

Making the Right Moves

A Practical Guide to Scientific Management for Postdocs and New Faculty

Chapter 13

COURSE IN SCIENTIFIC MANAGEMENT: AN OVERVIEW AND LESSONS LEARNED

Burroughs Wellcome Fund
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Chapter 13

COURSE IN SCIENTIFIC MANAGEMENT: AN OVERVIEW AND LESSONS LEARNED

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From July 27 to July 31, 2002, the Burroughs Wellcome Fund (BWF) and the Howard Hughes Medical Institute (HHMI) sponsored the “Course in Scientific Management for the Beginning Academic Investigator.” It was held at HHMI headquarters in Chevy Chase, Maryland. The 128 participants were biomedical research scientists who had recently received their first academic appointment or postdoctoral fellows looking for an appointment; all were current or former BWF and HHMI grantees. This chapter explains why and how the course was developed, gives an overview of the course sessions and the materials provided to course participants, and discusses the course evaluation and lessons learned.

COURSE DEVELOPMENT

Why Have a Course in Scientific Management?

The course was conceived following discussions between BWF and HHMI staff and scientists who had received research training or career development grants from the two organizations and expressed a need for additional training in laboratory management to successfully launch their research programs. These scientists had not received formal training in this area during graduate or medical school or postdoctoral study.

The course had three goals. First, it aimed to provide participants with laboratory management skills that would help them rapidly establish well-run, productive laboratories. Second, it aimed to provide participants with an opportunity to develop networks with their peers and more established scientists. Third, it sought to point out the need for early career training in laboratory management to universities, professional societies, and postdoctoral associations and provide these institutions with an example of how they might design their own courses in laboratory management.

How the Course Took Shape

The course was developed over a two-and-a-half year period by staff from BWF and HHMI, with assistance from the American Association for the Advancement of Science (AAAS).

The first year was spent identifying the topics to be covered. The course developers convened two focus groups mainly composed of BWF and HHMI grant recipients, including advanced postdocs and newly appointed faculty and physician and non-physician scientists. The focus group participants (see Appendix 1) identified a diverse range of career development needs that coalesced under the general theme of scientific management. To further refine the list of topics, the course developers consulted with senior scientists and professionals affiliated with BWF and HHMI.

The course developers also retained executive coaches Christine Harris, Ed.D., and Joan C. King, Ph.D., to create an in-depth introductory session on laboratory leadership and interpersonal management strategies designed specifically for scientists in laboratory settings. As part of a preliminary needs assessment, Dr. Harris and Dr. King designed a questionnaire that was completed by 41 “model laboratory leaders”—biomedical research scientists who had been identified by their peers, students, and post-docs as particularly good motivators, mentors, leaders, or managers (see Appendix 2 for the list of model laboratory leaders).

Because of the limited time frame of the course, certain important topics were not covered, such as lab safety. Course developers and focus group participants felt that this information was either taught at most universities or was available from other sources.

The course developers eventually narrowed down the list of potential topics to 14, which they thought could be adequately covered within the time frame of the course. These topics were

- ◆ Laboratory leadership
- ◆ Project management
- ◆ Collaborations
- ◆ The scientific investigator within the university structure
- ◆ Getting funded
- ◆ Getting published
- ◆ Current issues in research ethics
- ◆ Time management
- ◆ Data management and laboratory notebooks
- ◆ Mentoring and being mentored
- ◆ Gender issues in the laboratory
- ◆ Technology transfer
- ◆ Obtaining and negotiating a faculty position
- ◆ Budgets and budgeting

The next step was to develop the chosen topics into sessions. The session organizers researched the areas, discussed the topics with BWF and HHMI grantees and senior scientific staff, determined the amount of time needed to address each topic and the format to be used, identified and contacted potential speakers, and organized the background materials for the course syllabus. A course coordinator oversaw the session organizers' activities, set the final course agenda, sent out invitations to speakers and participants, and tracked the responses. The preparation time for materials, speaker invitations, presentations, and the course notebook (see "Course Materials" below) was about 10 months.

Course Agenda and Session Formats

The course began with an evening reception and welcome and keynote addresses by the presidents of BWF and HHMI and continued over the next three-and-a-half days, with a full schedule of back-to-back sessions (see Appendix 3 for the course schedule). Course topics were presented in four formats: workshop (one session), panel discussion (seven sessions), roundtable discussion (one session), and single speaker or keynote address (seven sessions). Some sessions of interest to particular subgroups of participants (e.g., technology transfer and obtaining a faculty position) were offered concurrently. Each session concluded with time for questions and answers. The course format also included opportunities for participants to informally network with their peers, the speakers, and senior scientists and staff from BWF and HHMI.

Speakers and Participants

The course was taught by 32 scientists and other professionals from academia, industry, and scientific communications (see Appendix 4).

The number of participants was limited to 128 current and former BWF and HHMI grant recipients, who were selected on the basis of the stage they had reached in their scientific careers. Preference was given to scientists who either had recently obtained academic faculty positions and started their laboratories, had received a job offer, or had started interviewing for a position. Forty-one percent of the course participants were women, 43 percent were physician-scientists, and 48 percent were advanced postdocs.

Cost per Participant

The actual cost per participant is difficult to calculate because HHMI lent much of its infrastructure to the course and most development costs were included in staff salaries or in time donated by speakers. However, not counting these costs, the amount was approximately \$2,800 per participant, which was paid for by the sponsors. Most of this amount can be attributed to travel, meals, lodging for participants and speakers and speaker honoraria. A similar course conducted for on-site participants at a university would cost significantly less.

Course Materials

Each participant was given a course notebook—a large three-ring binder containing the agenda, outlines of the presentations, and other resource materials. It also contained exercises that were to be completed during or after some of the sessions. Each participant was also given a copy of HHMI-produced videos on laboratory safety and the opportunity to receive complimentary copies of the following books:

- ◆ *At the Helm: A Laboratory Navigator*, by Kathy Barker (Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press, 2002)

- ◆ *Tomorrow's Professor: Preparing for an Academic Career in Science Engineering*, by Richard M. Reis (New York: IEEE Press, 1997)
- ◆ *Writing the Laboratory Notebook*, by Howard Kanare (Washington, DC: American Chemical Society, 1985)
- ◆ *Project Management for Dummies*, by Stanley E. Portny (New York: Hungry Minds, 2001)

SYNOPSIS OF SESSIONS

This section provides an overview of the course sessions in the approximate order in which they took place, along with the session learning objectives and highlights from the session evaluations.

Starting a Research Group in 1978: Are Any of the Lessons Still Relevant in 2002?

Following a welcome address by BWF President Enriqueta C. Bond, Ph.D., HHMI President and Nobel laureate Thomas R. Cech, Ph.D., described his entry into biomedical science in the 1970s. Dr. Cech talked about the challenge of job hunting and negotiating for resources; the strategies he used to balance teaching, research, and other responsibilities; and the lessons he learned about the importance of interpersonal skills in the establishment of a successful research program.

Excerpts from Dr. Cech's address can be found in chapter 3, "Defining and Implementing Your Mission," and at <http://www.hhmi.org/labmanagement>.

Workshop in Basic Laboratory Leadership Skills

This eight-and-a-half-hour workshop, held over two consecutive days, was organized by Martin Ionescu-Pioggia, Ph.D. (BWF). Interpersonal skills are among the most difficult to teach effectively and the most important in managing a laboratory. Consequently, the course organizers allotted the largest amount of time to this session. The executive coaches for the session, management consultant Christine Harris, Ed.D., and scientist Joan C. King, Ph.D., taught participants the skills that form the basis for effective leadership in the scientific setting. Based on the results of their survey with 41 model lab leaders and six in-depth interviews, together with their combined expertise and experience, Dr. Harris and Dr. King recommended a set of topics to be included in the leadership portion of the course. These topics included creating a vision and mission statement for the laboratory; identifying key leadership values; and learning how to lead and manage, interact with, and motivate laboratory staff. Extensive time was devoted to understanding and appreciating the variety of interpersonal preferences and helping participants identify their communication styles and personality types. The workshop provided participants with opportunities for practicing lab leadership skills through visualization and role-playing exercises and small-group discussions. For example, participants were asked to visualize the ideal laboratory, identify their values, and translate their visions and values into an action plan. Participants worked on strategies for communicating expectations, giving and receiving feedback, and managing conflict. They also took the Myers-Briggs Type Indicator, the widely used personality inventory developed by Isabel Briggs Myers and Katharine C. Briggs.

Because only basic leadership and interpersonal skills could be taught during the course, the organizers arranged for participants to obtain additional one-on-one tutorials after the course to develop leadership skills of particular relevance to the issues in their laboratories. Participants were invited to apply for six hours of post-course coaching in laboratory leadership from Dr. Harris and Dr. King.

Project Management

This two-and-a-half-hour session was organized by Jim Austin, Ph.D. (AAAS). Stanley E. Portny (Stanley E. Portny and Associates) spoke about developing a managerial perspective toward the operation of a laboratory. A successful research program comprises a series of discrete projects, all designed to help address different aspects of the overall program's goals. This session presented a proactive approach to planning and performing these projects that minimizes wasted time and effort, helps anticipate risks and uncertainties, and supports timely and insightful project tracking and control. The format consisted of a two-hour presentation followed by a question-and-answer period.

Collaborations

This one-and-a-half-hour panel session was organized by Victoria McGovern, Ph.D. (BWF). The panelists were Claire M. Fraser, Ph.D. (The Institute for Genomic Research); Rick Tarleton, Ph.D. (University of Georgia); and Joseph DeRisi, Ph.D. (University of California–San Francisco). It explored the benefits and challenges of collaborative research as well as the practical issues of establishing collaborations across sectors and among researchers in disparate fields. The format consisted of a 10-minute presentation by each panelist, followed by a question-and-answer period.

The Scientific Investigator Within the University Structure

This evening keynote session was organized by Maryrose E. Franko, Ph.D. (HHMI). Tony G. Waldrop, Ph.D. (University of North Carolina–Chapel Hill), gave an overview of the “standard” organizational structure of a university, how the investigator fits within this structure, and the entities the investigator interacts with. He also described the factors involved in promotion and tenure for university faculty.

Getting Funded

This two-hour panel discussion was organized by Jim Austin, Ph.D. (AAAS). The panelists were Anthony M. Coelho Jr., Ph.D. (Office of the Director, National Institutes of Health [NIH]); Bettie J. Graham, Ph.D. (National Human Genome Research Institute, NIH); and Suzanne Pfeffer, Ph.D. (Stanford University). The focus of this session was on preparing winning proposals in a competitive environment. Key themes included understanding the mission of the grant-making organization; the intricacies of the review process at NIH; and how best to meet the expectations of review panel members. The format consisted of a 10-minute presentation by each panelist, followed by a question-and-answer period.

Getting Published

This one-hour session was organized by Jim Austin, Ph.D. (AAAS). Angela Eggleston, Ph.D. (senior editor, *Cell*, *Molecular Cell*, and *Developmental Cell*), gave participants an overview of the submission and review process at a scientific journal, including how the initial assessment of a submission is made, how reviewers are chosen, how the decision to publish is made, and what the process for revisions and appeals is. The

presentation also provided tips on developing a paper, including what to include in a cover letter, abstract, and introduction; how to present results; and how to apply those results more broadly in the discussion. The format consisted of a 45-minute presentation followed by a question-and-answer period.

