Statistical Science
1991, Vol. 6, No. 2, 163-174

Meeting the Needs of New Statistical Researchers

A report by The New Researchers' Committee of the IMS
N. Altman (Chair), D. Banks, P. Chen, D. Duffy, J. Hardwick, C. Léger, A. Owen and T. Stukel

Abstract. In 1988, the President's Council of the IMS created the New Researcher's Committee (NRC) to determine the needs of new researchers (NRs) and means by which the IMS can help meet those needs. The NRC submitted its report to the 1991 IMS Council during the 1990 summer meetings. This paper summarizes the report and material from a guide for NRs being prepared by the NRC.

The NRC soon realized that a number of factors work in concert to influence the research environment. These include the opportunities for publication and speaking at professional meetings, funding, the work environment, interactions with colleagues and the social and political climate. As well, NRs can help promote their own research careers if they are aware of the opportunities that exist. Finally, the first few working years can be greatly influenced by the degree to which the graduate program prepared the NR for all aspects of a statistical career.

This report covers the role of the IMS in its peer review and publication policies and its sponsorship of professional meetings. It also discusses the role of the IMS as an advocate for NRs in the political process, including funding, policies regarding dissertation format and family policy in the workplace. Means are suggested by which NRs can help themselves, both as graduate students and early in their professional careers. The role of the IMS membership in creating a positive work environment, providing mentoring and inviting the participation of NRs in a variety of statistical activities is emphasized. The report concludes by presenting the action items submitted to the IMS Council, and the results, to date, arising from these items.

Key words and phrases: Publication, refereeing, meetings, grant application, dissertation, mentor.

Editor's note: *Statistical Science* will be willing to publish comments on this article and additional suggestions for the IMS and for new researchers in a future issue, subject to editorial review and approval. We invite new and senior researchers alike, statisticians and other researchers, to submit discussions on this topic, not exceeding 750 words each. Correspondence should be directed to the editor of this journal, with a copy to Professor N. Altman, Chair of the IMS New Researchers' Committee, by September 1, 1991.

N. Altman (Chair), Biometrics Unit, Cornell University, 337 Warren Hall, Ithaca, New York 14853-7801; D. Banks, Department of Statistics, Carnegie Mellon University; P. Chen, Department of Mathematics, Syracuse University; D. Duffy, Bell Communications Research; J. Hardwick, Department of Statistics, University of Michigan; C. Léger, Département d'informatique et de recherche opérationnelle, Université de Montréal; A. Owen, Department of Statistics, Stanford University; T. Stukel, Department of Community and Family Medicine, Dartmouth University. *We thank S. Miller and J. Sconing for their early participation.*

1. INTRODUCTION

The New Researchers' Committee (NRC) is a standing committee of the Institute of Mathematical Statistics (IMS), established in 1988 to assist the IMS in identifying the needs of New Researchers (NRs) and ways in which the IMS can help them develop to full research productivity.

Institute of Mathematical Statistics is collaborating with JSTOR to digitize, preserve, and extend access to *Statistical Science*. www.jstor.org

The 1988–1990 committee consisted of ten North American new researchers, all of whom received their doctorate within the past seven years. The NRC includes members in medical research, industry and government, but most NRC members hold positions in academic departments. This report largely reflects the concentration of the committee membership in North American academic and research institutions.

In this report, an NR is defined as a graduate statistician in the first few years following graduation. An NR is, by definition, employed in a position with substantial commitment to statistical research. Thus, although graduate statisticians are widely employed as consultants and teachers, the report concentrates on research needs and productivity.

This report represents the general consensus of the committee on a range of issues. That consensus was distilled from our experiences, those of our peers and the helpful suggestions of established researchers. The diversity of the committee's opinions are reflected in the following discussion.

The committee's perspective is that people who choose research careers enjoy the intellectual challenge of the discipline and want to make meaningful contributions to statistics and statistical applications. Our primary charge is to help the IMS in discovering institutional avenues for fostering professional growth among NRs. However, since so many aspects of career growth are influenced by the work environment and interactions among colleagues, the NRC went beyond this charge to identify means by which the membership at large can assist NRs.

The NRC recognizes that the IMS, through its publication policies and professional meetings, provides substantial assistance to NRs. The purpose of this report is to make more explicit the concerns of NRs, and how these concerns are, or could be, addressed by the IMS and its members. We have benefited from advice given to new researchers in other disciplines and expect that many of the items covered by this report are not unique to statistics.

The NRC thanks the IMS for providing this opportunity to represent the interests of NRs and hopes that this article will provoke discussion of long-term benefit to the discipline. A separate article, outlining discussion received on this report will appear in a future issue of *Statistical Science*.

The remainder of this report is in five sections. Section 2 considers topics directly related to IMS activities, particularly publications and professional meetings. Section 3 is a discussion of issues in which the IMS can play an advocacy role. Section 4 is a summary of advice to new researchers condensed from the draft of the *New Researchers' Survival Guide* (Banks and Hardwick, 1991) under preparation by the Committee. Section 5 describes ways in which the IMS membership can, as individuals, assist NRs. Section 6 discusses recommendations which the NRC proposed to the IMS Council during the 1990 meetings.

