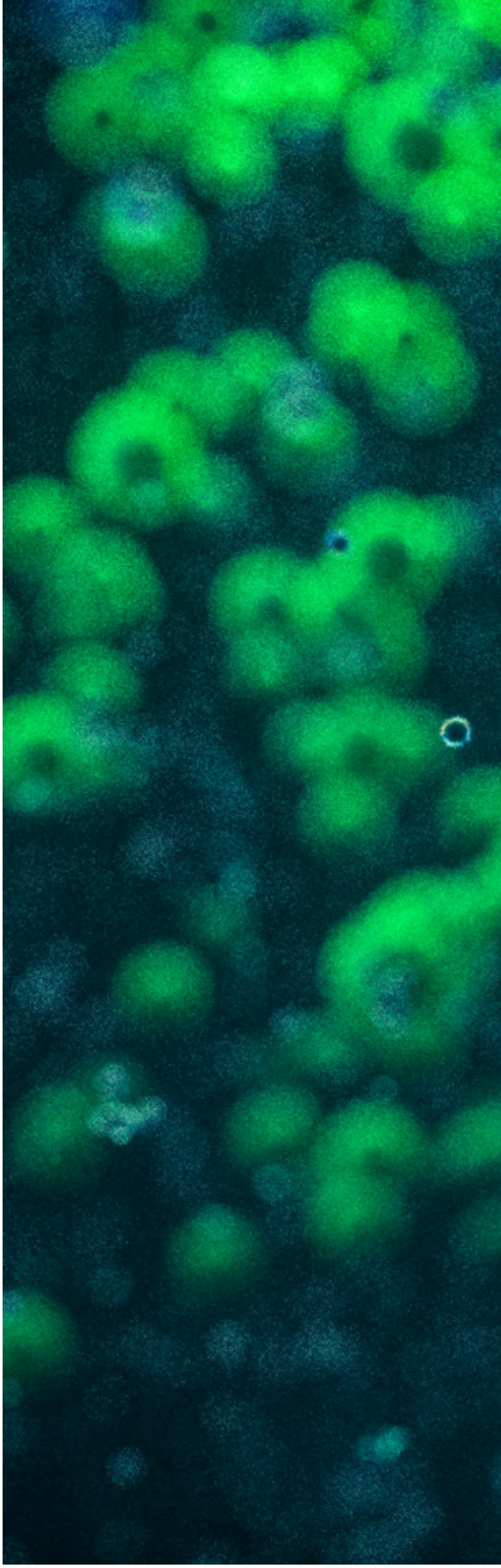
HFSP project: Studying sea urchin dermal photoreception to unravel principles of decentralized spherical vision

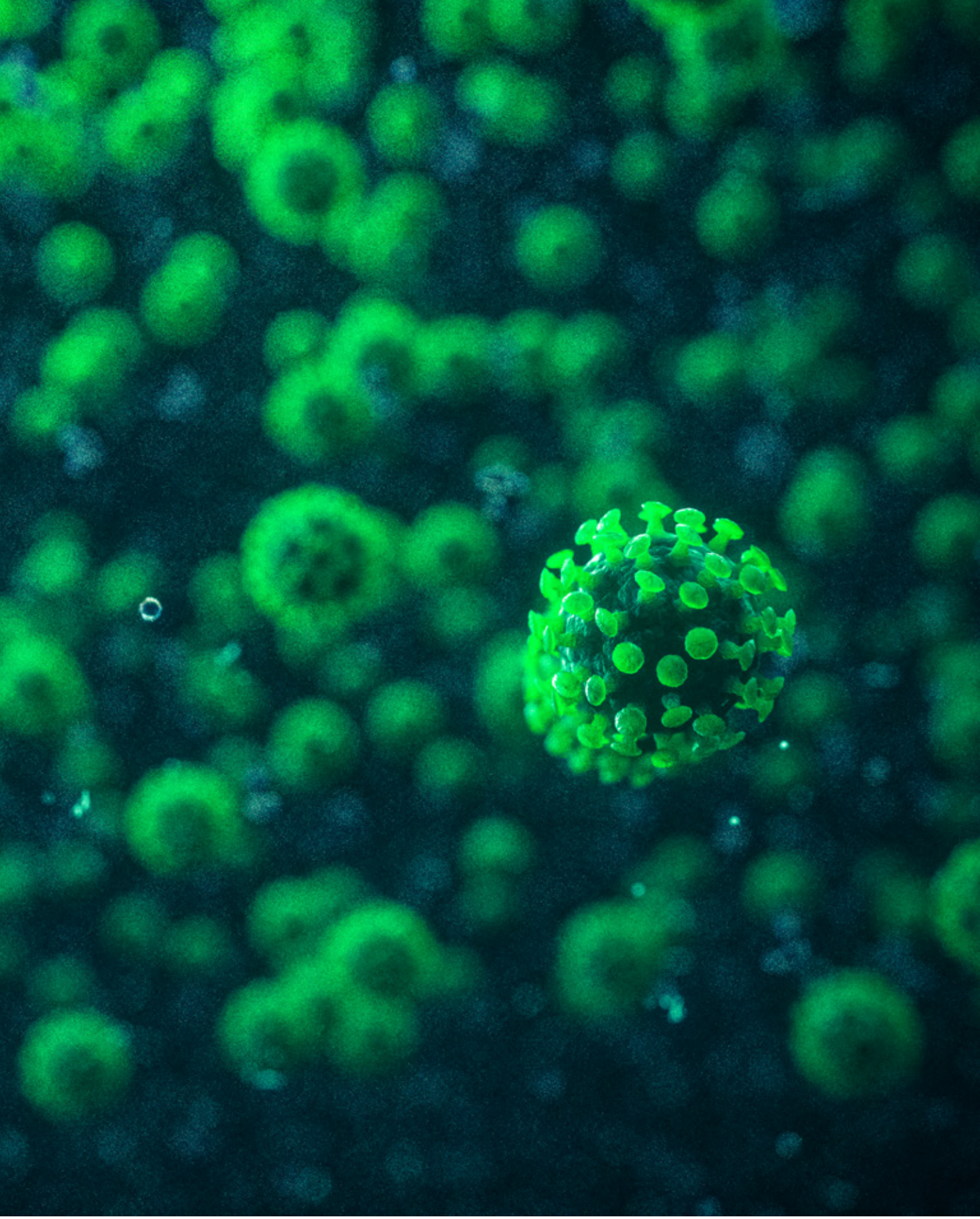
Seeing without eyes and a brain

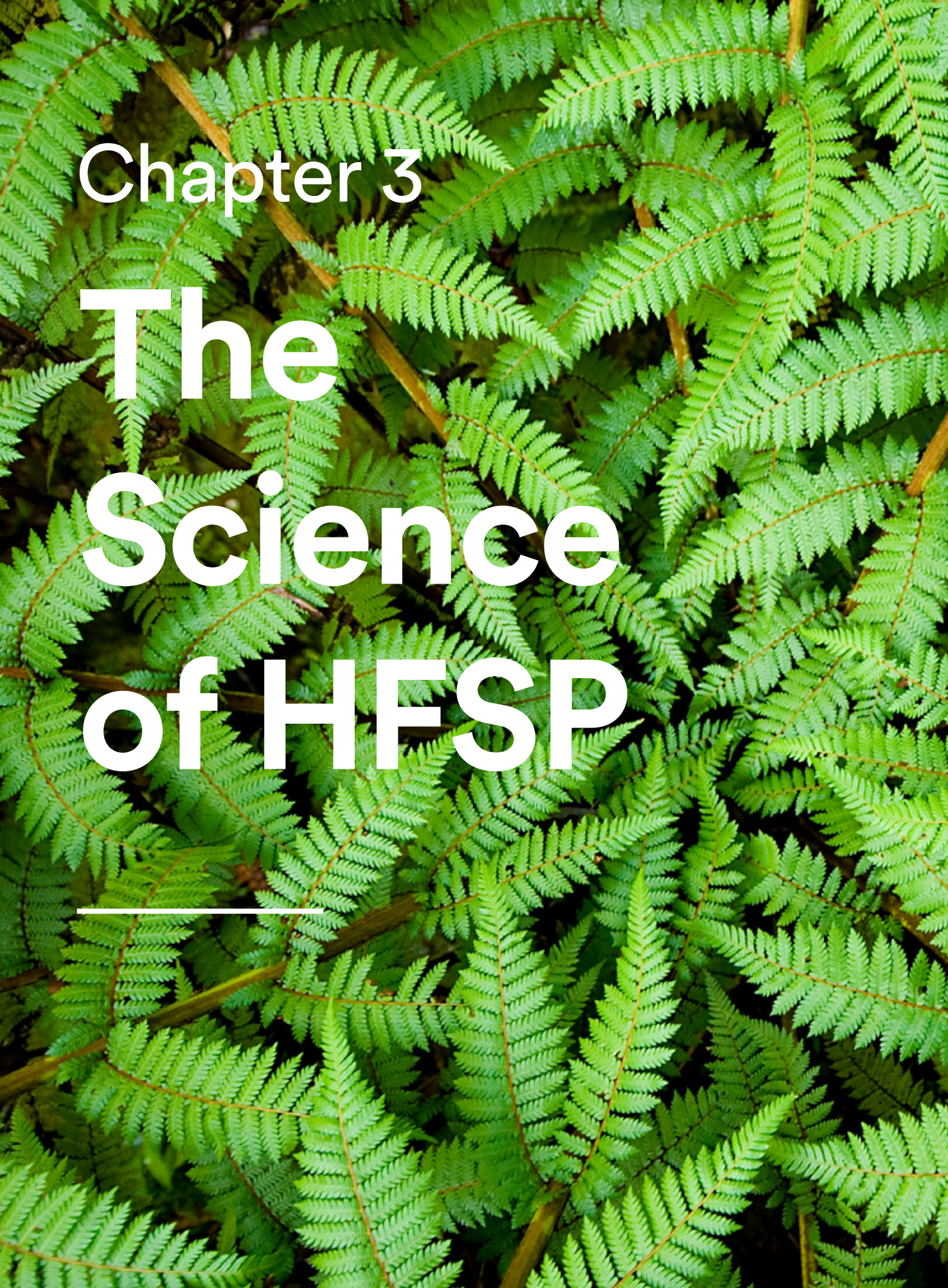
Sea urchins are marine animals genetically close to the vertebrate lineage. Being eyeless and lacking a central nervous system (NS), these animals feature instead dermal photoreceptors dispersed over their spherical body surface and feeding into a decentralized NS. However, sea urchins can visually resolve objects and move towards them, and they can detect looming visual stimuli from any direction and accurately point their spines towards them. Such performance is normally associated with proper eyes feeding information into a brain. Sea urchins thus offer access to a unique visual system of a type that to date has not been studied in terms of its information processing. This alternative solution to vision may also have potential biomimetic applications for robotic miniaturization, smart probes, and intelligent materials where dispersed light detectors control the properties of the material.

The core of the project is to investigate and model the neural mechanisms of information processing, which enable sea urchins to perform spherical vision by deploying an obviously very different mechanism from today's technology, and also very different from visually guided behavior in most other animals. Our study includes molecular and morphological identification of cell types, measurements of behavioral responses and electrophysiological photoreceptor responses, mapping the connectome of sea urchin photoreceptors and NS, and theoretical modelling of the information processing underlying visually guided behavior.

The research will gather genetic, biophysical and behavioral data together with theoretical modelling of information derived from the NS and from recording the activity from key positions in the processing of visual information and generation of locomotory responses.







Chapter 3

The Science of HFSP

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3.1
HIGHLIGHTS

- **The 19th HFSP Awardees Meeting:** the 2019 HFSP Awardees Meeting took place at the Tsukuba International Congress Center from 10 to 12 July. The meeting was attended by almost 300 participants and we would like, once again, to thank our Japanese partners METI, MEXT and AMED for their generous support.

