6

Presenting Yourself and Your Data

IF YOU CAN'T COMMUNICATE your data, they don't exist. You must be able to explain your results and the implications of those results to people with more and less knowledge than you have. This is done orally, through discussions and seminars, and on paper, through journal articles and grant submissions. You should become comfortable—or appear comfortable—with both. If your first language is not the language of the lab, presenting yourself well can be an even more difficult task, but it still must be done.

Presenting your data well is not something merely for the ambitious. It is necessary for your survival.

COMMUNICATION TIPS

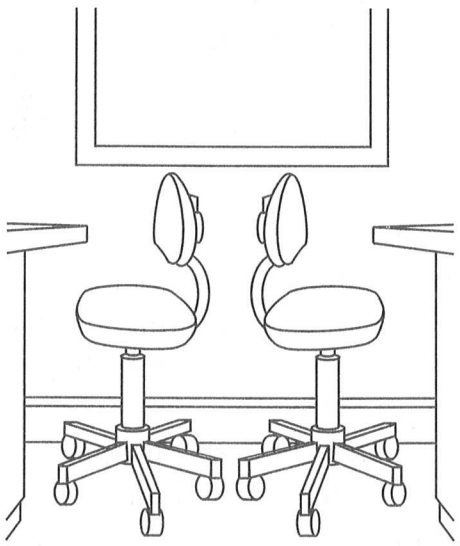
Forget the still-cherished image of the scientist struggling alone in the lab at midnight, shunning the world. For sure, there will be plenty of late hours with you alone with your tubes, but it is not possible to practice modern science in a vacuum. As many discoveries and connections are made in conversations as in biochemical assays, and you must be open to contact with other scientists to make the most of their—and your own—research.

Getting Along in the Lab

The first and most important situation in which you will present yourself is to the people in your own laboratory. Most of what you make of yourself in science has its basis in how your fellow researchers perceive you and your data, and it is well worth expending energy to deal with the other lab members.

Chapter 1 describes some of the usually unspoken rules to follow when you first start work in a new lab. But the nature of your communication with other lab members will evolve as weeks turn into months, and new issues will take on importance.

- **Absentee P.I.** People in labs complain that either the P.I. is oppressively present and wants to know every detail of what is going on, or is never around. If the P.I. of your lab isn't around a lot, take it upon yourself to stay in touch. Leave a note about a good result, pop into her office for 5 minutes, try to have lunch together. It's your career, and you are the one to be hurt if the P.I. can't remember you when it is time to write a recommendation.
- **Bay- and benchmates.** These are your physically (and often, emotionally) closest colleagues in the laboratory. Your bench- and baymates will be the first to see great raw data, the first to know that the Big Experiment didn't work, the first to hear your ruminations and give advice on your experiments. And you will offer the same services to your benchmates. Enjoy the scientific expertise and companionship so close at hand. But in this intimate situation, you must sometimes allow for privacy: There are times when you must just back off and leave your bay- or benchmate alone.
- **Collaborations and credit.** Although most collaborations are worked out before the experiments really begin, they can move in unplanned directions. The usual problem is that the importance of the individual experiments has changed, and the assumed first author will be relegated to another position on the credit list. Ask the P.I. to mediate all disputes.



- **Confrontations.** Most lab confrontations involve a lab member angry because another lab member broke a piece of equipment and didn't deal with it, didn't do the assigned lab job, used up a reagent without ordering more, or used a "private" reagent or equipment without permission. If you are the offended party, deal only with the immediate issue, and don't make personal

remarks or ascribe an evil agenda to the perpetrator. If you are the guilty party, confess and deal with the problem as soon as possible, without excuses or resentment.

It is helpful to have an occasional lab meeting dedicated to airing complaints about lab equipment.

Another class of confrontation deals with intellectual (and emotional) property. Someone may be angry because she believes another lab member infringed on her project, or discussed sensitive data with an outside person. It is worth the two parties trying alone to fix this, but it is usually necessary to ask the P.I. to mediate. Don't bring personal disagreements to the P.I.

- **Deadlines.** Follow deadlines, your own and others, religiously. It keeps you organized, and it helps everyone to whom you have made a commitment. Try to set a deadline when someone asks you to do something (or when you ask someone for a favor): For example, if you ask someone to read a manuscript, you could say "Can you read this manuscript this week? If not, let me know and I'll ask someone else."

- **Difficult P.I.s.** The P.I. has a lot of control over the path of a researcher's career, and there will always be some people who deal badly with this kind of power. Although you should have checked out the personal dynamics of the lab before joining (by asking others in the lab and department how well they enjoy working there), you may find yourself in a nasty situation. The difficulty can take many forms, and you must be able to sort out the trivial from the important. If you think there is a serious problem, document all complaints, include witnesses for confrontations, and seek collaboration of the problem from other lab members before deciding what to do.

- **Favorites.** In a lab, there always seems to be someone who has the P.I.'s attention and admiration. Look carefully. Is it deserved? Maybe you can learn something. And if it isn't deserved, mind your own business and learn to not let it bother you. It is only a problem if you feel it results in detrimental treatment to yourself. Concentrate on your experiments.

  The favorite could be you! If so, don't abuse the situation, and don't let it get to your head. You might be out of favor tomorrow.

- **Gossip and bad-mouthing.** It is true that the line between gossip and information isn't clear. People do talk about people. But be careful. You have to live with your labmates, so don't sabotage the relationships by passing on information that isn't anyone's business. The intimate atmosphere of the lab demands a high level of respect and consideration, even for people you may not like.

  Most large labs find a scapegoat, someone to blame for the missing gel combs, radioactive ice buckets, and dearth of good results. Don't jump on the bandwagon. The talk may be true, but it is also possible that a long-ago personal

problem with one person became unfairly expanded. Make your own unbiased judgments as time goes on.

It is also common for labs to dislike the work of certain other labs, usually competitors. Do not assume this idea is right, and continue to assess competitors' work honestly and fairly. Don't disparage other people's results without good cause. It is not true that making someone look bad makes you look good. Nothing is to be gained by bad-mouthing anyone.

- **Harassment.** The atmosphere can cause one to assume too much and get quite sloppy. Never be casual about racist or sexist remarks. If you feel you are the target of harassment, speak your mind firmly and in front of other lab members before you think about official action.