2. IMS PUBLICATIONS AND MEETINGS

The IMS, as publisher of four journals in the fields of statistics and probability and cosponsor of a fifth, and as the sponsor of three annual meetings, is in a unique position to foster publication and promote conference attendance by NRs. The NRC notes that many editors and many meeting organizers have become commendably active in enlisting the participation of NRs.

2.1 Publication

NRs know they must "publish or perish." However, NRs lack experience in doing research, writing research papers targeted to appropriate journals, evaluating referee reports and implementing revisions.

Editors and associate editors are generally eager to assist NRs, and some NRs have benefited substantially from special efforts by associate editors to obtain timely and helpful reviews. The NRC has been informed that it is the implicit policy of some IMS journals to provide this type of assistance to NRs. The NRC applauds these efforts and hopes that this practice will become the explicit policy of most journals.

In informal discussions with editors and associate editors, we have been told that work of lesser quality, or lesser content, may be accepted from an NR, to provide some encouragement for continued research. The NRC approves of the positive intent of the editors. However, we feel that NRs benefit more from detailed comments about what improvements are necessary than from preferential treatment that leads to the publication of lesser quality work. The latter policy gives misleading messages to NRs about what research is considered significant, particularly if the NRs do not realize that they are receiving preferential treatment.

The purpose of the peer review system is to provide feedback to both the editor and the author about the quality and importance of the work and, to a lesser extent, the quality of the writing in the paper. The reviewer thus owes to all concerned a frank discussion of the merits and demerits of the ideas and form of presentation. Because new re-

searchers lack perspective in interpreting referee reports, and may lack confidence about the importance of their work, they benefit from referees who take the time to point out specific problems with the paper and even to suggest improvements. Reports with very general negative remarks do nothing to assist the NR and may do considerable damage. Senior researchers have also expressed anger over the tone of some referee reports. The NRC hopes that IMS editors will formulate a policy of rephrasing or withholding unfriendly referee reports. We expect that everyone will benefit if common norms of courtesy have editorial enforcement.

Lengthy turn-around time for referee reports is an annoyance for researchers at all levels. However, NRs are under considerable pressure to do new research at a rapid pace and may be hurt even more by late feedback. Since future research may depend heavily on papers currently under review, rejection of the work many months later can be costly, especially if the reports are vague and do not suggest improvements. Gleser (1986) suggests that delays are often due to referees not understanding their role in the publication process. Robinson (1987) suggests that detailed instructions could be sent to referees. Armstrong (1982) also gives an example of a rating sheet provided to referees to assist in evaluating the paper. More explicit instructions to referees might improve both the turn-around time and the report quality. Instructions would particularly help new referees, who often receive little more direction than a cover letter from an associate editor.

The NRC considered other suggestions for improving the refereeing process. After extensive debate, we attained a general consensus that special journal sections, special editors and similar schemes were against the best interests of NRs, as they can be interpreted as venues for less competent work.

An early draft of this report generated considerable debate about the merits of double-blind refereeing. In the current IMS system, the author is known to the referee, but the referee is unknown to the author. This contrasts with the double-blind systems used by some professional journals, in which the identity of the author is hidden from the referee. The NRC feels that the current system has the potential for bias or perceived bias against NRs, women and identifiable minorities, (a disproportionate number of the latter two categories are NRs). The merit of a paper should be determined by its contents, rather than by its author's reputation. Although such bias has not been studied in statistical publications, it has been studied in other fields, particularly in psychology and the social sciences, but also in the natural sciences. These studies show some evidence of bias.

Peters and Ceci (1982) selected 12 recent articles from psychology journals and resubmitted them to the journals where they had appeared, after making small cosmetic changes and changing the names and affiliations of the authors. The original authors were famous and came from prestigious universities, whereas the new names and affiliations were fictitious. Although all articles had appeared within the three years previous to the study, only three articles were recognized by the referees or editors. Eight of the remaining nine were rejected on grounds of methodological shortcomings.

In a study in the physical sciences, Gordon (1980) showed that papers from authors in major universities were evaluated the same way by referees from minor and major universities. However, papers from minor universities were judged more harshly by referees from major universities than from minor universities. These authors contend that double-blind refereeing would be beneficial.

Evidence of sex bias is reported in Billard (1989). She refers to Paludi and Bauer (1983), who submitted similar papers for review under the names John T. McKay, Joan T. McKay, and J. T. McKay. The papers were rated by 180 reviewers of each gender. The papers submitted under John T. McKay were rated significantly higher by both sexes than those submitted under the other names; further questioning showed that most reviewers thought J. T. McKay to be a woman.

Although these findings are provocative, one may wonder about extrapolating from the social sciences to statistics. In fact, Rubin (1982), in his discussion of Peters and Ceci (1982), argued that he would be extremely surprised if an article published in the *Journal of the American Statistical Association* were resubmitted and the prior publication not detected. Although these studies may not apply directly to statistics, they do demonstrate clearly that the potential for bias exists.

In the double-blind refereeing system, only the associate editor knows the paper's authors and the paper's referees. Although some referees may be able to recognize some authors from the references or style (as some authors currently may recognize some referees), most submissions will obtain a more objective rating. The NRC is aware that double-blinding may require more attention on the part of referees; currently, knowledge of the author enables the referee, for example, to put a strong prior on the probability that an intricate calculation is correct. Cognizant of these deficiencies, the NRC considered many alternatives to minimize this

burden (including a totally open system, in which no one enjoys anonymity). However, after extensive discussion, the consensus of the NRC is that the advantages of the double-blind system outweigh the costs, and we recommend that IMS journals evaluate the benefits of adopting such a system.

