

# PFS Principles of Operation

version 2

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# 1 Preface

The Prime Focus Spectrograph (PFS) is a wide-field multi-object spectrograph being constructed for operation on the Subaru 8.2 meter telescope, operated by the National Astronomical Observatory of Japan (NAOJ). The PFS collaboration is responsible for the instrument construction and for development of a major survey (300 or more nights) to be carried out with the instrument on the Subaru Telescope, under the Subaru Strategic Program (SSP). PFS will be a Subaru facility instrument, operated by Subaru/NAOJ, and the PFS collaboration will work closely with Subaru in carrying out the survey.

The current document describes a set of policies governing data and publication rights for the collaboration.

These policies take their inspiration largely from the successful policies of the Sloan Digital Sky Survey, as well as the policies of the Hyper Suprime-Cam (HSC) survey collaboration. The HSC survey is a precursor to the PFS, and the two together are referred to as SuMIRe (“Subaru Measurements of Images and Redshifts”).

The PFS project includes both the construction effort and the scientific collaboration designing, carrying out, and doing science with the PFS survey data. This document emphasizes the latter, but must make reference to the former as well.

## 2 PFS organization; definitions

We here define bodies responsible for various aspects of the construction of the PFS and the management of the survey to be carried out by it.

- The PFS collaboration consists of scientists from the PFS member institutions, as defined further below. The current list of member institutions is given in Appendix A.
- The PFS Project Office is based at the Kavli Institute for the Physics and Mathematics of the Universe (Kavli IPMU), the University of Tokyo, and is responsible for system/project-level project management and systems engineering, system integration and instrument commissioning, and the direct interface with the Subaru Telescope. It coordinates the efforts of the team instrument builders and oversees the instrument development for delivery to the Subaru Telescope.
- The PFS Steering Committee (SC) sets policy and direction for the collaboration, as described in § 7.
- Scientific and technical working groups (see the list in Appendix B) are responsible for specific scientific and technical aspects of the project.

## 3 Project Membership and Data Access

Those scientists with full PFS data rights are termed “Survey Participants” in what follows. They fall into three classes, as described here. No Survey Participant may distribute proprietary data to scientists without data rights without explicit permission from the Steering Committee.

### 3.1 Survey Participants

Survey Participants include faculty and long-term research staff who receive  $\geq 50\%$  of their salary from the PFS member institutions, or are named individuals at PFS associate member institutions or participation groups, as listed in Appendix A, and who register as Participants in the survey, indicating their intention to participate and their willingness to follow its organization and rules<sup>1</sup>. In addition, the rules of the SSP also give data access to all scientists employed at academic institutions in Japan and all employees of Subaru Observatory, as well as all holders of a Japanese passport no matter where they are employed, allowing them to register as participants of the survey as well.

Scientists who leave member institutions do not automatically keep their data rights, unless they are named Builders or External Participants. External Collaborators, Continuing Collaborators, and Continuing Participants have more narrowly defined rights, as described below.

Each Survey Participant may grant data rights to up to four junior scientists (any mix of postdocs and graduate or undergraduate students) working with them at a given time. Data access for additional students or postdocs may be requested through the external collaborator mechanism described below.

### 3.2 Builders

Builders are registered specific individuals as approved by the Steering Committee following nomination by one of the Member Institutions. The Steering Committee will be guided by the principle that a Builder has made one or more major and fundamental contributions to the Survey, normally of order two full years of effort during the construction and/or commissioning phases, such as crucial contributions to instrument construction, data pipeline development, developing the survey design or science case, fundraising, or other crucial components of the project. A proposal that a given individual be named a Builder or an External Participant (see below) may come from any Survey Participant, or from the candidate him- or herself.