Current Issues in Research Ethics

This evening keynote session was organized by Maryrose E. Franko, Ph.D. (HHMI). R. Alta Charo, J.D. (University of Wisconsin Law School), talked about the challenges of protecting the rights and welfare of all who volunteer to participate in research and to make those protections relevant to the myriad new forms of research. Topics included the examination of medical records, stored human tissue samples, family cohorts, and international collaborative studies. Dr. Charo also spoke about the challenge of developing better rules to protect those who cannot decide for themselves to participate, such as children, the mentally ill, or the neurologically impaired, as well as the challenge of managing conflict of interest within review boards.

Excerpts from Dr. Charo's presentation can be found at <http://www.hhmi.org/labmanagement>.

Time Management

This two-hour panel session was organized by Maryrose E. Franko, Ph.D. (HHMI). The panelists were Richard M. Reis, Ph.D. (Stanford University); Sandra L. Schmid, Ph.D. (Scripps Research Institute); and Todd R. Golub, M.D. (Dana-Farber Cancer Institute; also HHMI associate investigator). The session focused on two distinct aspects of time management in a laboratory setting: managing day-to-day activities efficiently, such as handling multiple priorities and deadlines, and managing the concurrent demands of teaching, administrative duties, and family responsibilities. The format consisted of a 15-minute presentation by each panelist, followed by a question-and-answer period.

Data Management and Laboratory Notebooks

This two-hour panel session was organized by Maryrose E. Franko, Ph.D. (HHMI). The panelists were Howard Kanare, Ph.D. (Construction Technology Laboratories); Joseph M. Vinetz, M.D. (University of Texas Medical Branch–Galveston); and David J. Adams, Ph.D. (Duke University Medical Center). The session focused on how to set up a system for efficient flow of information in the lab and how to maintain accurate and consistent records. Case studies were presented to stress the importance of maintaining electronic records and laboratory notebooks. The format consisted of a 15-minute presentation by each panelist, followed by a question-and-answer period.

Mentoring and Being Mentored

This topic was addressed in two separate sessions, which were organized by Victoria McGovern, Ph.D. (BWF). Speakers for the first session were Dorothy E. Shippen, Ph.D. (Texas A&M University); David S. Roos, Ph.D. (University of Pennsylvania); and Stephen L. Hajduk, Ph.D. (University of Alabama–Birmingham; now at the Marine Biological Laboratory). Panelists for the second session were E. Lynn Zechiedrich, Ph.D. (Baylor College of Medicine), and Elizabeth Keath, Ph.D. (Saint Louis University).

The sessions explored what it means to be a mentor and, in particular, using mentoring as a strategy for facilitating learning. The first session, lasting one-and-a-half hours, was an introduction to basic principles of mentoring. The presentations were followed by a 30-minute question-and-answer period. Participants were given “homework” questions to complete in preparation for a one-hour session the next day that included a panel discussion and a question-and-answer session in response to questions from the audience. The second session on mentoring was held concurrently with the session “Budgets and Budgeting.”

Roundtable Discussion: Problems and Solutions in Scientific Management

This two-hour panel session was organized by Rolly L. Simpson (BWF); Laura Bonetta, Ph.D. (course coordinator); and Maryrose E. Franko, Ph.D. (HHMI). The moderators were Maryrose E. Franko and Rolly L. Simpson. The panelists were Thomas R. Cech, Ph.D. (HHMI); Peter J. Bruns, Ph.D. (HHMI); Klaus R. L. Nüsslein, Ph.D. (University of Massachusetts–Amherst); Christine Harris, Ed.D. (laboratory leadership skills workshop designer); and Kathy Barker, Ph.D. (author, *At the Helm: A Laboratory Navigator*).

Before the course, participants were asked to submit summaries of problems they had encountered in their labs. Forty responses were received, the majority dealing with issues in laboratory leadership and mentoring. BWF and HHMI staff then selected 10 cases that were representative of the topics covered in the course and career situations of course participants. Participants met in the conference center auditorium for an introduction to the session. Then participants were assigned to 1 of 10 small groups, each consisting of about 13 participants. Each group was given a case study and 30 minutes to discuss the problem and develop a solution. The groups then returned to the auditorium, and each was given 8 minutes to present its solution to all the session participants and receive feedback from a panel that included course presenters and BWF and HHMI staff who had developed the course sessions.

The session was included as a way to tie together all the issues discussed during the course and to provide participants with an opportunity to use what they had learned in the course to develop solutions to lab management problems. The most common themes selected for the case studies were mentoring, collaboration, and laboratory leadership. In order to cover as many areas as possible, issues involving publishing, technology transfer, time management, and project management were also included. The following laboratory management problems were discussed:

- ◆ Collaborations. A senior principal investigator used a tool for genetic mapping studies that was developed by an assistant professor working in the field of bioinformatics. The assistant professor’s technician trained the senior principal investigator’s technician in the use of the tool. Should the assistant professor’s contribution be acknowledged in a subsequent paper?
- ◆ Mentoring and time management. A fourth-year postdoctoral fellow in a large research lab in a large medical school is performing poorly because of family obligations and the lack of a long-term goal. What would be the best advice from the postdoc’s mentor?

- ◆ Mentoring, laboratory leadership, and time management. A first-year clinical faculty member in a university research laboratory has accepted a position that includes clinical responsibilities and protected time for research. How can the physician-scientist balance laboratory with clinical responsibilities?
- ◆ Mentoring and technology transfer. A postdoctoral fellow in the last year of training (Ph.D.) in a university research laboratory was working in an area that was no longer being pursued by the principal investigator. However, as results were accumulated, the principal investigator developed renewed interest in the area. The postdoc wants to continue the work as an independent investigator after leaving the lab, but the principal investigator wants to keep the project. How can this situation be resolved?
- ◆ Mentoring and laboratory leadership. A new assistant professor wants his three postdocs to be more motivated and productive. How can this be done?
- ◆ Project management and laboratory leadership. A postdoc joins two other postdocs on a project that requires two of them to work all day on Sundays. The postdoc who most recently joined the group finds it increasingly difficult to work on Sundays because of family responsibilities. Can a compromise be worked out?
- ◆ Mentoring. A doctoral student left a lab to take a postdoctoral position before a manuscript was completed. Subsequently, some experiments were repeated and new data were incorporated with the understanding that the former doctoral student would still be an author on the paper. After three years, the manuscript is still not complete. What can the former doctoral student do to move the manuscript along? What responsibility does a principal investigator have to former students?
- ◆ Laboratory leadership. A lab technician was a productive member of a laboratory until his acceptance into an MBA program, at which time his work and attitude began to deteriorate. It will be nine months before the lab tech starts school. What can the principal investigator do to improve the lab tech's performance?
- ◆ University structure. Two faculty members, both Ph.D.s, were encouraged to take leading roles in the establishment of a translational research program. Because of conflict between the two faculty members, the program has gone nowhere. What can be done to correct this situation?
- ◆ Mentoring. A physician-scientist will be leaving a lab to take a position as an independent investigator. The physician-scientist has been working on several projects using mouse knockout strains and would like to take one of the projects to the new position. The principal investigator is reluctant. What is the principal investigator's responsibility?

Gender Issues in the Laboratory

This evening keynote session was organized by Laura Bonetta, Ph.D. (course coordinator). Gina Turrigiano, Ph.D. (Brandeis University), discussed how gender plays a role in the professional life of a research scientist. She reviewed data from a study on the status of women faculty in science at the Massachusetts Institute of Technology that indicated inequities in advancement and salary levels and found that women

faculty felt more marginalized as their careers progressed. Dr. Turrigiano also spoke about the challenges of balancing work and family and related issues, such as deciding when to have children and taking maternity leave. She discussed the special issues that principal investigators face as they mentor women and that female scientists face as they seek to be mentored.

Technology Transfer

This two-hour panel session was organized by Andrea L. Stith, Ph.D. (HHMI; now at the Federation of American Societies for Experimental Biology). The panelists were Francis J. Meyer, Ph.D. (A. M. Pappas & Associates); Christopher T. Moulding (HHMI); and Martha J. Connolly, Ph.D. (EntreMed; now at the Maryland Technology Enterprise Institute). This session introduced participants to the terminology, processes, and concepts related to intellectual property and technology transfer. The speakers demonstrated various scenarios to help participants avoid potential disputes and hazards and maximize their effectiveness in working within the system. Participants received a list of helpful Web sites, textbooks, and journal articles. The format consisted of three 25-minute lectures followed by a 30-minute question-and-answer period. The session was held concurrently with the session “Obtaining and Negotiating a Faculty Position.”

Obtaining and Negotiating a Faculty Position

This two-hour panel session was organized by Rolly L. Simpson (BWF). The speakers were Chris M. Golde, Ph.D. (Carnegie Foundation for the Advancement of Teaching); Johannes Walter, Ph.D. (Harvard Medical School); and Christopher Wylie, Ph.D. (Cincinnati Children’s Hospital Research Foundation). It was included in the course because the topic was of key interest to advanced postdoctoral participants who participated in the precourse focus groups. The format consisted of three 25-minute lectures followed by a 30-minute question-and-answer period.

Budgets and Budgeting

This one-hour session was organized by Jim Austin, Ph.D. (AAAS). Michael E. McClure (National Institute of Environmental Health Sciences, NIH) discussed writing effective grant proposals and tracking and managing the fiscal side of conducting research. The format consisted of a half-hour presentation followed by a question-and-answer period. The session was held concurrently with the “Mentoring Panel Discussion.”

COURSE EVALUATION AND LESSONS LEARNED

Evaluation Process

Participants completed an evaluation at the end of each session and an overall evaluation at the end of the course (see Appendix 5 for a sample session evaluation form and Appendix 6 for the course summary evaluation form). The evaluations were anonymous—responses were associated with the participant’s badge number on the evaluation form. The number was then linked to the participant’s demographic information (e.g., academic level, degree), but not to his or her name. Additional feedback was obtained from a focus group held with several course participants directly after the course ended. Evaluations at six months and at one year have been conducted to determine which components of the course have been useful to participants.

Information from the on-site evaluation and the postcourse focus group was analyzed by an evaluation specialist. The results were used to shape the content of this manual and may prove useful to institutions that are developing their own courses in scientific management. A summary of the evaluation results is presented below. For detailed information about evaluation outcomes, contact BWF and HHMI at labmgmt@hhmi.org.

Lessons Learned

Overall impressions of the course. All 128 course participants completed the course evaluation and said they would enthusiastically recommend the course to their colleagues. Seventy-eight percent rated the course as far exceeding or exceeding their expectations for overall course quality, and 87 percent rated the course as far exceeding or exceeding their expectations for overall relevance. Eighty-one percent said the degree of change they anticipated in the way they run or will run their laboratories far exceeded or exceeded their precourse expectations. Many mentioned they planned to share information from the course with coworkers. Some pointed out that the course was especially valuable for postdocs who had yet to set up a laboratory. Some participants thought the course was valuable both to senior postdocs and junior faculty and that it was good to have a mix of people at different levels to get different perspectives.