Double-blind refereeing has already been adopted by other statistical associations in related contexts. In June 1990, the Editorial Board of the *Canadian Journal of Statistics* adopted double-blind refereeing with the consent of the Board of Directors of the Statistical Society of Canada. This was implemented as of January 1991. *Psychometrika* has been using this system since its origin and *Technometrics* allows an author to request double-blind refereeing. The student paper competition sponsored by ENAR of the Biometrics Society uses double-blind refereeing.

During discussion of the peer review process in the committee and with associate editors of IMS journals, we heard differing opinions about the biases and variability inherent in the process. Lindley (1984) anecdotally documents the variability in the refereeing process in statistical journals, and more formal studies have been done in other fields. As statisticians, we urge concerned editors to consider a formal study to determine the sources of error in the peer review process. Hence, the NRC welcomes the formation of a committee, announced at the 1991 IMS Council Meeting of August 1990, to study the issue of double-blind refereeing. Changes guided by real data, rather than anecdotal evidence, will undoubtedly lead to improvements in the system and will be better accepted by the statistics community. Finally, it must be noted that no evidence has shown double-blind refereeing to be harmful.

2.2 Professional Contacts and Meetings

Attendance at meetings is an important means for NRs to keep up with new work, make contacts and make their own work known. Special workshops that focus on single topics can be an important way for an NR to break into a new research area. However, NRs often lack travel funds to go to meetings, and organizers seldom ask NRs to give invited talks or to chair sessions.

The 1990 IMS Bootstrap meeting provides an excellent model of how conference organizers can assist NRs. NRs were invited to speak in every session. NRs chaired several sessions. Travel assistance was available for NRs. And low cost accommodations were provided preferentially for NRs and others unable to afford the regular accommodation. As a result, NRs were very well represented at the meeting.

Some statistical associations have special sessions for graduate students and/or NRs. While the NRC recognizes the positive intent of the organizers, the committee feels that NRs are better served by being integrated into the main conference program, so that their work is given equal footing and is presented in the context of other work in the area. This can best be done by encouraging organizers of invited sessions to include NRs in their sessions. The thesis abstracts printed in the *IMS Bulletin* provide a valuable means of identifying NRs whose work fits into the program.

At the August 1990 IMS Council meeting, the NRC requested that the IMS solicit travel funds from funding agencies to assist NRs to attend meetings and that local arrangements at IMS meetings include low-cost accommodation, such as university dormitories. In response, the Council approved setting up and publicizing a travel fund for NRs from IMS reserve funds, and it agreed, in principle, to arrange for some inexpensive accommodation at future meetings.

Special topics meetings, such as the IMS Bootstrap meeting, are an important means for researchers to get an overview of currently exciting topics and opportunities for research. Because of limited funding, NRs frequently bypass special topics meetings. The NRC therefore proposes sponsoring a special session (or sessions) at each annual meeting, which will focus on a single, current topic, with the goal of providing an overview and outlining directions for research. The organization of this session is described in Section 6.

3. THE IMS AS ADVOCATE

Research requires the allocation of time and money and is therefore affected by political and social settings. The IMS can assist NRs by acting as their advocate in the political process. To a greater or lesser extent, the IMS can speak for the interests of NRs to departments, universities and national funding agencies.

3.1 Funding Agencies

NRs often have little experience in writing grant proposals. They and their work are not well known, so they are at a disadvantage in the peer review process. Their resources for traveling, supporting visitors, purchasing equipment and paying assistants are very limited. In many academic situations, summer funding is available only from grants or extra teaching, so the NR must devote research time to proposal writing.

For NRs, small annual sums can go a long way towards promoting research opportunities. The

NRC points to the Canadian system as an example of how full-year appointments, plus a system of small, less competitive grants, can benefit NRs. In the United States, there are a number of special grants available for NRs. However, on the whole, these are highly competitive programs, in which a few researchers receive a great deal of money. The needs of new statistical researchers could be better served by programs that guarantee far fewer funds to far more researchers. These funds should be administered on a competitive basis based on a short proposal description.

The NRC asks the IMS to encourage funding agencies to sponsor small, less competitive grants for NRs. The form of the proposal should be rigidly controlled, so that the production time, aside from that spent engendering the ideas, does not exceed a few days.

3.2 Thesis Format

Most NRs begin their research careers by rewriting their thesis results for publication. Often there are difficulties in splitting theses into journal articles. Given the competing pressures to adjust to a new work environment, shoulder new responsibilities, interact with new colleagues, develop a research program and so forth, there can be considerable delay in submitting the thesis results to journals. In turn, this can delay new research.

The writing skills learned in preparing a monograph style dissertation are much different from those needed to write compact journal articles. Some advisors allow, in place of the monograph, a series of related articles that can then be bound together as a dissertation. Using this format, the student begins a career with a set of articles already in the publication process.

Some advisors and departments prefer the monograph style dissertation. However, alternatives to the traditional book-length dissertation are currently being considered by a committee formed by the Council of Graduate Schools. We urge the IMS to act as an advocate for theses formed from sets of separate articles on statistics and probability. In fact, simply by publicizing this option and pointing out its merits, the IMS will be providing a valuable service to advisors and graduate students.

