JOB APPLICATION RESEARCH STATEMENT

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Article #1 is a bit long but it is quite thorough and well worth your time. Article #2 gives one example of a successful research statement. - Rick Reis

1. Writing a Research Plan

By Jim Austin
Editor, Science Careers
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Hiring committees desperately want to avoid making a serious mistake by investing institutional and intellectual capital in the wrong person. The aim of your research plan, then, as of the rest of your application, is to assure the hiring committee that life with you will be pain-free.

Nearly every applicant for a tenure-track faculty job is expected to include a research plan. Exceptions are rare. Just as rare are programs designed to help doctoral students and postdocs learn how to create a research plan. Which is too bad: Writing an effective research plan is tricky. And until now, there was little advice to be found.

Okay, so that isn't exactly true: It isn't hard to find advice. Opinions, after all, are not in short supply in the academy. What *is* hard is finding advice you can rely on. We can help.

Why? Because we talked to a lot of people. We interviewed and corresponded with faculty and research scientists who have served on hiring committees. All of our sources have experience; some of our sources have a lot of experience. We considered everything, filtered out the muck, and distilled it all down to a general strategy and a few

simple principles, with a few variations on the theme thrown in for good measure. Our aim is to do some of your homework for you, to make sure that you'll never have to read more than you have time for.

Furthermore, we'll keep talking to people about this topic, and we'll incorporate new responses into this document as we receive them. As a consequence this piece, like the other tools in the tool kit, will remain fresh and useful when other resources have become dated and useless.

So, onward and upward ...

What's the purpose of a research plan?

It depends on who's asking the question, and who's answering it. From your immediate point of view, the purpose of a research plan is to help get you hired.

The research plan, however, serves another, very important function: It contributes to your development as a scientist. Your research plan is a map for your career as a research science professional. As will become apparent later in this document, one of the functions of a research plan is to demonstrate your intellectual vision and aspirations. It's also an opportunity to begin to demonstrate the creative and independent thinking required of a successful scientist.

Not yet on the job market? Just starting out as a postdoc? A research plan isn't just for demonstrating; it's also for honing and refining. It's possible to function quite well as a postdoc or grad student while giving little thought to your future. Writing a research plan casts your gaze forward and prompts you to begin planning for when you have your own laboratory. And if you've already started to think about your own lab, it will help you to refine your plans. So take a stab at writing a research plan, even if you don't expect to be on the job market for a while. Think of it as a rough draft, a fantasy trip for your career.

But never mind about that. Most of you are trying to get hired. In that case what matters is, what is the committee looking for?

The answer: relief from anxiety.

Hiring committees desperately want to avoid making a serious mistake by investing institutional and intellectual capital in the wrong person. The aim of your research plan, then, as of the rest of your application, is to assure the hiring committee that life with you will be pain-free.

How do you do this? Provide the committee a compelling, reassuring, believable image of what their life will be like when you are working down the hall.

Tell them a story--a believable, credible story--about what your lab will be like 5 years from now: well-funded, vibrant, productive, pursuing a valuable, ambitious but realistic research agenda that meshes well with the department's mission and with the other research going on in the department.

Please don't misunderstand: You shouldn't *tell* them this ("in 5 years my lab will be vibrant, productive, and well-funded ..."); rather, you need to lead them to believe it by describing a research agenda that persuades them that you will succeed. There are two

parts to this: You have to tell a good story, and you have to make them believe it. If the story isn't compelling you won't get hired, and if they can't quite imagine it becoming reality, you won't get hired.

How do I tell a good story?

First, choose an important subject. If the research you plan is not compelling, no rhetorical skill will make it compelling to a committee of smart scientists. If the research you propose is not manifestly, obviously important, if you don't know *why* it's important, or if you can't convey its importance effectively, convincing the committee to hire you won't be easy. Note that there are two issues here: believing in the importance of your own work, and persuading *others* that your work is important.

If *you* don't think the work you'll be doing is important, your best bet is to change fields. The goal of science may be to uncover truth, but uncovering objective truth is a very difficult thing to do, and doing it requires passion. If you aren't passionate about your work, your best bet is to find work about which you can be passionate. It isn't easy to change gears midcourse, but getting yourself into an important area of research will be well worth the effort in the long term--to your hirability, to your fundability, to your tenurability, and also to your career satisfaction. Do another postdoc if you must.

