



Postdoctoral RCR Training Program

Introduction: Responsible Conduct of Research

The following is an excerpt from Federal Register: August 20, 2009 (Volume 74, Number 160):

“Effective January 4, 2010, NSF will require that, at the time of proposal submission to NSF, a proposing institution’s Authorized Organizational Representative certify that the institution has a plan to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students, and postdoctoral researchers who will be supported by NSF to conduct research. While training plans are not required to be included in proposals submitted to NSF, institutions are advised that they are subject to review upon request.”

Responsible Conduct of Research (RCR) is a priority that will benefit everyone at Bigelow Laboratory. In an effort to actively institute this priority, the postdoctoral education program at Bigelow Laboratory has instituted the ethics policies included herein. Furthermore, we have established a method for training and oversight that also will be outlined in this document. RCR training will be mandatory for all postdoctoral researchers supported by NSF grant funding beginning 4 January 2010.

[See <http://www.nationalpostdoc.org/publications/toolkits/rcr-toolkit>]

Data Acquisition, Management, Sharing, and Ownership

Data Sharing and Ownership

All data generated as a result of government-funded research is subject to the express ownership of Bigelow Laboratory and the government institution from which the funding originated. Postdoctoral researchers often produce, organize, and analyze a great deal of these data. As a result, the Laboratory grants postdoctoral researchers fair use access to these data when they have contributed greatly to the project for which the data were generated, but not at the expense of the institution or its collaborators.

Intellectual Property

Postdoctoral researchers provide much of the stimulus for the research emerging from many of the research programs at Bigelow Laboratory. They often make invaluable intellectual contributions to the productivity of the Laboratory while working with the Senior Research Scientists (SRSs) who lead their respective research enterprises. In some cases, postdoctoral researchers generate new ideas that they want to test in the laboratory, and eventually publish the results of such experiments. Postdocs are free to pursue experiments based on their ideas only if [1] funding for these experiments is available, and [2] the SRS who is their direct research supervisor agrees to it. Due to the funding model of Bigelow Laboratory, such experiments are ultimately funded by research grants to the institution that are the responsibility of the supervising SRS. As a result, intellectual property is shared in fair use with Bigelow Laboratory and the SRS.

Data Management and Record Keeping

All researchers are expected to keep and maintain laboratory notebooks that include all pertinent information resulting from funded research programs. It is especially important for postdoctoral researchers to maintain a laboratory notebook because it provides a straightforward way for postdoctoral supervisors to stay apprised of research progress on



projects for which they are responsible. Bigelow Laboratory postdoctoral researchers are often visa holders who may prefer to keep notes in their native language instead of English. Postdoctoral supervisors take this into consideration and establish guidelines on an individual basis for the extent to which record keeping must be generally accessible.

Mentor/Trainee Responsibilities

Establishing Parameters

Immediately upon entering into a formal relationship as mentor and trainee, supervisors and postdoctoral researchers should mutually establish their relative roles and responsibilities, including how conflicts and grievances will be managed, and mapping out the extent of their collaboration. The supervisor is not always the only mentor a postdoctoral researcher will have. We acknowledge the benefit of multiple mentors at Bigelow Laboratory and appoint an SRS to serve as a Postdoctoral Education Coordinator to further mentor postdocs in topics that may not be directly associated with the central research project the postdoc was hired to work on.

Postdocs Acting as Mentors

Postdoctoral researchers should not only be mentored, they should also act as mentors for less experienced students. At Bigelow Laboratory, postdocs are expected to assist SRSs in accomplishing the goals of the Keller-BLOOM program for high school students and the Research Experience for Undergraduates (REU) program for undergraduate students. Although postdocs have a limited role in the mentoring of students, they will be greatly benefited by hands-on time with students and the guidance of a SRS through the mentoring process.