For the nonnative English speaker

- Resist the urge to speak your native language in the lab, even if the majority of the lab members speak the same language. Speak only English at work.
- Keep your lab notebook in English.
- Take a speaking or writing class in English. Many universities have conversation groups, where you can practice English once a week with other nonnative English speakers. You could also start your own conversation group.
- Practice speaking with people who are willing to correct you. Let other lab members know that you want mistakes to be pointed out to you.
- Always ask a native English speaker to read through and correct everything you write.
- Ask lab members to clarify what you don't understand. For experimental protocols, this is particularly important. If a repeated explanation still isn't satisfactory, ask the person to write down what they are saying.
- Before any oral presentation—even for an informal lab seminar—go through your talk with a native English speaker. Incorporate that person's comments, and practice the talk again in front of the same person.
- Ask a person who speaks your native language, but speaks and writes English well, to comment on your speech and on your written work. People speaking the same language tend to make many of the same mistakes, and this person could point out patterns of mistakes.
- For your first seminar, write out exactly what you are going to say. Have someone correct it. If you feel you are too nervous to memorize or ad lib a good talk, read your lecture.
- Socialize with other lab members. Go to lunch or to happy hour once in a while, and try to join in the conversation. Don't forget to ask people to correct you.

- **In or out.** Your data are good, the P.I. thinks you are good. The data are nonexistent, the P.I. thinks you are nothing. Have a thick skin, and don't rely on results as the sole basis for your feeling of self-worth.
- **Language.** If English is not your native language, it is imperative that you learn to speak and write English as well as you can. Most people in the lab will respect your scientific skills and admire you tremendously for assuming the task of doing science in another language. But some, in the lab and outside, might still avoid working with you if they can't understand you. Without good language skills, it will be difficult to advance in your job or obtain a new job that you are otherwise qualified for.
- **Letters of recommendation.** Letters of recommendation will be an issue for many years, because they are required for many grant and job applications, even at the full professor level. This is not to say that you should curry favor with people because of the letters you may need. But keep in mind that you should be enough a member of the scientific community that you could easily give several names of scientists who know you and know your work. If you can't think of three people from whom you could expect a good letter, you are probably not interacting enough with other scientists.
- **Personal and political differences.** Almost everything gets discussed in labs, sometimes quite heatedly. Try not to let disagreements get in the way of lab interactions.
- **Socializing.** Very important! This is especially important if you have children or commute, and don't get to hang out in the lab at night. Many collaborations are forged over lunch or a beer. Make it a point to join, at least occasionally, in lab parties or outings.
- **Time.** There is no unit of time smaller than half an hour in the lab. If you are arranging a time to get together with someone, always add 30 minutes to your most generous estimation of when you will be ready.
- **Vacations.** There is probably an unofficial vacation policy, as well as an official one. Find out what the lab policy is, and try to conform to it. If it is the custom to take no vacations (a strange and macho custom in some academic institutions), you should take one anyway, but be prepared to deal with sullen resentment and snide remarks.

  Try not to arrange any vacation at a particularly bad time for the laboratory. Give the P.I. plenty of notice about the date and extent of your vacation! Tell her, in person. Then write down the dates of your departure and return, and give it to the secretary. It is also useful to post a notice on your desk or bench, so others in the lab know when to expect you back. Even if you decide to take just one day off, always let someone in the lab know.

Networking

Networking is a fancy term for staying in touch with people in your field. It is necessary. It takes energy. But don't worry if you aren't terrifically extroverted. It certainly helps, but there are many ways in which you can interact with other scientists.

- **Chatrooms and newsgroups on the WWW.** Scientific chatrooms and newsgroups allow you to exchange information, scientific or otherwise, on the Internet. You can do anything from getting a recipe for a buffer to asking advice about a job offer at another institution.

- **Collaborations.** A good collaboration is exhilarating. Two or more people, with different and complementary expertise, can achieve much more than the sum of the parts. And it is fun, it is everything one expects from science, but a bad collaboration is a drain without compensation.

  All collaborations take more time than you think. The agreement starts out with the promise of "just one experiment," but this almost always expands and expands into multiple controls and experiments. If you can't afford the time, if participation has become one-sided or unfair, or if results are not forthcoming, end the collaboration as soon as you can.

  Don't make any collaboration, even a casual one, without discussing it first with the P.I.!

- **Confidence.** Don't be intimidated by titles and long C.V.s: Don't let fear of not knowing as much as someone else stop you from discussing data with that person.

- **Conflict of interest.** Multiple collaborations can lead you here, so be on the alert that your collaborators are not in competition with each other. Be up front with everyone you are working with.

  Reviewing a competitor's grant or manuscript is another conflict of interest. If you will be influenced by the data you will read about, you should not review the grant or manuscript. It is perfectly permissible to return something you have been asked to review with a note saying that you are unable to do so, and why.

- **Good data.** Great results are a passport to the scientific community. When you are a winner, everyone wants to know you. If sudden success happens to you, take advantage of the opportunity to meet as many people as you can: Promote your data and yourself enough to last through the inevitable dry times. But don't rest on your laurels, and don't assess your self-worth based on your good data any more than on your "bad" data.

- **E-mail.** E-mail is an easy way to request a plasmid or ask for a protocol. Sending a quick note to someone you met at a meeting, or complimenting someone on a

How to "give" a poster session

- If someone appears interested in your poster, ask him or her "Would you like me to walk you through this?" Don't just stand quietly beside the poster.
- If the person says no, just remind him that you are available for questions, and fade back.
- Most will say yes, and you should then give a very brief, figure-by-figure summation of the poster.
- Stop when you have finished, let the person move on if he or she pleases: People like to maneuver quickly at poster sessions. Don't be offended at quick comings and goings.
- If you become very engaged with someone, and other people come to see the poster, let everyone know that you are aware of them, and will get to them as soon as possible. Exchange addresses and phone numbers, or arrange another meeting with the (pleasantly) monopolizing person if it is clear that 5 minutes won't be enough time.