Passion for your work is a necessary, but insufficient, condition for capturing the attention of hiring committees. After all, some people are passionate about, um, peculiar things. To convince the committee to hire you, you must convince them that your passion is justified and that they will benefit from investing in your passion--that is, that your work is important.

Be specific. Curing cancer is *not* a suitable goal for one individual's research plan--exciting, yes, but much too big to be believable. Inhibiting tumor growth? That's better, says one of our respondents--especially when that general goal is supported by more specific strategies. "[That kind of research] can travel down several different mechanistic routes," this respondent says, "i.e., angiogenesis, breakdown of extracellular matrix, gene activation, induction of molecules involved--it can use different models--implanting tumors, using different tumor models, in vivo, in vitro, etc." The combination of a manifestly important goal with manifestly interesting, feasible approaches is the foundation of the research plan.

Being specific is not the same thing as including loads of detail. Being specific means including only as much detail as the job requires--not more. "Vague generalities are the sign of a vague mind," says one source. "This means that the proposal must walk the fine line of enough detail to show the reader that the candidate knows what they are talking about, but not too much detail that it confuses or bores the search committee."

Keep it short and focus on the major themes. "Brevity and clarity are the most important elements," wrote another respondent, expressing a sentiment shared by everyone. "Clear, concise writing ... is a plus," said another. "Superfluous details are not

just unnecessary, they are often the hallmark of a poor plan. The specific aims must be clear and succinct." Identify your goals, state why those goals are important, define your approach to achieving those goals, and indicate the kinds of evidence that will validate your approach. Oh, and do it clearly and succinctly.

"If you were sitting for 4 hours reading such proposals, what would you look for? Clear and to the point wins every time in this arena."

Effective communication requires anticipating readers' needs, giving them exactly the information they need just when they need it. Constructing a research plan along these lines strengthens your application in three ways: You avoid alienating the committee by boring them; you tell the committee precisely what you intend to do; and you show that you have a subtle mind and a deep knowledge of your field.

Can't do this yet? No hurry--consider spending another year as a postdoc, and study hard.

Be serious about writing. Writes one respondent: "If the proposal confuses the reader in almost any way, it is simply tossed out. I strongly recommend that the candidate have colleagues pre-review the proposal and make sure the English is clear and ideas explained so that a variety of people in the general area can understand what is being proposed and the importance of the work."

If your writing skills are weak, it might be time to strengthen them. Or hire an editor. And by all means have several people--preferably senior colleagues who have served on hiring committees--critique your research plan.

But there were two parts to this, remember? You not only have to tell a good story--you also have to make it seem real, to make them expect it to come true.

How do I make my research plan seem real?

Have a solid, well-considered, realistic plan. If you want to get a job at an institution that takes its research seriously, you'll have to convince your future colleagues that you've gotten past the young, impressionable phase, where every idea glitters with promise despite the fact that it isn't feasible and isn't likely to work. Show the committee that, although your high ideals remain intact, your years of graduate and postdoctoral study have helped you to know the difference between good ideas and good intentions. In the words of one scholar, "You can tell a 'building castles in the sky' research plan. They are not built on solid data and go to the very bottom of the pool." Indeed.

Include preliminary data. Preliminary data offer the most convincing argument for the viability of your research plan. If you have them, use them--positive results will be of interest and persuasive to hiring committee members. The nature of your preliminary data and findings will vary--some will have much to share, others might be forced to share *very* preliminary data.

Nothing grounds your hopes and dreams in the real world like good, solid data. Your plan might sound exciting, but will it work? It's one thing to make it sound good; if you can *show* that you've already taken the first, tentative but successful steps of that long journey, reaching your destination will seem a lot less like a pipe dream. One of my sources was unequivocal on this point: "Does the research question build on the preliminary data the person has generated? No preliminary data equals no research

question." Which also equals no job offer at that institution.

It is important to remember that just as institutions vary widely in their practices, so too do the expectations of hiring committees. Do your homework: Learn about the culture of the department and the experiences of previous faculty hires.

