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Special Paper

Outcomes of an Intensive Summer Course in Reproductive Biology[1]

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ABSTRACT

The Frontiers in Reproduction (FIR) course has been held annually, starting in 1998, at the Marine Biological Laboratories in Woods Hole, MA. To evaluate the impact of the FIR course in training reproductive biologists, a group of participants who completed the course between 1998 and 2002 were surveyed. The major findings of the survey were that: (1) FIR had a positive impact on the overall career development of the participants; (2) a significant majority (97%) continue to conduct research in the reproductive sciences; (3) 58% had successfully competed for grant funding; and (4) manuscripts by participants were published in higher-impact journals. In summary, FIR has had an overall positive influence worldwide on the training of future scientists whose research interests and studies are focused on the reproductive sciences.

INTRODUCTION

In 1995, an international research and research training support program, the Reproductive Sciences Network (RSANET), was established with competitive project funding awarded by the U.S. Department of State and matched by the National Institute of Child Health and Human Development (NICHD). The rationale for establishing RSANET emerged from an international workshop convened in May 1995 in Mexico City, Mexico, and charged with evaluating the need for collaborative research and mentored research training in the reproductive sciences. Increasingly limited U.S. funding for such mentored research and training had impaired the ability to conduct professional development efforts in this area and, especially, to support the research career development of physician-scientists, who were increasingly seen as an endangered species [1].

As early as 1980, a national study projected a 36% increase in the need for faculty in obstetrics and gynecology departments over the next five years and envisioned an even larger need for physician-scientist faculty involved in research [2]. This need remained unmet. As of 1990, only 34% of faculty in departments of obstetrics and gynecology were able to devote 20% or more of their time to research, and there were increasingly insufficient resources for basic and clinical research [3, 4]. Although total annual research funds averaged $1M per department in 1990, a surprising 59 (45 percent) of 130 departments received less than $100,000 in competitively awarded research funding from federal agencies. In particular, academic obstetrics and gynecology departments received in aggregate less than 1.5 percent of all National Institutes of Health research funds [5]. The authors concluded there was a major need to increase effort targeted at addressing the additional learning needs dictated by the expanding knowledge base and emerging research technologies.

Based on the report of the Mexico City workshop, as well as the increasing difficulty in obtaining NIH funding for training basic reproductive scientists, RSANET was established to develop expanded opportunities for the career development of Ph.D. and M.D. researchers in the reproductive sciences. Its goals were to: foster collaborative basic and clinical research, provide advanced training in research and technical skills, and disseminate information on career opportunities and scientific meetings in areas of emerging importance to reproductive health.

The mentored training course component of RSANET, the Frontiers in Reproduction Research (FIR) program, was a result of numerous technical workshops as well as advice from more than 70 senior scientists and physician-scientists from the reproductive sciences community. This advanced training course, the FIR Program, was guided by a National Board of Scientific Counselors.

FIR involves an intensive six-week laboratory and lecture course in reproductive biology held at the Marine Biological Laboratory (MBL) in Woods Hole, MA. Course activities include lectures by faculty and other invited scholars, discussion groups, informal seminars, laboratory exercises, and individual tutorials. All aspects of reproduction are covered, ranging from the molecular basis for regulation of reproductive hormones, gametogenesis, fertilization, implantation, and early embryonic development. Participants also perform experiments that utilize such methodologies as assessing apoptosis, gene targeting, phosphoprotein analysis, stem cells, transgenic technology, gamete collection and handling, tissue recombinations, implantation, and placental biology, and are introduced to the basics of genome-wide screening and bioinformatics. The course is open to advanced

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TABLE 1. Former participants' perceptions of course benefits.