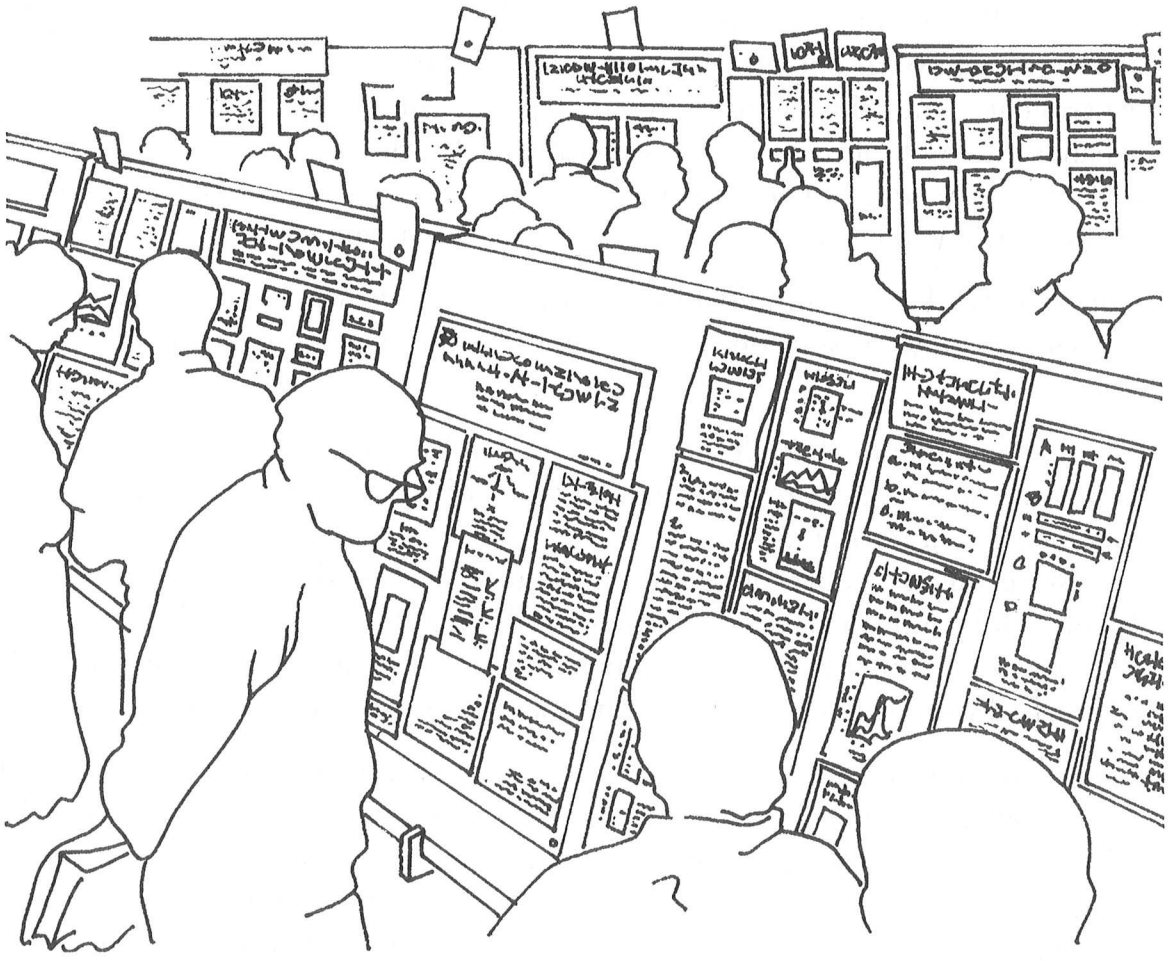


FIGURE 1.

Data set up for a poster session. The actual session, during which the investigators are available to explain the data, is 1 or 2 hours. The boards may be left up for a morning or afternoon.

talk, is relatively painless for sender and recipient and maintains contact with the outside world.

- **Interdepartmental seminars and journal clubs.** Theme meetings with scientists outside of your own group are an easy way to network in your geographical area. If there isn't a cross-institutional meeting in your field, think of starting one.
- **Meetings.** Attend at least one meeting a year. Don't pass up an opportunity to give a talk, but go even if you are not presenting. Once you are at the meeting, be as active as you can about learning the field and meeting people. Poster sessions are the best places at meetings to meet and interact with other scientists. Go to as many posters as you can. Ask questions. Take addresses. Give a poster, if you have a chance.

Attending Seminars

Rule # 1—Stay awake! It is sometimes hard to avoid the Thursday afternoon, 4 P.M. slump. You sit in a crowded seminar room, "listening" to a lecture. The lights are out, the room is warm, the topic is tepid... but be active and pull yourself together! It is rude and grotesque to fall asleep and to lean, slack-jawed and snoring, on the shoulder of the guy next to you. It is insulting to the speaker, and it is an image the rest of the department won't be able to get out of their heads, maybe forever.

Furthermore, it really is a complete waste of time to go to a seminar and not then listen actively. Unless there is a political reason that your body had to be at the seminar, bring your mind also: You don't learn anything by merely showing up.

Choose carefully the seminars you attend. Don't go to seminars you know you won't listen to.

Even if it is a terrible seminar (it happens), don't give into the temptation to call yourself out with your beeper—this is too obvious a ploy. If you really must go, get up and leave.

Stay involved with the seminar by

- **Listening** actively, trying to understand what the speaker is saying.
- **Anticipating** where the speaker is going with the data.
- **Weighing** what the speaker says versus what you know. Relate his experiments to what is known in the field.
- **Reviewing** and **summarizing** what is being said.
- **Looking** at the speaker. It is tempting to just look at the slides, board, or overheads, but you should look as long as you need to take in the data and return your gaze to the speaker.

- **Taking notes.** But listen while you take notes: It is all too possible to take beautiful notes without hearing a word.
- **Sorting** out evidence and facts from statements unsupported by evidence. Make judgments, but remain open-minded. Be ready to ask a question about something you don't understand.
- **Asking questions.** In an informal seminar, you can ask the questions as they occur to you, but you should wait until the end of a formal meeting to ask most questions.
- **Sitting up.** Don't get too comfortable, and keep your gaze focused on the speaker.

Asking questions

Questions and answers are the very heart of scientific research, so you must let go of any baggage that prevents you from asking questions freely.

At most seminars, the same few people ask questions. Why? Does no one else have a question? Of course they do—if they were listening, that is. The reason more people don't ask questions is insecurity. Oh, it is masked behind reasonable explanations, such as

- My question won't interest anyone else, so I'll ask the speaker after the seminar.
- I won't be able to express my question, it is too complicated.
- I'm probably supposed to know the answer, it is my field.
- It is too obvious a question. Everyone else knows the answer.
- I don't want to look stupid or unread.
- I don't want to have a confrontation in public.
- I must have missed the slide that would explain. I can't let on that I wasn't paying attention.

Formulate questions as the seminar progresses. Try to ask at least one question a seminar. Listen to the answer. You may have a follow-up question.

Acknowledge the answer. Nod, smile, or say something to thank the speaker for the answer. Question, don't attack. If you must ask a hostile question, do it very politely and professionally.

Ask only questions you want the answer to! Don't ask a question because you want everyone to know that you know your stuff, and that your own experiments are exciting and brilliant ("That was a very interesting talk. Now, in *my* lab……") This is a very transparent maneuver.

You may be nervous, but learn to live with it. It is important that you be an active rather than a passive participant in all laboratory meetings and discussions.

ORAL PRESENTATIONS

Consider that you are giving an oral presentation every time you discuss your data with someone. Not to say you should be stiff or formal, but you must be organized and thoughtful. The same rules apply to conversations as to international meetings.