Include redundant approaches. If you want to succeed as a scientist you have to be resourceful. You can't be a one-trick pony. And the focus must be on the science--on the problem you aim to solve--not on the scientist or a particular approach. No matter how knowledgeable you are, no matter how well considered your research plan, you can't predict the future. And if you haven't done the work yet, you don't know how it will turn out. That means that any one approach you specify might not work, even if it seems compelling. So if you want to convince the committee that you will succeed, give them not one, but two, or even three, compelling approaches, all of which have a good chance of success.

How do I demonstrate my independence?

Different institutions expect you to be at different stages of your career. Think of it as a continuum: At one end sit well-established researchers with strong research records, many first-author (or last-author) publications, and their own research funding. At the other end sit rosy-cheeked, freshly minted Ph.D.s full of enthusiasm, promise, and ideas, but with little yet to show for it. Most candidates for entry-level tenure-track faculty jobs at institutions that require research (that is, most of the people who write research plans for job applications) are somewhere in the middle. You probably won't get hired anywhere if you aren't well prepared to start a productive research program at a scale appropriate for the institution.

But these days some institutions and departments are looking for more than that. Increasingly, especially in the biomedical field, universities are hiring established researchers, even at the "entry" (assistant professor) level. How is this possible? These days some pretenure-track scientists are setting up their own research programs. Increasingly, senior postdocs are being promoted to research associate or research faculty positions during what the GrantDoctor calls the "postpostdoc" phase of their research career. In that position, they write research grants in their own names and their host institutions sponsor them. Very often these folks have an R01 before they begin applying for a tenure-track job.

The key objective if you're applying to one of these institutions is securing research grants: If you have a grant in your own name, you'll be a strong candidate; if you don't have your own grant, you are less competitive. It's a cynical cop out on the institution's part, really, taking a pass on the difficult job of evaluating talent and capitulating to the reality of big-time biomedical research: It's all about the cash. Still, increasingly it's a fact of life. But how do you know if the institution to which you hope to apply is one of these? Ask.

Those scientists and institutions--the ones sitting at the experienced far end of the continuum--are exceptional. Indeed, second-tier research institutions tend to expect the most experience; Harvard and Johns Hopkins do not expect you to have your own research grant. Most hiring committees aren't looking for completely independent work;

they're looking for original, creative ideas, together with a record of accomplishment. Few people applying for tenure-track jobs have had the opportunity to start their own research programs. After all, traditionally that's what assistant professorships are all about, and most institutions still think that way. It helps to be somewhere in the middle of that continuum, but most committees are still looking more for promise than for guarantees.

Demonstrate your promise by displaying your potential and actual independence. Show the committee that you have the deep thinking and talent to operate independent of your adviser.

How do you demonstrate your independence when you have never been given the chance to work independently?

Likely as not, all your data were collected in someone else's lab, as a part of someone else's research agenda. How, then, do you distinguish *your* research from your adviser's research?

On paper. It's an apparent Catch-22: You need to show that your ideas are fresh, new, and yours, and you have to show they're grounded in work you've already done, usually in someone else's lab. It's a tough sell, but most of your competitors are in the same boat.

So how do you do it? One respondent said it beautifully: "The best plans usually build on the prior experience of the applicant but are not direct extensions of their postdoctoral work."

I'm going to type that phrase again, it's so important: The best plans usually build on the prior experience of the applicant but are not direct extensions of their postdoctoral work.

Unless you're one of the select few applicants with lots of experience leading your own lab, that's the key to your rhetorical strategy. That's the outline of the story you must tell: "I did this work as a grad student/postdoc and it was important and it was great. Now, as a faculty member, I want to do something a little bit different, but the work I'm proposing takes full advantage of the knowledge and skills I gained during the training phase of my career." It's different enough to be original, but similar enough that your years of training aren't wasted.

Another respondent wrote, "Most candidates (95%) stick to extensions of what they are most familiar with, but the key is, have they figured out some rather creative new directions for the research and have they done a good job convincing us that they can do it based on what is already known?" "Once we have a short list of candidates," writes yet another source, "the research proposals are looked at more carefully for imaginative ideas that differ from the candidates' Ph.D. or postdoctoral research." Get the message?