Course benefit	Percentage who responded[a]			
	A great deal	Some	Only a little	Not at all
Attributes related to reproductive biology research				
Increased substantive knowledge in reproductive biology	83.9	14.5	1.6	0.0
Enhanced ability to use modern research techniques in reproductive biology	72.6	24.2	3.2	0.0
Greater confidence in conducting research in reproductive biology	61.3	29.0	6.5	3.2
Increased enthusiasm and commitment to conducting research in reproductive biology	82.0	8.2	8.2	1.6
Networking and collaboration				
Opportunities to interact with major scientists in the field	87.1	12.9	0.0	0.0
Development of longer-term research collaborations with other scientists	43.6	27.4	0.0	29.0
Other research skills				
Use of standard research methodologies and instrumentation	51.6	38.7	9.7	0.0
Laboratory management skills	17.7	41.9	19.4	21.0
Procedures involved in applying for research funds	11.3	29.0	30.7	29.0
Different way of thinking about the research process or a research area	66.1	25.8	6.5	1.6
Pursuit of new research direction	51.6	40.3	6.5	1.6
Confidence in pursuing more risky or innovative research ideas	51.6	38.7	6.5	3.2
Development of an independent research program	30.7	50.0	9.7	9.7

[a]Percentages are row percentages and may not total to 100.0 % due to rounding; they are based on a total of 62 respondents.

graduate students, postdoctoral fellows, and independent investigators, most of whom are in the early years of their careers.

The intensive nature and duration of the course requires considerable resources, including not only the time and effort of the 15–25 senior scientists who serve as faculty, the three senior lead course directors, and the 20–25 teaching assistants, but also laboratory space, equipment, research supplies, housing, travel expenses, and tuition. The lead directors rotate every four years. This ensures that the curriculum is continuously updated and that each group of directors leaves a unique imprint on the success of the course. Major funding in support of FIR is provided by the Burroughs Wellcome Fund and the National Institute of Child Health and Human Development. Financial support also has been provided by other NIH Institutes and federal agencies, private foundations, scientific societies, industry, and unrestricted individual donations (see Funding Acknowledgements below). Given this expenditure of resources, the extent to which the course has achieved its intended outcomes – namely, the development of investigators who successfully conduct research in problems relevant to reproductive biology – is an important question.

This article summarizes data that address this question, focusing on selected outcomes related to the development of research careers in reproductive biology. First, participants' views concerning whether the course benefited them in direct and indirect ways (e.g., use of modern research methodologies and confidence in pursuing new research problems) are described. Whereas collection of such attitudinal data is frequently done in assessing course outcomes, data also were gathered on research efforts in the years following course completion. These include participants' current involvement in research and the extent to which participants have successfully sought external research support. Of particular interest is the extent to which former participants are actively conducting research in areas relevant to reproductive biology as indicated by their reported research area and the type of journals in which they have published.

MATERIALS AND METHODS

Between 1998 and 2002, 79 individuals had completed the FIR course. Valid e-mail addresses were available for 73 (92 percent) of these former students. After receiving an advance e-mail informing them of the purposes of the study, uses of the data, and confidentiality pledges, participants received an electronic questionnaire in March 2003. The questionnaire included items that asked individuals for (a) their assessments of the quality of the course as well as its strengths and weaknesses; (b) their perceptions of how they benefited from the course; and (c) their current career stage, employment, work activities, and research funding status. Participants also were asked to forward a copy of their curriculum vitae as a source of information on recent publications. Three separate follow-up e-mails to nonrespondents were sent over the next six weeks. Of the 73 individuals who were contacted, 62 responded for a final response rate of 86 percent.

Where possible, missing information on current employment and publication records was obtained for the 11 nonrespondents, those for whom contact information was unavailable ($n = 6$), and the 9 individuals who failed to return a curriculum vitae with their completed questionnaire. In addition to Web-based searches of relevant sites for current positions, both PubMed and the Web of Knowledge were consulted for recent publication data.

RESULTS

Characteristics of Course Participants

Approximately 56 percent of those who enrolled in and completed the FIR course between 1998 and 2002 were women. Only a handful of individuals were from minority groups that have been identified as underrepresented in U.S. biomedical science. Thirty-nine percent were foreign citizens from such countries as Argentina, Canada, Chile, Columbia, India, Mexico, and South Africa.

