

iPlant Grand Challenge Workshop Proposals

Overview of the nature and role of the iPlant Collaborative

To understand how biological systems function, one must uncover the higher order principles by which such systems self-organize, function, and evolve. Vast quantities of data now exist from which to discover such principles, but the datasets tend to be large, unwieldy and disordered. Scientists working at all levels of biological complexity need to be increasingly adept at mathematical and computational analysis in order to even handle these data. To truly understand biological systems requires the detection and mathematical description of reproducible patterns within and across the datasets. In all but a few cases, many barriers prevent this from being possible. In addition to many practical barriers such as heterogeneous and incomplete data sources, there is a generally low adoption of computational thinking, and collaborations between computational scientists and biologists are limited because too often their goals are not aligned.

To address these challenges the iPlant Collaborative has been designed as a new community of plant biologists, computer scientists, mathematicians and engineers organized around a core cyberinfrastructure. The iPlant Collaborative seeks to empower these groups to integrate their research and collaboratively address major questions (Grand Challenges) in biology, simultaneously advancing both the biological sciences and the computer and information sciences. By leveraging this integrated research cyberinfrastructure, the iPlant Collaborative also seeks to train the next generation of plant and computer scientists with innovative programs for teachers, K-12 students, and undergraduates.

Grand Challenge teams are an organizing principle of the iPlant Collaborative. These are cross-disciplinary, community-driven research groups that work cooperatively with iPlant Collaborative staff to design and develop 'Discovery Environments', software platforms custom-designed to help the team address a Grand Challenge question. Discovery Environments will typically take the form of applications that facilitate the integration of diverse types of data and tools. Discovery Environments will be integrated into the growing infrastructure of the iPlant Collaborative, in time becoming an open source resource that is expanded and maintained by the community as a whole. The Discovery Environments will also form the core for many of the training materials for iPlant's Education, Outreach and Training mission.

The process for proposing a grand challenge

A first principle of the iPlant Collaborative is that it must directly serve the community. Computing infrastructure and tools will be built in response to needs articulated by the community. This requires collaboration of those who think deeply about important questions in plant biology with those who understand computational approaches and cyberinfrastructure development. The project has designed two mechanisms by which the community can identify grand challenge problems suitable for the iPlant Collaborative: Grand Challenge Workshops (GCW) and Grand Challenge Projects (GCP).

Typically, the first step is for a group of scientists to propose a Grand Challenge Workshop. These are opportunities for groups of researchers with common interests to coalesce around a central problem in plant biology. Their focus can range from well-defined topics with large existing datasets and a community that has worked collaboratively for some time, to groups that have yet to coalesce around a specific set of goals. GCW proposals will be evaluated and

prioritized by the independent Board of Directors and high ranking workshops will be arranged using iPlant Collaborative resources and funds according to the justified needs of the workshop.

Once a diverse collaborative group has identified a true grand challenge that is suitable for the iPlant Collaborative (i.e., one that is not solvable through normal NSF funding mechanisms, but requiring the resources of iPlant), it is ready to submit a detailed proposal for allocation of Collaborative resources to the development of a custom designed cyberinfrastructure that is needed by the community for solution of the Grand Challenge. Details of the timing of the GCP proposal process will be made available prior to the first Grand Challenge Workshops. While it is envisioned that the majority of Grand Challenge Project proposals will come from groups that have participated in an iPlant-funded GCW, this step is not required for submission of a GCP proposal. Any group considering submitting a GCP proposal in the absence of a prior GCW is encouraged to contact Richard Jorgensen (raj@ag.arizona.edu) early in the planning process.

While most Grand Challenge Projects will evolve from the two stage process of GCW proposal followed by GCP proposal, the BoD also reserves the right to recommend a GCW proposal for fast-track status in the first year, prior to the first call for GCP proposals. These proposals would be limited in number and would contain Grand Challenge ideas that are sufficiently developed to be suitable for first year activities. The proposing group would also need to be judged to be ready to begin collaborating with the iPlant development team.

The Grand Challenge Workshop concept

A pivotal process in the success of the iPlant Collaborative is the identification, by the community, of *true* Grand Challenge questions that can be addressed through computational tools and a cyberinfrastructure and cannot be solved through normal NSF funding mechanisms. The GCWs are designed to provide a forum for researchers to explore and evaluate a given topic in plant biology from this perspective. By encouraging the participation of a broad range of researchers, these workshops will also facilitate the formation of interdisciplinary teams that can subsequently submit GCP proposals. Each GCW is likely to be somewhat distinct, as the degree that each topic and community are positioned to take advantage of the iPlant Collaborative resources will differ. Workshops along the continuum of 'readiness' are possible and could be selected. Specific goals of each GCW include but are not limited to:

- Discussion of the nature of “true” grand challenge(s) and identification of specific grand challenges
- Identification of datasets that currently exist or are expected in the next 6-24 months and their suitability for solving particular grand challenges
- Assessment of the current state of computational resources and computational thinking in the field
- Identification of barriers that currently prevent effective utilization of available data
- Identification of barriers that could be overcome with additional datasets
- Participation of diverse types of both plant and computational researchers, including some that have not previously worked in this area of plant biology.
- Assessment of Education, Outreach and Training opportunities that derive from potential GC questions in this field.