A Builder who leaves a PFS member institution may retain his or her data rights (i.e., continues being a Survey Participant), upon formal request to the Steering Committee. Like a Survey Participant at a member institution, a Builder may name up to four junior

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<sup>1</sup>The mechanism for registering as Participants is not yet in place, but will presumably involve an on-line form; the Project Office would keep a formal list of all Participants who so register.

scientists from their institution to work with them on PFS data. A Builder has the right to add their name to any collaboration paper, as described in § 5.1.

### **3.3 External Participants**

External Participants are registered specific individuals as approved by the Steering Committee (following the recommendation by the Data Rights Subcommittee) who are nominated by one of the Member Institutions. An External Participant will have made a contribution equivalent to of order one year of effort on survey infrastructure (i.e., considerably less than the Builder status described above); such an individual will typically request External Participant status when they anticipate leaving a member institution for another job. An External Participant retains his or her data rights. However, unlike a Builder, an External Participant cannot confer data rights to his or her postdocs or students, but may request External Collaborator status (§ 3.4) for junior scientists working under them. An External Participant does not have the automatic right to add their name to any collaboration paper.

### **3.4 External Collaborators**

External Collaborators are registered specific individuals (of any academic rank or position) so approved by the Steering Committee upon nomination by a Member Institution, Builder or Survey Participant. Designation of an External Collaborator must be justified by the collaboration's/Survey's need for the individual's participation in order to effectively carry out one or more specific scientific investigations based on the Survey data. A Survey Participant requests External Collaborator status for their colleagues via an e-mail distributed to the full collaboration, explaining the need to bring in these individuals. Any Survey Participant may raise objections to an external collaborator request if they feel it is inappropriate or gives unfair internal scientific competition. Approved External Collaborators have the right to access the data only to work on the project for which they have been approved. That is, External Collaborators do not have all the rights of a Survey Participant.

Larger-scale collaborations between surveys which have the potential to lead to a significant number of publications will be handled in a case-by-case basis by a Memorandum of Understanding (MOU).

### **3.5 Continuing Collaborators**

A scientist who starts a scientific project at a member institution using PFS data may request Continuing Collaborator status if they move to another, non-PFS institution, allowing him or her to finish the work. Like External Collaborator status, Continuing Collaborators have the right to access the data only to work on the project for which they have been approved.

### 3.6 Continuing Participants

Scientists who make a contribution equivalent to or more than 0.25 year effort (cumulative contribution of three months) to PFS survey infrastructure, defined as contributions to instrument construction, data pipeline development, developing the survey design or science case for any piece of the PFS survey, fundraising, or other key components of the PFS project, may request Continuing Participant status to give them access to the data to work on a specific science project with PFS data, where the scientific project should be narrowly focussed. A single project may result in multiple papers as the survey progresses. Scientific projects are expected to be done in collaboration with other members of the PFS team.

This category is designed for scientists who contribute to infrastructure while at a PFS institution but before the PFS data are available, but then leave to a non-PFS institution. Continuing Participant requests, including both contributions to the project, and planned scientific investigations, are first made to the chair of the relevant Working Group to which the individual would contribute. If the chair, in consultation with the Working Group as a whole finds that the proposed contribution would be valuable and the proposed science projects would enhance the Working Groups activities, the chair, together with the individual interested in pursuing this option, should prepare a Statement of Work, describing the work they plan to carry out, the timeline of the work, and the scientific project they will do with the data. The chair announces the request to the general mailing list to share the information with the full PFS collaboration, and at the same time passes the request onto the PFS Project Manager and the PFS Steering Committee. The Steering Committee, based on a recommendation from the Data Rights Subcommittee, will determine whether the scientific project to be carried out is self-contained, of the scale of a single project announcement and whether the infrastructure work the individual promises to carry out is needed by the project. Access to the data to carry out the proposed science will be granted only after it is determined that the proposed contribution to the project has been completed successfully.

A Continuing Participant cannot confer data rights to his or her postdocs or students, but may request External Collaborator status for junior scientists working under them. A Continuing Participant does not have the automatic right to add their name to any collaboration paper.