Participants were asked to rate the overall value of each session. The following six sessions (in alphabetical order) received the highest ratings:

- ◆ “Getting Funded”
- ◆ “Mentoring and Being Mentored”
- ◆ “Obtaining and Negotiating a Faculty Position”
- ◆ “Roundtable Discussion of Problems in Scientific Management”
- ◆ “Time Management”
- ◆ “Workshop in Basic Laboratory Leadership Skills”

Format of the course. Many participants liked that the course was held as a “retreat” rather than at a university or some other setting where it would be more difficult to focus on the course content and take advantage of the networking opportunities. One individual pointed out that he/she would not have been comfortable discussing a laboratory management problem if the course had been offered at his/her university because of the lack of anonymity in such a setting.

Some participants thought that the course would be improved by providing more take-home materials in book, CD/DVD, or Web format. Several participants felt one way to increase exposure to the course was to offer video conferencing with small groups interacting at local sites. All seemed to agree that the information provided in the course should be disseminated as widely as possible.

Improving the course. Participants had the following suggestions:

- ◆ Increase the input from senior investigators—for example, include them in the roundtable discussion breakout groups and have them sit on more panels and participate in the question-and-answer periods at the end of the sessions.

- ◆ Include at least one practicing scientist in each panel session.
- ◆ Have panelists review each other's presentations before the course and adapt their presentations to avoid overlap. Allow more time for questions and answers in each session, and have a strong moderator to keep the questions focused on the session topic.
- ◆ Reduce the number of plenary lectures and increase the number of small-group discussions.
- ◆ Use "graduates" of the course to lead small-group breakout sessions in future courses.
- ◆ Focus less on "big picture" aspects of a topic and more on its relation to scientific management and the needs of a beginning investigator.
- ◆ Have the speakers include a short executive summary or take-home message for their sessions.
- ◆ Promote networking among course participants and with speakers and senior investigators by setting aside more time for informal interactions and organizing the tables by scientific field at one of the dinners.
- ◆ Offer a follow-up workshop for more established principal investigators who are getting ready to apply for tenure.

Overall course length. Seventy-four percent felt the length was about right. Twenty-four percent felt that the course was too long and should be reduced by half to one day. Participants felt that time could be saved by

- ◆ Holding the speakers to their allotted time
- ◆ Keeping the question-and-answer sessions more focused
- ◆ Offering more simultaneous sessions (however, some participants felt that they were missing something when sessions were offered concurrently)
- ◆ Reducing the length of the "Workshop in Basic Laboratory Leadership Skills" by conducting the Myers-Briggs testing before the course
- ◆ Giving participants any session-related "homework" materials before the course

Several criticized the 7:30 a.m. start times, especially those who had arrived from the West Coast. Several said they would have appreciated a longer break in the afternoon, with sufficient time for exercise or rest, even knowing that this would then push the course sessions into the evening hours.

Most useful aspects of the course. Many respondents commented that one of the most valuable parts of the course was the question-and-answer period at the end of each session. This part of the session was sometimes considered more valuable than the structured presentations. Many respondents also felt that the networking opportunities during the breaks and meals were very important and would like to have had even more such opportunities (possibly including a more purely social event). The most popular format for the sessions was the small breakout group. Many participants also noted that the most useful panels included background information provided by the presenters, followed by case study examples. Having a diverse panel in terms of age, faculty position, and scientific discipline was also thought to be useful.

Sessions identified as having overlap. The following sessions were identified as having similar material: “Getting Funded” and “Budgets and Budgeting,” “Gender Issues” and “Time Management,” and “Project Management” and “Time Management.” Several respondents commented that they didn’t think the sessions were redundant so much as that some information was presented in more than one session. Some thought that in many cases this overlap served to reinforce the concepts.

The course organizers held one or more group conferences with members of each session before the course, partially to reduce overlap, which is difficult to accomplish when multiple independent presenters are used for different sessions. These conferences were successful in reducing overlap within a session and probably reduced overlap throughout the course.

Additional topics for future courses. Many suggestions for additional topics were offered, but there was also concern about lengthening the course to include such sessions. The following is a list of ideas contributed by respondents, in no particular order of popularity:

- ◆ Include a separate session for physician-scientists.
- ◆ Include a session on designing and conducting an academic course. (It was thought that this could be offered simultaneously with the session for physician-scientists.)
- ◆ Provide more specific information on mentoring women and minorities in science.
- ◆ Include a discussion of issues related to hiring and firing.
- ◆ Include a separate session on how to get tenure, instead of combining the topic with how to negotiate for and obtain a job.

Lessons Learned by Session

Workshop in Basic Laboratory Leadership Skills. This session worked especially well when the participants broke into small groups to discuss how to resolve problems or conflicts. It was suggested that sending reading material to the participants before the beginning of the course might be a way to reduce the time required for this session. Although participants enjoyed learning about themselves through the Myers-Briggs testing, they thought the testing was too time-consuming. To reduce the length of the session, some suggested offering the Myers-Briggs testing before the course. There was great interest in adding material on conflict resolution (e.g., when or when not to get involved in lab conflicts, how to fire someone, how to mend bridges). Another suggestion was to invite more senior principal investigators to attend and participate as much as possible in the question-and-answer period.

Project Management. It was thought that this session might work better with the following format: a one-hour presentation followed by a one-hour small working group session headed by lab managers familiar with project management strategies (principal investigators or senior technicians). In the working group session, the participants could try to apply the principles learned in the previous presentation. Participants also thought that the addition of case studies based in a biological laboratory would make it easier to absorb the information.

Collaborations. Several participants recommended limiting the presentations to a few key points and case studies and then reserving a larger amount of time for the question-and-answer session. In addition to learning about collaborations with large laboratories at major research institutions or commercial operations, participants were interested in learning more about establishing collaborations between small independent laboratories. Participants wanted more information on how to approach someone about starting a collaboration, how collaborations affect the tenure decision, and how to establish authorship in a collaborative situation.

The Scientific Investigator Within the University Structure. This subject might be better suited to a panel format so that once the general structure of the university had been discussed, other related topics could be addressed. Of special interest was the information on how to assemble promotion materials and develop a “tenure” CV, the administrative structure of a university (e.g., the difference between a chancellor and a provost), and how to make the maximum use of university research resources. Participants were eager to learn more about the tenure process and fulfilling contract obligations.

Getting Funded. Participants appreciated that the panel included a representative from NIH to explain the internal structure of NIH and whom to contact with questions or problems, as well as a chair of an NIH study section. They said that they also wanted the panel to include representatives from a university grants and contracts office and from a private foundation that supports scientists, as well as a senior principal investigator from a major research university. Participants wanted an example of a successful R01 grant application (including a sample budget) as a handout for this session. (Course organizers attempted to obtain examples of successful grant applications from several sources but were unsuccessful in doing so.) Physician-scientists appeared to have many questions specific to their unique status at medical schools, where they have clinical duties in addition to research. Participants thought a breakout session for this subgroup, with specific information on career development awards and salary limits, would be useful.

Getting Published. Because all the participants had some experience in writing scientific papers, this session was geared toward the process of getting a paper published (e.g., selecting the appropriate journal, responding to reviewer comments, and learning more about the editorial process). Participants would have liked a variety of journals to be represented in the panel, rather than only a single, for-profit journal (although many found the process of paper submission at such a journal interesting). Participants were also interested in learning more about how to become reviewers and wanted examples of good and bad submissions.

Current Issues in Research Ethics. While several participants with Ph.D.s in the basic sciences commented that this talk was geared toward medical researchers, and as such, should be offered as a separate session just for M.D.s, others pointed out that it was very helpful to learn more about the human research guidelines and to not be intimidated by experiments dealing with human subjects. Other topics of interest were the production and retention of accurate tissue and medical records, the purpose and structure of Institutional Review Boards, and international research. Some participants thought that it was especially helpful that the bioethics speaker had a law degree because this provided a different perspective than a presentation by a Ph.D. or an M.D. There was also considerable interest in expanding the discussion on laboratory ethics and issues of misconduct, in addition to the “big picture” ethics of using human subjects in research. Perhaps the session could be reconfigured to have two speakers, one to deal with laboratory research problems and another to discuss the use of human subjects.

Time Management. This session was extremely popular, especially with participants who were trying to juggle work and family issues. Any concrete suggestions on how to save time or to be more efficient were greatly appreciated. While some participants felt it would make more sense to separate the M.D.s and Ph.D.s into separate sessions because of their different time management challenges, others thought it was a good idea to keep the groups together to get a better understanding of each other's challenges. The diverse panel (in terms of age, faculty position, mix of M.D. and Ph.D. degrees, and scientific discipline) was thought to be important to the success of this session.

Data Management and Laboratory Notebooks. Many participants recommended that this session be combined with the one on project management because the two sessions complemented each other. They thought that having a diverse panel (in terms of faculty position, M.D. and Ph.D. degrees, and scientific discipline) was an advantage. Participants thought it would be helpful to include several senior principal investigators to speak about their experiences in managing a variety of projects simultaneously. There was great interest in learning more about data management and, to a lesser extent, project management software. It was suggested that vendors be invited to display their software.

Mentoring and Being Mentored. Participants appreciated the concrete suggestions for creating an open and productive laboratory environment, including advice on mentoring individuals close in age to themselves (such as postdocs) and writing good recommendation letters. There was also significant interest in learning how to get the most out of being mentored. Participants liked the diverse composition of the panel (age, professional level, and mentoring style).

Roundtable Discussion: Problems in Scientific Management. This was one of the most popular sessions in the course because it allowed participants to apply what they had learned in practical situations and begin to achieve a sense of competence about laboratory management. The session was offered on the third day of the course after participants had completed sufficient training to solve case studies. However, the participants were getting tired by this point and would have appreciated having fewer than 10 cases to discuss as a group during the roundtable feedback session, especially because some of the cases had significant overlap. Five to six cases seemed to be the ideal number. A small-group format could have been used, but all participants would not have benefited from feedback from the entire audience.

Participants suggested including a senior principal investigator in each breakout group to help lend some perspective. However, the senior principal investigator should be reminded not to dominate the discussion process. If the course were to be held at a small research institution, it might be a good idea to use examples from a previous course so as not to embarrass the person submitting the problem (or potentially cause more serious problems with their department heads). It would speed up the session if the participants could review the case studies the night before or even to have the material sent to them before the course.

Finally, soliciting cases during rather than before the course might have resulted in a broader, more salient variety of case studies being discussed. Participants would have been exposed to the wide range of components that make up lab management and had a chance to think about how to apply the lessons they had learned to their own situations.

Gender Issues in the Laboratory. Participants wanted more statistics (perhaps as “ammunition” to take back to their departments). They also suggested that a hand-out containing recommended reading on the subject be included in future presentations. Participants wanted to expand the talk beyond women and raising children to include discrimination in the workplace (including minorities) and specific strategies on how to support both male and female junior faculty and postdocs. Instead of having a single-speaker format, participants thought the session would benefit from having panel members who are at different career stages; who have spouses with similar time constraints; and who have spouses who contribute their time, not just income, to child care.

Technology Transfer. Because this session was offered concurrently with “Obtaining and Negotiating a Faculty Position” and attendance was optional, participants recommended that they be told ahead of time why it was worthwhile to attend such a session. It would appear that many universities have not educated their faculty or postdocs about the benefits of patenting or bringing a product to market, so some sort of pitch should be made before the session to attract attendees. It was also recommended that the panel include a technology transfer software specialist. Participants would have appreciated sample completed forms for invention disclosure and boilerplate technology transfer agreements.