Publication Practices and Responsible Authorship

Determining Authorship

Working in a new laboratory or joining a new research group often presents several challenges to a postdoctoral researcher, not the least of which is learning the authorship practices for that group. Although individual Bigelow Laboratory SRSs may differ in their opinions about determining authorship order, it is the policy of the Laboratory that authorship credit should be based on three general criteria: [1] substantial contribution to conception and design, acquisition of data, or analysis and interpretation of data; [2] drafting the manuscript or revising it critically for important intellectual content; and [3] final approval of the version to be published. All authors should meet each of these three criteria. Individuals who do not meet all three criteria, but still have contributed substantively to the project described in the publication should be thanked in the Acknowledgements.

[Criteria: http://www.icmje.org/ethical_1author.html]

Image Manipulation for Publication

Determining how extensively one can manipulate a digital image for publication before the data are no longer faithfully depicted represents a growing concern in the scientific community. Ethical violations of this issue are often more prevalent among early career scientists for various reasons. The consensus seems to be that some manipulation is allowable if it makes the data presentation more clear and does not mislead. General guidelines include: [1] authors should list all image acquisition tools and image processing software packages used; [2] authors should document key image-gathering settings and processing manipulations; [3] images gathered at different times or from different locations should not be combined into a single image unless it is stated that the resultant image is a product of time-averaged data or a time-lapse sequence; [4] the use of touch-up tools is to be avoided; and [5] processing (e.g., changing brightness and



contrast) is appropriate only when it is applied equally across the entire image and is applied equally to controls.

[Criteria: <http://www.nature.com/nature/authors/submissions/images/index.html>]

Peer Review

Peer review is the process through which the relative merits of scientific research are determined. Postdoctoral researchers are often invited to review papers for journals and sit on review panels, so learning about the process will be a pertinent skill for them to acquire. General guidelines for peer review include: [1] be courteous – editors frown upon scathing, destructive reports that serve no constructive purpose; [2] permission from the editor should be sought before seeking input from other referees or asking someone else to act as the referee instead of the individual who was originally asked; [3] most editors are in favor of student and postdoctoral referees – these are necessary training experiences; [4] do not accept an invitation to review a paper until it can be determined if the editor’s deadline can be observed; [5] act as a referee as often as possible – it strengthens the reviewer’s science; [6] be honest and constructive; and [7] be appreciative of help received when manuscripts are carefully and helpfully reviewed.

[Criteria: http://sciencecareers.sciencemag.org/career_development/previous_issues/articles/0980/peer_review_techniques_for_novices/]

Collaboration, Communication, and Misconduct

Collaborative Science

Collaborative science covers all aspects of developing and maintaining research collaborations and includes communicating and establishing the parameters of the collaboration. Authorship determinations and the sharing of data and materials are part of collaborative science.

Postdoctoral researchers are in the process of transitioning to independence and building their professional network. As this professional network grows and new project ideas emerge, postdocs and their supervisors should be sure to have clear communication about the responsibilities of their own collaboration as well as the possibilities for collaboration with others.

Setting up the ground rules for collaboration is a critical first step for postdoctoral researchers who may not be aware of potential complications that may arise from their participation in collaborations. Postdoctoral supervisors may be concerned about postdocs collaborating outside of their primary project, especially when 100% of the postdoc’s effort is funded by that project. Although postdocs naturally want to broaden their scholarly network to benefit both their science and their career prospects, building these networks through outside collaboration can increase the potential for conflict between postdoc and supervisor.

Communication for Difficult Situations

The position of postdoctoral researchers at any institution is one with little official status that often requires that postdocs rely on persuasion and goodwill to navigate some aspects of the research environment. A postdoc’s sole reliance on his or her supervisor for resources, support, approval, and future job recommendations means that communication is a critical skill, as is diplomacy, when conversations turn toward difficult or sensitive topics. These skills are doubly important for international postdocs who come from a different cultural perspective and may have to have these difficult conversations in a second language.