An individual granted Continuing Participant status will have data access rights for the life of the survey, but only to work on the specific project described in their Statement of Work. They will be required to post a Project Announcement to the collaboration (Section 4.1), and are subject to the publication policy (Section 5), like all those with data rights.

## 4 Science Policies

The PFS collaboration adopts an open science policy, in which no science areas are “assigned” a priori to any given group of individuals, and in which all scientists are free to work and collaborate on any given project. However, scientists are required to announce each

project to the entire collaboration, and are encouraged to collaborate with one another. This policy will lead to the maximum amount of scientific output by the collaboration with a minimum amount of controversy. In this spirit, we list the following guidelines:

## 4.1 Announcement of Projects

When a Survey Participant or group of Participants *begins* a specific scientific investigation using survey data, they should post an announcement of their project through the PFS website, detailing:

- Who is involved
- The scope of the project
- The relevant timescale
- Anticipated papers to be written

The more focused and specific the announcement, the better (thus, for example, an announcement stating simply that you plan to work on baryon oscillations would not be specific enough). Others in the collaboration who are actively interested in participating and contributing to the project may request to collaborate on this specific analysis. While there is no formal requirement that all such requests be granted, all Survey Participants are urged to foster a spirit of collaboration and cooperation in such matters.

The fact that one group has announced a project to do a specific analysis does not preclude another group working on similar things. Indeed, separate groups working on overlapping projects may provide valuable cross-checks of some of the analyses.

The Scientific Working Groups will coordinate projects in their area, and will be an additional mechanism by which collaboration will be encouraged.

## 4.2 Student Theses

Graduate student theses are an exception to the rule stated in § 4.1 that two separate groups may work on a specific project. A sufficiently focused PhD thesis project should not have to face competition from other researchers in the PFS collaboration. Thus people should offer to collaborate with students who announce graduate thesis projects, but should not compete directly with them. This requires that the student thesis announcement be quite specific, so as not to prevent others from working in the same general area. Thus a thesis project to study “Milky Way structure in PFS”, for instance, would not be appropriate. Moreover, graduate students and their advisers should be particularly open to accepting collaborators on their project.

### 4.3 Science Projects and the Roles of the Working Groups

The Science Working Groups have the responsibility to encourage scientific analyses and the publication of results in their field, and to foster communication about the progress of the Group’s projects. They are encouraged to define “Key Projects”, which represent the core scientific analyses that the surveys have been designed to carry out.

To keep the collaboration as a whole informed about progress, the mailing lists and wikis should be used throughout as the analysis in any given project proceeds.

The project announcements and communications on the mailing lists and wikis are confidential documents, not to be shared with those who are not Survey Participants.

## 5 Publication Policies

This section describes rules associated with publications of papers based on proprietary data from the PFS. The spirit of these rules is to make sure that those whose hard work made the instrument and surveys possible are appropriately recognized, and to allow the collaboration to check results scientifically before they become public.

### 5.1 Authorship

The author list of the paper will be in two tiers. Those people who contributed directly to the specific scientific analysis of the paper will be in the first tier, ordered as they deem appropriate. All Survey Builders have the right to be a co-author on any such paper, by e-mail request to the first author, once they have read the paper (see below). Similarly, all Survey Participants, External Participants, and Continuing Participants have the right to *request* co-authorship if they believe they have contributed to the paper in some direct way; their e-mail request should explain their contribution to the project. All such people who request co-authorship after the paper is posted shall be listed in alphabetical order in the second tier. Any disagreements about authorship will be adjudicated by the SC.

- No person shall be a co-author on any paper without their explicit knowledge and agreement.
- No person (even a Builder) shall be a co-author on any paper until they have read the paper, and confirmed that they agree with the conclusions of the paper. That is, all co-authors accept explicit scientific responsibility for the paper.

### 5.2 Technical Papers

Scientists in the PFS project will write papers describing the technical aspects of the project: the design of the spectrographs, fiber systems, and camera, the software pipelines, descriptions of the data and their public release, and so on. Papers based on the PFS survey data should cite these technical papers.