3.3 Family Policy

Women and single parents with young children are at a particular disadvantage in the promotion process. This is especially true in institutions without legislated family leave. Lengthened time to tenure for new parents could easily be accommodated by the current tenure system. Some employers allow job-sharing, or part-time positions; these possibilities should be considered, along with appropriately adjusted promotion procedures, among the options for keeping NRs in the field. The IMS can act as an advocate promoting more liberal family policy.

4. HOW NRS CAN HELP THEMSELVES

This section is a highly condensed version of the *New Researchers' Survival Guide* (Banks and Hardwick, 1991), which contains advice to graduate students and new researchers from both new and senior researchers. A copy of the Guide is available from the IMS Business Office. Those planning careers in industry will also benefit from reading the provocative article by Joiner (1985). Those planning an academic career will benefit from the article by Taylor and Martin (1986).

4.1 Graduate Preparation

Those who know their career paths early have an advantage in selecting suitable graduate programs. However, most graduate programs offer a good start for your research career, and a look at the educational backgrounds of eminent statisticians should be reassuring as to the variety of experience leading to excellent statistical research.

Most departments offer a core of courses in theoretical and applied statistics. These may be supplemented by special topics and reading courses. Since statistics is an interdisciplinary subject, it is also useful to minor in another area relevant to one's career goals.

Graduate school is also the place to learn effective library skills. You should be familiar with the use of on-line catalogs and computer reference searches (often available from the librarian). Also, you should be familiar with reference indices, such as the *Current Index to Statistics*, the *Science Citation Index*, *Statistical Abstracts* and *Mathematical Reviews*.

Computer Literacy. Computer literacy is essential for statistical research. Basic skills needed are familiarity with at least one programming language, at least one statistical package, a word-processing package and electronic mail. Statistical programming languages (higher level languages with built-in statistical and graphical capabilities) and symbolic manipulation routines (higher level languages that can handle algebra) are also invaluable assets. There is a growing diversity of hardware and software available, so one needs to have enough understanding of computing concepts to readily change to a new environment when entering the work force.

Writing Skills. Writing skills, for writing journal articles, lay articles and consulting reports, are needed no matter what your career path. Most universities offer courses for those whose skills are weak and for foreign students. Time spent on such courses as a student will save you many hours of revisions later on. A number of useful books on writing are available, including *The Elements of Style* (Strunk and White, 1982) for general advice, and *How to Write Mathematics* (Steenrod, Halmos, Schiffer and Dieudonné, 1978) for advice specific to mathematical writing. No amount of theory will teach you to write without practice. If your department has a technical report series, write up some consulting or other results for the series, and get feedback from your advisor about the quality of your writing.

A substantial amount of time will also be spent on administrative writing—letters, your curriculum vitae and so on. Have a look at the vitae of some recent, successful job candidates and typical cover letters for journal articles, letters of recommendation and so on, to see what is expected.

Refereeing. Refereeing the work of others is a valuable way to understand the peer review process for both publications and funding sources. Usually, advisors are delighted to delegate such tasks and to provide some feedback on the quality of your report. It also helps you understand the editorial policies of the journals you will soon be publishing in yourself. The article by Gleser (1986) has useful guidelines for referees.

Dissertation. Your dissertation is evidence to the profession that you have mastered research skills and have made a positive contribution to the field. At least for your first job, your research interests will be judged by your thesis topic. Therefore, although you may be somewhat constrained by the interests of your advisor, the topic should reflect your career goals to the extent possible.

The dissertation is usually a monograph, which will need to be split for publication in journals. The NRC strongly recommends that you have this process well in hand *before* your defense. Once you are working, you will probably have to write up results for publication as you obtain them, without waiting for the entire body of work to be complete. Handling your dissertation work in the same way will give you practice in recognizing and reporting on publishable chunks of research while you still have the benefit of your committee's advice. As well, you will have your thesis publications in the stream when you launch your career, and you will be able to start new research immediately. See Section 3.2 for an alternative to the monograph, favored by several NRC members.

Teaching. Teaching experience is invaluable for those planning academic careers. Government and industry statisticians often give short courses, so the experience is useful even if you plan a nonacademic career path. Teaching is also a useful way for foreign students to improve language skills and, if planning teaching careers in Canada or the United States, of demonstrating linguistic ability. If you have never taught before, you will probably start by being a teaching assistant, leading a practice and discussion session. Some people are born teachers, but don't be discouraged if there are difficulties, even severe ones, the first time. Most find things go considerably better the second time around.

Being a teaching assistant is a valuable experience, but it is not the same as teaching a course for which you are the primary instructor. If you are planning an academic career, arrange to teach a course, preferably one in which you can learn to effectively manage teaching assistants. (This may cost you a semester of research, but it will pay off when you start work.)

The key to good teaching is preparation. You should have a good idea of the direction of the entire course, not just the current chapter, and know exactly what you plan for each class. Enthusiasm for the subject, and at least the illusion of self-confidence, help motivate the students. Clear guidelines about grading and absolute fairness and consistency will head off serious problems when it comes time to assign grades. Fixed, posted office hours will generally save you time. Finally, be sure to set aside some time each week during which you do only research, or you may find the course absorbs all your time.

Consulting. Consulting is a component of many jobs. It provides a means of disseminating statistical knowledge to the scientific community, and it is a fascinating source of problems in methodology. Much statistical research, both applied and theoretical, has its roots in consulting work.