- **Celebrating 30 years of HFSP:** scientific meetings and commemorative events were organised throughout 2019 in Washington DC, Tokyo and Strasbourg. HFSP awardees and alumni, together with members of HFSPO statutory bodies and representatives from member countries, came together to celebrate the Program's unrivalled success.

- **The 2020 HFSP Nakasone Award:** Angelika Amon of the Koch Institute for Integrative Cancer Research at MIT was selected as the winner of the 2020 HFSP Nakasone Award for 'discovering aneuploidy-induced cellular changes and their contribution to tumorigenesis.'

- **Reaching out to the world's science journalists:** for the first time, HFSPO announced the 2019 winner of the HFSP Nakasone Award at a public event – the World Conference of Science Journalists.

- **Breakthrough discoveries** from HFSP funded research provided novel approaches:
  - for developing a new class of cell-contact-sensing devices that has the potential to become useful in future cancer therapy;
  - for increased survival of injured neurons enabling functional recovery in neurodegenerative settings;
  - for identifying a common molecular mechanism that fuels cancer growth in up to 70 percent of head and neck cancer patients, shedding light on possible new therapeutic strategies.

3.2

CELEBRATING 30 YEARS OF BREAKTHROUGH SCIENCE

During 2019, HFSPO celebrated its 30th anniversary with multiple events. Each time HFSP awardees and alumni participated and were joined by representatives of the HFSPO Members. Individual scientific events with social gatherings were held in Washington DC and Strasbourg. The main celebration took place in Japan and included the HFSPO Annual General Meeting (AGM), the Triennial Conference of HFSPO Members (TCHM), a special anniversary event and the annual HFSP Awardees Meeting.

The first Board of Trustees meeting in Strasbourg in 1989

The Japan-US research partnership: celebrating 30 years of the Human Frontier Science Program

The commemorative events began with a scientific symposium hosted by the Japanese Embassy in Washington DC in collaboration with the National Institutes of Health (NIH) and the National Science Foundation (NSF). HFSP's anniversary also reflects the very successful 30-year Japan-US research partnership with the Human Frontier Science Program. It was thirty years ago when Japanese Prime Minister Nakasone and his G7 peers, including US President Ronald Reagan, agreed to form a funding body to encourage international research collaborations that would generate discoveries and extend the frontiers of science.

Speakers representing the Japanese and US governments highlighted the Program's resounding success in delivering innovative outcomes that flow from frontier research in the life sciences and biomedical research fields. In addition, talks by HFSP grant alumni Diane Lidke and Duncan Irschick provided accounts of very recent breakthrough discovery research.

Participants in the 30th anniversary event in Washington DC

Speakers at the 30th anniversary event in Washington DC

- **Shinsuke J. Sugiyama**, Ambassador Extraordinary and Plenipotentiary of Japan to the United States of America
- **Yoshio Yamawaki**, Senior Deputy Minister, Ministry of Education, Culture, Sports, Science and Technology (MEXT) – Government of Japan
- **Shigekazu Nagata**, President, International Human Frontier Science Program Organization (HFSPO)
- **Warwick Anderson**, Secretary-General, International Human Frontier Science Program Organization (HFSPO)
- **Makoto Suematsu**, President, Japan Agency for Medical Research and Development (AMED)
- **France A. Córdova**, Director, National Science Foundation (NSF)
- **Duncan J. Irschick**, University of Massachusetts, Amherst
- **Francis S. Collins**, Director, National Institutes of Health (NIH)
- **Diane Lidke**, University of New Mexico

The 19th HFSP Awardees Meeting and 30th anniversary celebration

Almost 400 HFSP awardees, alumni, committee members, local dignitaries and students congregated at Hitotsubashi Hall in Tokyo on 9 July to celebrate 30 years of HFSP science. The event featured a series of talks by distinguished speakers including four Nobel laureates:

- **Tasuku Honjo**
  (2018 Nobel Prize in Physiology or Medicine)
- **Jules Hoffmann**
  (2011 Nobel Prize in Physiology or Medicine)
- **Ada Yonath**
  (2009 Nobel Prize in Chemistry)
- **Torsten Wiesel**
  (1981 Nobel Prize in Physiology or Medicine)

The 30th anniversary event at Hitotsubashi Hall in Tokyo

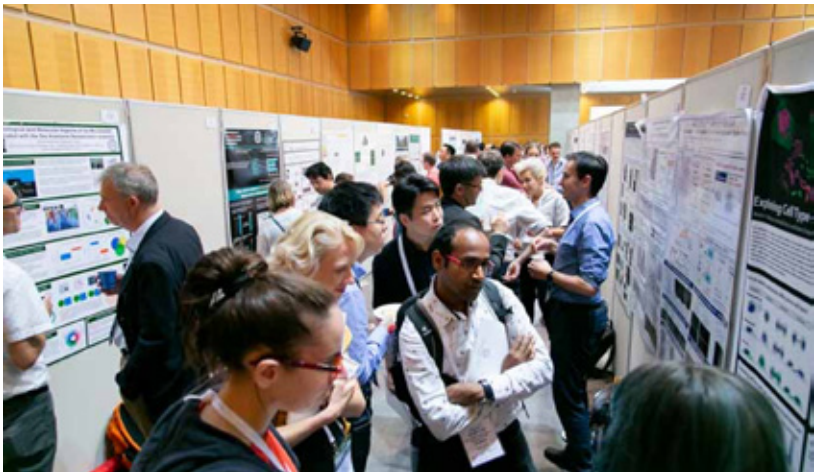
All four speakers have close connections to HFSP: Profs Honjo, Hoffmann and Yonath are alumni of the Research Grant program and Torsten Wiesel served as Secretary-General from 2000 to 2009.

Another highlight of the meeting was the HFSP Nakasone Award ceremony. We were honoured that the presentation of the award to the 2019 winner, Michael Hall, was made by Hirofumi Nakasone, Member of the House of Councillors, National Diet of Japan and son of former Prime Minister Yasuhiro Nakasone of Japan upon whose initiative HFSP was founded in 1989.

Tasuku Honjo at the 30th anniversary event in Tokyo

The 2019 HFSP Nakasone Award ceremony in Tokyo

The anniversary celebration was followed by the 19th HFSP Awardees Meeting at the Tsukuba International Congress Center from 10 to 12 July. Almost 300 participants attended, including current HFSP awardees and alumni. The meeting featured 30 talks, with a special session for HFSP alumni based in Japan. Over the three-day meeting, 155 posters were presented, of which 30 were selected for three-minute poster-teaser talks.
Special excursions to the International Institute for Integrative Sleep Medicine (IIIS), The National Institute of Advanced Industrial Science and Technology (AIST) and the BioResource Research Center at RIKEN were organised for a small number of participants.



Poster session at the 19th HFSP Awardees Meeting in Tsukuba

Attendees also enjoyed the social events, appreciating both the networking opportunities and the delicious Japanese cuisine at Sansuitei restaurant and the Okura Frontier Hotel. HFSPO is grateful to MEXT (Ministry of Education, Culture, Sports, Science and Technology, Japan), METI (Ministry of Economy, Trade and Industry, Japan) and AMED (Japan Agency for Medical Research and Development) for their generous assistance and support.

The 30th anniversary celebration of HFSP in Strasbourg

Strasbourg, the home city of the HFSPO Secretariat, was the location of the final 30th anniversary celebrations in 2019. An afternoon celebrating three decades of HFSP science took place at the Nouveau Patio on the University of Strasbourg campus on Thursday, 14 November. A number of exciting speakers presented their research at the frontiers of the life sciences.

The celebration of 30 years of HFSP science in Strasbourg

Speakers

- **Ineke Braakman**, University of Utrecht (1990 HFSP Long-Term Fellow)
- **Angela Giangrande**, IGBMC, University of Strasbourg (1997 HFSP Research Grant)
- **Michael Hall**, Biozentrum, University of Basel (winner of the 2019 HFSP Nakasone Award)
- **Jean-Luc Popot**, Institut de Biologie Physico-Chimique, Paris (2000 HFSP Research Grant)

The scientific symposium was followed by a reception hosted by the Président of the Eurométropole de Strasbourg and the Consul General of Japan in Strasbourg.

3.3

THE 2020 HFSP NAKASONE AWARD

Angelika AMON

At the 38th meeting of the HFSPO Council of Scientists, Angelika Amon of the Koch Institute for Integrative Cancer Research at MIT in Cambridge was selected as the winner of the 2020 HFSP Nakasone Award for 'discovering aneuploidy-induced cellular changes and their contribution to tumorigenesis.'

Angelika Amon's studies showed that in primary cells changes in chromosome number (aneuploidy) cause proteomic imbalances that lead to numerous cellular stresses and decrease fitness. The idea that aneuploidy is highly detrimental for cells was barely conceivable given that all cancer cell lines are aneuploid and proliferate with great speed. Her work has defined the field, and provided the theoretical foundation for novel therapeutics that can specifically kill cells that experience proteotoxic stress. Indeed, Amon has even found lead compounds that serve as a springboard for translating this concept into actual therapeutics.

Amon's work on how aneuploidy promotes tumorigenesis has been groundbreaking. She showed that aneuploidy causes multiple forms of genomic instability, leading to the discovery of a new class of mutations important for tumorigenesis (mutations that mediate aneuploidy tolerance), and because aneuploidy is rare in normal tissues, she paved the way for exploiting aneuploidy as a therapeutic target in cancer through genetic and small molecule screening efforts. Angelika Amon started the field of aneuploidy; she developed the models and tools to determine how aneuploidy affects cellular and organismal physiology and described the systemic effects of aneuploidy-induced proteomic imbalances. Her work further led to compelling hypotheses as to how aneuploidy drives cancer.

3.4

THE HFSPO COUNCIL OF SCIENTISTS

Hendrik STUNNENBERG

Chair of the HFSPO Council of Scientists

CHAIR
- **Hendrik STUNNENBERG**, University of Nijmegen, Netherlands

VICE-CHAIRS
- **Anne-Claude GINGRAS**, Lunenfeld-Tanenbaum Research Institute, Sinai Health System, Canada
- **Beverly GLOVER**, University of Cambridge, UK

AUSTRALIA
- **Linda RICHARDS**, Queensland Brain Institute, Brisbane

CANADA
- **Anne-Claude GINGRAS**, Lunenfeld-Tanenbaum Research Institute, Sinai Health System, Toronto

EUROPEAN COMMISSION
- **Hendrik STUNNENBERG**, University of Nijmegen, Netherlands

FRANCE
- under appointment

GERMANY
- **Helmut GRUBMUELLER**, Max-Planck-Institute for Biophysical Chemistry, Göttingen

INDIA
- **Vidita VAIDYA**, Tata Institute of Fundamental Research, Mumbai

ISRAEL
- Under appointment

ITALY
- **Leonardo CHELAZZI**, University of Verona

JAPAN
- **Tadashi UEMURA**, Kyoto University

REPUBLIC OF KOREA
- **Ildoo HWANG**, Pohang University of Science and Technology, Pohang

NEW ZEALAND
- **Wickliffe ABRAHAM**, University of Otago

NORWAY
- **Vincent EIJSINK**, Norwegian University of Life Sciences, Ås

SINGAPORE
- **Yik Ying TEO**, National University of Singapore

SWITZERLAND
- **Theodor LANDIS**, University of Geneva

UNITED KINGDOM
- **Beverly GLOVER**, University of Cambridge

UNITED STATES OF AMERICA
- **Thomas DANIEL**, Washington University

3.5

NEWS FROM HFSP IS READ ALL OVER THE WORLD

For many years HFSPO has published a newsletter that presents information about the Organization, scientific events and achievements from HFSP awardees and alumni. It started with a text based email on 25 September 2001. The first issue highlighted a breakthrough study by two HFSP fellows leading towards a possible vaccination strategy for prion disease, and it also presented the new program initiatives launched in award years 2000/2001 by former Secretary-General Torsten Wiesel. At the time the email-based news was sent on a regular basis to some 5000 subscribers.