The workshops will typically be several days in length, and most will be held at the BioSphere2 Conference Center in Oracle, AZ or at the Banbury Conference Center at Cold Spring Harbor Laboratory, NY, though other sites may be proposed if justified. It is anticipated that workshops

will have approximately 25-35 community participants, as well as observers and facilitators from the project team and Board of Directors. The precise format of the workshop is to be decided by the organizers, but should facilitate discussion of the above topics, and enable significant interactions among the participants. After the GCW is completed, a workshop report will be required from the organizers summarizing the outcomes and action items from the workshop and this will be posted on www.iplantcollaborative.org.

The iPlant Collaborative's sponsorship of selected workshops will include covering reasonable and appropriate costs of travel, meeting facilities, lodging, and meals, and will include logistical support for workshop planning. During the planning stage, iPlant Collaborative personnel can also help to identify members of the scientific community with expertise and interest in different domains.

Review of the Grand Challenge Workshop Proposals

It is planned that proposals will be reviewed at least twice a year, with 16 June and 1 December deadlines for 2008.

The iPlant Collaborative [Board of Directors](#) (BoD), which has representatives from a broad range of relevant disciplines, has the responsibility to make recommendations on major allocation of resources in the iPlant Collaborative, including Grand Challenge Workshops. During review of GCW proposals, the BoD will obtain input from members of the community to supplement its expertise, and make recommendations to the Director of the iPlant Collaborative (Richard Jorgensen). All proposals will be kept confidential until the Board has made its recommendations. The review process itself will be confidential, including the identity of reviewers. Reviews and BoD summary of the review process and the Board's recommendation will be sent to the listed contact person for each proposal. Recommendation categories will be (1) high priority, (2) strong potential but needs improvement, and (3) not recommended at this time. A one page summary of all proposals and the Board's recommendation will be made public. High priority proposals will be made public in their entirety.

Proposal Review Criteria

The BoD will consider a variety of criteria in making recommendations to the Director of the iPlant Collaborative. These include, but are not limited to:

1. The context and significance of the problem or field for advancing our understanding of plant biology and the likely existence of true grand challenges suitable for iPlant but not suitable for solution through normal funding channels.
2. The types of data that are currently available, or will become available in the next 6-24 months, their scope, scale, quality and accessibility to the open access iPlant Collaborative.
3. How and why advancement of this area is being limited by lack of availability of computational tools and cyberinfrastructure.
4. Availability of clear information about how far along the proposing group is in its planning and how the GCW would bring the group and larger community closer to a Grand Challenge proposal. ***Note that GCW proposals are planned to be approved for groups at all stages of development, but it is important to describe explicitly the current status of the group.***

5. Range of diversity of expertise of participants. (Participation of plant scientists is expected to be broadly multi-disciplinary, for instance spanning the molecular to the ecological, to ensure fully informed discussion of grand challenges. Participation of a broad range of computational and computing researchers is also very important because to help assess the tractability of GC questions.)
6. Plan for Education and Outreach discussions within the workshop and a plan for ensuring broad participation at the workshop.
7. Plan for involvement of individuals from different domains. How will the group use the GCW to increase involvement of researchers in computer science, information systems, computational biology/bioinformatics, mathematics and modeling?

Proposal Content

Please provide the following, in the order indicated, in a single PDF file:

Front page:

A list of 2-5 organizers, including designation of main contact person. Please provide contact information for each (Institution, Department, phone, fax, email), and a 1-2 sentence description of their research, education and outreach interests. List others who have expressed interest in participating in the GSW under 'likely participants'.

Second page:

2-3 paragraph summary of the proposed workshop, including information about the target size and general format of the proposed GCW, and the overall goal of the meeting. This text will be used to summarize the successful GCW proposals; this summary should be understandable to workers across the iPlant subject area domains.

Biographical Sketches:

NSF format Biographical Sketch (vita) from each organizer ([Use this link for information on format of Biographical Sketch](#))

GCW Description: No more than 4-5 pages (11 point Times New Roman and 1" margins) describing the following:

Statement of the scientific problem being addressed, including past and current work of the group submitting the proposal, if any (see point 4. of Proposal Review Criteria above).

Why the problem requires cutting-edge computer science, bioinformatics, computational biology, statistical or modeling tools, rather than off-the-shelf solutions.

A general description of datasets currently available or that will be available to the community during the next 6-24 months. Please note that iPlant Collaborative funds are not allowed to be used for data acquisition.

Goals for the GCW - what are the outcomes to be achieved by having this meeting?

What other biology or interdisciplinary groups are working in this or related areas? Which individuals from these groups are anticipated to be involved in the GCW?

The format of the meeting that is being proposed including a general outline of the agenda for the meeting. To the extent possible, include provisional titles, suggested conveners and key contributors for each session or area of discussion.

Members of the iPlant Collaborative are available to help in a variety of ways, including identifying members of the scientific community with expertise and interest in different domains. Provide a description of areas where you anticipate that the collaborative can help in the organization of the GCW. This will not be used in review of the proposal, but will be of value to the collaborative members in planning for successful GCWs.

On the final page, provide a list of suggested reviewers in any of the domain areas related to the proposal (names, contact information and areas of expertise); please avoid suggesting reviewers with whom the organizers of the GCW are currently collaborating, their PhD and postdoctoral advisors and individuals from their home institutions. Individuals to be excluded as reviewers can be named with a short explanation.