Preparation

- **Prepare what you are going to say** before you say it whether you are having a one-on-one conversation with the P.I., or are giving a seminar at an international meeting. Learn as much as you can about the topic to be discussed.
- **Know your audience.** It is your responsibility to get an idea across. If you are speaking in a place you don't know, ask several weeks beforehand about the composition of the listeners. Are they students, physicians, chemists? It will (it should!) make a difference in the preparation of the talk.

- **Practice** your talk. Practice it alone. Practice it in front of critics, at least 3 days before the seminar so you will have time to calmly make changes. Practice with your visual aids. Shorten the seminar if it runs over time

Execution

- **Don't worry about nervousness**—think of it as excitement and channel it into enthusiasm. Most people get nervous.

- **Speak clearly and distinctly.** Avoid mumbling, speaking too fast, speaking too slowly, and mispronouncing words.

- **Be alert for conversational tics** and eliminate them. Don't say "Uhhhh," "Uhmmm," or "Okay" at the end of every sentence.

- **Watch the timing** of the seminar. If it is supposed to be a 45-minute seminar, make sure the seminar is 45 minutes or less, even if you have to jettison some of your slides to make it. Less is more.

- **Inject your personality** into the talk. It keeps you and the audience more attentive, and it reminds everyone that a seminar is really a large conversation.

Research Seminars

The laboratory seminar is the forum in which you will present your own data to your lab or department members. Although you should be constantly talking to the head of the lab and other coworkers about your data, the laboratory seminar is where you will really put the whole picture together for everyone in the department. Too often, the preparation for a lab seminar is the first time a researcher actually sits down with the data and tries to make a story. Try to avoid this by routinely analyzing your data, but be sure to give yourself enough time for preparation of your seminar to organize yourself.

This seminar will either be *formal* or *informal,* and each type is organized quite differently. Each laboratory has its individualized format, which you should follow for your presentation.

Data from lab seminars are confidential.

A formal laboratory seminar

- Is usually for the entire department and is handled as a seminar at an international meeting would be.
- Is held in a lecture room or hall.
- Is usually 45 minutes to an hour long.
- Has data presented as slides.
- Should be a slick presentation.
- Focuses on an understanding of the problem and the approach, as well as the data.
- Has few technical problems.
- Is devoid of jargon.
- Has a question and answer period at the end of the seminar.

An informal laboratory seminar

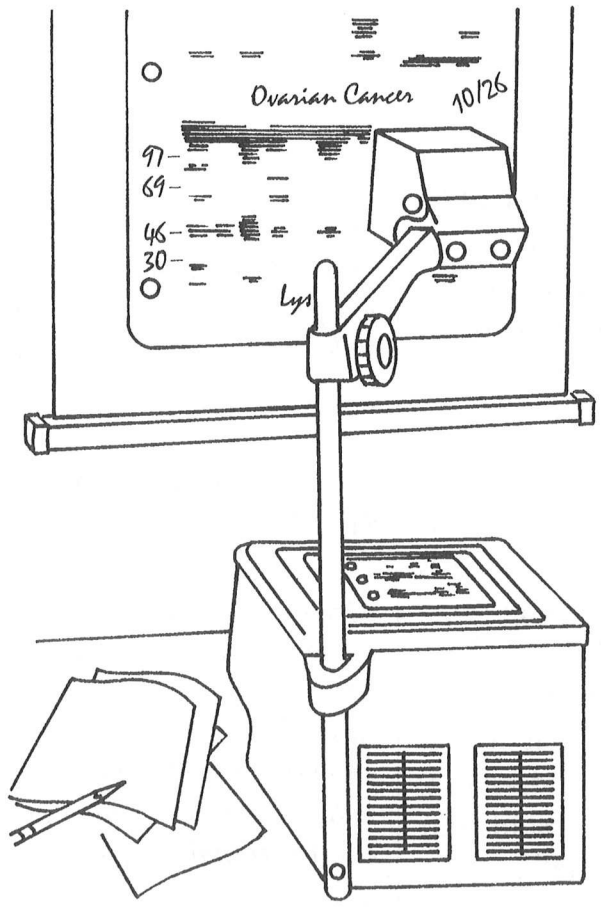
- Is only for the members of the laboratory.
- May be held in the lab or lab library, as well as in a meeting room.
- Is 30 minutes to an hour in length.
- Has actual gels and films shown on an overhead projector or passed around and often uses blackboards.

- Is a forum for problem solving.
- Focuses on the data. Technical difficulties are brought up for discussion.
- Permits jargon.
- Allows questions to be asked throughout the seminar.

Avoid the making-more-data-before-the-seminar-syndrome. Instead of wildly running sequencing gels the day before the seminar, use the time to organize and prepare the data you have. No one will care about the extra 500 bases you sequenced, but they will mind a messy seminar. Everyone knows that experiments done just before meetings seldom work, anyway.

Informal laboratory seminars

- **Objectives.** Informal laboratory seminars are really working meetings, and you should approach yours as an opportunity not just to impress, but to learn. You should be as prepared for an informal seminar as you would be for a formal one. Orchestrate the meeting, stay in control! Your major concern should be in explaining your experiments—what they are, what the results are, what went well or wrong, and why.
- **Introduction.** Give a brief description of the theory and background to your experiments. It is assumed that the audience knows the field, but you should mention where the experiments fit into the field. You should not give more than 5 minutes of background. Recap your experiments that led up to the research you will discuss. Describe any esoteric methodology.



- **Data presentation.** Have your data—slides, gels, graphs, and photographs—ready and stacked in order. Show films on an overhead projector. Hold up photographs. Draw graphs on the blackboard.

  Show data basically in the order it was generated, but keep to a logical progression of thought. Each time, explain why you did the experiment.

  Unless you want to prove a point about technological difficulties, show only good data. State whether that exquisite gel is typical

or unusual, and be honest about the reproducibility of the data.

Have statistics and other analysis ready. You don't have to show it all, but you should have solid numbers available.

Know your data. If you are showing a complicated gel, be sure you know what every lane is, even if only lanes 1–3 are relevant to the experiments you are discussing.

Know your methodology. This is not the place to say, "I don't know" too many times. In this little world of your work, you should know everything.

Acknowledge any help you received with experiments as you discuss the experiment. Don't forget to acknowledge intellectual contributions.

Make a conclusion for every piece of data you show.

Summarize your mini-conclusions of each experiment. Have your experiments been successful? Discuss whether you have met your objectives and if not, why. Remind the audience of your goal, and the experiments you need to do to achieve it.

- **Answering questions.** Answer questions about the experiments as you go along. If someone asks a lot of background questions, appears to be the only one missing the point, and your time is short, ask that person to hold questions until after the seminar. Use the question time to answer your own questions. You can ask the audience for suggestions about a particular experiment, or advice about a protocol.