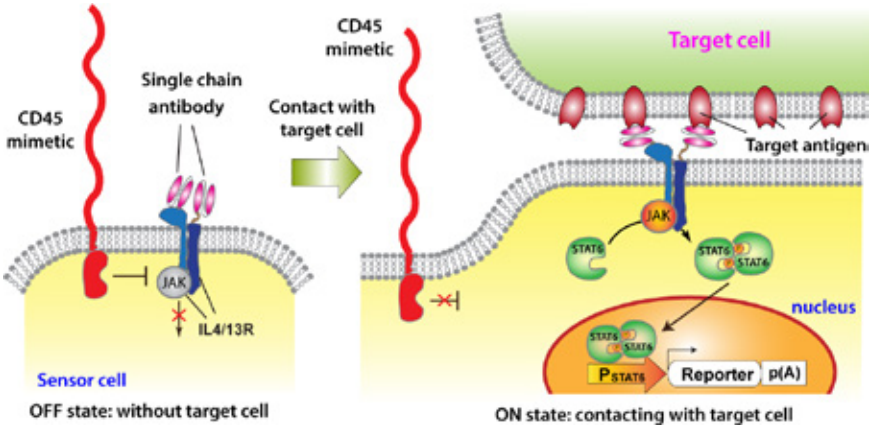
The first issue of the newly designed newsletter "HFSP Matters" in PDF format was published in January 2013 and has since evolved into a more modern email version that the HFSP communications team prepares with a novel marketing communications tool allowing us not only to track distribution but also to find out how many active readers there are. Currently the newsletter is sent to over 8000 subscribers and was verifiably received by more than 7000 recipients all over the world (see figure) of which more than 2000 actually opened the issue.

3.6

BREAKTHROUGH RESEARCH OUTCOMES

Engineering non-immune cells to fight cancer

In this study, the 2014 HFSP Long-Term fellow and CDA awardee Dr. Ryosuke Kojima and colleagues developed a new class of cell-contact-sensing devices that has the potential to become useful in future cancer therapy. This study also contributes to the advancement of synthetic biology by providing a new design principle to transmit extracellular information into cells.
At present, it is not easy to stably integrate multiple gene components into the sensor cells in a controlled manner. However, as gene editing technologies improve, precise quality control of the designer cells should become possible. Also, if it is possible to unveil how this system functions in living animals (ultimately in the human body), it might become possible to apply the designer cells (or design principles of cellular functions) to medical applications in the future.

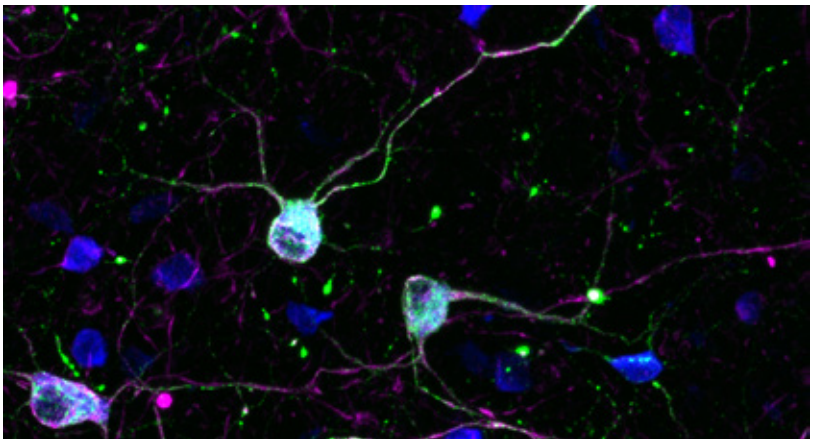


Synthetic-biology-inspired signaling device for sensing specific cell contact. A sensor cell expresses interleukin 4 / interleukin 13 receptors (IL4/13R) bearing extracellular antigen recognition moieties. Without a target cell, activity of JAK associated with IL4/13R is inhibited by a CD45 mimetic in close proximity. When the sensor cell recognizes a target cell, the CD45 mimetic is segregated from the cell-cell interface due to its large extracellular domain. As a result, JAK is liberated from the suppression by the CD45 mimetic, which triggers the downstream signaling.

Nonimmune cells equipped with T-cell-receptor-like signaling for cancer cell ablation.
Ryosuke Kojima, Leo Scheller, Martin Fussenegger. Nat. Chem. Biol. 2018, 14, 42-49.

New ways to save injured neurons

HFSP Long-Term fellow Inbal Benhar looked at injury to the mammalian central nervous system (brain, spinal cord or retina), which usually leads to irreversible loss of function. This is because many injured neurons die and those that survive are generally unable to regrow their axons, which are needed to form connections with their partners. Neurons in the retina, called retinal ganglion cells (RGCs), relay visual information to the rest of the brain through their axons, which make up the optic nerve. Optic nerve crush injury, which severs the axons of RGCs, results in the death of ~80% of these neurons within two weeks.



Retinal ganglion cells (RGCs) in the adult mouse retina are made up of 46 distinct molecular types, which differ in their ability to survive after injury. This image shows immunolabeling of RGCs (RBPMS, blue) that have survived for 2 weeks after optic nerve crush injury, when ~80% of RGCs are lost. These resilient RGCs are enriched for specific types, including certain Alpha-RGCs (SPP1, green and SMI32, magenta). Image: Dr. Nicholas Tran.

RGCs are not a homogenous population. In fact, there are many types of RGCs, which differ morphologically, molecularly and functionally. The study looked at differences in the ability of distinct RGC types to withstand injury, hypothesizing that genes selectively expressed in resilient or vulnerable types could be involved in their differential survival.

The team generated a 'molecular atlas' of the 46 different types of RGC. After optic nerve crush the fraction of each type that survived through two weeks post injury showed differences ranging from 1% to 98% survival. With the atlas as a reference, the team looked for genes selectively expressed in the most resilient or vulnerable types. They chose several of these genes and manipulated their expression *in vivo*. By increasing the expression of genes associated with resilience, or decreasing the expression of genes associated with vulnerability in injured RGCs, the team was able to improve their survival after injury. This included rescuing some types that were extremely vulnerable when left untreated. Excitingly, perturbing some of these genes not only enhanced the survival of RGCs, but also stimulated regrowth of their axons towards the brain, which is a required next step towards functional recovery. RGCs are crucial for vision, and are the target in many blinding conditions, such as glaucoma. Exploring the targets uncovered in this study could be applicable to a variety of such conditions. Furthermore, differential neuronal resilience to injury or other insults is a phenomenon that extends beyond the retina and optic nerve, and is seen in many neurodegenerative settings. Thus, this approach could be adopted as a strategy for finding ways to protect and regenerate damaged neurons.

Single-cell profiles of retinal ganglion cells differing in resilience to injury reveal neuroprotective genes.
Nicholas M. Tran, Karthik Shekhar, Irene E. Whitney, Anne Jacobi, Inbal Benhar, Guosong Hong, Wenjun Yan, Xian Adiconis, McKinzie E. Arnold, Jung Min Lee, Joshua Z. Levin, Dingchang Lin, Chen Wang, Charles M. Lieber, Aviv Regev, Zhigang He and Joshua R. Sanes. Neuron (2019). doi: 10.1016/j.neuron.2019.11.006.

Major breakthrough in 200-year-old puzzle

HFSP Long-Term fellow José Pardo-Vazquez together with colleagues in the lab of HFSP Young Investigator Grant holder Alfonso Renart at the Champalimaud Centre for the Unknown have discovered a new psychophysical rule that allowed them to identify a unique and robust explanation for Weber's law.

About 200 years ago, the German physician Ernst Heinrich Weber made a seemingly innocuous observation which led to the birth of the discipline of psychophysics – the science relating physical stimuli in the world and the sensations they evoke in the mind of a subject. Weber asked subjects to say which of two slightly different weights was heavier. From these experiments, he discovered that the probability that a subject will make the right choice only depends on the ratio between the weights.

For instance, if a subject is correct 75% of the time when comparing a weight of 1 Kg and a weight of 1.1 Kg, then they will also be correct 75% of the time when comparing two weights of 2 and 2.2 Kg – or, in general, any pair of weights where one is 10% heavier than the other. This simple but precise rule opened the door to the quantification of behavior in terms of mathematical 'laws'.

Weber's observations have since been generalized to all sensory modalities across many animal species, leading to what is now known as Weber's law. It is the oldest and most firmly established law in psychophysics. Psychophysical laws describe precise rules of perception and

Time holds the key to the explanation of Weber's law. Illustration: Diogo Matias.

are important because they can be used to obtain mathematical explanations of behavior in terms of brain processes, just like the precise patterns of movement of the planets in the sky were useful to understand gravitation.

Many explanations for Weber's law have been proposed throughout the years. Although they can all account for Weber's findings, no experimental test had been found to identify which model was correct. Thus, the puzzle of a mathematical explanation of Weber's law remained unsolved. Now, a team of researchers at the Champalimaud Centre for the Unknown in Lisbon, Portugal, has discovered that Weber's law can be described as the consequence of a new psychophysical rule involving the time that it takes to make a choice, not just the outcome of the decision. The team has shown that this new rule is sufficient to derive a unique and accurate mathematical model describing the cognitive process underlying Weber's law. Their results are described in an article published in the scientific journal Nature Neuroscience.

The Mechanistic Foundation of Weber's Law.
Jose L. Pardo-Vazquez, Juan R. Castiñeiras-de Saa, Mafalda Valente, Iris Damião, Tiago Costa, M. Inês Vicente, André G. Mendonça, Zachary F. Mainen, and Alfonso Renart. 2019. Nature Neuroscience 22 (9): 1493–1502. https://doi.org/10.1038/s41593-019-0439-7. Epub 2019 Aug 12.

3.7

GREAT MINDS AT WORK: HONOURS AND PRIZES

Out of the hundreds of scientists HFSP funds each year, many are recognized for their brilliant research and receive highly prestigious prizes and awards.

We cannot but list the most highly honoured in 2019 below:

- HFSP grant alumna and 2020 HFSP Nakasone Award winner Angelika Amon was awarded the 2019 Breakthrough Prize in Life Sciences;
- HFSP fellowship alumna Rosa Cossart received the 2019 Liliane Bettencourt Prize for the Life Sciences from the Bettencourt Schueller Foundation;
- Research grant alumni Hans Clevers and Tadamitsu Kishimoto were awarded the Keio Medical Science Prize;
- Young Investigator Grant alumnus Botond Roska was the recipient of the 2019 Louis-Jeantet Prize for Medicine.

The recognition of HFSP funded scientists provides unequivocal evidence of the outstanding quality of the contribution of HFSP to breakthrough advances and technological developments which have significant benefits for society. Over the years, the scientists funded by HFSP have been recognized for their seminal work that in many cases has led to important tangible outcomes. HFSP alumni belong to an elite group of researchers destined for the most prestigious scientific distinctions, not least the Nobel Prizes, of which HFSP awardees have claimed 28 in the past 30 years (https://www.hfsp.org/awardees/nobel-prizes-hfsp-awardees).

Noteworthy also are the HFSP awardees who received the Kyoto Prize from the Inamori Foundation and the various distinctions from the Japan Academy, among which two scientists have been awarded the Imperial Prize. Since the beginning of the Breakthrough Prize in Life Sciences in 2013, HFSP awardees have been among the winners every single year. The same applies to the Kavli Prize in Neuroscience, which was awarded to HFSP awardees every time since its inception in 2008.