Obtaining and Negotiating a Faculty Position. This was a very popular session, mostly with postdocs rather than junior faculty who had recently gone through the process of finding a job. Participants were particularly eager to learn more about what is allowable in terms of negotiating (e.g., just how much back and forth is acceptable) and wanted more information on typical start-up packages, including sample faculty offers. Several participants suggested this would have been an ideal format for a workshop. Participants wanted the panel to consist of people with diverse perspectives—including individuals who had recently obtained their first faculty positions and others who had served on search committees.

The session also included information on obtaining tenure. Many junior faculty course participants were unable to attend because they were attending the concurrent session on technology transfer. They strongly recommended that the topic of obtaining tenure be covered in a separate session.

Participants who were physician-scientists wanted to know when it was necessary to obtain legal advice for negotiating clinical duties and call schedules. Participants also wanted tips about negotiating a job for a spouse (especially in locations with only one university).

Budgets and Budgeting. Participants thought this session could be combined with the “Getting Funded” session. Participants thought a panel session, with at least two senior principal investigators, and possibly a workshop or small discussion group section, would be ideal. Participants wanted more information on how to construct a reasonable budget for the first R01 grant application—how much to allocate for salaries, fringe benefits, equipment, and supplies. As such, sample budget forms (perhaps in electronic format on a CD) would be of great use. Participants also wanted specific information about what NIH (or the National Science Foundation) allows in terms of salaries and how to split salaries between multiple grants or funding sources. Other issues that were of particular interest were equipment ownership (regarding NIH grants), indirect versus direct costs, and how to make the most out of start-up funds.

APPENDIX I

Focus Group Participants

The following faculty and postdoctoral fellows provided feedback on the course at various stages of development:

Suzanne Admiraal, Harvard Medical School
Matthew Anderson, Massachusetts Institute of Technology
Gerard Blobe, Duke University
Azad Bonni, Harvard Medical School
Doris Brown, Wake Forest University
George Daley, Whitehead Institute for Biomedical Research
Ricardo Dolmetsch, Stanford University
Robert Flaumenhaft, Harvard Medical School
Lisa Glickstein, Tufts University
Lindee Goh, Massachusetts Institute of Technology
William C. Hahn, Harvard Medical School
Bill Kobertz, University of Massachusetts
Klaus R. L. Nüsslein, University of Massachusetts–Amherst
Patrick O'Brien, Harvard Medical School
Konstantine Severinov, Rutgers University
Brent Stockwell, Whitehead Institute for Biomedical Research
Catherine Wu, Brigham and Women's Hospital

APPENDIX 2

Model Laboratory Leaders

The Workshop in Basic Laboratory Leadership Skills was developed by Christine Harris, Ed.D., executive coach and management consultant, and Joan C. King, Ph.D., Tufts University School of Medicine, and principal, Beyond Success. As part of their preliminary needs assessment, Dr. Harris and Dr. King designed a questionnaire that was completed by the following 41 principal investigators, regarded as model laboratory leaders by their peers, students, or postdoctoral fellows:

Cornelia Bargmann, Howard Hughes Medical Institute and University of California–San Francisco
 John Boothroyd, Stanford University
 Gail H. Cassell, Eli Lilly and Company
 Thomas R. Cech, Howard Hughes Medical Institute and University of Colorado–Boulder
 M. Paul de Koninck, University of Laval
 Tamara L. Doering, Washington University in St. Louis
 Ann Etgen, Albert Einstein College of Medicine
 B. Brett Finlay, University of British Columbia
 Elaine Fuchs, Howard Hughes Medical Institute and The Rockefeller University
 William Goldman, Washington University in St. Louis
 David Goltzman, McGill University
 Susan Gottesman, National Institutes of Health
 Ashley Haase, University of Minnesota
 Margaret K. Hostetter, Yale University
 Nancy Kanwisher, Massachusetts Institute of Technology
 Marc Kirschner, Harvard University
 Mark Krasnow, Howard Hughes Medical Institute and Stanford University
 Joseph Majzoub, Harvard University
 Kelly Mayo, Northwestern University
 Louis J. Muglia, Washington University in St. Louis
 Charles E. Murry, University of Washington
 Erin O’Shea, Howard Hughes Medical Institute and University of California–San Francisco
 Joseph Pagano, University of North Carolina
 Suzanne Pfeffer, Stanford University
 Barry I. Posner, McGill University
 Howard A. Rockman, Duke University
 John Roth, University of Utah
 Thomas P. Sakmar, Howard Hughes Medical Institute and The Rockefeller University
 Gerald Schatten, University of Pittsburgh
 Lucy Shapiro, Stanford University
 George Sheldon, University of North Carolina
 John Sheridan, Ohio State University
 Christopher Somerville, Carnegie Institution
 Coimbatore B. Srikant, McGill University
 Jerome Strauss, University of Pennsylvania
 Jenny Ting, University of North Carolina
 Christopher Wylie, Cincinnati Children’s Hospital Research Foundation
 Tony Wynshaw-Boris, University of California–San Diego
 John D. York, Howard Hughes Medical Institute and Duke University
 Hans Zingg, McGill University
 Huda Y. Zoghbi, Howard Hughes Medical Institute and Baylor College of Medicine

APPENDIX 3

Course Schedule

BWF-HHMI Course in Scientific Management
HHMI Headquarters, Chevy Chase, MD
Saturday, July 27, to Wednesday, July 31, 2002

Saturday, July 27

- 3:00–6:00 p.m. Registration
- 4:00–6:00 p.m. Reception
Great Hall
- 6:00–7:30 p.m. Dinner
Dining Room
- 7:30–8:00 p.m. **Welcome**
Enriqueta C. Bond, President, Burroughs Wellcome Fund
Auditorium
- 8:00–9:00 p.m. **Keynote Address**
**Starting a Research Group in 1978: Are the
Lessons Still Relevant?**
Thomas R. Cech, President, Howard Hughes
Medical Institute
Auditorium

Rathskeller open until 11:00 p.m.

Sunday, July 28

- 7:00–7:30 a.m. Breakfast
- 7:30–9:30 a.m. **Workshop in Basic Laboratory Leadership
Skills, Session I**
Moderator: Martin Ionescu-Pioggia, Burroughs
Wellcome Fund
Speakers: Christine Harris, Management Consultant
Joan C. King, Tufts University School of Medicine
Dining Room
- 9:30–10:00 a.m. Break
Great Hall

- 10:00 a.m.–12:00 noon **Workshop in Basic Laboratory Leadership Skills, Session I**
Moderator: Martin Ionescu-Pioggia, Burroughs Wellcome Fund
Speakers: Christine Harris, Management Consultant
Joan C. King, Tufts University School of Medicine
Dining Room
- 12:00–12:30 p.m. Break
- 12:30–1:30 p.m. Lunch
Dining Room
- 1:30–4:00 p.m. **Project Management**
Moderator: Jim Austin, American Association for the Advancement of Science
Speaker: Stanley E. Portny, Stanley E. Portny and Associates, LLC
Auditorium
- 4:00–4:30 p.m. Break
Great Hall
- 4:30–6:00 p.m. **Collaborations**
Moderator: Victoria McGovern, Burroughs Wellcome Fund
Speakers: Claire M. Fraser, The Institute for Genomic Research
Rick Tarleton, University of Georgia
Joseph DeRisi, University of California–San Francisco
Auditorium
- 6:00–7:30 p.m. Dinner
Dining Room
- 7:30–8:45 p.m. **Keynote Address**
The Scientific Investigator Within the University Structure
Introduction: Enriqueta C. Bond, Burroughs Wellcome Fund
Speaker: Tony G. Waldrop, University of North Carolina–Chapel Hill
Auditorium

Rathskeller open until 11:00 p.m.

Monday, July 29

- 7:00–7:30 a.m. Breakfast
Dining Room
- 7:30–9:30 a.m. **Workshop in Basic Laboratory Leadership Skills, Session II**
Moderator: Martin Ionescu-Pioggia, Burroughs Wellcome Fund
Speakers: Christine Harris, Management Consultant
Joan C. King, Tufts University School of Medicine
Auditorium
- 9:30–10:00 a.m. Break
Great Hall
- 10:00 a.m.–12:30 p.m. **Workshop in Basic Laboratory Leadership Skills, Session II**
Moderator: Martin Ionescu-Pioggia, Burroughs Wellcome Fund
Speakers: Christine Harris, Management Consultant
Joan C. King, Tufts University School of Medicine
Auditorium
- 12:30–1:00 p.m. Complete Application Forms for Postcourse Coaching in Laboratory Leadership
Auditorium
- 1:00–2:00 p.m. Lunch
Dining Room
- 2:00–4:00 p.m. **Getting Funded**
Moderator: Jim Austin, American Association for the Advancement of Science
Speakers: Anthony Demsey, National Institutes of Health
Bettie J. Graham, National Human Genome Research Institute
Suzanne Pfeffer, Stanford University
Auditorium
- 4:00–4:30 p.m. Break
Great Hall
- 4:30–5:30 p.m. **Getting Published**
Moderator: Jim Austin, American Association for the Advancement of Science
Speaker: Angela Eggleston, Cell Press
Auditorium
- 5:30–6:00 p.m. Reception
Great Hall

6:00–7:30 p.m.	Dinner
7:30–8:45 p.m.	<p>Keynote Address Current Issues in Research Ethics Introduction: Maryrose Franko, Howard Hughes Medical Institute Speaker: R. Alta Charo, University of Wisconsin Law School <i>Auditorium</i></p>

Rathskeller open until 11:00 p.m.

Tuesday, July 30

7:00–7:45 a.m.	Breakfast <i>Dining Room</i>
7:45–10:00 a.m.	<p>Time Management Moderator: Maryrose Franko, Howard Hughes Medical Institute Speakers: Richard M. Reis, Stanford University Sandra Schmid, The Scripps Research Institute Todd Golub, Dana-Farber Cancer Institute <i>Auditorium</i></p>
10:00–10:30 a.m.	Break <i>Great Hall</i>
10:30 a.m.–12:30 p.m.	<p>Data Management and Laboratory Notebooks Moderator: Maryrose Franko, Howard Hughes Medical Institute Speakers: Howard Kanare, Construction Technology Laboratories Joseph M. Vinetz, University of Texas Medical Branch David J. Adams, Duke University Medical Center <i>Auditorium</i></p>
12:30–2:00 p.m.	Lunch <i>Dining Room</i>
2:00–3:30 p.m.	<p>Mentoring and Being Mentored Moderator: Victoria McGovern, Burroughs Wellcome Fund Speakers: Dorothy E. Shippen, Texas A&M University David S. Roos, University of Pennsylvania Stephen L. Hajduk, University of Alabama–Birmingham <i>Auditorium</i></p>
3:30–4:00 p.m.	Break <i>Great Hall</i>

- 4:00–6:00 p.m. **Roundtable Discussion: Problems and Solutions in Scientific Management**
Moderators: Maryrose Franko, Howard Hughes Medical Institute
Rolly L. Simpson, Burroughs Wellcome Fund
Panelists: Thomas R. Cech, Howard Hughes Medical Institute
Peter J. Bruns, Howard Hughes Medical Institute
Klaus R. L. Nusslein, University of Massachusetts–Amherst
Christine Harris, Management Consultant
Kathy Barker, Author of *At the Helm: A Laboratory Navigator*
Auditorium
- 6:00–6:30 p.m. Reception
Great Hall
- 6:30–7:30 p.m. Dinner
Dining Room
- 7:30–8:30 p.m. Keynote Address
Gender Issues in the Laboratory
Introduction: Laura Bonetta, Course Coordinator
Speaker: Gina Turrigiano, Brandeis University
Auditorium
- 8:30–8:45 p.m. *Break*
- 8:45–9:30 p.m. **An Overview of Scientific Management: Course Summary**
Speakers: Peter J. Bruns, Howard Hughes Medical Institute
Victoria McGovern, Burroughs Wellcome Fund
Auditorium

Rathskeller open until 11:00 p.m.

