

Human Frontier Science Program Organization (HFSP) Review Final Report, March 2, 2007

INTRODUCTION

1). The Operations of the Review Panel.

Following the receipt of a substantial amount of written material, the Review Panel on the HFSP, consisting of Nicole LeDouarin, John Sulston, Ryoji Noyori, and Bruce Alberts (chair), held two meetings. The first meeting was held by phone conference call on November 9, 2006, with Dr. Noyori submitting a lengthy commentary on November 7 as his contribution. For our second meeting on January 12, 2007, all Panel members except Dr. Noyori traveled to Strasbourg for an intensive site visit. During this visit, the Panel met the entire HFSP staff, and we held extensive discussions throughout the morning with the HFSP leadership and senior staff consisting of Torsten Wiesel, Kazuo Shimomura, Martin Reddington, Geoff Richards, Guntram Bauer, and Patrick Vincent. Requests for additional written data were made at this time; all of this material was provided to the Panel in an expeditious manner.

The entire afternoon was devoted to the private deliberations of the Panel. However, individual senior staff members remained available to answer questions and provide additional data, as requested. During this time, the main conclusions of the report were formulated, and a report outline was produced. In the late afternoon, each member working individually on different sections of the report drafted written text. This material was collected at the end of the day for consolidation and editing by the Panel chair. A draft report was then put together in the weeks following the meeting that was sent electronically to the other three Panel members. Through email exchanges, the comments and concerns of panel members were incorporated to produce this final report, which presents the unanimous views of the Panel.

2). The “Review of HFSP’s Initiatives 2000-2005” by NIFU STEP.

The written material provided in advance to the Review Panel included a copy of a commissioned review of HFSP’s 2000-2005 programs that had been prepared by an evaluation team led by Liv Langfeldt from Norway (see www.nifustep.no). Completed in February 2006 and totaling 117 pages, this review is based on an extensive written survey sent to all awardees (response rate of 82 percent), as well as on a variety of other types of inputs. The NIFU review provides a quite exhaustive overview of how HFSP functions. Containing numerous tables that present a careful, detailed analysis of all aspects -- including applications, awards, success rate, age, nationality, and gender -- it provides an overview of the impact of the Program in the scientific community, broken down according to the participation of scientists from different nations.

Our panel is impressed by the professional quality of the NIFU-STEP review, which we find to be thorough, well documented, and clearly written. This prior effort has not only been enormously helpful for our own review; it provides much of the basis for it. We fully support its positive findings and conclusions, as we emphasize in this report.

THE HFSP IS A UNIQUE, VERY SUCCESSFUL PROGRAM

The HFSP has been continuously evolving since its initiation in 1989 through the remarkable and far-sighted initiative of Prime Minister Nakasone of Japan. The various components that comprise its present structure are very effectively presented in two high-quality documents: the 2005 HFSP Annual Report and the NIFU-STEP 2000-2005 Review described previously. Thus, we need not repeat that information here. Instead, we shall focus this report on our evaluation of the changes made since 2000.

But first, the bottom line: the HFSP is a great success, and it enjoys great prestige in the international scientific community. The number of applications that the Program receives each year is very high (719 letters of intent for research grants and 753 for fellowships in 2006). The review procedure, which is carried out carefully and very professionally, is elitist (4.5% success rate for grants, 12% for fellowships in 2006). As a result, those scientists who receive an HFSP award are honored, and the distinction of having received either a grant or a fellowship will accompany them throughout their entire career.

The size of the HFSP is limited by funding constraints (more about this later); in the 2006 award cycle, its \$55 million annual budget supported 32 new Research Grants involving 101 scientists (12 grants in the Young Investigator category), 83 new Long-Term Fellowships, 10 new Cross-Disciplinary Fellowships, and 29 new Career Development Awards. Nevertheless, the HFSP occupies an important, unique niche in the world of science through its mode of supporting the best innovative, international, interdisciplinary research.

Several aspects of the Program particularly impress us. First, there is clear evidence that it has made a major difference to the science performed by those who receive research grants. For example, recent data from the Secretariat shows that more than 90 percent of the awards made in 1998-2001 resulted in publications co-authored by grant team members who had not published together previously (average of two such publications per grant). We also note the young average age of the funded investigators: 36 years for the Young Investigator awards and 46 years for the regular Research Grant program. Finally, the NIFU-STEP report finds that 38 percent of the Young Investigators funded would not have carried out any of the research without their grant; it also reports that nearly 90 percent of all projects funded in 2005 involved more than one discipline (compared to only 30 percent in 2000).