With your adviser's cooperation. One key to doing this successfully is to make sure your boss tells the same story. It is hoped that you have a good, open relationship with your adviser; if you do, go in and chat and coordinate your strategies. Decide what turf is his or hers, what turf is yours, and what story you intend to tell in your research plan and his or her letter of recommendation. But make sure they don't match too precisely.

Is this sort of coordination unethical? Hardly. There's no deception here, no attempt to pull the wool over the committee's eyes. On the contrary, it's clarity you're seeking: in

your relationship with your adviser and with the hiring committee.

Be careful, however: This *is* tricky ethical territory. The ideas you're claiming *must* be yours. Don't just take your adviser's ideas and package them as your own, even if your adviser signs off on the plan.

If your relationship with your adviser isn't so chummy, you still want to do these same things; you just want to do it more carefully.

If you still have time, set up your own lab in the corner of your adviser's. If you aren't applying for jobs right now, there's still time. Talk to your adviser about carving out your own research niche within the larger research effort, where you do work motivated by your own original ideas, something related but oblique to what your adviser is doing in the rest of the lab.

Is the research plan more important in the screening phase or late in the game?

In general, research plans are weighed more heavily later in the game, with more readily comprehensible evidence (especially pedigree, letters of recommendation, impact factor of journals, etc.) being weighed more heavily in the early rounds.

However, your research plan must be designed to serve more than one purpose. It must withstand intense scrutiny in the later rounds of the job search, and it must make a good first impression.

How long should it be?

Opinions vary. One person I spoke to said that a research plan should be "about three pages of 1.5-spaced text, and NEVER more than five." Another source prefers "three semi-independent (but related) sub-proposals not more than about three to four pages (single-spaced) each with a half page of important and relevant references." That's nine to 12 pages. There is some variation from one discipline to the next (the first of these recommendations came from a medical school, the second from a department of chemistry), but there are few if any standards even within a field. This shows how much of a crapshoot getting hired can be: Because you usually don't know in advance how long a document the hiring committee is looking for, there's little chance of the same candidate, no matter how qualified, getting offers from both of these institutions.

My recommendation? Call the chair of the hiring committee (or send e-mail) and ask for advice. If no advice is forthcoming, aim for five pages, 12-point Times New Roman, 1.5 spaced. Some will think it's a bit too long, others a bit too short, but no one will throw it out because of its length.

Remember that we said that a research plan needs to help you through initial screening and withstand careful scrutiny in the later stages.

How do you make a good first impression?

Keep it short. No more than five 1.5-spaced pages, unless you've gotten different advice from the hiring committee chair.

Write it carefully. Make sure that it swings. If you're a lousy writer, get help.

Include an executive summary. Call it an abstract if you wish. The idea is to present, up

front, in half a page or so, the information that the committee is most likely to be looking for in the early, screening phase of the search: clearly stated research goals, the most compelling motivation, and the general approach you intend to take.

Pay attention to the layout. Keep the number of fonts to a minimum, but make sure the various sections and ideas are set off by plenty of white space, well-chosen section headings, etc. Bulleted lists are good; page-long paragraphs, bad. And for gosh's sake, use your spell checker.

Use good graphics. A good figure, displayed prominently and captioned carefully, is worth, say, a couple hundred words. "Clear figures and illustrations," writes a respondent, "that can give the reader (skimmer!) a quick (and clear) idea of the proposed research is a must." If committee members can get the gist of what you're saying from a figure without wading through your impenetrable prose, your odds of getting interviewed shoot up.

Focus on the work, not yourself. A research plan should tell how great the science is, not how great you are. Selling yourself is the job of your curriculum vitae and letters of recommendation. "Focus on contributions to scientific knowledge, not research experience and expertise," writes one respondent.

Avoid obvious mistakes. Surprisingly, a lot of people mess this up. In her list of fatal errors, one respondent wrote: "Poorly covering or misstating the literature, grammatical or spelling errors, and, near the top of the list, writing research plans that ask for too much effort on the part of the reader--they should be clear and concise."

Avoid obvious hype. You want the value of your research to speak for itself--avoid exaggerated claims of its importance. "Over hyping," writes a source, "is very dangerous."