HFSP grantees awarded the Nobel Prize

Nobel Laureate	HFSP Research Grant	Nobel Prize
Christiane NÜSSLEIN-VOLHARD	1993	1995 (Physiology or Medicine)
Rolf ZINKERNAGEL	1994	1996 (Physiology or Medicine)
Stanley PRUSINER	1994	1997 (Physiology or Medicine)
John WALKER	1996	1997 (Chemistry)
Steven CHU	1993	1997 (Physics)
Paul NURSE	1994	2001 (Physiology or Medicine)
Tim HUNT	1992, 1997	2001 (Physiology or Medicine)
John SULSTON	1991	2002 (Physiology or Medicine)
Peter AGRE	2000	2003 (Chemistry)
Linda BUCK	1995	2004 (Physiology or Medicine)
Avram HERSHKO	1998	2004 (Chemistry)
Roger KORNBERG	1990, 1993, 1997, 2000	2006 (Chemistry)
Roger TSIEN	1995	2008 (Chemistry)
Jack SZOSTAK	2001	2009 (Physiology or Medicine)
Venkatraman RAMAKRISHNAN	2000, 2009	2009 (Chemistry)
Ada YONATH	2003	2009 (Chemistry)
Jules HOFFMANN	1995	2011 (Physiology or Medicine)
Ralph STEINMAN	1996, 2006	2011 (Physiology or Medicine)
Randy SCHEKMAN	1991, 1995	2013 (Physiology or Medicine)
Thomas SÜDHOF	1995	2013 (Physiology or Medicine)
James ROTHMAN	1990, 1994, 2005	2013 (Physiology or Medicine)
Martin KARPLUS	2005	2013 (Chemistry)
Michael LEVITT	2008	2013 (Chemistry)
John O'KEEFE	1994	2014 (Physiology or Medicine)
Stefan HELL	2010	2014 (Chemistry)
Aziz SANCAR	1992	2015 (Chemistry)
Jeffrey C. HALL	1991, 2000	2017 (Physiology or Medicine)
Tasuku HONJO	1990	2018 (Physiology or Medicine)

The following section lists other recent awards and prizes to HFSP awardees or alumni from 2019 or earlier that have come to our attention in FY 2019[1]

[1] It should be noted that Research Grants were awarded up until 2001 when Program Grants and Young Investigator Grants were introduced. The Short-Term Fellowship program was terminated in April 2010.

Name	Nationality	Current affiliation	HFSP award
Bayer Science and Education Foundation - Hansen Family Award			
Edith HEARD	UK	European Molecular Biology Laboratory (EMBL), Heidelberg, Germany	LT 1990, PG 2003
Bettencourt Schueller Foundation - Liliane Bettencourt Prize for the Life Sciences			
Rosa COSSART	France	Institut de Neurobiologie de la Méditerranée, Université de Marseille, France	LT 2002
Breakthrough Prize - Life Sciences			
Angelika AMON	USA/Austria	Massachusetts Institute of Technology, Cambridge, USA	RG 2000/ 2020 HFSP Nakasone Award
CNRS - Bronze Medal			
Marie MANCEAU	France	Collège de France, Paris, France	PG 2019
CNRS – Silver Medal			
Laurent BLANCHOIN	France	Biosciences and Biotechnology Institute of Grenoble, France	PG 2011

Name	Nationality	Current affiliation	HFSP award
EMBO - Gold Medal			
Madan Babu MOHAN	India	MRC Laboratory of Molecular Biology, Cambridge, UK	YI 2010
Gairdner Foundation - Canada Gairdner International Award			
John F.X. DIFFLEY	USA/UK	The Francis Crick Institute, London, UK	PG 2001
Japan Prize Foundation - Japan Prize			
Max D. COOPER	USA	Emory University School of Medicine, Atlanta, USA	RG 1996
Keio University Medical Science Fund - Keio Medical Science Prize			
Hans CLEVERS	Netherlands	Hubrecht Institute, Utrecht, Netherlands	RG 1998
Tadamitsu KISHIMOTO	Japan	Osaka University, Suita, Japan	RG 1991
Lasker Foundation - Albert Lasker Basic Medical Research Award			
Max D. COOPER	USA	Emory University School of Medicine, Atlanta, USA	RG 1996
Lasker Foundation - Lasker-DeBakey Clinical Medical Research Award			
Axel ULLRICH	Germany	MPI for Biochemistry, Martinsried, Germany	RG 1990
Louis Jeantet Foundation - Louis Jeantet Prize for Medicine			
Botond ROSKA	Hungary	Institute of Molecular and Clinical Ophthalmology Basel (IOB), Switzerland	ST 2000, YI 2003

Name	Nationality	Current affiliation	HFSP award
Robert Koch Stiftung - Robert Koch Award			
Rino RAPPUOLI	Italy	GlaxoSmithKline (GSK) Vaccines, Siena, Italy	RG 1992
Rosenstiel Basic Medical Sciences Research Center - Lewis Rosenstiel Award for Distinguished work in Basic Medical Science			
David JULIUS	USA	University of California, San Francisco, USA	2017 HFSP Nakasone Award
Shaw Prize Foundation - Shaw Prize			
Maria JASIN	USA	Memorial Sloan-Kettering Cancer Center, New York, USA	RG 1997
Wiley Foundation - Wiley Prize in Biomedical Sciences			
Svante PÄÄBO	Sweden	Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany	2018 HFSP Nakasone Award
Wolf Foundation - Krill Prize			
Ori KATZ	Israel/ Germany	The Hebrew University of Jerusalem, Israel	PG 2016
Emmanuel LEVY	France/Israel	Weizmann Institute of Science, Rehovot, Israel	LT 2008, CDA 2015

Chapter 4

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4.1

HFSPO MEMBERS' FUNDING

HFSPO is supported by voluntary contributions from 16 Members. Australia, Canada, France, Germany, India, Italy, Japan, Republic of Korea, New Zealand, Norway, Singapore, Switzerland, the United Kingdom, the United States of America and the European Commission (EC) currently work together with the Secretariat to implement the scientific program of the Organization. Israel has recently joined as an additional member.

A Joint Communique is issued every three years at the Triennial Conference of HFSPO Members (formerly Intergovernmental Conference or IGC), indicating the intended contributions for a three-year budgetary period. The applicable agreement for FY 2019-2020 was signed in London in June 2016 for FY 2017-2018 to FY 2019-2020. Members commended the leading role of Japan in supporting HFSPO for 30 years and committed the other HFSPO Members to more even sharing of the overall budget.

At the London meeting, representatives accepted a financial framework for their indicative contributions to HFSPO for the period of 2017-2019 based on a 2% annual increase and recognised the urgent need to develop and implement new principles for calculating financial contributions in the long-term, taking into account quantitative and/or qualitative indicators and the impact of currency issues for HFSPO Members' contributions and income to HFSPO.

4.2

FY 2019-2020 FINANCIAL SUMMARY

The table 4.1 presents a summarised overview of income and expenditures for FY 2019-2020 which extends from 1 April 2019 to 31 March 2020.

Income from contributions is at 76% of the amount budgeted at the end of the financial year. With additional income from unspent funds returned to HFSPO and capital gains above expected levels in the budget, the total income represents 77% of the amount budgeted.

Program expenditures for research grants reach 100% of the budget values whereas payments to fellowship and CDA awardees are below budget because of shifts in the starting date of awards. More details are given in the corresponding items below.

Operational costs are USD 327 thousand below budget due to lower expenditure. Therefore, the net cash expenditure of HFSPO consolidated in USD at actual exchange rates amounts to USD 55.854 million, against USD 44.284 million cash income.

The net balance for HFSPO's activities at year-end 2019-2020 is negative at USD 11.569 million.

Each item in this table is explained in detail in the text below.

Table 4.1

Budget vs. Actual Fiscal Year 2019-2020 (in thousands USD)

From 1 April 2019 to 31 March 2020

Contributions	FY19-20 Budget	FY19-20 Actual	Var. Budget/Actual	%	FY18-19 Actual
Contributions	56 303	42 764	(13 539)	76%	52 629
Other income		213	213		115
Interest and capital gains	941	1 307	366	139%	937
Total Income	**57 244**	**44 284**	**(12 960)**	**77%**	**53 681**

Program awards	FY19-20 Budget	FY19-20 Actual	Var. Budget/Actual	%	FY18-19 Actual
Research Grants - Program	25 200	25 200	-	100%	24 950
Research Grants - Early Career	8 960	8 960	-	100%	8 540
Fellowships	15 818	13 637	(2 181)	86%	12 509
Career Development Award	3 800	3 500	(300)	92%	2 700
Total Program awards	53 778	51 297	(2 481)	95%	48 699
Program activities	758	594	(164)		568
Total Program awards & activities	54 536	51 891	(2 645)	95%	49 267
Total Operations	**4 289**	**3 962**	**(327)**	**92%**	**3 929**
Total Expenditure	**58 825**	**55 853**	**(2 972)**	**95%**	**53 196**
Net Income (loss) Balance	**(1 581)**	**(11 569)**	**(9 988)**		**485**

Additional Activity
HFSPO receives financial support from other life science research funding agencies to fund the work needed for the launch of the Global Biodata Coalition (GBC). Major support is being provided by the Wellcome Trust, the NSF, the NIH's National Human Genetics Research Institute and the Agency for Science and Technology of Singapore. The actual income of USD 582 thousand is below the budgeted income of USD 683 thousand.

Activities regarding the establishment of the GBC are time limited and the Secretariat plays a facilitating role.

Expenditure regarding GBC activities amounts to USD 189 thousand in FY 2019-2020. Unspent funds of USD 393 thousand are carried forward to FY 2020-2021.

Table 4.2
Simplified statement of financial performance for GBC activities

Non-Program Activities	FY19-20 Budget	FY19-20 Actual	Var. Budget/Actual	%	FY18-19 Actual
GBC Income	683	582	(101)		N/A
GBC Expenditure	305	189	(116)		N/A
Net Income Balance for GBC activities	378	393	15		N/A
Net Consolidated Balance	**(1 203)**	**(11 176)**	**(9 973)**		**N/A**

HFSPO net consolidated balance (HFSPO and GBC activities) is negative at USD 11.176 million.

4.2.1 INCOME FROM HFSPO MEMBER CONTRIBUTIONS FOR FY 2019-2020

Table 4.3
Contributions from HFSPO Members in FY 2019-2020 (1 April 2019 to 31 March 2020)

	Joint Communique London, 2016 for FY 2019-2020 in LC		FY 2019-2020 Actual payment in LC		Joint Communique London, 2016 for FY 2019-2020 in USD		FY 2019-2020 Actual payment in USD equivalent	
Australia	803 000	USD	803 000	USD	803 000	USD	803 000	USD
Canada	2 080 000	CAD	2 079 420	CAD	1 600 000	USD	1 564 349	USD
EC	5 261 000	EUR	5 261 000	EUR	5 845 556	USD	5 914 942	USD
France	2 463 000	EUR	2 463 000	EUR	2 736 667	USD	2 772 982	USD
Germany *	4 901 000	EUR	4 617 000	EUR	5 445 556	USD	5 187 661	USD
India **	1 114 000	USD	0	USD	1 114 000	USD	0	USD
Italy ***	995 000	EUR	25 000	EUR	1 105 556	USD	27 963	USD
Japan	21 043 000	USD	2 314 762 000	JPY	21 043 000	USD	21 236 349	USD
Korea ****	880 000	USD	799 792	USD	880 000	USD	799 792	USD
New Zealand	153 000	USD	153 000	USD	153 000	USD	153 000	USD
Norway	685 000	USD	685 000	USD	685 000	USD	685 000	USD
Singapore	574 000	USD	574 000	USD	574 000	USD	574 000	USD
Switzerland	976 000	CHF	920 000	CHF	976 000	USD	930 873	USD
UK	1 625 000	GBP	1 625 000	GBP	2 500 000	USD	2 113 809	USD
USA **	11 183 000	USD	0	USD	11 183 000	USD	0	USD
					56 644 333	**USD**	**42 763 719**	**USD**

LC: local currency
*: Germany contributed at level of contribution for FY 2016-2017 according to the Brussels Joint Communique (2013)
**: Outstanding contribution, not paid as of 26 May 2020
***: Outstanding contribution from Italy of EUR 970 thousand as of 31 March 2020
****: Outstanding contribution from the Republic of Korea of USD 80 thousand as of 31 March 2020

In FY 2019-2020 contributions received from HFSPO Members total USD 42.764 million. Individual payments match the amounts agreed by the Intergovernmental Conference held in London in June 2016.