Consistent with course objectives, individuals who completed the course were typically in the early stages of their careers. Nearly one-quarter were students in doctoral training programs. Thirty-two percent were engaged in postdoctoral study, 22 percent held faculty positions, and 13 percent were staff scientists in organizations responsible for conducting research. Among these latter three groups, almost one-third had earned a Ph.D, 27 percent were M.D.s, and 35 percent held dual degrees (e.g., M.D./Ph.D., D.V.M./Ph.D.).

Perceived Knowledge, Skills, and Attitudes for Conducting Reproductive Biology Research

The FIR course is specifically targeted at training individuals in the conceptual and methodological skills needed for conducting research in reproductive biology. As shown in Table 1, large majorities of respondents believed that the course had indeed accomplished its primary goal. Eighty-four percent judged their substantive knowledge in reproductive

biology to have increased a great deal, and 73 percent felt similarly about their ability to use state-of-the-art research techniques. No respondent viewed the course as doing nothing to increase his/her substantive or methodological expertise in reproductive biology.

Given this strong endorsement, it comes as no surprise that participants also believed that the course promoted the development of other attributes that complement the knowledge and skills necessary to pursue research in this area. When asked if the course had increased their enthusiasm for and commitment to conducting research in reproductive biology, 82 percent responded a great deal. In terms of building self-confidence in pursuing research in reproductive biology, however, judgments were more reserved. The course was regarded as strengthening this a great deal (61 percent) or some (29 percent). Again, a minority (10 percent) judged the course to have accomplished little (or nothing) in this regard.

The extent to which these benefits were attributed to the course depended partly on an individual's career stage. For example, participants who had completed both their doctoral and postdoctoral training prior to enrolling in the course are likely to have had more research skills and experiences than their younger counterparts; as such, their perceptions of the course's impact may differ from those expressed by students and postdoctoral fellows who are still involved in formal training efforts. Although small sample sizes limit the ability to confidently detect differences among groups, there is some suggestion that perceptions of individuals who held faculty positions, postdoctoral fellows, and doctoral students differed. Whereas course participants with faculty and other independent research positions (92 percent) overwhelmingly attributed an increased conceptual understanding of reproductive biology to the course, somewhat smaller majorities of postdoctoral fellows (81 percent) and graduate students (77 percent) believed this to be the case. On the other hand, those holding faculty positions and those employed as scientists rated the course less strongly than these two groups with regard to its influence on greatly improving their skills in the use of state-of-the-art research techniques – 63 percent of those in faculty positions and scientists versus 81 percent of postdoctoral fellows and 77 percent of doctoral students. Academic faculty members and employed scientists (as well as graduate students) also were notably less likely than postdoctoral fellows to say that the course had strengthened their confidence in conducting reproductive biology research; 54 and 47 percent responded a great deal as compared to 81 percent of postdoctoral fellows.

Differences were smaller for judgments regarding the course's impact on enthusiasm and commitment to reproductive biology research. About 81 percent of students, 77 percent of postdoctoral fellows, and 88 percent of those holding faculty and other full-time scientist positions felt that the course had been instrumental in generating excitement, enthusiasm, and dedication to reproductive biology as an avenue of research.

Interactions with Course Faculty, Speakers, and Other Participants

The format of the FIR course is designed to provide participants with opportunities to interact with major scientists who serve as course faculty or give invited presentations. Individuals also have six weeks to become acquainted with other participants, share similar interests, and develop relationships that can eventually lead to longer-term research collaborations such as joint studies or sharing of research materials.

Participants strongly agreed that the course provided them with valuable opportunities to meet leading researchers in reproductive biology (see Table 1). Eighty-seven percent believed that there was a great deal of opportunity to have these interactions; this strong support was voiced by all groups (83 percent of those holding faculty positions, 91 percent of postdoctoral fellows, and 88 percent of graduate students). The extent to which these interactions resulted in longer-term collaboration was decidedly lower. Approximately 44 percent of participants in independent research positions, along with 50 percent of postdoctoral fellows, but only 35 percent of graduate students believed the course had done a great deal in this regard.