### 5.3 Internal Review

When a paper using PFS data is completed, it should be posted to the broader collaboration for review. The collaboration as a whole has the opportunity to read the paper and offer suggestions and changes to improve it. This is also an opportunity for those not on the writing team to request co-authorship (see above). It is left to the discretion of the first-tier authors whether to incorporate all the comments from the rest of the collaboration.

The principal authors of the paper are free to submit it for publication at the end of a three-week period. This period should be extended if, for example, the comments from the collaboration require significant revisions to be made. During the collaboration review, before the paper is submitted, it should be considered a confidential document, not to be shared with those who are not Survey Participants. Thus it may not be posted to <http://www.arxiv.org> (i.e., “astro-ph”) until the time of submission after the collaboration review is completed.

The first author of the paper is responsible for keeping all co-authors informed about the status of the paper, including modifications made based on comments from the collaboration as a whole, posting to astro-ph, and the receipt of, and response to, referee reports.

This three-week review is in place to allow the collaboration as a whole to review and check scientific conclusions based on PFS survey data. In this spirit, it is important that any new results to be presented at conferences and colloquia similarly be reviewed by the collaboration. Thus all Survey Participants are required to post public talks or abstracts to the collaboration, if they include results based on PFS data that have not previously been published. It is impractical to require a full three-week vetting period in all cases, but there should be opportunity for the collaboration to comment to any new results in time that suggestions might be incorporated into a public presentation.

## 6 Institutional Membership

Membership in the PFS collaboration is open to individual institutions. Collaborative arrangements among institutions will be considered on a case-by-case basis if there are compelling and mutually beneficial reasons to do so. Membership proposals from an institution will be judged and decided upon by the Steering Committee, upon consultation from the collaboration as a whole.

Full membership for an institution consisting of up to 11 faculty and/or research staff likely to actively use PFS will require a contribution of an amount commensurate with the current value of contributions of the current members.

To accommodate institutions that cannot commit to a Full membership, Associate Institutional Membership allows a specified number of faculty and/or research staff to register as Survey Participants, where the fee-per-Participant is set to one-fifth of the fee of a Full membership. These Participants are to be named individually. Participation rights can be moved from one researcher to another at the Associate institution with the consent of the Steering Committee.

The project will also consider membership from “Participation Groups” (PGs). A PG is a collection of active faculty and/or research staff distributed across three or more separate institutions from the same country, who would have the right to register as Survey Participants, with all the rights described in § 3.1. The buy-in cost per individual is equal to 1/11 the cost of a full institution to join. A PG may consist of more than 11 PI’s.

The PG will receive one vote on the Steering Committee. Each PG should arrange for a central office that is responsible for signing the Memorandum of Understanding, that will appoint the representative to the Steering Committee, that will handle the cash payments, that will ensure that the collaboration rules outlined in this document are followed, and that will provide a point of contact in all other matters concerning the PFS collaboration.

Survey Participants may give data access to their students and postdocs in the numbers described in § 3.1.

A list of all Participants and other personnel authorized to access the PFS Data Archives at a given time will be maintained by the Steering Committee and posted on the internal PFS website. All Participants must read and abide by the PFS Principles of Operation, and are responsible for protecting the scientific integrity of PFS and the data rights of other Participants.

Full details of membership in the project for each new institutional partner will be described in an addendum to the existing MOU establishing the PFS collaboration.

The Subaru Observatory bears responsibility for the costs of PFS commissioning and telescope operations; the Institutional Members will not be asked to bear costs for operations beyond their initial contribution to join the collaboration.

## 7 Responsibilities and Membership of the Steering Committee

The Steering Committee has the following responsibilities:

- Fund-raising for the instrument and pipeline software construction, as well as additional expenses associated with the survey;
- Overseeing the development of the PFS SSP science case;
- Technical oversight of the construction project, in coordination with the Project Office;
- Development of collaboration policy, with input from the collaboration as a whole. This includes development and modification of this document, as described in § 12;
- Overseeing the survey plan and its execution, in coordination with NAOJ.