Many departments offer courses in statistical consulting. In those that do not, interested students can often pick up projects by letting the faculty know that they are interested. There are usually many more requests for consulting assistance than the faculty can handle. A number of excellent articles on various aspects of statistical consulting are available and can be located using the *Current Index to Statistics*. An interesting text on the subject is Boen and Zahn (1982).

Interesting consulting problems usually require analyses not covered by the basic statistics curriculum; as well, knowledgeable clients often come equipped with statistical methodology widely used

in their own field, but not known to the consultant. You should not be discouraged by this. You will always have to learn or develop new techniques as you go along. If you understand the basics of design and data summary, you will help the client.

The most important consulting skill is the ability to listen. Before answering questions or describing techniques, make sure the client describes the problem fully, including the objectives, the data collection method and the data. Clients have often completed data collection, sometimes poorly, before seeking statistical advice. A positive attitude will help the client get the most from the current study and convince the client of the need for statistical assistance earlier for the next project.

Gear your advice to the capabilities of the client. Plots or simple tables may be more suitable than an elaborate technique, even if the latter will be somewhat more accurate and informative.

Unless you need the data analysis experience, your role is to dispense advice. The client should be responsible for the actual analysis. If you have put in substantial effort in terms of time or developing new techniques, you may wish to take some part in the analysis and writing the paper. In this case, you should ask to be a co-author. If you have developed some interesting statistical methodology, you may also want to write the work up for an applied statistics journal with the client as co-author.

Seminars. Giving seminars is an important means of communicating your current work to statistical colleagues. A seminar is almost always part of the interviewing process for jobs at the doctoral level. If you are visiting another institution, you will probably want to give a talk to let your colleagues know your research interests.

The keys to good seminars are preparation and practice. If you figured out a new theorem at breakfast that day, by all means mention it. But leaving preparation until the last moment invites disaster.

The first step is to outline your talk. It should begin with motivation, an overview and/or an illustrative example. The first 10 minutes should be clear to an advanced undergraduate. Then give the substance of the talk. At the end one can point out technical generalizations, simulation results or open questions. Summarize the points you have made, so that the audience is left with a clear sense of your contribution.

Prepare your transparencies and any supporting handouts. Transparencies should be legible from the back of a moderately sized lecture hall. If you need tables, lengthy equations and other material that is difficult to read, use a handout. If the details of a proof are critical, hand those out as well, and just cover the heuristics verbally. Too much technical detail is difficult for an audience to absorb and may detract from your main message.

Practice with a view to timing, clarity of the transparencies and handouts, and clarity of the presentation. Have at least one practice before a live audience—your fellow graduate students, your committee or, for a job talk, at a neighboring university.

When fielding audience questions, try for brevity and precision. If you haven't understood or cannot answer the question, suggest that you will be able to talk individually following the general discussion.

Contributed papers at meetings are generally only 15 to 20 minutes. These require similar presentation skills, but much *more* preparation time, to distill the talk into the most important points, while still giving enough background to make it understandable. The American Statistical Association gives a seminar at the annual summer meetings with good advice on preparing contributed papers.

Job Search. Most academic institutions have career services, which help their graduates organize their job search. These services run seminars on writing résumés and cover letters, conducting interviews and so on. Your committee can also give you good advice about where and how to look and a realistic assessment of your value on the job market. Recent articles by Watson (1990) and Gray and Drew (1990) give good advice that is applicable to statisticians.

Careful selection of potential employers will often pay off better than mass mailing. Find out as much as you can about the current research being done in the department and what the department is looking for. Gear your cover letter, possibly your letters of reference, and of course your talk, to the department.

Letters of reference carry real weight. Make sure that those writing on your behalf will give good recommendations. If possible, discuss with them any key points you would like them to mention besides your research.

When an offer is made, you should be ready to negotiate freely, frankly and fairly. This is the stage at which you have the most leverage to improve your work conditions. More competitive salary, improved computing equipment, teaching load, secretarial and computing support and conference travel allowance are among the items that will have long-term consequences for your career.

4.2 Starting Your Job

Adjusting to a new work environment is exciting but stressful. The new graduate has numerous new

skills to learn, new colleagues to meet and pressure to start performing at a high level immediately.

Writing skills, teaching, consulting and presenting seminars are covered in the section on graduate preparation. This section covers professional contacts, mentors, committee work and funding from outside agencies. An interesting, if idiosyncratic, source of advice on these and other topics is Halmos (1985).

Professional Contacts. NRs find themselves under considerable time pressure and are often tempted to miss informal gatherings with their colleagues. The informal contacts gained by attending department gatherings, having lunch or coffee with colleagues and so on are invaluable in promoting good relationships.

Don't be shy about offering to give seminars at your own and other local institutions; this is the best way for others to find out what you are doing. Try to meet the visitors that come to your and local departments, even if only for coffee. Participate in local chapters of statistical organizations. These contacts help you build a pool of people who can offer the benefit of their own experience. You will discover shared research interests in unexpected places. Your name will come up more frequently when conference organizers are looking for invited speakers. In short, getting to know people in the field, besides being a pleasant social activity, can be a real career boost.

It is also important to participate in professional meetings. Give a contributed paper whenever possible. Take the time to talk to other participants, as well as listen to talks. Many fruitful collaborations start from chance remarks during coffee breaks.