The second and fourth columns show the contributions in local currency (LC) agreed in the Joint Communique for FY 2019-2020 during the London meeting, and converted into USD respectively. The following exchange rates were used to convert into USD: 1 USD = 0.90 EUR, 1.30 CAD, 1.00 CHF, 0.65 GBP. Actual payments during FY 2019-2020 are recorded in the third column in the agreed currencies, and converted amounts into USD, exchanged at the daily accounting rate, in the fifth column.

HFSPO limits currency exchange as far as possible by using contributions in one currency for the payment of awardees in the same currency. Where there are insufficient funds in a given currency, this deficit is made up by exchanging USD into the required currency.

4.2.2 INCOME FROM OTHER SOURCES

- **Other income**
  Other income of USD 213 thousand comes, in full, from reimbursements of unused funds from awardees.

- **Interest and capital gains**
  Financial income from asset management (interest and capital gain) comes close to USD 1.307 million before tax, which was about USD 0.4 million more compared to the previous year.
  This financial income is generated through three different financing mechanisms: coupon payments for USD 876 thousand, short-term deposits for USD 251 thousand and interest-bearing accounts for USD 180 thousand.
  All investments have been made in accord with the Prudential Rules for financial investment approved by the Board of Trustees in March 2016.

4.2.3 EXPENDITURE OF PAYMENTS OF AWARDS AND OTHER PROGRAM ACTIVITIES

HFSPO disbursed USD 51.297 million to its awardees, which was equivalent to 99% of the budget amounts (Table 4.4).

Table 4.4

Payments of awards and scientific activities in thousands USD

Program awards	FY2019-2020 Budget	FY 2019-2020 payments	Var.	% of total payments	FY 2018-2019 payments
Research Grants - Program	25 200	25 200	0	49%	24 950
Research Grants - Early Career	8 960	8 960	0	17%	8 540
Fellowships	15 818	13 637	(2 181)	26%	12 509
Career Development Awards	3 800	3 500	(300)	7%	2 700
Total Program Awards	53 778	51 297	(2 481)	99%	48 699
Awardees meeting	388	247	(141)	0%	116
Program meetings	337	299	(38)	1%	427
HFSP Nakasone Award	11	26	15	0%	18
Outreach activities	22	22	0	0%	9
Program activities	758	594	(164)	1%	568
Total Program awards and activities	**54 536**	**51 891**	**(2 645)**	**100%**	**49 267**

Payments per program activity as shown in Table 4.4 were as follows:

- **Research Grants**
  USD 34.160 million for research grants (USD 25.200 million for Research Grants - Program and USD 8.960 million for Research Grants – Early Career) representing 65.8% of total award payments. Research grants paid in FY 2019-2020 were at the budget level.

- **Fellowships**
  USD 13.637 million for Long-Term and Cross-Disciplinary Fellowships corresponding to 26.3% of payments.
  Long-Term Fellowship awards paid in FY 2019-2020 were USD 2.181 million below budget at USD 13.637 million. The date on which the fellowship actually starts and whether the recipient takes up the option to defer the third year of the fellowship or not are relevant for the management of the fellowship program budget. These decisions can shift a significant portion of the total amount budgeted from one fiscal year to another without changing the total amount disbursed.

- **Career Development Awards**
  HFSPO disbursed USD 3.500 million to CDA holders, the equivalent of 6.7% of payments.
  The annual cost of Career Development Awards was USD 0.3 million below budget because of three deferrals to the following fiscal year.

  Table 4.5 shows total payments for all schemes of the Program to scientific institutions of HFSPO Members and non-members (non-members include Argentina, Brazil, Chile, Republic of China, Hong-Kong, Mexico, Russia, and South Africa). Israel has joined during the fiscal year, and is still grouped with the non-members. It will be listed separately in subsequent annual reports.

Table 4.5
Geographical distribution of HFSP awards in FY 2019-2020 in thousands USD

Awards/ geographical area	Career Development Awards	Fellowships	Research Grants	Total in thousands USD	% all awards
Australia	100	144	1 057	1 301	3%
Canada	200	212	1 016	1 428	3%
EC	300	1 361	4 027	5 688	11%
France	400	473	2 919	3 792	7%
Germany	600	1 169	4 406	6 175	12%
India	100	0	237	337	1%
Italy	100	0	842	942	2%
Japan	400	131	1 999	2 530	5%
Korea	0	6	571	577	1%
New Zealand	0	0	180	180	0%
Singapore	0	115	573	688	1%
Switzerland	0	2 340	1 454	3 794	7%
UK	200	593	3 070	3 864	8%
USA	200	6 848	9 273	16 321	32%
Non Members	900	246	2 535	3 681	7%
Total	**3 500**	**13 637**	**34 160**	**51 297**	**100%**

In terms of geographical distribution, 47% of the total amount of awards disbursed in FY 2019-2020 went to awardees in the European area, 35% to North America, 11% to awardees in Asia-Pacific and 7% to non-HFSPO members.

- **Other program activities**
  Approximately USD 0.568 million were paid for other program activities, which are Awardees Meetings, Program meetings, the HFSP Nakasone Award and outreach activities.
  Total annual expenditure is USD 164 thousand below budget mainly due to a one-off donation from the Japanese government to support the 19th Awardees Meeting and 30th anniversary of HFSP in July 2019, in Tokyo and Tsukuba, Japan.
  Costs related to review committees for research grants, fellowships and Career Development Awards, travel costs for members of the Council of Scientists and the Independent Scientific Review Committee are integrated into the Program meetings expenditure, as per Table 4.6.

Table 4.6
Breakdown in Program meetings expenditure in thousands USD

Program meetings expenditure	FY 2019-2020 Payments	FY 2018-2019 Payments	Var.
Council of Scientists	46	55	(8)
Review Committee Fellowships	108	115	(7)
Review Committee Grants	96	107	(11)
Review Committee CDA	0	45	(45)
Selection Committee	44	41	2
Independent Scientific Review	0	25	(25)
Other	5	38	(33)
Total	**299**	**427**	**(127)**

Travel and accommodation costs for all categories are included in the amounts above.
For review committee panels, honoraria paid for the reviews are also included.
Other expenditure is fully composed of costs related to participation fees for the young scientists awarded by HFSP who attended the 69th Nobel Laureate Meeting in Lindau in June-July 2019.

Since the Career Development Award program came to an end in March 2019, HFSPO does not incur any expenditure for this award type any longer.

The Analytic Program Review commissioned by the Independent Scientific Review Committee corresponds to a one-off expenditure in FY 2018-2019.

4.2.4 HFSPO OPERATIONAL COSTS

The HFSPO Secretariat has 15 employees and two seconded colleagues responsible for the management and implementation of the Program activities.

Table 4.7
Breakdown of operational costs for the HFSPO Secretariat in thousands USD

HFSPO Operational Expenditure	FY 2019-2020		FY 2019-2020	FY 2018-2019
	Budget	Actual	Var. Bud/Act	Actual
Payroll	2 056	1 934	(122)	1 798
Social charges & taxes	1 147	1 072	(75)	1 030
Other personal costs	55	70	15	21
Admin. meetings	191	130	(61)	154
Staff travel	101	60	(41)	110
Equipment	1	1	(1)	0
Consultancy fee	225	178	(47)	291
IT	282	184	(99)	162
Telecommunication	10	10	0	8
Communication & advertising	80	99	19	61
Building running costs & security	69	48	(21)	65
Property taxes	28	27	(1)	29
Utilities	20	17	(4)	20
Insurance	7	7	1	7
Supplies	11	6	(4)	9
Miscellaneous	6	3	(3)	3
Income tax	0	116	116	161
Total HFSP operation	**4 289**	**3 962**	**(327)**	**3 928**

In FY 2019-2020, operational expenditure is USD 3.962 million representing 7.1% of total expenditure. The HFSPO Secretariat is located in France and its operational costs occur mostly in euros. Actual costs above are shown in the US dollar equivalent at the annual average exchange rate EUR/USD of 0.90, whereas the budget was prepared with 0.89.

The difference of USD 0.327 million below budget is explained by a volume effect of USD 276 thousand (lower expenditure) reinforced by an exchange rate effect of USD 51 thousand (exchange rate variation).

Provision was also made in the FY 2019-2020 budget for:

- a new Chief Operations Officer to start in September 2019, which explains the higher payroll, social charges & taxes expenditure budgeted. He officially started mid-March 2020;
- costs for travel and accommodation for a second meeting of the Board of Trustees during this financial year, which finally was not held.

Expenditure on IT consultancy fees, IT and other costs is below budget because some projects have been postponed to FY 2020-2021, in particular the decision to change the Grant Management System.

4.3

SUMMARIZED STATEMENT OF FINANCIAL POSITION

HFSPO's financial position is the balance between its assets and its liabilities. A positive position ensures that the payments to current awardees are guaranteed for the period of their award by HFSPO's available resources.

Table 4.8

Assets and liabilities at actual rates in thousands USD

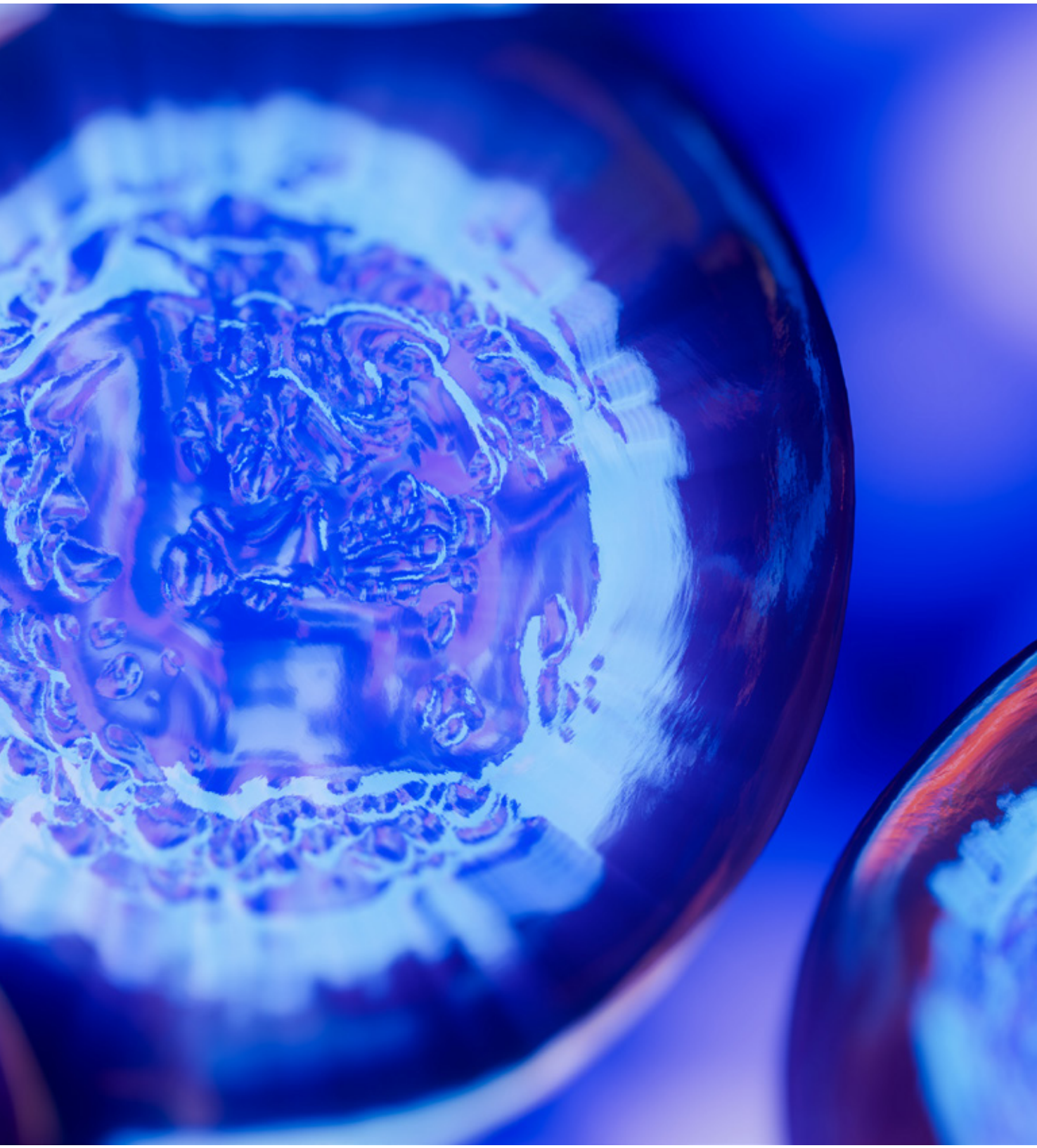
ASSETS	FY 2019-2020
Cash	14 498
Long & Short-term investments	47 053
Total Current assets	61 551
Prepaid expenses	70
Outstanding contributions	14 511
Total other current assets	14 581
Other assets	3 780
Total assets as of 31/03/2020	**79 911**