Wednesday, July 31

All guests check out of hotel. Bring luggage to Conference Center

- 7:00–8:00 a.m. Breakfast
Dining Room
- 8:00–10:00 a.m.
(concurrent session) **Technology Transfer**
Moderator: Andrea Stith, Howard Hughes Medical Institute
Speakers: Francis J. Meyer, A.M. Pappas & Associates
Martha J. Connolly, EntreMed
Christopher T. Moulding, Howard Hughes Medical Institute
Auditorium

8:00–10:00 a.m. (concurrent session)	Obtaining and Negotiating a Faculty Position Moderator: Rolly Simpson, Burroughs Wellcome Fund Speakers: Chris M. Golde, Carnegie Foundation for the Advancement of Teaching Johannes Walter, Harvard Medical School Christopher Wylie, Children’s Hospital Research Foundation in Cincinnati <i>Conference Room A (D125)</i>
10:00–10:30 a.m.	Break <i>Great Hall</i>
10:30–11:30 a.m. (concurrent session)	Budgets and Budgeting: Survival Management Strategies 101 Moderator: James Austin, American Association for the Advancement of Science Speaker: Mike McClure, National Institute of Environmental Health Sciences, National Institutes of Health <i>Auditorium</i>
10:30–11:30 a.m. (concurrent session)	Mentoring Panel Discussion Moderator: Victoria McGovern, Burroughs Wellcome Fund Speakers: Elizabeth Keath, Saint Louis University E. Lynn Zechiedrich, Baylor College of Medicine <i>Conference Room A (D125)</i>
11:30 a.m.–12:00 noon	Complete Course Evaluation Forms
12:00 noon	Meeting Adjourns (Bag lunches available in Dining Room)
12:15 p.m.	Vans and Cabs Depart for Airports, Train Stations, or Other Local Addresses

APPENDIX 4

Speaker Biographies

David J. Adams, Ph.D., Associate Research Professor of Medicine, Department of Medicine, Duke University Medical Center

David J. Adams completed his undergraduate work in 1972 at the University of Iowa and obtained his Ph.D. in biochemistry from the University of Nebraska. In his post-doctoral work at the University of Texas Health Sciences Center in San Antonio, he moved his studies from steroid hormone action in the rat uterus to the understanding of estrogen-dependent growth in human breast cancer. He was a senior tumor biologist for 12 years at Burroughs Wellcome Company, Research Triangle Park, North Carolina, developing new anticancer drugs. He helped advance three compounds to clinical trial, one of which (Crisnatol) soon will be approved for therapy of brain tumors. In addition, he was involved in the development and the Investigational New Drug Application for Navelbine, an important drug for breast and ovarian cancer. Adams currently heads the Drug Discovery and Development Laboratory of the Duke Comprehensive Cancer Center. The mission of this laboratory is to develop novel, more selective anticancer drugs and drug combinations and to provide laboratory support for phase I and II clinical trials. Currently, his lab is collaborating with investigators at the Research Triangle Institute and the National Cancer Institute to develop the next generation of drugs based on the natural product camptothecin (analogs of which are used clinically to treat breast and colon cancer). In addition, Adams's group is evaluating new drug combinations for leukemia, work that has led to two clinical trials at Duke. Adams is a member of the Cancer Protocol Review Committee and Duke University Medical Center Institutional Review Board, which are responsible for protecting human subjects in clinical research.

Thomas R. Cech, Ph.D., President, Howard Hughes Medical Institute

Born in Chicago, Illinois, on December 8, 1947, and raised and educated in Iowa, Tom Cech received a B.A. degree in chemistry from Grinnell College. He obtained his Ph.D. in chemistry from the University of California–Berkeley and then conducted postdoctoral research in the Department of Biology at the Massachusetts Institute of Technology. In 1978, he joined the faculty of the University of Colorado–Boulder, where he became a Howard Hughes Medical Institute (HHMI) investigator in 1988 and Distinguished Professor of Chemistry and Biochemistry in 1990. In 1982, Cech and his research group announced that an RNA molecule from *Tetrahymena*, a single-celled pond organism, cut and rejoined chemical bonds in the complete absence of proteins. Thus, RNA was not restricted to being a passive carrier of genetic information but had an active role in cellular metabolism. This discovery of self-splicing RNA provided the first exception to the long-held belief that biological reactions are always catalyzed by proteins. In addition, it has been heralded as providing a new, plausible scenario for the origin of life. Because RNA can be both an information-carrying molecule and a catalyst, perhaps the first self-reproducing system consisted of RNA alone. Only years later was it recognized that RNA catalysts, or “ribozymes,” might provide a new class of highly specific pharmaceutical agents, able to cleave and thereby inactivate viral RNAs or other RNAs involved in disease. Cech has received many national and international awards and prizes, including the Heineken Prize of the Royal Netherlands Academy of Sciences (1988), the Albert Lasker Basic Medical Research Award (1988), the Nobel Prize in Chemistry (1989), and the National Medal of Science (1995). In 1987, Cech was elected to the National Academy of Sciences and also was awarded a lifetime professorship by the American Cancer Society. Since 2000, Cech has been president of HHMI, headquartered in Chevy Chase, Maryland. He continues research on ribozyme structure and on telomerase in his Boulder, Colorado, laboratory.

R. Alta Charo, J.D., Associate Dean, Research and Faculty Development, University of Wisconsin Law School

R. Alta Charo is associate dean for research and faculty development at the University of Wisconsin Law School and professor of law and bioethics at the University of Wisconsin–Madison, where she is on the faculty of the law school and the medical school's Program in Medical Ethics. She offers courses on health law, bioethics and biotechnology law, food and drug law, medical ethics, reproductive rights, torts, and legislative drafting. In addition, she has served on the University of Wisconsin Hospital clinical ethics committee, the university's Institutional Review Board for the protection of human subjects in medical research, and the university's Bioethics Advisory Committee. She has also been a visiting professor at law and medical schools in Argentina, Australia, Canada, China, Cuba, France, Germany, and New Zealand. Charo is the author of more than 75 articles, book chapters, and government reports on topics such as voting rights, environmental law, family planning and abortion law, medical genetics law, reproductive technology policy, and science policy and ethics. She currently serves on the editorial boards of the *Journal of Law, Medicine and Ethics*, *Cloning: Science and Policy*, and the *Monash Bioethics Review*. Charo is a member of the board of the Alan Guttmacher Institute and the Foundation for Genetic Medicine and has been on the board of the Society for the Advancement of Women's Health Research and the board of the American Association of Bioethics. In addition, she was a member of the steering committee to found the International Association for Bioethics and has served as a consultant to the National Academy of Sciences Institute of Medicine and the National Institutes of Health Office of Protection from Research Risks. Since 2001, she has been a member of the National Academy of Sciences Board on Life Sciences. Charo obtained her B.A. degree in biology from Harvard in 1979 and her J.D. degree from Columbia University in 1982.

Anthony M. Coelho Jr., Ph.D., Review Policy Officer, Office of Extramural Research, Office of the Director, National Institutes of Health

Anthony M. Coelho Jr. received his doctoral degree from the University of Texas–Austin. As review policy officer, he is responsible for developing and implementing regulations, policies, procedures, methods, and guidance documents as well as governing National Institutes of Health (NIH) extramural review functions to ensure standard approaches to the peer review of grants, cooperative agreements, and research and development contracts. Before his current position, Coelho served for seven years as the chief of the Clinical Studies and Training Review Section at the National Heart Lung and Blood Institute (NHLBI) at NIH; he also served for seven years as a scientific review administrator at NHLBI/NIH. Before joining NIH, Coelho held positions as scientist in the Department of Physiology and Medicine and laboratory director at the Southwest Foundation for Biomedical Research in San Antonio. He also was a professor in the Department of Surgery/Neurosurgery, an associate professor in the Department of Pediatrics, and an associate professor in the Department of Dental Diagnostics Sciences at the University of Texas Health Sciences Center in San Antonio. He was the recipient of more than 18 years of grant and contract funding from NIH and other federal agencies. In addition, Coelho served for 12 years as a peer reviewer of grants and contracts for NIH and other federal agencies.

Martha J. Connolly, Ph.D., EntreMed (Now Director, Maryland Industrial Partnerships, Maryland Technology Enterprise Institute)

Martha J. Connolly is the director of the Maryland Industrial Partnerships (MIPS), a program of the Maryland Technology Enterprise Institute (MTECH). MIPS acceler-

ates the commercialization of technology in Maryland by providing matching funds for collaborative R&D projects between companies and University System of Maryland faculty. Connolly holds a B.S. and an M.S. degree in chemistry from Stevens Institute of Technology and a Ph.D. in biomedical engineering from The Johns Hopkins University. She was a research faculty member at Johns Hopkins and later an assistant professor at the University of Maryland, Baltimore. She is the author of 36 publications in cardiovascular systems physiology. She is the former senior biotechnology specialist for the State of Maryland Department of Business and Economic Development. She was also a founder of Clairus Technologies and director of business development at EntreMed. Connolly is experienced in business development and technology commercialization in academia, government, and industry.

Joseph DeRisi, Ph.D., Assistant Professor, Department of Biochemistry and Biophysics, University of California–San Francisco

Joseph DeRisi completed his undergraduate degree in biochemistry at the University of California–Santa Cruz in 1992. In 1999, DeRisi earned his Ph.D. from the department of biochemistry at Stanford University, under the supervision of Patrick O. Brown. His graduate thesis was entitled “Whole genome gene expression studies of the budding yeast *Saccharomyces cerevisiae*.” After graduating, DeRisi joined the University of California–San Francisco Fellows Program. One-and-a-half years later, he accepted an assistant professorship offer in the department of biochemistry and biophysics at the University of California–San Francisco. In his new lab, DeRisi has been extending genomic approaches to the study of malaria and human respiratory viruses.

Angela Eggleston, Ph.D., Senior Editor, Cell Press

Angela Eggleston received her B.S. degree in microbiology and M.S. degree in molecular genetics from the University of Notre Dame. She conducted her Ph.D. training in biochemistry and molecular biology with Stephen Kowalczykowski at Northwestern University Medical School and the University of California–Davis. Her doctoral studies concerned the role of the *Escherichia coli* RecBCD helicase/nuclease in the initiation of genetic recombination and resulted in a U.S. patent. For her postdoctoral studies, she made the first of four trans-Atlantic moves to work with Stephen West at the Clare Hall Laboratories of the Imperial Cancer Research Fund (now Cancer Research UK). There, she studied the opposite end of the recombination process, characterizing the *E. coli* RuvABC Holliday junction resolution complex. Her postdoctoral fellowship was sponsored in part by a Burroughs Wellcome Hitchings–Elion Fellowship. She then undertook a short postdoc with Fred Alt at HHMI/Children’s Hospital in Boston, working on nonhomologous end joining in mammalian cells. From there, she went into scientific publishing and joined the Nature Publishing Group in London as an associate editor for *Nature Cell Biology*. In July 2001, she joined Cell Press in Cambridge, Massachusetts, as a senior editor and is responsible for molecular-biology-related manuscripts received for consideration for *Cell*, *Molecular Cell*, and *Developmental Cell*.