Conflict Resolution

Given the highly competitive nature of scientific research and the increasing trend toward team science, conflicts may arise that strain collaborations. Postdoctoral researchers can avoid most conflicts by actively acquiring management skills. However, when conflicts inevitably arise, postdocs must be prepared to seek an amicable resolution with the parties involved. To facilitate this preparation, postdocs will receive training in conflict resolution. As largely transient researchers, postdocs have only limited official status and power within the long-term Bigelow Laboratory organization, so training in conflict resolution will emphasize how to avoid conflict by clearly communicating expectations, concerns, and questions in a forthright and respectful manner. The Postdoctoral Education Coordinator, who may act as an advocate for postdocs, and the Executive Director may assist in conflict resolution if necessary.

Research Misconduct

The basic components of research misconduct include falsification, fabrication, and plagiarism, often referred to as “FFP.” Questionable research practices, or “QRP,” comprise a component of research misconduct that is receiving increasing attention, but may not be as serious as FFP. Studies have suggested that individuals that engage in QRP, however, are more likely to commit FFP.

Training in this topic typically involves the various agency definitions of misconduct, how to report occurrences, and the roles and responsibilities of the whistleblower. It also is important for postdoctoral researchers to identify the risk involved in whistleblowing since they are particularly vulnerable to repercussions, especially when they are reporting conduct of their immediate supervisor or research mentor. Bigelow Laboratory has established a SRS-level Postdoctoral Education Coordinator at the institutional level to help address this situation. Postdocs may privately ask advice and questions of the SRS in this position without fear of immediate or serious repercussions.

Instructional Plan

Role of Postdoctoral Supervisors

It is the acknowledged consensus that the best method for influencing responsible behavior is through mentoring from an advisor. The relationship between a postdoctoral researcher and his or her supervisor is a critical one, since postdocs are particularly reliant upon their supervisors for both financial and infrastructural support, as well as further career advancement. Supervisors must be actively involved with RCR training for it to work properly. Minimally, they should support the postdoc’s participation in the institutional program. However, training is greatly enhanced by the supervisor also taking on a mentoring role for RCR topics. In any case, having a supervisor’s support for training activities can assist in making postdocs feel comfortable taking time away from research in order to participate.

Institutional Postdoctoral Education Program

In order to establish a formal postdoctoral mentoring program Bigelow Laboratory for Ocean Sciences has recently appointed a senior research scientist (SRS) to serve as the Postdoctoral Education Coordinator, a paid position. Postdoctoral researchers at Bigelow Laboratory meet monthly as a group with the postdoctoral coordinator to discuss topics pertinent to early-career scientists, including career counseling, improving teaching and mentoring skills, grant writing, and RCR training. Other activities will include regular assessment of project and career goals through consultation with postdoctoral supervisors.



Mentoring and Being Mentored

Although Bigelow Laboratory is primarily a research institution, postdocs are expected to participate in laboratory-wide educational and public outreach programs. These include the yearly Keller BLOOM program in which Maine high school students are given hands-on ocean science experiences for a week, and the newly established Research Experience for Undergraduates (REU) program funded by NSF. Postdocs are expected to assist by mentoring, providing lectures, and guiding students in the laboratory. Finally, due to Bigelow Laboratory's dependence on external funding, postdocs are expected to shadow and aid SRSs in preparing grant applications.

Other Institutional Opportunities

Postdocs are expected to attend institutional seminars, periodically present research, and invite and host speakers as part of the regular Bigelow Laboratory seminar series. They participate in the on-going postdoc organized journal club and, as mentioned above, career development workshops. Postdocs are expected to attend the monthly SRS meetings, the primary method of internal governance at Bigelow Laboratory, and participate fully in standing and *ad hoc* committees (e.g., Education and Outreach, Safety, Personnel, etc.). By the end of postdoctoral employment at Bigelow Laboratory, postdoctoral researchers should be an independent scientists who are not only more experienced in particular research topics, but also more experienced in responsible conduct of research (RCR), student mentoring, funding a research program, and institutional governance. They will have assembled skills that will empower them to actively direct their own careers and be more competitive in the job market. This broad experience base should advantageously prepare these individuals for future positions as faculty members or research scientists, and positively influence the rest of their careers.