Nonetheless, collaborations initiated at the FIR course have led to several joint projects, and a PubMed search located at least 12 peer-reviewed publications that have resulted from these interactions. In addition, nine of the graduate students who completed the FIR course went on to be postdoctoral fellows in labs of the course directors or teaching faculty.

General Research Capability

The questionnaire asked participants to rate the extent to which the course enhanced more general research skills and capabilities such as the use of standard research techniques, laboratory management skills, and thinking differently about the research process. Compared to the majority of results reported in the previous section, the FIR course was viewed as typically less influential in these aspects. At the same time, significant percentages of respondents believed that they had left the course somewhat richer in these areas.

The course was viewed as quite valuable by at least half of the respondents in terms of augmenting skill levels in the use of standard research techniques, providing the opportunity to move one's research in a new direction, and encouraging confidence in undertaking work that involved pursuing riskier ideas (see Table 1). Fifty-two percent of the respondents believed that their skills with standard research methodologies had improved a great deal, and 39 percent believed it had been somewhat helpful in this regard. A similar pattern of responses occurred in terms of the course bolstering participants' confidence in pursuing more risky or innovative research ideas. With regard to stimulating respondents to think a different way about the research process or a specific research problem, approximately 66 percent viewed the course as having a great deal of impact, with another 26 percent believing that it had some effect. For each of these three course outcomes, minorities (between 7 and 10 percent) regarded it as having little benefit, and few (if any) thought that the course played no role at all.

For the remaining items, lower percentages of participants judged the course to have made a substantial difference. About one-fifth (22 percent) believed that their grasp of the general process of seeking research support had increased a great deal; more than half (55 percent) thought it had increased somewhat. Less than one-fourth of the respondents felt that the course had done little or nothing in this regard. More mixed views surfaced for the remaining areas covered in the questionnaire. In terms of helping improve laboratory management skills, 18 percent felt the course had helped a great deal, 42 percent believed that it had helped some, and 42 percent thought that it had made little or no difference.

Whereas 11 percent felt that the FIR training had increased their knowledge of applying for research grants a great deal and 29 percent thought that it had helped some, the remainder (60

TABLE 2. Number of articles by former FIR participants prior to and subsequent to completing the course.

Type of journal	Articles published in the years:			
	Prior to completing the course[a]		Subsequent to completing the course	
	N	%	N	%
Top-ranked journals in reproductive biology	83	22.4	163	32.1
Top-ranked journals in obstetrics and gynecology[b]	49	13.2	45	8.9
Other journals in reproductive biology or obstetrics and gynecology	35	9.4	47	9.3
Journals in other fields	204	54.0	252	49.7
Total articles	371	100.0	507	100.0

[a]Publications that appeared in journals for the same year of course completion are included in the totals, given that the research was most likely completed prior to participating in the FIR course.
[b]Obstetrics and gynecology journals that also were in the top-ranked journals for reproductive biology were included in the totals for reproductive biology.

percent) believed that there was little (if any) change as a result of their participation in the course.

Looking at differences among individuals in various career stages, independent research scientists, postdoctoral fellows, and students all tended to rate the course's impact as stronger in terms of refining their use of standard research methodologies and encouraging them to think differently about research, pursue a different direction, and entertain riskier research ideas. In contrast, more mixed views were expressed regarding its impact on understanding how to seek research support, establishing an independent research program, and strengthening their lab management skills. For example, 50 percent of those in faculty positions and independent scientists, 67 percent of postdoctoral fellows, and 41 percent of students believed that their use of standard research methodologies had improved a great deal as a result of their course participation. In contrast, this same rating was assigned by only 18 percent of independent scientists and 24 percent of postdoctoral fellows and graduate students to the course's influence on developing a better understanding of the general process of applying for research funds.