Mentors. One of the most important professional contacts you can make is a mentor, a more experienced colleague who takes an interest in and helps you with your career. Mentors can tell you what the unwritten rules are, offer advice on how to promote yourself, introduce you to their colleagues, help you get invited to speak at meetings or write comments on invited papers and write papers and grant proposals with you.

Don't expect a free ride; mentoring should be a reciprocal relationship in which both put in some effort and receive some benefits. Many senior people genuinely enjoy giving a boost to a junior colleague or feel the need to promote the field by helping others. Others want the stimulation of working with a new, enthusiastic colleague. Joint research or funding proposals are frequent outcomes of mentoring relationships. At times senior colleagues might ask you to fill in by giving a talk, organizing a section of meetings, handling consulting work or doing other tasks that might be chores for them, but good opportunities for you. Doing these things well reflects well on both of you and encourages a mutually beneficial relationship.

If you are lucky, a mentoring relationship will develop naturally with someone in your department or someone whose research is close to yours. Former teachers often fill this role. However, if you are feeling isolated, break the ice by approaching a senior person with ideas about extensions of their own research or by seeking advice about your own related work.

Committee Work. Committee work can increase your understanding of how your department and the profession work and broaden your professional contacts, as well as demonstrate your willingness to be a good colleague. However, if not carefully managed, it can also lead to time-consuming, nonproductive work.

If you have a choice, research the committee before joining. Who are the active members, and how much time do they put in? Is the committee's work important to you? Declining to serve is better than being an inactive member.

Sometimes, part of the work load can be delegated. Interested graduate students can look into the options for new workstations; other faculty can take visiting seminar speakers to dinner.

Once you are on a committee, determine how much work you are willing to do, and try to stick within those limits. And by all means, learn what you can of the ways of the world through your committee work.

External Funding. Obtaining external funding is very important to academic statisticians, particularly those on 9-month appointments, but less important to those in industry or government. The excellent article by Trumbo (1989) and the accompanying discussion give specific advice and outline reasons for seeking, or not seeking, such funding. For those just starting out, it is generally useful to team up with a senior colleague. Failing that, modest proposals for specific, well-delineated projects are best. Most academic departments have an administrator who can assist in preparing a budget and explain university policy. This person may also maintain a file of funding resources. Senior colleagues can often offer good advice that will increase your chances of success.

Most universities require proposals to include a substantial overhead charge to the funding agency. Sometimes you can recover part of this money, for example, by asking the university to provide matching funds for hardware purchases.

Time Management. Many researchers, new and senior, find time management to be the most challenging part of their career. Numerous nonaca-

demic courses and books offer hints on this important subject. For some, strict scheduling works. For example, designating a day on which only the most dire emergency can pull you away from research, and enforcing this by being extremely difficult to contact, ensures that you will have some time to devote to research each week.

5. HOW SENIOR RESEARCHERS CAN HELP NRS

NRs, in general, are eager to become full members of their department and of the statistical research community. Senior researchers, in their roles as colleagues, supervisors, and friends, can greatly assist NRs in becoming active research statisticians.

5.1 Graduate Preparation: A Note to Faculty

Graduate programs play a primary role in training NRs in statistical research skills. However, few NRs devote 100% of their time to research, and often the time spent on nonresearch tasks, including research related tasks such as writing up results for publication, can detract significantly from the time available for research. Some of the skills NRs should gain as graduate students are outlined in Section 4.1. Faculty should assist their students in acquiring these skills.

NRs who graduate with several papers already in the publication process have a clear advantage. Faculty who encourage students to write up suitable consulting or project results, or who involve their research assistants in preparing joint articles, help NRs recognize publishable research and provide early experience in writing journal articles. Advisors should also encourage their students to submit articles based on their dissertation research prior to graduation.

5.2 Work Environment

As mentioned above, very few positions involve only research. NRs are still in the process of learning strategies for handling teaching loads, advising students, consulting with clients, handling committee tasks and delegating tasks to their support help. They may, therefore, spend more time than senior researchers on nonresearch tasks even when tasks have been distributed equitably. Also, research-related tasks such as writing up results and preparing grant proposals take longer for inexperienced NRs.

Professional colleagues, particularly those in the same department and the department chair, can be of great assistance to NRs. Offers to lend lecture notes, read drafts of papers and assist with grant applications and other mentoring activities are generally very helpful. Some departments formalize this by assigning senior members to assist NRs. NRs are often reluctant to impose upon senior colleagues, so it is helpful if the senior members can take the initiative, either formally or informally.

Many NRs expressed concern that the majority of their time is spent on nonresearch tasks but that they are being evaluated primarily upon their research. Also, although consulting duties are frequently expected, NRs often do not receive proper recognition for their contribution to applied research. The evaluation and promotion process should be clearly understood by both the NR and the supervisor. Each party must acknowledge that job duties should be assigned the same priority that they are given in the promotion process. If consulting is expected, these contributions should receive weight in performance evaluation.

A reduced workload in the first few months of employment is a valuable aid to an NR, particularly if assistance is also offered in setting up a research program. Often the load on NRs may be reduced, without increasing the workload of others, by allowing NRs to take on duties with which they are already familiar—for example, teaching the same course for several consecutive semesters, sitting on the same committee and so on.