Formal laboratory seminars and meetings

- **Objectives.** A formal seminar is a story and should be a tidy package in itself, without loose ends. The background, the rationale, the methods, data, and conclusions should be internally logical, sensible, and attractive to a varied audience. You are not so much trying to educate as to convince and entertain.

Start with the whole story; let people know where they are going. The seminar as a gradually unfolding puzzle is only good in theory.

- **Introduction.** The introduction should be at least 10 minutes long. In a very few sentences, give the overall problem you are working on. Say why this problem is important. Let the audience know why this topic is worth researching (and why it is worth listening to).

  Give the relevant background to this problem. The audience will probably be varied, and you must explain the theory and experimentation that led to your research in a way that everyone can understand. State what you will be talking about for the rest of your seminar. Basically, give the outline of your talk.

Memorize the first few sentences of your talk. The initial moments of a seminar can feel awkward, and knowing exactly what you will say in your opening will ease the initial tension.

- **Data presentation.** Present data in a logical sequence, building on the data of each previous slide. Even if your experiments were not done logically, present them that way. Interpret each slide carefully, lane by lane, point by point. Clearly state the point shown by every data slide.

  Break the data into topics, and discuss each topic separately. Each topic should flow smoothly into the next. If you have very little data, you should still divide the data into separate topics. Three or four separate topics are optimal. Recap each topic before you move on to the next. Transitions are vital to a good seminar. You must provide a bridge of logic between each topic, and from section to section of the seminar.

  Stay enthusiastic through the seminar. **Don't be negative** about your own data!

  Discuss any problems honestly, but not extensively. Don't beat yourself on the head. If possible, deal with any problems or difficulties with the interpretation of the data during the body of the talk. Describe the future experiments you will do to address the problems.

  Summarize your data, point by point, but briefly. Give your conclusions of your data in a slide. It is okay to read this slide.

  It is generally most comfortable to end with acknowledgments. The tradition is to show a slide with a list of people who contributed to the research and to give a one-sentence summary of each person's contribution: A variation on this is to show group or single pictures of each person as you discuss the contributions. Don't worry that thanking too many people will take away from your own glory. It won't. Thank everyone who helped you, including those who may have helped prepare your slides.

  If you haven't put in an acknowledgment slide, you must verbally acknowledge all contributions to the work.

- **Answering questions.** If there isn't a chairperson who will thank you and request questions, you should thank the audience and ask for questions. You don't have to tell all. If some data are not ready to be discussed, say so. Respond only to what is being asked. If you don't know the answer, say it. Listen to the question until the end. Clarify questions "Do you mean ..." or "Let me recap your question." Treat everyone respectfully, even those who are acting hostile. Avoid debates. If someone is argumentative, try to gracefully and tactfully defuse the situation. Suggest meeting after the seminar.

At formal seminars, a projectionist or a friend will usually operate your slides. Just say "Next slide, please" when it is time to change. Thank the projectionist at the end of the seminar.

Don't read your talk. Use your slides as cue cards to prompt you.

Remind the audience frequently what the data mean, why you are doing these experiments and where you are going.

Don't leave people hanging. End with the feeling that there is no unfinished business.

Controlling the seminar

You should control not only the data, but also the physical environment.

1. **Sound.** Request an around the neck or clip-on microphone—don't get stuck with a permanently fixed mike.
2. **Stage.** Choose where to stand. Move to keep the audience's attention.
3. **Podium.** Put your notes on it and move away! Don't be chained to one position.
4. **Lights.** Don't put the house lights out. Check whether there is a light at the podium if you briefly need one.
5. **Room.** Encourage people to sit near you.
6. **Visual aids requirements.** Don't let your visual aids become dominant. Keep yourself as the focus.
7. **Take back-ups.** If you take your own projector, have a bulb. Bring a pointer.
8. Be sure about your **time length.** If the seminar is going longer than planned, do what you can, including cutting a section from your talk, to be finished in time.
9. **Try it all out.** Arrive early and test your equipment, including lights, pointers, and slides.

Hamlin, S. *How to Talk so People Listen,* p 185.

Ten-minute talks

Many talks you will give at meetings will be only 10 minutes. Arranging a good 10-minute talk is an art: Short talks are harder to organize than long ones. You must not describe all of your research. You must try to make one or two points only, and be extremely selective in what data you show. Polish that little talk like a jewel.

The *introduction* is 1 to 2 minutes of your precious allotment. It should be brief but thorough, for it sets the scene for data to be understood. One or two slides, especially of data, should be used.

Jump right in to the *data presentation.* Use three to six slides, and describe each very thoroughly. Don't use text slides for transitions, but make transitions orally.

A *conclusion slide* will help clarify the point of the seminar. Summarize your data, and avoid predictions and long descriptions of future plans.

There will be a brief *question and answer* period after the talk, with time for only two or three questions. Have with you extra slides describing data you had no time to show, but which may be used for answering questions.

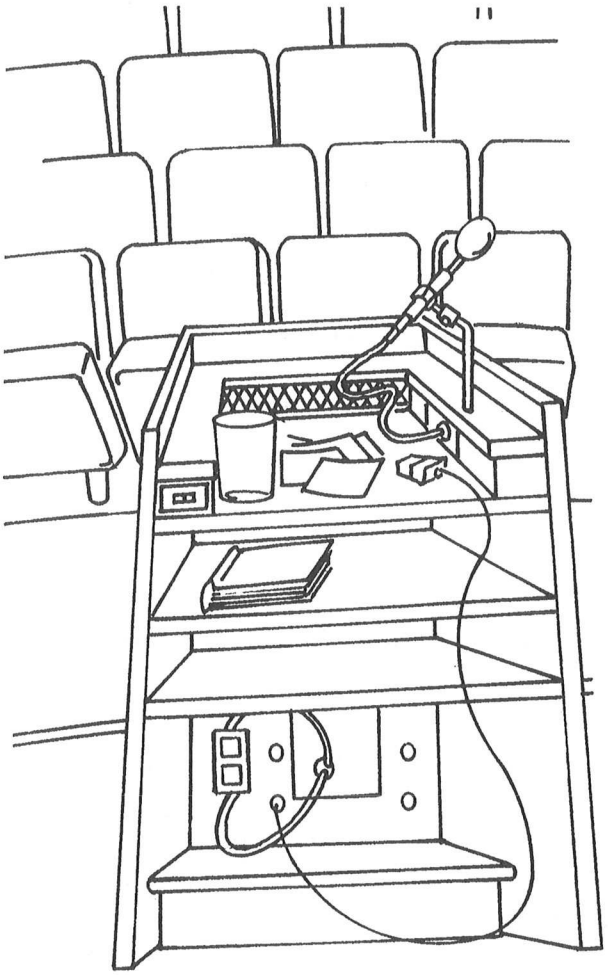


FIGURE 2.
Be sure you understand how to work the lights and pointer before the seminar starts.