Further, attributions of course benefits by graduate students in some cases were noticeably weaker than those expressed by their other counterparts. For example, whereas 79 percent of those in faculty positions and those employed as scientists and 67 percent of postdoctoral fellows believed that the course had influenced them to think differently about research, this was true for only 47 percent of graduate students. Similarly, 58 percent of independent scientists and 52 percent of postdoctoral fellows judged the course to be highly influential in helping them to pursue a new research direction as compared to 41 percent of doctoral students.

Current Career Status and Involvement in Research

Although participant views on course benefits provide useful information, it also is important to examine other outcomes related to individuals' current career status and involvement in research. At the time of the survey, nearly all former participants (97 percent) were in research training or research-related positions. (The most conservative estimate of the percentage of course participants who were still pursuing research careers is 83 percent. This is based on the fairly stringent assumption that in addition to individuals working in other positions and reporting no involvement in research, those for whom no contact or other information was available [e.g., searches of Medline and other databases revealed no publications in the years subsequent to their enrollment in the course] also were no longer working in science-related roles.) Ten percent were still in Ph.D. or M.D./Ph.D. training programs, and 16 percent were pursuing postdoctoral study. Slightly more than half (51 percent) held faculty positions in academic health centers or other institutions of higher education. Another 19 percent were working in university-affiliated research institutes, industry, government organizations, or other settings.

Most individuals (87 percent) reported spending at least 50 percent or more of their time in research during a typical work week. This was true for 79 percent of those in faculty positions and 100 percent of individuals working in research staff positions, engaged in postdoctoral study, or enrolled in predoctoral training programs. Nearly all (93 percent) of these former course participants indicated that their research was in the field of reproductive biology.

The survey asked specifically if individuals' training efforts had changed after taking the FIR course. Of the 31 individuals involved in training activities, 64 percent indicated that their training of students and postdoctoral fellows had shifted in some way. These shifts included the development of a new course or specific class lectures, improved supervision of students' research projects or more general mentoring, and better incorporation of the molecular biology aspects of diseases in teaching of clinical students.

Eighty-one percent of course participants with faculty or other types of research positions had submitted one or more proposals for external research support subsequent to completing the course, and 58 percent had applied for and successfully obtained external support for their research since completing the course. Of those with research funding, 21 percent were involved in a research grant from the NIH as either a principal or co-principal investigator. Approximately one-fifth held grants from federal agencies other than the NIH, 12 percent had received awards from nonprofit sponsors, and a small minority (2 percent) served as PI on an industrially supported research project. Slightly more than one-fourth (26 percent) had obtained funding from other types of sponsors (typically support from their home institutions).

Scholarly Productivity

Data on recent publications were available for 73 former course participants, based on information from curricula vitae or from searches of bibliometric databases (e.g., Medline). For individuals who did not provide curricula vitae, the publications that were identified by bibliometric searches were checked against other known information about the participants in order to ensure accuracy. Since completing the course, 93 percent of individuals had published one or more articles as of 2005. This included 89 percent of graduate students, 96 percent

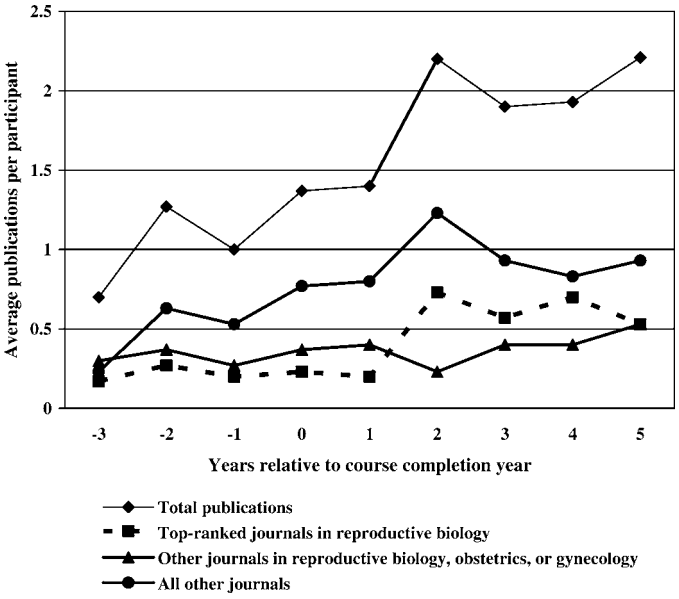

FIG. 1. Average Published Articles by Type of Journal and Year Relative to Course Completion for 1998–1999 FIR Participants.

of postdoctoral fellows, and 93 percent of academic and nonacademic researchers.