The Steering Committee includes one representative from each full member institution, selected by scientists at that institutions. A representative of the Subaru Users community

from Japan also has one seat on the Steering Committee. Associate member institutions will jointly elect a representative to the Steering Committee. Participation Groups consisting of five or more faculty and/or research staff will also name a representative to the Steering Committee.

The Steering Committee may identify additional individuals to join their discussions at any time, but these individuals would not have a formal vote. The Steering Committee will internally elect their own chair. They will select a Survey Director, a Survey Spokesperson, a Survey Chief Scientist, a Survey Project Manager, an Ombudsperson, and any other senior managers it deems appropriate, and may define additional committees to support various aspects of the survey.

## **8 Access to HSC data**

PFS targets will be selected in part from the catalogs of the HSC imaging survey. These data are proprietary (involving a subset of the PFS member institutions). Appendix C includes a letter from the Executive Board of the HSC giving PFS scientists who do not have HSC data rights access to the HSC catalogs for the express and sole purpose of developing PFS target algorithms, survey design, or flux calibration. Unless explicitly allowed by the HSC collaboration, no science papers may be written using these proprietary data. The use of public HSC data are not subject to this restriction.

## **9 Scientific Ethics and Integrity**

The PFS collaboration fully endorses the principles of professional conduct articulated in Article X of the Bylaws of the American Astronomical Society and expects all those associated with the project to follow those precepts. Specifically, PFS communications (meetings, phone conferences, e-mail exchanges) are intended to “provide an environment that encourages the free expression and exchange of scientific ideas.” It is the responsibility of participants in the PFS Collaboration to ensure that such discourse is “conducted in a professional atmosphere in which all participants are treated with courtesy and respect.”

## **10 The PFS Collaboration Post-SSP**

Although the formal commitment of the partners will end at the completion of the survey science, Subaru/NAOJ recognize the significant funds the partners bring to enable the construction of PFS and the longer term scientific utility of the instrument, particularly in the era of EELT, TMT and LSST. The PFS Principal Investigator will work with the NAOJ and Subaru management, the Subaru Advisory Committee (SAC) and the Subaru user’s community to enable access of the PFS collaboration members beyond the planned Subaru Strategic Program.

## **11 Public Release of PFS Data**

The PFS collaboration plans to make the fully reduced dataset (one-dimensional calibrated spectra, and inferred redshifts, classification, and object properties, as well as all relevant metadata) public in a searchable database after a suitable proprietary period, assuming that funds are identified to do so.

## **12 Modification of these Policies**

These draft policies have been developed by the PFS Steering Committee, and will be distributed to the PFS collaboration for comment and feedback. The Steering Committee has the authority to modify these policies, to be decided by a 2/3 vote of the SC membership, after distributing the proposed changes to the full collaboration for comment.

## A Member Institutions and the Membership of the PFS Steering Committee

*Hitoshi Murayama* is Chair of the Steering Committee and Principal Investigator of PFS. Below please find the institutional members, and the corresponding steering committee members in *italics*.

- Kavli Institute for the Physics and Mathematics of the Universe (IPMU), University of Tokyo, Japan; *Masahiro Takada*
- National Astronomical Observatory of Japan (NAOJ); *Michitoshi Yoshida*
- Academia Sinica Institute of Astronomy and Astrophysics (ASIAA), Taipei, Taiwan; *You-Hua Chu*
- California Institute of Technology; *Judy Cohen*  
Jet Propulsion Laboratory, USA; *Mike Seiffert* (Cohen and Seiffert share a single vote)
- Princeton University, USA; *Michael Strauss*
- The Johns Hopkins University, USA; *Tim Heckman*
- Laboratoire d'Astrophysique de Marseille (LAM), France; *Olivier Le Fèvre*
- Brazilian PFS Participation Consortium; *Laerte Sodré*
- Max-Planck Institut für Astrophysik (MPA)/Max-Planck Institut für Extraterrestrische Physik (MPE), Germany; *Eiichiro Komatsu*
- Chinese PFS Participation Consortium; *Yipeng Jing*
- North-East Participation Group, USA; *Danilo Marchesini*