Journal Clubs

People tend to think journal club presentations are a waste of time and have nothing to do with their own research (which is, of course, the only thing that is important). Wrong! First of all, you can learn a lot through journal clubs. And more importantly, make no mistake that your general science knowledge isn't being judged, and that that impression can imply something about your own research. If you are poorly prepared, can't explain the figures, and know nothing about the background of the work, it is very easy to imagine that your own research is being tackled as sloppily. But a sharp and brief presentation will leave the room with the impression that you are in control.

- **Format.** There are two common journal club formats: a very brief review of five or six current and unrelated papers, or a more in-depth review of one or two papers on the same topic. You will not have to do a journal club until you have sat through a few, so take note of the format and follow it for your first journal club.

- The tools of presentation are overheads, photocopies, blackboard, or nothing.
- The length of the journal club is usually 15 minutes to 30 minutes.
- You may share a journal club slot with someone else, or talk alone. If you are sharing time, you are usually expected to be more concise.
- There may or may not be handouts.
- The journal article or topic may be assigned, assumed, or left totally up to you.
- You may be expected to have the article distributed or, at least, the citation ready and posted a week or several days before the journal club.

Choice of Topic for Journal Club

Some departments expect each presenter to choose something close to that person's own research, and others expect that the choice should be on a different topic, for the sake of a learning experience. Follow the custom.

Pick something that the department, in general, will be interested in. Will be, not should be. Although all of science is connected, you'll have to work much harder to impress tired and harried animal physiology researchers with the importance of plant response to light than you would if you choose a more immediately relevant topic.

A combination of the known and unknown is usually best. Choose a topic that you are not totally unfamiliar with, since you will feel more comfortable with the presentation and will not have to do too much background reading. But don't, unless it is an amazingly splendid, controversial, or important paper, always pick a paper that is concerned exactly with your own research. You will appear (and well may be) one-dimensional. Use the journal club as an opportunity to learn something and show something of yourself.

Pick a current paper, one from the last month or so. The exception is a topic very important to the group, and a very good paper.

Pick a solid paper. Although you will point out the flaws of whichever paper you choose, a paper with too many problems will make everyone wonder what on earth you were thinking when you chose the paper. Don't assume that, because a paper is in *Nature, Science,* or *Cell,* it is a good paper. But picking a paper from a well-known journal does reduce journal club anxiety and defensiveness, and tends to make the audience assume that the time listening is a good investment.

Pick a simple paper. If the reasoning is too complicated, you will lose your audience unless you have a special gift for inspiring harried people to concentrate. And obviously, pick a paper that *you* understand!

Pick an interesting paper. Don't pick a paper that adds only incrementally to the great fund of knowledge. For example, don't pick papers that compare the effects of 15 agents on one protein—this is boring to listen to, and gives people no insight into their own work (actually, maybe it will! But they won't like it.) Papers that suggest a mechanism work the best for a group of people with mixed interests.

- **Length of Presentation.** Rule number 1—Don't go over time! Journal clubs are traditionally held at lunchtime or at the end of the day: Experiments are brewing, time is tight, and most people go reluctantly. Keep it short, and keep their interest.

- **Organization of the presentation.** Introduce the paper: Title, authors, and brief discussion of the topic. Give the background, 10–20% of the total time. Introduce your paper and make clear its place in the background and why it is important or interesting. Say why you chose it.

  Explain the data, 50–80% of the total time. If necessary, briefly describe unusual methodology. Give the author's conclusion.

  Point out any flaws in the data, the paper itself, or the conclusions. Are the author's conclusions warranted by the data? Quickly (three sentences) summarize the conclusions and the importance of the paper.

  Have the paper picked out a week before your presentation. Plan on spending two whole evenings to prepare your first few journal clubs. As you read, anticipate questions. Buffer concentrations you can look up during the presentation: a description of a competing theory you cannot.

> *Know the background of the paper. Read at least three papers referenced in the paper you have chosen. You should know the experiments that led up to this paper, and you should know if and why the results are controversial. You must understand how the experiments were done, and how dependable the methodology is.*

Presentation Tools

Use visual aids only to *augment* your talk. A flowchart can show the logic for your experiments, and a picture can impress and awe in a way a verbal description can't approach. But *you* should be the dominant source of interest during the seminar.

An *overhead projector* is an excellent aid for presenting data and keeping the crowd alert for a journal club. You can cut and paste the important figures (unless it is a short paper, it is not necessary to show all figures) from the paper, and draw your own figures and summaries. You can draw on the sheet during the talk.

Write large and boldly, because tiny writing can't be seen. If your handwriting is not neat and clear, type the text using a minimum type size of 14 points. Assemble the master sheet figures in the order in which you will present them, with a piece of paper between each one.

You will need to get the plastic pages for making overheads. These are special, because they need to fit onto the photocopy machine. Check the office or a stationery store. If you are drawing all your figures, you can do it on any transparent plastic sheets.

Speak loudly, above the noise of the projector. Don't stand in the way of the projected image.

Photocopies are basically the same as using an overhead projector, as far as preparation goes. Try to minimize the number of photocopies. Don't forget to maintain contact with your audience. Eye contact sometimes gets lost if you have text in front of you. You may photocopy the entire article and distribute it, but this is usually a waste of effort and paper.

A few anchoring figures can be drawn on the *blackboard* before the journal club starts. In this case, the board is being used like an overhead projector. The best use of the blackboard is to quickly draw and write as you are speaking. You must be well organized and thoroughly versed in your topic to do this, so you know before you start just what you will draw.

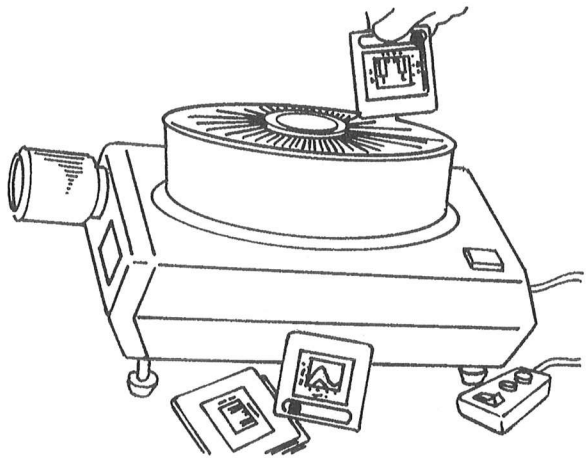
A presentation program will allow you to give a *computer slide show*, but this is only good for small and informal seminars. It is an excellent way to show data that you have scanned onto your computer.