LIABILITIES	FY 2019-2020
Accounts payable	508
Deferred income	9 003
Total current liabilities	9 511
Research Grants - Program	26 250
Research Grants - Early Career	8 850
Fellowships	19 132
Career Development Award	4 000
Total committed awards	58 232
Net loss balance FY 2019/2020	11 176
Net asset position (positive)	992
Total liabilities as of 31/03/2020	**79 911**

- **Assets**
  HFSPO assets include cash invested with various levels of liquidity originating from accounts and capital products (current accounts, short term deposits, and medium term notes) for a total of USD 61.551 million, outstanding contributions (HFSPO Members with overdue contributions for FY 2019-2020), assets including real estate property (office building is booked at its market value: USD 3.287 million).

- **Liabilities**
  Current liabilities include deferred income (contributions from HFSPO Members for FY 2020-2021 already received at year-end for USD 8.6 million and financial support for the launch of the Global Biodata Coalition in FY 2019-2020 for USD 393 thousand). Accounts payable include current suppliers and fiscal debts for French social charges for USD 508 thousand.
  There are no other long-term liabilities than awards payable to current awardees beyond FY 2019-2020. These amount to USD 58.232 million.

At the end of FY 2019-2020, HFSPO assets exceed its liabilities by USD 992 thousand.




Appendix

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A.1

Joint Communiqué of the Triennial Conference

International Human Frontier Science Program Organization Members

Tokyo, 9th July 2019

Representatives from the Members of the International Human Frontier Science Program Organization (HFSPO), Australia, Canada, France, Germany, India, Italy, Japan, the Republic of Korea, New Zealand, Norway, Singapore, Switzerland, the United Kingdom of Great Britain and Northern Ireland, the United States of America and of the European Commission met at a Triennial Conference of HFSPO Members on 9th July 2019 in Tokyo, Japan to review progress since the 2016 London Intergovernmental Conference and to discuss the future of the Human Frontier Science Program (HFSP).

1. MISSION AND ADDED BENEFIT

a) Representatives recognise that the ever-growing complexity and interdisciplinarity of science makes international collaboration more imperative than ever.

b) An independent review commissioned by the Board of Trustees in 2018 shows that HFSPO has an impressive track record in stimulating world-class excellence in high-risk/high-impact science and in supporting outstanding frontier life scientists, especially early career scientists. HFSPO's approach of small-scale, bottom-up, high-risk, interdisciplinary, intercontinental collaborative research adds significant value to other international and national funding schemes.

c) Representatives recognize that as a result of the investment made up to now, HFSPO is uniquely positioned as a global cooperation in supporting frontier life-sciences research. Representatives acknowledge the role of Japan as the initiator of HFSPO, its largest contributor and the cornerstone of its success and sustainability to date.

2. CONTINUATION OF THE HUMAN FRONTIER SCIENCE PROGRAM

a) Representatives renew their commitment to HFSPO.

b) Representatives confirm the mission given to HFSPO 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.

c) Representatives confirm their aim to maintain the uniqueness of HFSPO in supporting innovative, frontier research in the life sciences, encouraging high risk research and promoting international collaboration in the spirit of science without borders.

d) Representatives support the strategy of the Board of Trustees for the forthcoming triennium as set out in Annex 3, including the decision no longer to support the Career Development Award and the need to adjust the value of the Research Grant and Fellowship awards. Representatives request the Board of Trustees to continue to reflect upon and consider the awards to ensure they continue to serve HFSPO's mission.

e) Representatives acknowledge the need to ensure a sustained budget to maintain the value of the HFSP to frontier researchers, improve awarding capacity and be inclusive of fields as they emerge on the frontiers of the life sciences.

3. FINANCES

a) Representatives acknowledge and commend the leading role of Japan in supporting HFSPO for over 30 years and commit to ensuring that their contributions share support equitably so that HFSP continues to make profound contributions to extending scientific frontiers.

b) Representatives appreciate the new GDP-based formula for calculating the financial contributions and support that every effort should be undertaken to fully implement it in 2020-2022.

c) Representatives note the request of the HFSPO Board of Trustees that those countries currently contributing below their calculated amounts be encouraged to increase their contribution progressively over time while those countries contributing more than the GDP formula be encouraged to maintain their level of contribution for solidarity among HFSPO Members and for the benefit of HFSP.

d) Representatives accept the financial framework for their indicative contributions to HFSPO for the period 2020-2022 (Annex 1).

e) Representatives encourage the Board of Trustees to seek resources additional to the contributions from HFSPO Members.

4. NEW MEMBERS

a) Representatives encourage the Board to promote membership in HFSPO and reconfirm its view that HFSPO is open to new members, which enable the Program to better fulfil its mission. New members are a source of scientific enrichment and an indicator of the health and excellence of HFSPO.

Signatories, 9th July, 2019

Member
Australia

Management Supporting Party
National Health and Medical Research Council

Signatory
Dr. Anne Kelso

Member
Canada

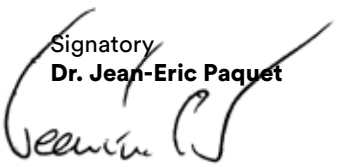
Management Supporting Parties
Canadian Institutes of Health Research
Natural Sciences and Engineering Research Council

Signatory
Dr. Digvir Jayas

Member
European Commission

Management Supporting Party
Directorate General Research & Innovation

Signatory
Dr. Jean-Eric Paquet



Member
France

Management Supporting Parties
Ministry of Higher Education and Research
Strasbourg Eurométropole
Région Alsace

Signatory
Dr. Jacques Demotes

Member
Germany

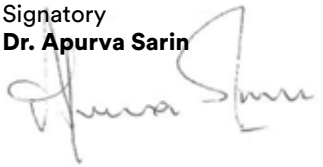
Management Supporting Party
Federal Ministry of Education and Research

Signatory
Dr. Klaus Vietze

Member
India

Management Supporting Party
Dept. of Biotechnology, Ministry of Science and Technology

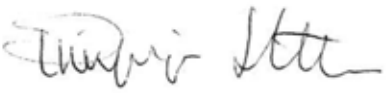
Signatory
Dr. Apurva Sarin



Member
Italy

Management Supporting Party
Ministry of Education, University and Research

Signatory
Dr. Piergiorgio Strata



Member
Japan

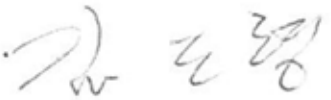
Management Supporting Parties
Japan Agency for Medical Research and Development
Ministry for Economy Trade and Industry
Ministry of Education, Culture, Sports , Science and Technology

Signatory
Mr. Hiroshi Masuko

Member
Korea , Republic of

Management Supporting Party
Ministry of Science and ICT

Signatory
Mr. Do Hyoung Kim



Member
New Zealand

Management Supporting Party
Royal Society of New Zealand

Signatory
Dr. Andrew Mercer

Member
Norway

Management Supporting Party

Signatory
Dr. Rein Aasland

Member
Singapore

Management Supporting Party
National Research Foundation of Singapore

Signatory
Dr. Teck Seng Low

Member
Switzerland

Management Supporting Party
State Secretariat for Education, Research and Innovation

Signatory
Dr. Isabella Beretta

Member
United Kingdom

Management Supporting Parties
Biotechnology and Biological Sciences Research Council
Medical Research Council

Signatory
Dr. Melanie Welham

Member
United States of America

Management Supporting Parties
National Institutes of Health
National Science Foundation

Signatory
Dr. Roger Glass

Annex 1.
Voluntary Contributions 2020-2022

HFSPO Member	Currency of contribution	FY 2020	FY 2021	FY 2022
Australia	AUD	1 686	1 686	1 686
Canada	CAD	2 137	2 180	2 223
European Commission	EUR	5 261	5 261	5 261
France	EUR	2 463	2 463	2 463
Germany	EUR	2 836	2 836	2 836
India	INR	144 240	147 125	150 067
Italy	EUR	500	500	500
Japan	JPY	2 271 314	2 271 314	2 271 314
Korea, Republic of	KRW	988 288	988 288	988 288
New Zealand	NZD	253	253	253
Norway	NOK			
Singapore	SGD	776	776	776
Switzerland	CHF	610	610	610
United Kingdom	GBP	1 657	1 690	1 724
United States of America	USD	12 000	12 000	12 000

All voluntary contributions are shown in thousands (k) local currencies. Contributions are voluntary and subject to annual budgeting and other decisions of individual HFSPO Members.
Note that the European Commission contributions are subject to adoption of the future relevant Work Programmes under Horizon 2020 (for the year 2020) and under Horizon Europe (the proposed EU Framework Programme for Research and Innovation 2021-2027).

Annex 4 contains a Table of HFSPO Member commitments and variance from Toronto formula calculation.

Annex 2.
Program Activity Plan 2020-2022

Implementing HFSPO strategic plan

The HFSPO Program Activity Plan is a description of the activities that will be undertaken to implement the Board's Strategic Plan and decisions, in accord with the requirements of the HFSPO Statutes. It will be updated annually in accord with Board decisions.

CONTENT

Funding frontier life science research and fellows
Research Grants
Long-Term and Cross-Disciplinary Fellowships
Termination of the Career Development Award
Peer review processes
Council of Scientists' advice

Fostering international collaboration in life science research
Awardees Meetings
Scientific Workshops - Frontier Issues in Life Science Research outreach activities

Regulatory and administrative matters
Statutory requirements
HFSPO website
Implementation of the EU regulation on data privacy (GDPR)
Improving the database for award management and implementation of ORCID
Secretariat development

FUNDING FRONTIER LIFE SCIENCE RESEARCH AND FELLOWS

HFSPO will undertake annual funding rounds in 2020, 2021 and 2022, funding awards that will commence from April in 2021, 2022 and 2023. The number of awards each year will be decided by the Board of Trustees based on recommendations of the Recommendations Committee and on the funding available as advised by the Treasurer.

Research Grants
Applications for Letters of Intent will be called for near the beginning of each calendar year.
The grants review committee will work to identify around 300 of the best of these. They will then be reviewed by a peer review Selection Committee and invitations to submit a full application will be issued to approximately 80-100 applicants. These applications then will undergo rigorous review by the grants review committee in January/February, each with up to six written external reviews.
The awards' amount for Research Grants will be increased from 2020.

Postdoctoral Fellowships
Applications for Long-Term and Cross-Disciplinary Fellowships will close in August each year. The Fellowships peer review committee will identify the top applications (around 150) and they will be discussed at the face to face meeting of the review committee in January/February each year.
The awards' amount for fellowships will be increased from 2020.
To ensure that outstanding non-biologists apply, HFSPO will consider whether to extend Cross-Disciplinary Fellowships to four years.
The Secretariat will work to further increase the visibility of Cross-Disciplinary Fellowships internationally.