Claire M. Fraser, Ph.D., President and Director, The Institute for Genomic Research

Claire M. Fraser is president and director of The Institute for Genomic Research (TIGR) in Rockville, Maryland, which has been at the forefront of the genomics revolution since it was founded in 1992. Fraser led the TIGR teams that sequenced the genomes of *Mycoplasma genitalium*, the spirochetes *Treponema pallidum* and *Borrelia burgdorferi*, and two species of *Chlamydia*. She is now overseeing several major research projects, including the genomic sequencing of *Bacillus anthracis*, and is a member of

National Research Council committees on countering bioterrorism and on domestic animal genomics. She also has served on review committees of the National Science Foundation and the National Institutes of Health (NIH). Fraser has published more than 160 articles in scientific journals and books. She edited two volumes in the *Receptor Biochemistry and Methodology* series on neurotransmitter receptors, has been a reviewer for nine scientific journals, and currently serves on the editorial board of *The Journal of Biological Chemistry*. She is a former editor for *Comparative and Microbial Genomics* and for the *International Encyclopedia of Pharmacology and Therapeutics*. Before becoming TIGR's president in 1998, Fraser was the institute's vice president of research and director of its microbial genomics department. Before that, she worked as a researcher at NIH, including three years as chief of the section of molecular neurobiology at the National Institute on Alcohol Abuse and Alcoholism. She is a summa cum laude graduate of Rensselaer Polytechnic Institute and received a Ph.D. in pharmacology from the State University of New York at Buffalo. She has received numerous academic and professional honors, including professorships in both microbiology and pharmacology at The George Washington University.

Chris M. Golde, Ph.D., Senior Scholar, Carnegie Foundation for the Advancement of Teaching

Chris M. Golde is a senior scholar at the Carnegie Foundation for the Advancement of Teaching, where she works with the Carnegie Initiative on the Doctorate (CID). The CID seeks to develop and study experiments in doctoral education that are focused on preparing students to be stewards of their discipline. Before joining Carnegie, she was a faculty member at the University of Wisconsin–Madison, where her research focused on doctoral education. She is the lead author of *At Cross Purposes: What the Experiences of Today's Doctoral Students Reveal About Doctoral Education*, the report of the national Survey on Doctoral Education and Career Preparation, funded by the Pew Charitable Trusts. Her other work has focused on interdisciplinary and multidisciplinary graduate education and doctoral student attrition. Golde received a Ph.D. in education in 1996 and an M.A. degree in sociology in 1993 from Stanford University. She is also a graduate of Brown University (B.A. degree in linguistics, 1982) and Columbia University Teachers College (M.A. degree in student personnel administration, 1984).

Todd Golub, M.D., Charles A. Dana Investigator in Human Cancer Genetics, Dana-Farber Cancer Institute (Also Associate Investigator, Howard Hughes Medical Institute)

Todd Golub serves as director of the Cancer Genomics Program at the Whitehead Institute Center for Genome Research. He is also the Charles A. Dana Investigator in Human Cancer Genetics at the Dana-Farber Cancer Institute and associate professor of pediatrics at Harvard Medical School. Golub obtained his M.D. degree at the University of Chicago Pritzker School of Medicine and pursued clinical training in pediatric oncology at Boston Children's Hospital and the Dana-Farber Cancer Institute. He completed his postdoctoral research training at the Brigham and Women's Hospital and Harvard Medical School. His work as director of the Cancer Genomics Program at the Center for Genome Research focuses on discovering genomic and computational solutions to problems in cancer biology and cancer medicine, including the development of improved strategies for the diagnosis and treatment of cancer. Golub is recognized for his numerous contributions to cancer research, including the discovery of the most common genetic aberration in childhood leukemia and the development of genomics-based approaches to cancer diagnosis. He received the Discover Magazine Inventor of the Year Award, Health Category (2000), and the Judson Daland Prize of the American Philosophical Society for Outstanding Achievement in Clinical

Investigation (2001). In 2002, Golub was appointed Howard Hughes Medical Institute (HHMI) associate investigator in HHMI's competition for physician-scientists.

Bettie J. Graham, Ph.D., Program Director, National Human Genome Research Institute, National Institutes of Health

Bettie J. Graham received her undergraduate degree from Texas Southern University and her Ph.D. in virology from Baylor College of Medicine in 1972. She did postdoctoral research at Albert Einstein College of Medicine and in the intramural laboratory of the National Cancer Institute. In 1979, she was selected to participate in the Grants Associates Program at the National Institutes of Health (NIH); this was a one-year program to provide scientists with management experience. All of her positions at NIH have been on the program side. She has experience at the National Eye Institute, the Fogarty International Center, and now the National Human Genome Research Institute. She was one of the first program directors at the National Human Genome Research Institute, which was then called the National Center for Human Genome Research. Her research portfolio includes grants in mapping technology and sequencing technology by using mass spectroscopy. She also coordinates the institute's Small Business Innovation Research and Small Business Technology Transfer programs and its training and career development program. She has been invited to participate in many workshops dealing with the NIH process of funding research grants and research training and career development programs.

Stephen L. Hajduk, Ph.D., Professor, Department of Biochemistry and Molecular Genetics, University of Alabama–Birmingham (Now Director, Program in Global Infectious Diseases, Marine Biological Laboratory)

Stephen L. Hajduk received a B.S. degree from the University of Georgia in 1977. He pursued graduate studies at the University of Glasgow and the University of Amsterdam in the laboratories of professors Keith Vickerman and Piet Borst and obtained his Ph.D. in 1980. He did postdoctoral work in the Department of Physiological Chemistry at The Johns Hopkins University in Paul Englund's laboratory, studying the replication of mitochondrial DNA. Hajduk joined the faculty at University of Alabama–Birmingham (UAB) in 1983 and was promoted to full professor in 1992. He is a member of the UAB Center for AIDS Research and the Comprehensive Cancer Center. In 1991, he was named a Burroughs Wellcome Scholar in Molecular Parasitology, and, in 1994, he was named a Fogarty International Scholar. In 1998, he was named director of the UAB Center for Community Outreach Developments. Hajduk directed the biology of parasitism course at the Marine Biological Laboratory, Woods Hole, Massachusetts, from 1994 to 1998 and coordinates the annual molecular parasitology meeting at Woods Hole. Hajduk joined the Bay–Paul Center at the Marine Biological Laboratory in 2003 as director of the Ellison Program in Global Infectious Diseases. Hajduk is on the editorial boards for the *Journal of Biological Chemistry*, *Molecular and Biochemical Parasitology*, *Parasitology International*, and *Experimental Parasitology*. His research is supported by grants from the National Institutes of Health (NIH). His science education outreach programs are supported by the Howard Hughes Medical Institute, Robert Wood Johnson Foundation, the National Science Foundation, NIH, and the State of Alabama.

Christine Harris, Ed.D., Personal and Executive Coach and Management Consultant

Christine Harris received her undergraduate degree in psychology from Pomona College and her master's degree with a concentration in organizational development and her doctorate in adult development and education from Harvard University. For more than 18 years, Harris has helped individuals, groups, and organizations to clarify and commit to their visions and to develop the strategies and behaviors required to

express their inherent excellence. She uses her expertise in adult development and experiential learning to support individuals in realizing their full potential, to train and build collaborative management and work teams, and to design and implement change-management strategies. Her personal and executive coaching focuses on enhancing individuals' career satisfaction and on improving their interpersonal, group-process, and leadership skills. Harris's consulting clients include AT&T Bell Laboratories, Pfizer, Digital Equipment Corp., the Red Cross, the National Council on Library Resources, the American Association of Publishers, the National Engineering Foundation, The Vanguard Group, and Public Service Electric and Gas as well as several health care, educational, and service organizations. Her teaching experience includes seminars and courses on consulting theory and methods, action science, action inquiry, and adult developmental theory at the Harvard Graduate School of Education, Columbia University Teachers College, Boston College Carroll School of Management, the Wharton Business School Global Leadership and Teamwork program, and several American and European consulting firms. She also served on the staff of the National Training Laboratories Graduate Student Professional Development Program in experiential education and has taught workshops on leadership, conflict and meeting management, and effective communication. She is a member of the National Organizational Development Network, the Academy of Management, and the Cypress Consulting Group.

Howard Kanare, Senior Principal Scientist, Construction Technology Laboratories

Howard Kanare has been with Construction Technology Laboratories (CTL), Skokie, Illinois, and its parent company, the Portland Cement Association, since 1979. He has worked in technical services and applied research, and for 15 years he managed CTL's materials testing labs, including optical and X-ray spectroscopy, electron microscopy, analytical chemistry, and physical testing. He specified and supervised installation of all the major analytical instrumentation and developed three generations of laboratory information management systems. Kanare established procedures for sample handling and identification, instrument calibration and maintenance, report review, and quality assurance documents. His staff has been responsible for the unique development, production, and certification analyses for more than 15 standard reference materials under contracts with the National Institute of Standards and Technology. He is an active member and officer of the American Society for Testing and Materials (ASTM) Committee F-6 on Resilient Floor Coverings and principal author of several ASTM standards. He is the author of the American Chemical Society's best-selling book *Writing the Laboratory Notebook*, published in 1985. He is author or coauthor of more than 250 technical reports and more than 25 publications.

Elizabeth Keath, Ph.D., Associate Professor, Department of Biology, Saint Louis University

Elizabeth (Betsy) Keath is an associate professor of biology at Saint Louis University in St. Louis, Missouri. She received her doctorate in biochemistry and molecular biology in 1985, moving to a postdoctoral fellowship and then instructor position in the Mycology Center at the Washington University School of Medicine from 1985 to 1990. Her research interests focus on the relationship between dimorphism and virulence in the pathogenic fungus *Histoplasma capsulatum*, using an array of molecular, genetic, and immunological approaches to understand the fundamental cell biology of this medically relevant ascomycete. Her research has been supported by funding from the American Lung Foundation and by both a FIRST and R01 award from the National Institute of Allergy and Infectious Diseases. Most recently, she was the recipient of a scholar award from the Burroughs Wellcome Fund in molecular pathogenic

mycology. Over the past 12 years at Saint Louis University, she has actively taught in the undergraduate and graduate curriculum, mentoring five Ph.D. students and six master's degree candidates, while serving on 20 thesis dissertation committees. She has served on various section committees for the American Society for Microbiology and has been an ad hoc member of the Bacteriology and Mycology Study Section 2.