NRs are often excluded from decisions that influence their work environment, such as determination of teaching duties or committee assignments. NRs need to be involved in such decisions. Decision-making in the department should be organized to include NRs whenever possible. However, time-consuming committee work, not directly involving the work environment, will unnecessarily hamper NRs.

5.3 Funding and Proposal Writing

Senior researchers can assist NRs to become involved in the competitive funding process early in their careers by inviting them to write joint proposals and to referee proposals written by others.

Employers who encourage researchers to solicit funding can assist by providing professional support for such activities. Such support may include mentors, files of funding agencies and their interests, departmental administrators to handle budget and costing and so forth.

Outside funding is often used to supplement funds provided by the employer. NRs will be better prepared to start research early if the employer provides start-up funds to meet immediate needs. Computing equipment, summer funding and travel money for one conference annually should be guaranteed for at least two years.

5.4 Starting New Research

NRs may find it difficult to branch out to new areas after intense concentration in their dissertation research. They are under considerable pressure to publish and may be reluctant to make the time commitment needed to start in a new area. Due to lack of experience, NRs may also have difficulty in identifying fruitful areas of new research.

Joint research with a senior researcher is a time-honored method for starting in a new area. Visiting an institution active in the new area is also helpful. Senior researchers who actively solicit NRs for joint research and invite them as visitors perform an enormous service to our profession.

Because promotion generally depends on completed work, not current projects, adequate allowance must be made for start-up time for new projects. A periodic review provides a time to discuss the relative merits of beginning new work and finishing up previous projects.

5.5 Research Facilities

Most NRs need computers in their work, either for computation or word-processing. NRs should be involved in departmental decisions about equipment purchases. Also, if NRs are involved in joint funding proposals, equipment purchases for the NR should be part of the budget.

Support of computer bulletin boards and databases, such as the computerized *Current Index to Statistics*, is becoming increasingly important to the statistical community. These services are often especially beneficial to NRs. Some commercial databases provide, for minimal fees, reference and other services that can supplement free government and academic reference services.

5.6 Family Commitments

The changing family structure places special time demands on NRs that conflict with research needs. NRs must balance their own employment needs with the career commitments of working spouses.

Many NRs have primary or joint responsibilities towards young or ailing family members. Senior researchers are also often challenged by the changing family structure. However, with better job security and experience gained earlier in their careers, they can often better handle the conflicts of career and family.

Department chairs often have discretionary powers regarding family leave and promotion policy, which can be used to assist NRs. Family-related policies should be stated explicitly to all applicants during the interviewing process.

Flexible scheduling of courses and committee meetings is a benefit to those with family commitments. Department duties and seminars should be scheduled during the regular 9–5 working day, to avoid conflict with day-care schedules. The loan of terminals and portable equipment can greatly improve the productivity of NRs by allowing them to complete work when family commitments keep them from the office and to utilize quiet hours at home.

5.7 Integration into the Research Community

NRs often have difficulty in switching from their roles as students into becoming members of a department and a research community. Senior researchers can assist by seeing to it that NRs are included in department activities, both formal and informal. Senior researchers can also encourage NRs to participate in local statistical organizations, to give seminars and to be active in other informal and formal gatherings.

6. ACTION ITEMS

The NRC presented 11 action items for consideration to the IMS Council during the 1990 session. The items and the results are presented here.

6.1 Supported Proposals

Expand the scope of IMS publications to include more applied and computer-intensive research. The IMS Council voted to co-sponsor the *Journal of Computational Statistics and Graphics* with the American Statistical Association and the Interface Foundation of North America. The first issue of this journal will be published in the first quarter of 1992.

Solicit travel funding to help NRs to attend conferences. The IMS Council approved using IMS reserve funds to set up a fund to give grants to NRs to assist them to attend conferences. Applications for this support are now available in the *IMS Bulletin*.

Provide low-cost housing at meetings. The NRC recommended that conferences be held at sites with adequate low-cost accommodation, such as university dormitories, nearby and that such housing be made available preferentially to those in financial need. The IMS Council supported this proposal.

6.2 Proposals Under Discussion

The NRC proposed two reforms to the peer review system for IMS journals that provoked much discussion. These are outlined below.

Determine the merits of double-blind refereeing for IMS publications, and implement double-blind refereeing for appropriate journals. Double-blind refereeing is discussed in detail in Section 2.1. A summary of the heated Council discussion is reported in the Minutes of the 1991 IMS Council Meeting, published in the *IMS Bulletin*, September 1990. It was decided that the President would appoint a committee to examine the issue of double-blind refereeing and to report to the Council as soon as possible.

Improve the refereeing system. The NRC recognized the assistance that has been given to NRs by IMS editors, associate editors and conscientious referees. The NRC recommended that IMS editors establish guidelines for referees for providing helpful and timely reviews to NRs. Emphasis should be on helping NRs learn to write publishable papers. There was considerable discussion of the turnaround time, quality and tone of referee reports from IMS publications. The NRC offered to collect data from NRs.

6.3 Proposals Not Discussed by Council

Sponsor "mini-conferences" on currently active areas of research at IMS meetings. Meetings devoted to special topics are a good means for NRs to start in a new research area. However, NRs often lack travel funds and prefer to use the funds they have to attend annual meetings. The NRC, therefore, proposed to organize "mini-conferences" on currently active areas of research at IMS meetings.