Career Development Award
This award has been terminated. Applications will not be called for the Career Development Award in the future. The final funding round for CDAs will have been conducted for the last time in 2018, for funding beginning in 2019.

Review processes
HFSPO will continue to recruit outstanding, highly active scientists to its review committees, with assistance from the Council of Scientists. This takes careful, thorough and ongoing diligence by the Directors of Research Grants and Fellowships, supported by the Secretary-General and the whole Secretariat.
The peer review committees will meet in Strasbourg in January and early February each year and in July for the research grants Selection Committee. The review committees will have a non-reviewing chair, well briefed in HFSPO guidelines and ethos.
The results of the review committees' meetings will be provided to the Recommendation Committee, which will submit its recommendations to the Board.

Council of Scientists
The Council of Scientists will meet at least once each year to provide the Board of Trustees with recommendations and with its independent view on the Program. The Council will judge applications for the Nakasone Award and provide its recommendation to the Board.

FOSTERING INTERNATIONAL COLLABORATION IN LIFE SCIENCE RESEARCH

Awardees Meeting
A meeting to which all current award holders are invited will be held annually to further foster HFSPO's aim to increase interdisciplinary and intercontinental research collaboration.
This meeting, to which Board and Council members are also invited, affords awardees a means of testing their ideas on a top science audience and of forming new scientific collaborations. It assists fellows in their future career paths and allows awardees to provide direct feedback to the Secretariat, Council of Scientists and Board members in attendance.
The meeting will be held in collaboration with HFSPO members, with the aim that it be held in each HFSPO member over time. Organisational aspects of the meetings will be tendered to professional organisers.

Scientific Workshops - Frontier Issues in Life Science Research
The organisation of scientific workshops is one means by which HFSPO achieves its objective of "promoting and funding" basic life science research.
Life science is changing rapidly and HFSPO will conduct workshops each year on issues of the most importance to the "the promotion and funding of basic research in the life sciences".
HFSPO will continue to offer assistance to the establishment of a Global Biodata Coalition, an international cooperative initiative that grew from a HFSPO workshop, through end of 2020.

Outreach activities
HFSPO's website will continue to feature articles by HFSP awardees and other articles related to frontier science. Links with communications officers in the HFSPO Members will be enhanced, to increase bi- and multi-lateral communication activities.
Scientific Directors will develop stronger links with HFSPO Member research funding organisations to share views and increase mutual interactions.
At the request of HFSPO Members, HFSPO Scientific Directors will undertake visits to research institutions in HFSPO Members to promote HFSPO opportunities to top frontier scientists at leading institutions, with a particular emphasis on HFSPO Members from which application numbers are low, and to ensure that other disciplines are more aware of HFSPO's interdisciplinarity.

REGULATORY AND ADMINISTRATIVE MATTERS IN LIFE SCIENCE RESEARCH

Statutory requirements
Each year, the Board will receive, for approval and publication, the Statutory Auditors report, and an Annual Report.
The Program Activity Plan will be presented for approval annually to the Board of Trustees

HFSPO website
The redevelopment of the HFSPO website will be completed.

Implementation of the EU regulation on data privacy (GDPR)
HFSPO will continue its work to ensure compliance with this Regulation by the beginning of the 2020- 2022 triennium, based on professional advice. Throughout the triennium, HFSPO will continue to work with its Data Protection Officer to ensure that we provide the protection required, within an ethos of continuous improvement.

Improving the database for award management and implementation of ORCID
The HFSPO database will undergo a renewal process to include important aspects of the measures for protecting private data within the HFSP database network and award processing and integration of ORCID identification.

Secretariat development
The Secretariat will continue to modernise and professionalise its administrative practices and processes as agreed by the Board of Trustees, incorporating advice of the Internal Audit Committee.
The next Secretary-General will be recruited during the triennium 2020-2022.

Annex 3.
Strategic Plan 2020 – 2022 of the International Human Frontier Science Program Organization

The International Human Frontier Science Program Organization (HFSPO) is an international collaboration promoting global cooperation in frontier life science research. It was established in 1989 to implement the Human Frontier Science Program (HFSP, “The Program”).
The Strategic Plan 2020 - 2022 describes HFSPO’s strategic direction for the next three-year period. The accompanying Program Activity Plan describes how this strategy is planned to be implemented.

HFSPO'S STATUTORY OBJECTIVES

HFSPO's objective is 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. Statutes, Article 2.2.

The Human Frontier Science Program funds high-risk, interdisciplinary, intercontinental, collaborative, fundamental life science research, with a philosophy of "science without borders". It encourages innovative and novel thinking to support transformative and paradigm shifting research.

Fundamental research benefits all humankind by advancing understanding of the complex mechanisms of life which provides the germination for developments in industry, health and human well-being.

HFSPO aims to complement and not duplicate the life science research programs of individual countries.

STRATEGIES 2020 - 2022

HFSPO's strategies for 2020 - 2022 are built upon the achievements of the Program over the last 30 years. They take into account the findings of an International Scientific Review Committee (ISRC) which reported in 2018.

HFSPO's key strategies are to:

1. Continue to support the Program of frontier life science research and international collaboration through the Research Grants (Program and Emerging Investigators) and Fellowships (Long Term and Cross-Disciplinary) schemes.

2. Increase the amount awarded to successful Research Grant and Fellowship applicants, in recognition of the growth in complexity, breadth and interdisciplinarity in the last three decades.

3. Discontinue the Career Development Award, now that similar schemes are available in many HFSPO Members.

4. Consider extending the Cross-Disciplinary Fellowships, which are unique to HFSPO, to four years.

5. Continue to use international peer review of the highest quality as the sole method of deciding which applications to recommend for funding.

6. Expand HFSPO membership to other leading life science research countries, encouraging all countries with excellence in basic life science research to apply for membership.

7. Promote international life science collaboration by working with others to promote growth and collaboration in life science research.

8. Establish the HFSPO Foundation[1].

9. Communicate the achievements of the Program.

10. Continually seek to provide efficient and effective service to the HFSPO Members and the life science research community through professional, internationally-connected administration.

[1] Board of Trustees decision out of session, 12 April 2018

EXPLANATION OF STRATEGY

The Board of Trustees believes that stimulating new scientific collaboration across disciplines and across the world remains as important to the future of the life sciences and to fostering international cooperation as ever.

Research Grants are available to international teams working across continents, using interdisciplinary approaches, with each team member working with their collaborator(s) for the first-time and on a new topic. Both **Program Grants** and **Emerging Investigator Grants** (previously Young Investigator Grants) will be offered. The Research Grant amounts have not been increased since 2002. HFSPO will consider an increase following issue of the Joint Communique at the Triennial Conference of HFSPO Members.

Postdoctoral Fellowships provide future leaders in frontier research from anywhere in the world with the opportunity to work in new fields carrying out high-risk and potentially transformative research in the most stimulating laboratories in a new country. By funding researchers who will be leaders in transformative frontier science in their own careers, the Fellowships represent HFSPO's investment in the future. A recent comparison provided to the International Scientific Review Committee showed that the amounts of each Fellowship, last set in 2010, were no longer comparable to other highly prestigious awards. HFSPO will consider this following the Triennial Conference of HFSPO Members.

HFSPO's **Cross-Disciplinary Fellowship** for non-biologists is a unique HFSP award. The Board will consider extending the duration of the Cross-Disciplinary Fellowship to 4 years. This is in recognition of the effects of a major change in direction for these scientists as they move into biology. Understandably, they risk experiencing a lag before they achieve publications and outcomes compared to competitors with a Ph.D. in a biological field. This can be a handicap when competing for subsequent positions.

The decision to terminate the **Career Development Award** (CDA) was taken by the Board after consideration over recent years and upon the recommendation of both the Council of Scientists and the International Scientific Review Committee. Current CDA holders will of course be supported until the end of their award. The final application round will be that of 2019 (i.e. for applicants who applied before the Board's decision).

ACHIEVEMENTS

The portfolio of research and fellowship awards

HFSPO has supported 1090 international collaborative teams conducting interdisciplinary research since 1990 and 3157 young scientists through postdoctoral fellowships. More than 100 Cross-Disciplinary Fellowships have now been awarded to scientists from fields other than biology – physicists, chemists, mathematicians, IT scientists and more – who have thereby brought a diversity of expertise, scientific approaches and perspectives to research into the complex mechanisms of life.

Success of awardees

Many of the scientists who have been supported by HFSPO have received great acclaim in their subsequent careers. This includes membership of National Academies and prestigious international science prizes[2] (listed in HFSPO's Annual Reports).
Twenty-eight scientists who have received HFSP awards have gone on to win a Nobel Prize, including Nobel Prizes for Physiology or Medicine, for Physics or for Chemistry. Nobel Prizes in Physics and Chemistry attest to the success of HFSPO's interdisciplinary approaches.
Many of these highly successful scientists ascribe their later success to the support for innovative higher risk research that the Program provided (see examples of awardees' articles on the HFSP website).

HFSP Nakasone Awards

The HFSP Nakasone Award is made to scientists who have undertaken frontier-moving research in biology, encompassing conceptual, experimental or technological breakthroughs.
The award recognizes the vision of former Prime Minister Nakasone of Japan in the creation of HFSP.

[2] Breakthrough Prize in the Life Sciences, CNRS Gold and Silver Medals, Daiwa Adrian Prize, Leibniz Award, EMBO Gold Medal, European Inventor Award, Brain Prize, Balzan Prize, Japan Academy Prize, Albert Lasker Basic Medical Research Award, Louis Jeantet Prize, National Medal of Science, NIH Director's New Innovator Award, NIH Director's Pioneer Award, Kavli Prize in Neuroscience, Robert Koch Prize, Heineken Prize, Shaw Prize, Gairdner Foundation International Prize.

HFSP Nakasone Award winners

2010 - **Karl Deisseroth** for his work on the application of microbial opsins as "optogenetic" tools in neurobiology.

2011 - **Michael Elowitz** for studies on gene expression noise.

2012 - **Gina Turrigiano** for introducing the concept of homeostatic synaptic plasticity.

2013 - **Stephen Quake** for his work in advancing biological measurement techniques.

2014 - **Uri Alon** for his work on network motifs.

2015 - **James Collins** for his work on synthetic gene networks and programmable cells.

2016 - **Emmanuelle Charpentier** and **Jennifer Doudna** for their work on the CRISPR-Cas 9 system.

2017 - **David Julius** for his discovery of the molecular mechanism of thermal sensing in animals.

2018 - **Svante Pääbo** for his discovery of the extent to which hybridization with Neanderthals and Denisovans has shaped the evolution of modern humans, and his development of techniques for sequencing DNA from fossils.

PROMOTING INTERNATIONAL LIFE SCIENCES

HFSPO provides additional intellectual leadership by bringing expertise from around the world to address issues that face the life sciences now and might impede the advance of the frontier.
HFSPO holds annual meetings of those who have recently been awarded Research Grants and Fellowships to stimulate additional collaborations, transformative ideas and the ambitions of these outstanding scientists.
Additionally, HFSPO holds small, targeted workshops of international leaders on specific issues of global interest in basic life sciences. For example, the Secretary-General and staff of HFSPO have been working with other leading organisations around the world on the value and sustainability of the key life science data resources[3], on discussions of implementation of the Declaration on Research Assessment (DORA) principles in peer review in basic research, and on the physical sciences/life sciences interface. All of these are areas of importance to HFSPO's mission of the "promotion and funding of research into the sophisticated and complex mechanisms of life."

[3] In 2019 and 2020, this work will continue as a cost-neutral and time-limited activity.