Unless you are giving a 5-minute presentation, you will need some sort of visual aid to help people focus. If you have no visual aids, you will have to be particularly charming.

Slides are the heart and mainstay of a formal seminar.

- Find out how your lab makes slides a month in advance of your talk. Figures may be sent away, or photographed and developed at the institutional media center: Figures may be sent directly via computer to the media center. The use of a presentation or graphics program will help greatly in making both text and graphic slides, but don't wait until the day before to try it unless you don't have a shred of panic in your body.
- Slides should be finished a week before your talk. This gives you time to add new slides, to check that all slides can be read from the back of the room, and to redo slides that can't be read.
- Many labs have Polaroid cameras, which can make slides in 30 minutes. These cameras are usually for black and white film only and are better for text than for pictures. Find out if you have access to such a camera, get some film, and learn how to use it: You may realize the night before that you need a slide.
- Use at least a 20-point size for text. Check your completed slides to be sure they can be read from the back of the room.
- Each slide should make one point. Don't overload slides with information.
- Figures should be well labeled, so that they are understandable without any explanation. Unlike tables and figures for manuscripts, tables and figures for slides should have all axes labeled and a title that summarizes the figure.
- Look at your slides, projected on a screen in a room approximately the same size as the room in which you will talk. Some slides look very good on paper, but don't project well.

- 20–40 slides is a good number to have for a 45–60-minute talk. Don't have more than 20 "hard" data slides: If you have more than 20 slides, they should include pictures, drawings, models, and text slides.
- Put a mark on the lower left of each slide. Slides are placed in a carousel upside down, with the dot on the upper right.
- To avoid fumbling and incorrect slide loading, have your slides loaded into a carousel before seminar time. Check the order and placement of the slides before the seminar.



Checklist of slides

- A text introduction slide.
- Background slides. These can be borrowed from other investigators, or made from textbooks or the literature.
- Data slides.
- A text slide of one sentence for each section of the talk.
- A text summary or conclusions slide.
- An acknowledgment slide should be shown at the end of the talk. Include not only technical and theoretical research help, but also assistance with slide preparation and computer graphics, and people who contributed materials. No one will think you haven't done the work if you list many people, but forgetting to acknowledge someone is a breach of courtesy.

WRITTEN PRESENTATIONS

Manuscripts

The scientific, to say nothing of the political, machinations involved in getting a paper published are quite complicated. There are several books on the topic (some of which are listed in Resources), and plenty of good and practical advice from other scientists.

Some general tips

- Think of your experiments, from the beginning, as figures in a paper. Yes, it does sound as if mere ambition has supplanted scientific interest. But you must publish, and thinking about the publications can stop you from venturing too far down dead ends. It also helps you to always include the appropriate controls.
- Base the paper on the data, not the other way around. Prepare your figures before you do any writing.
- Your data must be reproducible before you can make a story out of it.
- Write your papers as soon as you can. Write them before you are ready. There will probably not be a pat answer to a story, so put an ending on, and wrap it up. If more needs to be done, it will become clear during the writing.
- Write up all papers before you switch projects or labs. No man or woman can serve two masters. Project carryover is very distressing, and you should have all writing finished before starting anew.
- Use spell and grammar checks. Spelling mistakes will cause you to lose credibility with readers.
- Be selective and thorough with the references and be sure, in your final draft, that the references are placed correctly. These sometimes get mixed up when running a bibliographic management program.
- Get at least three readers for your paper. Do this before you give the paper to the P.I. to read! Ask two people familiar with the field: They will point out omissions of background, suggest implications, etc. Ask someone, not necessarily in the field, who can read the manuscript for mistakes in logic, spelling, and grammar. Do this for every draft of the paper. Try to use the same readers. Don't get too many readers, because you will

If someone asks you to read a manuscript for comments, do it as soon as possible. Only quick feedback is useful. If you won't be able to read it for a few days, inform the person before you take the manuscript.

get in a complete muddle from conflicting suggestions. But do get good quality readers, people whom you know will be thorough, prompt, and honest.

- Assess the quality of the paper when choosing the journal to which you will submit it. If the choice of journal is your decision, ask the P.I. for advice. Journals tend to accept papers more readily from some labs than from others, and the P.I. will know the history of the submissions from your lab.
- Don't be discouraged by a negative review. Many reviews can be argued, and it is always worth a try. And actually, most papers are improved when revised in accordance with a review.

By the time the P.I. gets the paper, it should be in almost publishable form. It is not the job of the P.I. to correct your grammar and spelling mistakes.

When you submit a manuscript to a journal, you must include a short introductory letter to the editor.

When writing manuscript reviews

Be critical.
Be prompt.
Don't be pompous.
Don't be petty.

Research definitions

These abused research definitions have been circulating in laboratories for years. There is a painful truth to them, and most of the phrases should be avoided.

"IT HAS LONG BEEN KNOWN ..." I haven't bothered to look up the original reference.
"OF GREAT THEORETICAL AND PRACTICAL IMPORTANCE" Interesting to me.
"WHILE IT HAS NOT BEEN POSSIBLE TO PROVIDE DEFINITE ANSWERS TO THESE QUESTIONS ..." The experiments didn't work out, but I figure I could get publicity out of it.
"EXTREMELY HIGH PURITY, SUPERPURITY" Composition unknown except for the exaggerated claims of the supplier.
"THREE OF THE SAMPLES WERE CHOSEN FOR DETAILED STUDY" The results on the others didn't make sense and were ignored.
"ACCIDENTALLY STAINED DURING MOUNTING" Accidentally dropped on floor.
"HANDLED WITH EXTREME CARE DURING EXPERIMENTS" Not dropped on the floor.
"TYPICAL RESULTS ARE SHOWN" The best results are shown.
"PRESUMABLY AT LONGER TIMES ..." I didn't take the time to find out.
"THESE RESULTS WILL BE REPORTED AT A LATER DATE" I might get around to this sometime.

"THE MOST RELIABLE VALUES ARE THOSE OF JONES" He was a student of mine.
"IT IS BELIEVED THAT ..." I think.
"IT IS GENERALLY BELIEVED THAT ..." A couple of other guys think so too.
"IT MIGHT BE ARGUED THAT ..." I have such a good answer for this objection that I shall now raise it.
"IT IS CLEAR THAT MUCH ADDITIONAL WORK WILL BE REQUIRED BEFORE A COMPLETE UNDERSTANDING ..." I don't understand it.
"CORRECT WITHIN AN ORDER OF MAGNITUDE" Wrong.
"IT IS TO BE HOPED THAT THIS WORK WILL STIMULATE FURTHER WORK IN THE FIELD" This paper is not very good, but neither are any of the others on this miserable subject.
"THANKS ARE DUE TO JOE GLOTZ FOR ASSISTANCE WITH THE EXPERIMENT AND TO JOHN DOE FOR VALUABLE DISCUSSIONS" Glotz did the work and Doe explained it to me.