In addition, *Richard Ellis* (University College London) is a non-voting member of the steering committee, and the chair of the Subaru Advisory Committee, is a full member of the steering committee, representing the Subaru users' community.

## B PFS Working Groups and their Chairs

*Richard Ellis* and *Masahiro Takada* lead the science collaborations and coordinate their activities.

- Cosmology *Eiichiro Komatsu and Masahiro Takada*
- Galactic Archaeology *Masashi Chiba, Judy Cohen and Rosie Wyse*

- Galaxy Evolution *Jenny Greene, John Silverman, and Masami Ouchi*

Additional working groups will be defined if needed.

## C A Letter of Support of PFS from the HSC Collaboration

This letter was sent to Hitoshi Murayama as PFS Principal Investigator, on March 16, 2012.

To PFS Collaboration

The Subaru telescope boasts the widest field of view among the 8m telescopes around the world, and is particularly suited for large-scale survey projects. The Hyper Suprime-Cam (HSC) collaboration, which comprises of Japanese community, Princeton University, and Taiwanese community, has been investing in this direction by building a large CCD camera, wide-field corrector lens system, and strengthening the structure of telescope. The HSC camera is scheduled to have its first light this May, and the collaboration is putting together a proposal to the Subaru Strategic Proposal, anticipated to start the 300-night survey later this year or early next year for a five-year program.

We are delighted to learn that the Prime Focus Spectrograph (PFS) collaboration has been making an enormous progress in putting together the collaboration and the Conceptual Design Report, scheduled for a review later this month. PFS instrument is designed to maximize the scientific output of the HSC survey data by following up targets spectroscopically. In fact, the combination of large scale survey with both imaging and spectroscopy is unique in the world leading to many scientific objectives.

In order to exploit this great opportunity, we realize that some of the PFS collaborators outside the HSC collaboration need to access the HSC survey data. Even though the investment made by the HSC collaborators needs to be protected, it is natural that we grant limited access to the PFS collaborators so that we can work together effectively.

As the Executive Board, we decided to grant the PFS collaborators access to the HSC survey data for the following purposes

- (1) Survey design of PFS observation
- (2) Target selection
- (3) Flux calibration of observed data

To meet the goal, HSC project will provides PFS collaborators with the following items from the source catalogs:

- (1) Coordinate
- (2) Magnitudes (g r i z Y)
- (3) Size
- (4) Star/Galaxy flag

The detail of the catalog items, their definition and the magnitude limit will be discussed

separately.

(5) Images (pixels) for the PFS targets

However, we have to be clear that none of the PFS collaborators outside the HSC collaboration should publish scientific papers based on the provided HSC data alone. Writing proposals for telescope time based on the provided data is also prohibited. The usage of the data is only allowed when combined with PFS data.

There are other avenues for scientists outside the HSC collaboration to use the data as an “external collaborator” if the Executive Board approves. Those who are interested in the scientific objectives written in our SSP proposal should contact us for the appropriate coordination.

We believe the combination of this general policy as well as the possibility of “external collaborators” will make the work by our colleagues in the PFS collaboration smooth and efficient, so that we can exploit this great opportunity together.

This note is valid only until the PFS survey actually starts and the new framework of the collaboration between HSC and PFS will be discussed separately.

Satoshi Miyazaki, PI

HSC Executive Board:

Hiroaki Aihara

Nobuo Arimoto

Paul Ho

Hitoshi Murayama

David Spergel

Yasushi Suto

Edwin Turner