Publications can also indicate the extent to which course participants were working in reproductive biology and related fields. For each article that was authored or co-authored by course participants, the type of journal in which the article appeared was recorded. Journals were classified into four categories: (1) those ranked in the top 20 journals in reproductive biology; (2) those ranked in the top 20 journals in obstetrics and gynecology; (3) lower-ranked journals in reproductive biology, obstetrics, and gynecology; and (4) peer-reviewed journals in other fields. The top-ranked journals in reproductive biology and obstetrics and gynecology were identified based on each journal's field classification and impact factor as reported by the Institute of Scientific Information.

The percentages of all articles authored by course participants in each type of journal were examined for two time periods – the years prior to course participation and the years following completion of the FIR training. As a whole, participants had authored or co-authored 371 articles during the years preceding enrollment in the course (see Table 2). This total reached 507 for the years after course completion (an increase of 37 percent). The percentage of articles that appeared in journals specializing in reproductive biology, obstetrics, and gynecology rose from 45 to 50 percent of all participants' published research. Furthermore, this growth was a function of having more articles appear in the top 20 journals in reproductive biology. Whereas about 22 percent of participant-authored articles during the years prior to attending the FIR course were in such journals as *Human Reproduction*, *Biology of Reproduction*, and *Molecular Reproduction and Development*, 32 percent of their articles published after course completion appeared in this same group of journals. For all other types of journals, including those in obstetrics and gynecology and other fields, the percentages of articles declined or remained the same.

Moreover, a comparison of participants' published research during the years prior to and subsequent to completing the course showed a distinct shift toward reproductive biology. For the 1998 and 1999 classes, Figure 1 shows the means of published articles for the three years prior to enrolling in and completing the course and for the following five years; yearly averages are reported for total publications as well as for publications in top-ranked reproductive biology journals, other journals in reproductive biology as well as obstetrics and gynecology, and all other types of journals. As would be expected, there was a marked increase in publications; three years prior to the course participants published an average of 0.7 articles, whereas they published an average of 2.21 articles during the fifth year following the course. The pattern for articles appearing in the top-ranked reproductive biology journals, however, was distinctly different. During the three years prior to the course and up through the year following course completion, individuals published very little in these journals; the mean number of articles remained steady at 0.2 per year. However, there was a sharp rise in the average number of published articles beginning in the second year following the course. A piecewise linear model was used to estimate the slopes for the two time periods: Early (the three years prior to the course) and Late (the five years following course completion). The results showed that for the Early period, the slope was small and not statistically significant ($p < 0.58$) whereas for the Late period, the slope was larger and statistically significant ($p < 0.05$), even for this fairly small sample (n=30).

This growth in published research in the major scholarly outlets in reproductive biology is a clear indicator that those trained in the FIR course have pursued research in this area – and perhaps more productively than in the past. In some cases, this research involved the decision to change research programs and shift to reproductive biology. For example, prior to their enrollment in the course, 44 percent of participants had published an article in a top-ranked journal in reproductive biology, but after completing the course, this percentage had increased to 59 percent.

DISCUSSION

Based on both participants' perceptions and on indicators of research activities, the FIR course has accomplished its goals – namely, facilitating the development of careers in reproductive biology research. Although outside the scope of this evaluation, one should note that the course additionally provided career development benefits to the 20–25 teaching assistants who participated in at least one of the three modules of the course. As reported in the previous sections, the overwhelmingly majority of former participants (class members) of the FIR course judged the acquisition of substantive knowledge and skills in state-of-the-art technologies to be substantial. Because conducting meaningful research hinges on more than simply an arsenal of technical skills, their beliefs that the course strengthened their commitment to and self-confidence in conducting research in this area, and provided them with opportunities to network with senior investigators, are also noteworthy. Furthermore, attrition from science has been rare, based on the survey data and the assumption that those for whom contact information could not be found are likely to have left research for other pursuits. More importantly, nearly all (97 percent) report that their current research addresses a problem in reproductive biology, and this is confirmed by their increased contributions to the top-ranked journals in this area following course completion.