(Anonymous)

Grants

A grant is a much more complicated piece of writing than a manuscript because you must not only convince the audience of the validity of the work, you must also convince them that you are the person for the job. Grantsmanship is inseparable from politics.

Politics and practicalities of submission

- Stay in close touch with the grants office at your institution. These vary greatly in performance and responsibility. Some offices do nothing but sign the grants before they are submitted. Others actually critique the science as well as the financial and administrative sections, and give suggestions as to improvements. Try to keep to the grants office deadlines. They will understand, but you must give them as much time as possible to take advantage of the help they can offer. Cover pages—on disk—may be available at your grants office. If not, they may be available from the agency.

Many agencies solicit grants on particular topics throughout the year. These generally have higher funding percentages.

- It makes sense to submit the same grant to as many agencies as possible. But make no mistake about the amount of time reworking a grant for another agency will take. It is usually at least a week.
- Be a perfectionist. The reviewers have a lot of good grants to go through for each study section and are often looking for a reason to eliminate a grant from consideration.

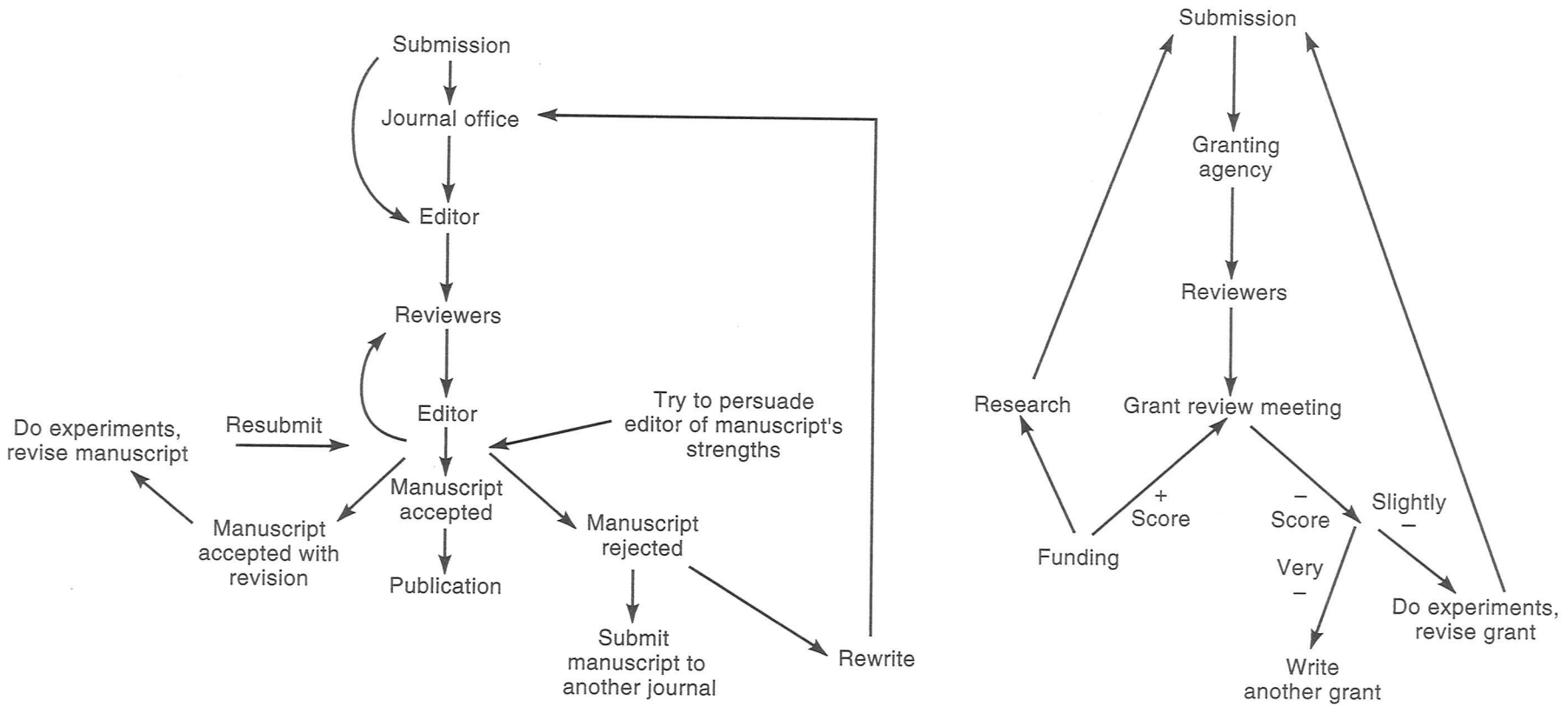


FIGURE 3.

Sequence of events after manuscript and grant submission. The submissions of a manuscript (*A*) or grant (*B*) are similar to each other, with the exception that more options are available for submission and maneuvers for manuscripts. Both sequences usually take approximately 3–6 months for funding or publication. Not all grant and manuscript submissions exactly follow the sequence shown here: For example, some editors do not send revised manuscripts back to reviewers, but accept or reject the manuscript personally. Revised grants are reviewed by the same people who reviewed the first submission in some granting agencies, and some agencies give an "accept" or "reject" without supplying a score or ranking or reason for the decision.

- The best way to get a grant is to already have published papers on the topic.
- You must have preliminary results before you submit the grant. This is especially important if you are doing something you haven't been trained in, or if you want to work on something controversial or new. The preliminary results don't necessarily have to be your own.
- Many agencies will allow you to submit additional data after the grant has been submitted, before review. Take advantage of this only if you have very clean, persuasive, and relevant data to add.

Avoid red flags! These are mistakes and omissions which, to a reviewer, are like waving a red flag at an angry bull. Anything that suggests sloppiness, for example, can put a reviewer in an extremely unreceptive mood. Examples are misspellings, incorrectly numbered references, and badly labeled figures.

- Add collaborators who can supply expertise you don't (or don't appear to) have. Mention these collaborators in the grant. Most agencies will request that you also submit the proposed collaborator's C.V., as well as a copy of a letter to you from the collaborator, affirming the collaboration.
- Get at least three readers for your grant, as you would for a manuscript. Revise it and ask the same people to read it again.

RESOURCES

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