DELIVERING ON THE MISSION TO "BENEFIT ALL HUMANKIND"

The founders of HFSPO were prescient when they stipulated that research in the Program should be fundamental research, but added that it should also be "for the benefit of all humankind."
HFSPO's funding of basic research through the Program has resulted

in changes in research paradigms. The Program has built stronger foundations for future research and opened up new important areas for research. It has launched and boosted the careers of numerous scientists who continue to undertake innovative, riskier frontier research throughout the world.
It has provided new tools and methodologies for global life science researchers. There have also been many practical gains. Basic research is the germination point from which grows the later development of valuable products, policies and practices.
Examples of where basic frontier research supported by HFSPO has led to practical benefits can be found in the following table.

A recently commissioned report found that HFSPO Long- Term Fellows produce three times more patents than the international norm[4].
We highlight the benefits through reports written by HFSPO supported scientists published each month on the HFSP website (see the Awardees Articles section). These provide many more examples of where the original basic ideas have led to often surprising new beneficial developments.

[4] Science Metrix 'Review of the Human Frontier Science Program' Final Report, 7 September 2018, Executive Summary.

EXAMPLES WHERE BASIC RESEARCH LATER LED TO SIGNIFICANT APPLIED BENEFITS

New tools to improve vaccinations
HFSPO funded a research project by Jean-Luc Popot and international collaborators Edward A. Berry and Catherine Vénien-Bryan (2000) to develop synthetic polymers with the basic aim "to advance basic cell membrane research." These tools called "amphipols" have now found myriads of purposes, including in vaccination where they stabilize biochemically and physically the membrane proteins used as immunogens.

Novel new adhesives
In 2012, Duncan J. Irschick and Alfred Crosby from UMass Amherst, USA, together with Walter Federle, University of Cambridge, UK, were awarded an HFSP Research Grant to investigate which kind of adhesive mechanisms animals, such as geckos, use when climbing smooth surfaces.
This team is now developing new and better adhesives based on the principles learned from this research; for example, small patch-like adhesives that can hold amazing loads and stick to even smooth surfaces.

Treating basal cell carcinoma
In 1993, HFSPO supported a basic science project by Andrew McMahon, Clifford Tabin and Philip Ingham to investigate fundamental mechanisms that regulate the development of the early mid-hindbrain region in vertebrate, studying zebrafish, chick and mouse.
The initial aim of these researchers was to unravel the regulation of gene expression patterns during vertebrate brain development, particularly whether the signaling molecule hedgehog found in the fruit-fly was also important in vertebrates. The unexpected findings of that project have led to a new treatment of the common skin cancer basal cell carcinoma in patients.

Living antibiotics
In 2005, Elizabeth Sockett led an HFSP funded Research Grant team to investigate Bdellovibrio bacteria as tiny predators due to their secretive way of growing inside other bacteria.
The project not only illuminated new ways in how bacteria grow and divide, but also how Bdellovibrio consume prey bacterial contents and act as an anti-pathogen. This work laid the foundation for current studies using Bdellovibrio as a promising strategy for antibacterial therapy in an immunological context.

EXPANDING THE MEMBERSHIP OF HFSPO

Membership of HFSPO is recognition of the excellence of basic life sciences in the member country or union of countries (HFSPO Members). Countries and unions of countries that are currently members include the original G7 countries (Canada, France, Germany, Italy, Japan, UK and USA) together with the European Commission (1989), Switzerland (1990), the Republic of Korea (2004), Australia (2004), New Zealand (2006), India (2006), Norway (2008) and Singapore (2014).
HFSPO has recently welcomed Israel's application for membership.

ACKNOWLEDGMENTS

HFSPO depends on the voluntary financial contributions provided by the 15 HFSPO Members. Further support in kind is provided by HFSPO Members through their Management Supporting Parties and especially by the Japanese government agency AMED which seconds an administrative officer to the Secretariat in Strasbourg.
In 2019-2020, AMED has also seconded a scientific officer.

The 2019 Triennial Conference of HFSPO Members in Tokyo in 2019 will agree the triennial funding to be provided by each HFSPO Member.

HFSPO particularly acknowledges the commitments of the numerous leading scientists from HFSPO Members who provide peer review each year.

Note: An HFSPO Program Activity Plan is published annually and describes how the Strategic Plan will be implemented.

LEGAL STATUS

The International Human Frontier Science Program Organization ("HFSPO") is an Association with international membership, governed by the local law on Associations applicable in the Haut-Rhin, Bas-Rhin and Moselle (Articles 21 to 79 IV of the Local Civil Code [Code Civil Local]), France (https://www.hfsp.org/about/governance/hfspo-statutes).

Annex 4.

Formula calculated contributions

A new formula for calculation of HFSPO Members' triennial commitments was adopted by the Board of Trustees in Toronto, July 2018. This Table shows this formula-calculated amount in USD and the conversion of that amount into local currencies. For the currency conversion, exchange rates of the 3rd April 2019 were used. The Table also shows actual commitments as in Annex 1.

HFSPO Member	1a Target Contribution Toronto formula	1b Target Contribution Toronto formula	Joint Communiqué currency of commitment	2 Joint Communiqué Commitment 2020	3 Joint Communiqué Commitment 2021	3a Joint Communiqué Commitment 2022
	K USD	K LOCAL CURRENCY		K LOCAL CURRENCY	K LOCAL CURRENCY	K LOCAL CURRENCY
Australia	1 200	1 686	AUD	1 686	1 686	1 686
Canada	1 425	1 897	CAD	2 137	2 180	2 223
EC	5 560	4 945	EUR	5 261	5 261	5 261
France	2 207	1 963	EUR	2 463	2 463	2 463
Germany	3 188	2 836	EUR	2 836	2 836	2 836
India	2 108	144 240	INR	144 240	147 125	150 067
Italy	1 703	1 515	EUR	500	500	500
Japan			JPY	2 271 314	2 271 314	2 271 314
Korea, Republic of	1 306	1 481 461	KRW	988 288	988 288	988 288
New-Zealand	172	253	NZD	253	253	253
Norway	349	2 987	NOK			
Singapore	283	383	SGD	776	776	776
Switzerland	612	610	CHF	610	610	610
United Kingdom	2 471	1 877	GBP	1 657	1 690	1 724
United States of America	17 016	17 016	USD	12 000	12 000	12 000

Legend:

Column 1a - the calculated commitment of each HFSPO Member in k USD, using the formula adopted by the Board of Trustees in Toronto, July 2018. Commitments on HFSP Awards are all in USD.

Column 1b - column 1 converted to local currencies on 3-4-19. Note that in some cases, the exchange rates further changed by the time that the HFSPO Member made its formal commitment.

Columns 2, 3 and 4 - HFSPO Member commitments as signed in this Joint Communique (in local currencies, see also note above).

A.2

Summary of decisions of the Board of Trustees in FY 2019

Annual General Meeting (56th Meeting), 11-12 July 2019

1. Approval of the minutes of the 55th Board meeting.
2. Approval of the contents of Annual Report FY 2018-2019 for publication on the HFSP website.
3. Approval of the reports of the HFSPO Directors for FY 2018-2019.
4. Approval of the report of the Statutory Auditors on Annual Accounts FY 2018-2019.
5. Approval of the Secretary-General's Management Report.
6. Approval of the Finance Report (published in the Annual Report above).
7. Approval of the Budget FY 2019-2020.
8. Approval of the Internal Audit Committee report and Secretariat responses.
9. Approval of Risk Register 2019 with one amendment.
10. Request that the Secretariat review the Risk Register regularly internally and document updates for formal review by the Board of Trustees and IAC.
11. Approval of reappointment of Mr. Peter Finnigan to the IAC for a further three year term.
12. Approval of Bylaw K, subject to amendments, except for paragraph 17 which awaits further resolution.
13. Approval of changes to Bylaw Section J Travel and introduce a two year trial of changed guideline arrangements for booking flights for Council and Review Committee members.

14. Approval of Bylaw Section M. Electronic Voting.
15. Approval of the following Regulations
    Regulation 1. Procedure for taking annual leave
    Regulation 2. Procedure for taking sick leave
    Regulation 9. Information technology and data protection
    Regulation 14. Honoraria
    Regulation 15. Conflict of interest
    Regulation 19. Performance appraisal.
16. Decision to develop a full cost analysis of 2 alternatives regarding Secretariat accommodation and seek further legal advice to clarify outstanding issues, with these options being compared to no change.
17. Decision to establish a separate review for the CDF, but with common approaches to the LTF and the CDF, and adjustments to the review criteria and committee composition to account for the differences in CDF applicants disciplinary backgrounds.
18. Decision to change the fellowship application system; to introduce a letter of intent, external mail reviews for full applications and to adjust some aspects of the scoring system.
19. Approval of changes to the wording of current HFSP documentation to harmonise over programs.
20. Decision to rename the 'Young Investigator Grant' the 'Research Grant-Early Career', without modification of the eligibility criteria.
21. Approval of the data retention policy.
22. Approval of the privacy policy.
23. Approval of the HFSPO policy on the responsible conduct of research in principle, subject to revision in accord with discussion and distribution by email of a final amended version for Board approval.

DECISIONS TAKEN OUT OF SESSION BY AN ELECTRONIC VOTE (INDICATING DEADLINE FOR APPROVAL)

- **28 June 2019:** Appointment of Almut Kelber as Director of Research Grants
- **4 July 2019:** Appointment of Prof. Wickliffe Abraham (New Zealand) and Prof. Ildoo Hwang (Republic of Korea) to the Council of Scientists
- **20 September 2019:** Approval of Israel's application to become an HFSPO Member
- **26 November 2019:** Approval of research misconduct policy
  Appointment of Prof. Linda Richards (Australia) to the Council of Scientists
- **6 January 2020:** Amendment of Bylaw Section H. Relating to the Secretariat
  Appointment of Prof. Masahide Kikkawa (Japan) to the Council of Scientists
  Approval of proposals regarding ongoing relationship with Norway after cessation of membership (31 March 2020)
- **13 January 2020:** Amendment of the Statutes to include Israel and remove Norway
- **16 March 2020:** Approval of Jacques Demotes as Vice-President of HFSPO from 1 April 2020

A.3

HFSPO Secretariat

EXECUTIVE OFFICE
- Warwick ANDERSON (Australia), Secretary-General
- Masami WATANABE (Japan), Deputy Secretary-General
- Jill HUSSER (UK), Executive Assistant

SCIENCE, POLICY AND COMMUNICATIONS
- Guntram BAUER (Germany), Director
- Rosalyn HUIE (UK), Communications Officer

RESEARCH GRANTS
- Geoffrey RICHARDS (UK), Director of Research Grants (until April 2020)
- Almut KELBER (Germany), Director of Research Grants (from January 2020)
- Carole ASNAGHI (France), Program Award Officer
- Armelle KOUKOUI (Benin), Program Award Officer

FELLOWSHIPS
- Barbara PAULY (Germany), Director of Fellowships
- Marie-Claude PERDIGUES (France), Program Award Officer
- Carine SCHMITT (France), Program Award Officer

ADMINISTRATION AND FINANCE
- Isabelle HEIDT-COQUARD (France), Director (until June 2019)
- Olaf KELM (Germany), Chief Operations Officer (from March 2020)
- Jennifer SAYOL (France), Head of Finance
- Severine ETCHANCHU (France), Administration and Finance Assistant
- Akira ARAI (Japan), Administrative Officer (until December 2019)
- Shunichi KANDA (Japan), Administrative Officer (from January 2020)

IT SYSTEMS
- Xavier SCHNEIDER (France), Manager

VISITING SCIENTIFIC OFFICER
- Takeya ADACHI (Japan)

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Israel
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Italy
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Research Council of Norway (RCN)

Singapore
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Switzerland
Swiss National Science Foundation (SNF)

United Kingdom of Great Britain and Northern Ireland
UKRI-Biotechnology and Biological Sciences Research Council (UKRI-BBSRC)
UKRI-Medical Research Council (UKRI-MRC)

United States of America
National Institutes of Health (NIH)
National Science Foundation (NSF)

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