EVALUATION OF THE NEW PROGRAM COMPONENTS

The Panel is very favorably impressed by the changes introduced since 2000 by the Secretary General, Torsten Wiesel:

A first change is the merging of the previously separate **molecular biology** and **neuroscience** competitions for funding into a single one, **complex mechanisms of living organisms**. We find this to be particularly appropriate in the post genomic era, where biology is being studied at a more integrative level than previously.

A second change is the strong encouragement that is being given to interdisciplinary research in all grant programs. This now provides the innovative focus for the whole program, being also supported by the establishment of the new Cross-Disciplinary Fellowship competition for young scientists.

A third change is the introduction of the special category of Young Investigator Grant, which encourages cross-national collaborations between younger scientists. This competition is particularly appropriate for targeting the frontiers of science, and we were told that the most innovative proposals now tend to come from this group.

A fourth change is the extension of fellowships from 2 to 3 years, with the possibility of a deferral after the first two years. This makes it possible for awardees to use the funds for the third fellowship year to return later to their home country. This has been part of a very important initiative aimed at encouraging many more of the fellows to return to their home nation to pursue their scientific careers following their training. This feature was introduced after it was found that most fellows had failed to repatriate in the previous program, contributing to a brain drain from their home nation.

A fifth change has the same purpose: the introduction of a competitive Career Development Award (CDA) program that supports the fellows as independent researchers after they have returned to establish their own laboratories in their country of origin.

A sixth change is the instigation of the annual Awardees Meetings. Organized for the first time in 2001, they have promoted active exchanges between young scientists who find there a unique opportunity to meet, exchange ideas and envisage new collaborations. As pointed out in the NIFU-STEP review, one or more of these meetings have been attended by 85% of the fellows and Young Investigators. Each year, some 200 fellowship and grant awardees attend from an invitation list of approximately 800, which is a good response in view of the many demands on the time of these scientists. We were particularly impressed by the enthusiasm shown by younger investigators in the survey conducted by NIFU-STEP, which in some cases has led to the initiation of new collaborations. In light of the latter point, one might consider invitations being extended to pre-awardees in a way that encourages new applications for grants. If the logistics of such a move were practicable, it could provide a powerful way of developing novel cross-disciplinary collaborations.

The final and newest change is the recent launching of the HFSP Journal. This is a courageous endeavor that has been carefully prepared by experienced professionals. Hopefully, it will provide a forum for the HFSP awardees who, because they have been selected through a very elitist procedure, often publish high profile papers. The organizers point out that these awardees have found their cross-disciplinary research difficult to publish in the past, and they feel that the Journal is therefore entering a relatively unpopulated field. However, we foresee inevitable adjustments by existing journals to fill the gap. Thus, we are not wholly sanguine about the Journal's prospects in a world that is overrun with primary journals, and we predict that it will need to compete aggressively to survive. The greatest potential strength of the HFSP Journal comes from the quality of work done by the HFSP awardees; thus, if many of

them are willing to publish their research in it, the Journal's impact factor will soon be high. Inasmuch as these people are also important opinion formers, we think it important that HFSP alumni be given concessions (immediate free online access for their articles is one suggestion), so as to make the Journal appealing and highly visible in their workplaces.

QUALITY OF THE HFSP ORGANIZATION AS JUDGED FROM SITE VISIT

The visit to Strasbourg provided an extensive opportunity for back and forth discussions between the members of the Review Panel and the senior HFSP staff. Each of us had previously known Torsten Wiesel from other contacts and had greatly admired his leadership in several previous roles. However, none of us had had any previous contact with the HFSP staff or its operations. The Panel members present in Strasbourg were extremely impressed by both the people and the organization. Through a great deal of back and forth questioning, we came to appreciate the spirit of openness and the competence of the staff, as well as its scientific expertise, energy, and quality. The fact that the directors of every division, including the Administration and Finance division, all have strong scientific backgrounds is remarkable and adds to the efficiency and management of the Program. And we could sense that the entire staff works as a team strongly committed to the success of their joint effort.

The HFSP staff has continually made adjustments to fine-tune their programs, and we were pleased to learn from our questioning of the many wise judgments that the staff makes each year in order to optimize their programs. For example, we learned that the funds allocated to particular parts of the different programs are adjusted to take advantage of opportunities. Thus, if there is a particularly outstanding group of applicants for the Cross-Disciplinary Fellowships in a given year, money is shifted in that direction from the Long-Term Fellowships so that the most promising young scientists are funded. We also learned that feedback from the reviews is now being provided to those young scientists who fail in the competition for a Career Development Award, as well as to applicants who fail to be awarded a Young Investigator or Program Grant after review of the invited, full applications. We agree with the staff that the extra work required to provide this information is justified by its value in helping to guide young scientists.