**Joan C. King, Ph.D., Professor Emerita, Tufts University
School of Medicine**

Joan C. King received her undergraduate degree in chemistry from Dominican College, her M.S. degree from the University of New Orleans, and her Ph.D. in neurosciences and psychology from Tulane University. King joined the faculty at Tufts University School of Medicine in 1979. During her 20 years at Tufts, she directed the medical neurosciences course and a research lab that focused on hypothalamic neurons that synthesize a peptide critical to reproduction. She received a National Institutes of Health (NIH) Career Development Award and her research was funded by both NIH and the National Science Foundation (NSF). As chair of the Department of Anatomy and Cellular Biology, she created and financed a multimedia resource center. King, together with a group of researchers, created and functioned as director of the NIH-funded Center of Excellence for Research in Reproduction. At the national level, King chaired the Population Research Committee, an advisory committee for the National Institutes of Child Health and Human Development, and several Committees of Visitors to NSF. Currently, King serves as past president of Women in Neurosciences and the Training and Development workgroup for the Society for Neuroscience strategic plan. King took early retirement to found her business, Beyond Success, which is devoted to enhancing people's potential. In addition to developing and presenting workshops and speaking publicly, she coaches individuals to express their highest levels of creativity. Her recently published book *Cellular Wisdom* articulates her coaching philosophy. In coaching researchers and administrators, King engages with each person to help them recognize their strengths, clarify their goals, hone their strategies, develop their leadership skills, and achieve success in a manner that generates personal and professional fulfillment.

**Michael E. McClure, Ph.D., Chief, Organs and Systems Toxicology
Branch National Institute of Environmental Health Sciences, National
Institutes of Health**

McClure is the chief of the Organs and Systems Toxicology Branch (OSTB) in the Division of Extramural Research and Training at the National Institute of Environmental Health Sciences (NIEHS) of the National Institutes of Health (NIH). In this capacity, he is responsible for and oversees a broad, national extramural research branch (with an annual budget of \$90 million) with five program areas staffed with senior scientist administrators. He also serves as the science program administrator for the NIEHS Toxicogenomics Research Consortium, the joint government–industry (NIEHS–American Chemistry Council) Developmental Toxicology Extramural Research Program, and the OSTB Reproductive System Pathophysiology Research Program. Before joining NIEHS in late 1998, he served as the chief of the Reproductive Sciences Branch and head of the Reproductive Genetics and Immunology Unit in the Center for Population Research of the National Institute of Child Health and Human Development (NICHD). The latter branch program in reproductive biology, endocrinology, genetics, and medicine grew from \$60 million to more than \$100 million during his tenure. Both branch programs consist of a wide range of grant mechanisms for research and research training conducted by extramural investigators employed by for-profit private sector companies or not-for-profit academic institutions. McClure received his Ph.D. in 1970 from the

University of Texas Graduate School of Biomedical Sciences in Houston, where he completed graduate and postdoctoral training in cell biology and biochemistry. He was elected to the faculties of the University of Texas Graduate School of Biomedical Sciences and the University of Texas M.D. Anderson Hospital and Tumor Institute in Houston in 1972, where he served in the Department of Biochemistry. In 1973, he joined the faculty of the Department of Cell Biology at the Baylor College of Medicine in Houston. He was subsequently recruited in 1976 to the Department of Developmental Therapeutics at the University of Texas System Cancer Center in Houston as a joint research faculty. He then served as research administrator at NICHD in 1979 and went on to NIEHS in 1999.

**Francis J. Meyer, Ph.D., Vice President, Enterprise Development,
A. M. Pappas & Associates**

Francis J. Meyer has 32 years of experience in academic technology transfer and the medical products industry. Meyer heads A. M. Pappas & Associates (AMP&A) Enterprise Group, a unit aimed at identifying and commercializing technologies emerging from the academic, government, and industry sectors. Before joining AMP&A, Meyer served as associate vice provost and director of the Office of Technology Development at the University of North Carolina–Chapel Hill, where he was responsible for managing, evaluating, patenting, marketing, and licensing the university's intellectual and tangible property. He was also responsible for new start-up company development, corporate-sponsored research, patent donations, and material transfer agreements. Meyer has taught a technology transfer course at the University of North Carolina–Chapel Hill Kenan-Flagler Business School to second-year MBA students. Before joining the university in 1995, Meyer worked for 10 years at The Johns Hopkins University School of Medicine, where he served as associate dean and director of the Office of Technology Licensing. During his academic technology transfer career, Meyer has evaluated 1,850 inventions, licensed 580 inventions, and assisted with the formation of 17 start-up companies based on university technologies (at Johns Hopkins and University of North Carolina–Chapel Hill). Before working at Johns Hopkins, Meyer was vice president of medical and regulatory affairs and a member of the management board at Extracorporeal, Inc., a Johnson & Johnson company. He received his B.S. degree in pharmacy from Loyola University in New Orleans and his Ph.D. in pharmacology from the University of Maryland–Baltimore. Meyer has served on various boards and committees of the Food and Drug Administration and the National Academy of Sciences as well as on industry association, academic, and professional boards and committees. He is currently a member of the Association of University Technology Managers, Licensing Executive Society, North Carolina Biosciences Organization Board of Directors, Research and Development Advisory Committee of the North Carolina Genomics & Bioinformatics Consortium, and the Wake County Technology Business Development Advisory Committee.

**Christopher T. Moulding, Science Administrator for Intellectual Property,
Howard Hughes Medical Institute**

Christopher T. Moulding is the science administrator for intellectual property at Howard Hughes Medical Institute (HHMI), a position he has held since April 2000. On behalf of HHMI, Moulding reviews and approves the agreements between HHMI investigators and their counterparts in industry through their collaborations, consulting, and material transfer agreements. Moulding's career began as a research technician at the National Institutes of Health and Harvard Medical School, where he worked for Philip Leder, HHMI senior investigator in the Department of Genetics. Thereafter, he attended business school and received his MBA from Stanford

University in 1986. He held positions as manager of business development at Chiron Corporation and Systemix before joining the Office of Intellectual Property Administration at the University of California–Los Angeles in 1991, where he worked as a licensing officer. Moulding subsequently joined the California Institute of Technology in 1997 as director of life science technologies in the Office of Technology Transfer. He came to HHMI with 14 years of technology licensing experience from both industrial and academic sectors and with hands-on experience as a laboratory researcher.

Suzanne Pfeffer, Ph.D., Professor and Chairman, Department of Biochemistry, Stanford University School of Medicine

Suzanne Pfeffer is a professor of biochemistry and chairman of the Biochemistry Department at Stanford University. Her research is aimed at understanding the localization of receptors to specific subcellular compartments and how receptors move from one compartment to another. She was president of the American Society for Cell Biology in 2003 and is a member of *Science* magazine's Board of Reviewing Editors. She received her Ph.D. from the University of California–San Francisco.

Stanley E. Portny, President, Stanley E. Portny and Associates, LLC

Stanley E. Portny is an internationally recognized expert in project management and project leadership. During the past 30 years, he has provided training and consultation to more than 100 public and private organizations in the fields of pharmaceuticals, health care, consumer products, information technology, finance, insurance, telecommunications, and defense. He has developed and conducted training programs for more than 25,000 management and staff personnel in research and development, engineering, sales and marketing, information systems, manufacturing, operations, and support. Portny has been president of Stanley E. Portny and Associates, LLC, for 25 years. A Project Management Institute (PMI)–certified Project Management Professional and a PMI global registered education provider, Portny is the author of *Project Management for Dummies*, part of the widely acclaimed *For Dummies* series of business and professional books. He received his B.S. degree in electrical engineering summa cum laude from the Polytechnic Institute of Brooklyn and his M.S.E.E. degree and the degree of electrical engineer from the Massachusetts Institute of Technology. In addition, he studied at the Alfred P. Sloan School of Management and the George Washington University National Law Center. Further information is available at <http://www.StanPortny.com>.

Richard M. Reis, Ph.D., Executive Director, Alliance for Innovative Manufacturing, Stanford University

Richard M. Reis has had a long-standing interest in higher education, particularly in helping individuals prepare for, find, and succeed at academic careers in science and engineering. He is currently the executive director of the Alliance for Innovative Manufacturing at Stanford University and the executive director of the Stanford Research Communication Program. From 1997 to 2000, he was the director of Academic Partnerships at the Stanford Learning Laboratory, founded in 1997 by former Stanford president, Gerhard Casper. From 1982 to 1997, he was the executive director of the Stanford Center for Integrated Systems, a major research partnership between Stanford and 15 industrial companies. Reis is also a consulting professor in both the electrical engineering and mechanical engineering departments at Stanford. Among his many responsibilities is teaching a year-round seminar on preparing graduate students for academic careers in science, engineering, and business. The seminar is part of the Stanford University Future Professors of Manufacturing Program, which Reis also directs. He is the founder and editor of *Tomorrow's Professor Listserv*, a

biweekly electronic publication with more than 15,000 subscribers in 106 countries. Reis is the author of *Tomorrow's Professor: Preparing for Academic Careers in Science and Engineering* (IEEE Press, 1997). He holds bachelor's degrees in physical geography (1964) and physics (1965), both with honors, and a master's degree in science education (1968) from California State University–Los Angeles. He also holds a master's degree in physical science (1969) and a Ph.D. in higher education (1971) from Stanford University.

David S. Roos, Ph.D., Merriam Professor of Biology, University of Pennsylvania

David S. Roos is the Merriam Professor of Biology at the University of Pennsylvania. He also directs the Penn Genomics Institute, integrating research in genomics campuswide. Roos earned his undergraduate degree at Harvard College and a Ph.D. at The Rockefeller University. He joined the University of Pennsylvania in 1989 after a postdoctoral stint at Stanford University. Roos's current research interests focus on protozoan parasites, including *Toxoplasma* (a prominent congenital pathogen and opportunistic infection associated with AIDS) and *Plasmodium* (the causative agent of malaria). Work in the Roos laboratory encompasses molecular genetic and cell biological dissection of parasite pathogenesis; pharmacological, biochemical, and structural studies on drug targets and resistance mechanisms; studies on the evolution of eukaryotic organelles and replicative mechanisms; and the development and mining of parasite genome databases. Further information is available at <http://www.bio.upenn.edu/faculty/roos/>.

Sandra L. Schmid, Ph.D., Chairman, Department of Cell Biology, The Scripps Research Institute

Sandra L. Schmid joined the faculty of The Scripps Research Institute in 1988 in the department of cell biology and is currently a professor and chairman of the department. Work in her lab aims to define the molecular mechanisms of receptor-mediated endocytosis through the development and analysis of cell-free assays that faithfully reconstitute this process and confirmation of function through *in vivo* analysis. Biochemical, molecular biological, and morphological approaches are used to elucidate the mechanisms of coat assembly, cargo recruitment, and the regulation of these events by GTPases (e.g., dynamin) and kinases. Schmid received her B.Sc. in cell biology, with honors, in 1980 from the University of British Columbia and her Ph.D. in biochemistry in 1985 from Stanford University. She has served on the editorial board of *The Journal of Cell Biology* and *Trends in Cell Biology* and is a founding coeditor of the journal *Traffic*. She has two children, a son born during her last year as a postdoctoral fellow in cell biology at Yale, and a daughter, born four years later. Her outside interests include camping and hiking with her family. She has coached her daughter's recreation league soccer team for five years and her son's for two years before that.