The "mini-conference" would be organized along the lines of the longer special topics conferences sponsored by a number of organizations. The goal is to give researchers an overview of a topic of current interest in the statistical community, including both work in progress and suggested areas for further research, and to promote contacts and research in this area.

The session would be in two parts. In the first part, a keynote speaker would give an hour long overview of the topic and the current state of research. This person would also be asked to provide a bibliography. The second part would consist of two half-hour talks focusing on current research activity and open problems within the chosen topic.

A subcommittee of the NRC would choose each year's topic and organize the session. An NR, chosen competitively from submitted abstracts, would be included as at least one of the nonkeynote speakers. Abstracts would be solicited through advertisements placed in the *IMS Bulletin* and other publications read widely in the statistical community.

Utilize NRs as referees and provide feedback to assist in learning about the peer review process. The NRC recommends that IMS editors include NRs as referees. New referees would benefit by receiving the material that is returned to the author or by other feedback. This aids in understanding the refereeing process, which is helpful to the NR both as author and as reviewer.

Invite NRs to speak in invited sessions. NRs gain considerably by giving invited talks at conferences. Organizers of invited sessions should be encouraged to use the dissertation titles published in the *IMS Bulletin* as a resource for identifying speakers. As well, established researchers are often aware of NRs working in their areas and can be encouraged to forward names to organizers. We recommend that IMS policy encourage including at least one NR in every invited session.

Invite NRs to chair sessions. The NRC recommended that conference participation by NRs be encouraged by inviting NRs to chair sessions at meetings.

Include NRs as members of IMS committees. NRs benefit from the contacts and professional experience gained by sitting on professional committees. The NRC recommended that each IMS committee recruit NRs.

Provide child care information at meetings as part of the local arrangements. Local arrangement committees routinely provide lists of local services to conference attendees. The NRC recommended that child care information be added to the information provided.

ACKNOWLEDGMENTS

The NRC thanks the IMS for providing a conduit for determining and publicizing the needs of NRs. Special thanks are due to R. Gnanadesikan for proposing and organizing the NRC and to S. Gupta and D. Siegmund for their support and encouragement. Also, we thank J. Utts for her assistance. This report benefited substantially from discussions with these people, but the opinions expressed herein are solely those of the committee members. This paper was prepared by Naomi Altman, David Banks and Christian Léger, based on the *Report of the New Researchers Committee*, edited by Naomi Altman, and *The New Researchers' Survival Guide*, edited by David Banks and Janis Hardwick.

REFERENCES

ARMSTRONG, J. S. (1982). Research on scientific journals: Implications for editors and authors. *J. Forecasting* 1 83–104.

BANKS, D. and HARDWICK, J., eds. (1991). *New Researchers' Survival Guide.* In preparation.

BILLARD, L. (1989). The past, present, and future of women in

academia. In *Proceedings of the ASA Sesquicentennial Invited Paper Session* 645–656.

BOEN, J. and ZAHN, D. A. (1982). *The Human Side of Statistical Consulting*. Lifetime Learning, Belmont, Calif.

GLESER, L. J. (1986). Some notes on refereeing. *Amer. Statist.* **40** 310–312.

GORDON, M. (1980). The role of referees in scientific communication. In *The Psychology of Written Communication: Selected Readings* (J. Hartley, ed.) 263–275. Kogan Page, London.

GRAY, P. and DREW, D. E. (1990). Some hints for finding and holding your first nonacademic job. *OR/MS Today* **17** 22–26.

HALMOS, P. R. (1985). *I Want to Be a Mathematician: An Automathography in Three Parts*. Mathematical Association of America, Washington, D.C.

JOINER, B. L. (1985). The key role of statisticians in the transformation of North American industry (with discussion). *Amer. Statist.* **39** 224–234.

LINDLEY, D. V. (1984). Refereeing. *Math. Intelligencer* **6** 56–60.

PALUDI, M. A. and BAUER, W. D. (1983). Goldberg revisited: What's in an author's name? *Sex Roles* **9** 387–390.

PETERS, D. P. and CECI, S. J. (1982). Peer-review practices of psychological journals: The fate of accepted, published articles, submitted again. *Behavioral and Brain Sciences* **5** 187–195.

ROBINSON, G. K. (1987). Instructions to referees: Do we need some? *Austral. J. Statist.* **29** 220–221.

RUBIN, D. B. (1982). Rejection, rebuttal, revision: Some flexible features of peer-review. *Behavioral and Brain Sciences* **5** 236–237.

STEENROD, N. E., HALMOS, P. R., SCHIFFER, M. M. and DIEUDONNÉ, J. E. (1978). *How to Write Mathematics*. Amer. Math. Soc., Providence, R.I.

STRUNK, W. and WHITE, E. B. (1982). *The Elements of Style*, 3rd ed. Macmillan, New York.

TAYLOR, S. E. and MARTIN, J. (1986). The present-mind professor: Controlling one's career. In *The Compleat Academic: A Practical Guide for the Beginning Social Scientist* (M. P. Zanna and J. M. Darley, eds.) 23–60. Random House, New York.

TRUMBO, B. E. (1989). How to get your first research grant (with discussion). *Statist. Sci.* **4** 121–150.

WATSON, H. J. (1990). Guidelines for finding and holding your first academic position. *OR/MS Today* **17** 28–31.