POSSIBLE NEW INITIATIVES

- 1). Some of the information that we received suggested that the availability of relatively small amounts of funds for travel, meetings and accommodation could keep collaborations going that otherwise end when a research grant terminates. The Program might wish to test the possibility that the availability of such funds to former grantees on a competitive basis could provide a useful supplement to current programs.
- 2). The Program may wish to consider the possibility of one-time renewals for a few particularly innovative and productive Young Investigator Grants, inasmuch as these have been cited as some of the most interesting, and young investigators may have unusual difficulties in finding alternative ways of continuing this research.

3). A more intensive effort might be made, perhaps in collaboration with other scientific organizations, to recruit and prepare the most outstanding young scientists from around the world to succeed as applicants for the Young Investigator Grants. A special effort might be directed in this regard to outstanding young female scientists, so as to help improve their success rates in the Young Investigator Grant program (see Table 6.3 on p. 48 of the NIFU-STEP review for data).

4). The vast majority of the funds available for international research collaborations support large complex programs with a huge barrier for entry. There is a real need for “HFSP-like” programs to develop young talent and support high-quality research on critical “sustainability science” issues, such as water, environment, and natural resource conservation. This work is inherently interdisciplinary, involving both the natural and social sciences, and it is also largely place-based and requiring international collaboration. The mechanisms developed by HFSP through funding experiments over the course of the past 15 years could very profitably be used to start new programs with such a different focus. If substantial new funds were provided by the MSPs, this might be accomplished with only a modest growth in the Strasbourg staff.

THE MSPS SHOULD CONSIDER INCREASING THEIR FINANCIAL CONTRIBUTIONS TO THE ORIGINAL HFSP PROGRAM

We feel that the HFSP should provide a model program for funding agencies. First of all, it gives all scientists the opportunity to increase the power of their science with new approaches and tools. This is especially true for Europe and Asia, where the resources available are currently more limited than in the United States. For the US, the Program is also very beneficial. Note especially that more than 50% of the highly selected, very talented fellows go to US laboratories and that they often stay in the US to pursue their careers. Furthermore, for the future of science, it is essential that young scientists, especially those in training, have an international outlook with exposure to the highest possible international standards in science. This is an important problem for the scientific community in every nation, and HFSP is a catalyst for strongly encouraging such exposures.

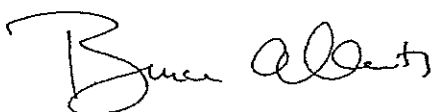
Secondly, inasmuch as quality is the only criterion used in the selection of HFSP awardees, the open tracking of its funding patterns provides important comparative information to the MSP nations that can be used to improve their policies for science support. Remarkable differences also are found in the behavior of the young scientists from different nations that are important for policymakers to note. For example, the near absence of applications from Japan for the Cross-Disciplinary Fellowships suggests that unusually high barriers separate the disciplines in Japan, which may reduce Japan’s future scientific success if they persist. Likewise, an examination of the applications for Career Development Awards calls dramatic attention to the fact that the best young scientists in France and Japan are very often returning to the same laboratories from which they received their PhD degrees. Most innovation in science comes from a cross-fertilization of different ideas and approaches. For this reason, other nations promote the careers of young scientists by encouraging them to establish completely independent laboratories in environments different from where they were

trained. Through the dissemination of such facts, HFSP can help to continuously improve world science policies, thereby increasing the effectiveness and influence of science and scientists around the globe.

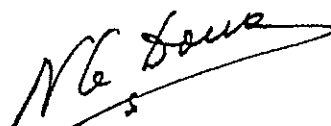
Last but not least, the collaborations made possible by the HFSP have been creating strong bonds of friendship and trust between many of the best scientists in every nation. In a world full of irrationality and despair, the tolerance, rationality and optimism of science badly need to be much more strongly disseminated throughout every nation in the world. By banding together across national boundaries, scientists can greatly increase both their usefulness and their influence with governments. The HFSP can thus be viewed as a major contributor toward future world harmony. From this perspective, the investments today made by governments in this Program are miniscule compared to the potential benefits it can bring.