Dorothy E. Shippen, Ph.D., Professor of Biochemistry and Biophysics, Faculty of Genetics, Texas A&M University

Dorothy E. Shippen received her B.S. degree from Auburn University and in 1987 was awarded a Ph.D. from the University of Alabama–Birmingham. Her Ph.D. thesis, which was carried out under the guidance of Anne Vezza, involved characterization of small ribosomal RNA genes from the human malaria parasite *Plasmodium falciparum*. For postdoctoral training, Shippen worked with Elizabeth Blackburn, beginning at the University of California–Berkeley and then moving in 1990 to the University of California–San Francisco. Her work in the Blackburn lab focused on the biochemistry of the telomerase RNP complex in the ciliated protozoan *Euplotes crassus*. A major contribution was the demonstration of a functional telomere DNA-templating domain

within the telomerase RNA subunit. In 1991, Shippen joined the faculty of the Biochemistry and Biophysics Department at Texas A&M University. She currently serves on the editorial boards of *Molecular and Cellular Biology* and *Eukaryotic Microbiology*. Her work at Texas A&M continues to focus on telomeres and telomerase, with a major emphasis on telomerase–telomere interactions in *Arabidopsis thaliana*, a new model system for telomere biology developed by the Shippen laboratory.

Rick Tarleton, Ph.D., Distinguished Research Professor, Department of Cellular Biology, University of Georgia

Rick Tarleton received his B.A. degree in biology (cum laude) from Wake Forest University in 1978, his M.S. degree in microbiology from Texas A&M University in 1980, and his Ph.D. in biology from Wake Forest University in 1983. He joined the faculty of the University of Georgia in 1984 and is currently distinguished research professor in the Department of Cellular Biology at the university. In 1986, he was a visiting scientist at Brunel University, London. His research focuses on mechanisms of immunity and disease in *Trypanosoma cruzi* infection (a causative agent of human Chagas disease) and vaccine development for *T. cruzi*. From 1995 to 2000, he was a recipient of a Burroughs Wellcome Fund Scholar Award in Molecular Parasitology. Tarleton was founding director of the Center for Tropical and Emerging Global Diseases at the University of Georgia from 1998 to 2001. He is a member of the Wake Forest University Board of Visitors and was a member of the National Institutes of Health tropical medicine and parasitology study section from 1996 to 2000. He serves on the editorial boards of the journals *Infection and Immunity* and *Experimental Parasitology*.

Gina Turrigiano, Ph.D., Associate Professor, Department of Biology and Center for Complex Systems, Brandeis University

Gina Turrigiano is an associate professor in the Department of Biology and the Center for Complex Systems at Brandeis University. She received a B.A. degree in 1984 from Reed College and a Ph.D. in 1990 from the University of California–San Diego. She has held postdoctoral fellowships at the University of California–San Diego (1990) and Brandeis University (1990–1993). In 2000, Turrigiano was awarded the prestigious MacArthur fellowship for her work on homeostatic forms of synaptic plasticity that contribute to learning and development. Turrigiano is also a recipient of a National Institutes of Health career development award and Sloan Foundation Fellowship. Currently she is an associate editor for *Neuron* and is on the editorial board of the *Journal of Neurophysiology*. She collaborates with her husband Sacha Nelson, who is also in the Department of Biology at Brandeis University. Together, they raise their two sons, Gabriel and Raphael.

Joseph M. Vinetz, M.D., Associate Professor, Departments of Pathology, Internal Medicine, and Microbiology and Immunology, University of Texas Medical Branch–Galveston

Joseph M. Vinetz received a B.S. degree in biology and in history of science and medicine from Yale University in 1985 and an M.D. degree from the University of California–San Diego School of Medicine in 1991. While a medical student, he was a Howard Hughes Medical Institute (HHMI)/National Institutes of Health (NIH) research scholar and worked on malaria in the Laboratory of Parasitic Diseases under the supervision of Louis Miller. He trained in internal medicine and infectious diseases at The Johns Hopkins School of Medicine and was an HHMI physician postdoctoral fellow in the Laboratory of Parasitic Diseases at NIH in the laboratory of David Kaslow. In 1998, he joined the faculty of the University of Texas Medical Branch, where he has continued his work on the molecular and cellular mechanisms

of *Plasmodium ookinete*–mosquito midgut interactions, focusing on ookinete–secreted chitinases. He also initiated a bedside–to–bench research program to study human leptospirosis in the Peruvian Amazon region of Iquitos. He is a member of the Center for Tropical Diseases at the University of Texas Medical Branch–Galveston, the American Society of Tropical Medicine, the ASTMH Clinical Group, the Infectious Diseases Society of America, and the American College of Physicians. In 2001, he was a participant in the Gorgas Memorial Institute’s Expert Course in Clinical Tropical Medicine in Lima, Peru.

Tony G. Waldrop, Ph.D., Vice Chancellor for Research and Economic Development and Professor of Cell and Molecular Physiology, University of North Carolina–Chapel Hill

Tony G. Waldrop, a Columbus, North Carolina, native, was a Morehead Scholar at the University of North Carolina–Chapel Hill in the 1970s. Before joining the faculty there, he was a professor of molecular and integrative physiology and vice chancellor for research at the University of Illinois at Urbana–Champaign and also was an interim graduate school dean there. At the University of Illinois, he led efforts to create a university-associated research park. Waldrop’s research has been supported by the National Institutes of Health and the American Heart Association (AHA). AHA selected him as an established investigator. At Illinois, Waldrop was a university scholar, the premier recognition accorded to faculty by their colleagues. His research interests are hypertension, developmental neurobiology, and the effects of hypoxia (low oxygen) on brain stem neurons. He has published more than 100 peer-reviewed journal articles and book chapters.

Johannes Walter, Ph.D., Assistant Professor, Department of Biological Chemistry and Molecular Pharmacology, Harvard Medical School

Johannes Walter obtained his B.A. degree in biochemistry at the University of California–Berkeley. He earned his Ph.D. in molecular biophysics and biochemistry at Yale University, where he worked with Mark Biggin on the control of *Drosophila* development by homeodomain transcription factors. For his postdoctoral studies, Walter joined John Newport in the Department of Biology at the University of California–San Diego. In 1999, Walter joined the Department of Biological Chemistry and Molecular Pharmacology at Harvard Medical School as an assistant professor. His lab works on the molecular mechanism and regulation of eukaryotic DNA replication.

Christopher Wylie, Ph.D., Director, Division of Developmental Biology, Cincinnati Children’s Hospital Research Foundation

Educated in Kenya and England, Christopher Wylie received a B.Sc. degree and Ph.D. at the University of London, United Kingdom. He was faculty member in the Departments of Anatomy at University College London and then at St. George’s Hospital Medical School. He moved to the F. J. Quick Chair of Biology at Cambridge University in 1989. In 1994, Wylie became the Martin Lenz Harrison Chair of Genetics and Development at the University of Minnesota. In 2000, he became the William Schuber Chair and Director of the Division of Developmental Biology at the Children’s Hospital Research Foundation in Cincinnati. Wylie’s research interests include the basic mechanisms of early vertebrate development, using *Xenopus* and mouse as model systems to study, in particular, the molecular basis of cell migration, cell architecture, and cell adhesion and specification. Activities outside the lab include being editor in chief of *Development*, an international journal of developmental biology; membership of study sections; president of the Society for Developmental Biology; and, occasionally, golf.

E. Lynn Zechiedrich, Ph.D., Assistant Professor, Department of Molecular Virology and Microbiology, Baylor College of Medicine

E. Lynn Zechiedrich has been an assistant professor in the Department of Molecular Virology and Microbiology at Baylor College of Medicine since 1997. She serves on the executive committee for the Houston-wide Program for Structural and Computational Biology and Molecular Biophysics and is a faculty member of additional inter-institutional programs joining Baylor College of Medicine with Rice University, the M.D. Anderson Cancer Center, the University of Houston, and the University of Texas. Zechiedrich earned her Ph.D. in biochemistry from Vanderbilt University and was a postdoctoral fellow at the University of California. The Zechiedrich laboratory studies the cellular roles of the bacterial DNA topoisomerases, which are required for every aspect of DNA metabolism. The topoisomerases are the cellular targets for several classes of antimicrobial agents, including the now famous Cipro, and her group uses a combination of genetics, molecular biology, bioinformatics, and genomic analyses to determine how bacteria resist drug treatment. For additional information, see <http://www.bcm.tmc.edu/~elz/>.

APPENDIX 5

Sample Session Evaluation Form

Badge Number: _____

Session Title:

Speakers:

Was the format for the session appropriate for the topic? (i.e., speaker, panel, workshop)?

- Yes
 Maybe
 No

Comments: _____

The amount of time devoted to the session was:

- Too long
 About right
 Too short

Check the appropriate box

<i>Rate the session in terms of the</i>	1 Far exceeded my expectations	2 Exceeded my expectations	3 Met my expectations	4 Fell short of my expectations	5 Fell far short of my expectations
Content					
In-class exercises					
Relevance to your role as a scientific manager					
Overall value of the session					

Which parts of the session were most useful to you? _____

What would you like to know more about? _____

Were any topics not as important to include in this session? Why? _____

Other comments: _____

Would you like to see this session included in a future version of the course?

- Yes
- Maybe
- No

APPENDIX 6

Course Summary Evaluation Form

Badge Number: _____

Check the appropriate box

<i>Rate the course in terms of</i>	1 Far exceeded my expectations	2 Exceeded my expectations	3 Met my expectations	4 Fell short of my expectations	5 Fell far short of my expectations
Overall quality of the course					
Relevance of the complete course to your role as a scientific manager					
Opportunities at the course for networking					
Degree of change the course will promote in the way your lab is managed and organized					

Overall course length:

- Too long
 About right
 Too short

Comments: _____

Which parts of the course were most useful to you? _____

What additional topics would you include in future course offerings? _____

Were there any topics you recommend excluding from the course and why? _____

Were any of these sessions redundant with each other? _____

Was the level of teaching in the course appropriate to your degree of experience in laboratory management?

- Too advanced
- About right
- Too basic

Comments: _____

The number of participants in the course (120) was

- Too many
- About right
- Too few

Comments: _____

Would you recommend this course to an associate?

- Yes
- Maybe
- No

Comments: _____

How can we improve or enhance this kind of course in the future? _____

Rate the course activities in terms of their importance to you (rate only those you attended).

Check the appropriate box

	1 Most important	2 Somewhat important	3 Average	4 Less important	5 Least important
Sessions					
Workshop in Basic Laboratory Leadership Skills					
Project Management					
Collaborations					
Getting Funded					
Getting Published					
Time Management					
Data Management and Laboratory Notebooks					
Mentoring and Being Mentored					
Roundtable Discussion: Problems and Solutions in Scientific Management					
Concurrent Sessions					
Technology Transfer					
Obtaining and Negotiating a Faculty Position					
Budgets and Budgeting					
Mentoring Panel Discussion					
Keynote Talks					
The Scientific Investigator Within the University Structure					
Current Issues in Research Ethics					
Gender Issues in the Laboratory					

Other comments about the course: _____

Do you think lab management skills can be effectively taught by methods other than an in-person course? _____

Rank the methods of offering the course by their effectiveness in teaching you laboratory management skills (1—most effective to 5—least effective).

- ___ In-person course like this one (length could vary)
- ___ Book
- ___ DVD
- ___ Book and DVD
- ___ Web

Is there anything else you would like us to know about the course? _____