In addition to benefits directly linked with conducting research in reproductive biology (e.g., knowledge and skills), participants believed that they accrued many other benefits from the course. Although the influence of the course varied,

notable percentages of respondents felt that the course had positively affected how they thought about the research process, their confidence in undertaking research that might be viewed as more risky or innovative, and their interest in addressing a question that represented a new direction in their career as a scientist. This suggests that the FIR training experience may have made additional differences in the careers of these individuals in terms of how they go about thinking and conducting research.

It might be argued that while encouraging, the data from this evaluation does (or does not) meet the accepted standards of evidence for identifying a causal connection between the course and the reported outcomes (e.g., a randomized trial). Individuals who applied for the course were highly motivated to learn the material and worked hard as course participants. Although true, there is reasonably strong evidence that the course at least partly influenced individuals' involvement in reproductive sciences research. Not only did former participants' views about the course support a conclusion that the course was effective, but the data on research involvement and type of journals in which published articles appeared provided additional support. Further, using individuals as their own controls in the regression analyses is based on a more rigorous design than simply measuring publication outcomes for a comparison group that was believed to be considerably different in ways related to outcomes (e.g., many of the applicants who unsuccessfully applied to the course were senior faculty who wished to spend time at MBL). Based on the results of the regression analyses, research involvement in the reproductive sciences remained low for the three years prior to course completion, took a distinct jump in the second year following the course, and fluctuated only a little for the next three years. Given how research is conducted and the lag-time between study results and publication of findings, it is not surprising that the abrupt increase in average publications was not evidenced until the second year. Moreover, a similar pattern did not occur for research published in other types of journals.

In addition, it is difficult to imagine that the observed abrupt increase in papers published in top-ranked, peer-reviewed reproductive biology journals would have occurred without completion of the FIR course. This is particularly true for early-career faculty and staff scientists, for whom opportunities to acquire the conceptual knowledge and skills with close mentoring are extremely limited. In fact, our analyses may be an underestimate of contributions to reproductive science research. It is likely that some number of the articles in other types of journals published by course participants were in the reproductive sciences, given that this group of journals included ones such as *Journal of Clinical Endocrinology and Metabolism.*

The feasibility of constructing a highly mentored, high-impact research training program of the nature of FIR for young research investigators was supported by historical knowledge of a national-level reproductive biology course that operated nearly 30 years before RSANET. The Fertilization and Gamete Physiology (Fer-Gap) Course once offered at MBL was a graduate student level training course organized in 1962–1963 by Dr. Charles B. Metz. Commencing in 1964, it provided mentored research training annually for about 16 students (range 7–21) until its demise in 1971–1972. No outcome evaluation report has been found for the course, but a nearly complete roster of the more than 100 young scholars who graduated from the Fer-Gap course has been reconstructed from the annual MBL Director's Reports published in the *Biological Bulletin* (1962–1974).

In addition to providing an empirical basis for judging the FIR course's success in achieving its goals, we also hope that the present evaluation accomplishes another purpose. Evaluations of similar intensive training experiences and other short-term courses often are restricted to participant evaluations at the end of the course designed to assist in refining subsequent course presentations. Although useful in helping to refine and improve course practices, such self-reports provide little information on what happens after the course in terms of outcomes; in fact, we could find no recent published examples. Additional attention to tracking course participants with respect to professional outcomes would offer useful information to course developers, sponsors, and potential applicants as well as contribute to the professional research education and training literature. The contents of the entire report from which these data were summarized for this article, as well as details on the course schedules and participants, are available on line at http://fir.mbl.edu/archive.htm.

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