Tables 1-3 in the Appendix display the funding that has been provided by the MSPs 2005-2007 in support of the HFSP. Also shown are the targets for each nation, as agreed to in Berne in 2004. We note that the discrepancy between the actual level of support and these targets has been increasing for the two nations that are currently not meeting their targets: the United States and Italy. In view of the uniqueness and value of the HFSP reflected here and the much longer NIFU STEP report, we strongly urge all nations to seriously consider increasing their financial commitment to HFSP in future years.

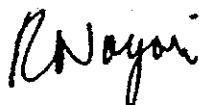
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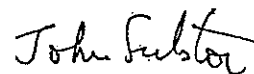
Bruce Alberts



Nicole Le Douarin



Ryoji Noyori



John Sulston

Appendix

Table 1: Contributions from HFSP MSPs vs objectives set at the Berne IGC for the period FY2005-FY2007 (detailed)

	FY2005			FY2006*			FY2007**		
	IGC Guideline or MoU in kUSD	Achievement Guideline or MoU in kUSD	% guideline FY2005	IGC Guideline or MoU in kUSD	Achievement Guideline or MoU in kUSD	% guideline FY2006	IGC Guideline or MoU in kUSD	Achievement Guideline or MoU in kUSD	% guideline FY2007
Berne IGC MSP									
CANADA	874	874	100%	955	955	100%	1,043	1,043	100%
EU-MSP	3,278	3,277	100%	3,581	3,580	100%	3,013	3,013	100%
FRANCE	2,240	2,197	98%	2,447	2,425	99%	2,674	2,628	98%
GERMANY	3,498	3,498	100%	3,820	3,820	100%	4,174	4,174	100%
ITALY	1,694	875	52%	1,850	875	47%	2,022	875	43%
JAPAN	30,000	30,000	100%	30,000	30,000	100%	30,000	30,000	100%
SWITZERLAND	492	492	100%	537	537	100%	587	587	100%
UK	1,839	1,839	100%	1,791	1,791	100%	1,958	1,958	100%
USA	11,418	9,000	79%	12,475	9,000	72%	13,630	9,000	70%
TOTAL	55,131	51,851	94%	57,456	52,983	92%	60,000	54,174	90%
New MSPs									
AUSTRALIA	486	486	100%	485	485	100%	504	504	100%
INDIA	-	-	-	-	-	-	780	780	100%
KOREA	548	548	100%	588	588	100%	591	591	100%
NEW EU10	609	609	100%	633	633	100%	659	659	100%
NEW ZEALAND	-	-	-	95	95	100%	99	99	100%
TOTAL	1,821	1,621	100%	1,781	1,781	100%	2,833	2,833	100%

* Based on statements from Board members at 38th Board meeting Dec. 2006

** Based on statements from Board members at 38th Board meeting Dec. 2006 to be confirmed at the 39th Board meeting in March 2007

Table 2: Contributions from HFSP MSPs vs objectives set at the Berne IGC for the period FY2005-FY2007 (overview)

	FY2005			FY2006*			FY2007**		
	IGC Guideline or MoU in kUSD	Achieved (Paid)	difference	IGC Guideline or MoU in kUSD	Achieved (paid or confirmed)	difference	IGC Guideline or MoU in kUSD	Achieved (assumed)	difference
BERNE MSPs									
TOTAL	55,131			57,456			60,000		
Other than Japan	25,131	21,851	-3,280	27,456	22,983	-4,473	30,000	24,174	-5,825
% Japan (@ 30 mio USD)	83.8%	72.8%		91.5%	76.6%		100.0%	80.6%	
All MSPs									
TOTAL	56,752			59,237			62,633		
Other than Japan	26,752	23,472	-3,280	29,237	24,763	-4,474	32,633	26,807	-5,825
% Japan (@ 30 mio USD)	89.2%	78.2%		97.5%	82.5%		108.8%	89.4%	

* Based on statements from Board members at 38th Board meeting Dec. 2006

** Based on statements from Board members at 38th Board meeting Dec. 2006 to be confirmed at the 39th Board meeting in March 2007

Table 3: HFSP funding capacity vs Berne IGC target for the period FY2005-FY2007 (overview) and opportunity cost of the difference, in number of awards.

TOTAL FY2005-FY2007 in mio USD	Target	Anticipated contribution	Difference(1)
ALL MSPs	178,622	165,042	-13,579 92%

(1) 13.6 mio USD would have enabled to fund: 12 more Research Grants
or 91 more Long Term Fellowships
or 45 more Career Development Awards