How do I make my plan withstand careful scrutiny?

Most of this has already been said:

Avoid mistakes.

Avoid misrepresentations. "A perceived misrepresentation of any kind can doom an application."

Motivate your work (why *must* this work be done?).

Think it through and present a workable strategy.

Use appropriate detail.

Include preliminary data.

Demonstrate your awareness of other work being done in the field. One respondent said, "I have seen applications rejected because they appear to have been produced in a vacuum without reference to other scientists."

Should I include a research hypothesis?

There is some disagreement here among respondents. One respondent listed a hypothesis among the essential features of a research plan. Others preferred a broad-brushed

approach: "Is the research question a good question? Is it big enough, but with answerable individual questions so that the question generates a research path that could be followed for some time?" Including a hypothesis is unlikely to hurt you (assuming it's done effectively), and it'll keep you in the running at institutions where a hypothesis is required.

Other advice

Present more than one good idea. Even the best idea might fail to pan out, so you need to have a backup. Furthermore, presenting more than one idea will help convince the committee that you aren't a one-trick pony. Your research plan should be coherent, with a theme common to all your work, but not so close that they seem to be shades of the same idea.

Customize your research plan to the institution you're applying for. It's pretty obvious, but you wouldn't send the same research plan to Johns Hopkins University and to Swarthmore College. And speaking of Swarthmore: Research plans sent to predominantly undergraduate institutions should be carefully designed to coexist with substantial teaching loads and to benefit from the participation of undergraduate students.

2. Research Statements Guidelines

Cornell University Graduate School

https://gradschool.cornell.edu/career-services/research-statements

What Is a Research Statement?

The Research Statement (or Statement of Research Interests) is a common component of academic job applications. It is a summary of your research accomplishments, current work, and future direction and potential of your work.

The statement can discuss specific issues such as:

funding history and potential

requirements for laboratory equipment and space and other resources

potential research and industrial collaborations

how your research contributes to your field

future direction of your research

The Research Statement should be technical, but should be intelligible to all members of the department, including those outside your subdiscipline. So keep the “big picture” in mind. The strongest Research Statements present a readable, compelling,

and realistic research agenda that fits well with the needs, facilities, and goals of the department.

Research Statements can be weakened by:

overly ambitious proposals

lack of clear direction

lack of big-picture focus

inadequate attention to the needs and facilities of the department or position

Why a Research Statement?

It conveys to search committees the pieces of your professional identity and charts the course of your scholarly journey.

It communicates a sense that your research will follow logically from what you have done and that it will be different, important, and innovative.

It gives a context for your research interests—Why does your research matter? The so what?

It combines your achievements and current work with the proposal for upcoming research.

Helps hiring committees assess:

areas of specialty and expertise

potential to get funding

academic strengths and abilities

compatibility with the department or school

ability to think and communicate like a serious scholar and/or scientist

Formatting of Research Statements

The goal of the Research Statement is to introduce yourself to a search committee, which will probably contain scientists both in and outside your field, and get them excited about your research. To encourage people to read it:

make it 1–2 or more pages, 3 at most

use informative section headings and subheadings

use bullets

use an easily readable font size

make the margins a reasonable size

Organization of Research Statements

Think of the overarching theme guiding your main research subject area. Write an essay that lays out:

The main theme(s) and why it is important and what specific skills you use to attack the problem.

A few specific examples of problems you have already solved with success to build credibility and inform people outside your field about what you do.

A discussion of the future direction of your research. This section should be really exciting to people both in and outside your field. Don't sell yourself short; if you think your research could lead to answers for big important questions, say so!

A final paragraph that gives a good overall impression of your research.

Writing Research Statements

Style:

Avoid jargon. Make sure that you describe your research in language that many people outside your specific subject area can understand. Ask people both in and outside your field to read it before you send your application. A search committee won't get excited about something they can't understand.

Write as clearly, concisely, and concretely as you can.

Keep it at a summary level; give more detail in the job talk.

Ask others to proofread it. Be sure there are no spelling errors.

Content:

Convince the search committee not only that you are knowledgeable, but that you are the right person to carry out the research.

Include information that sets you apart (e.g., publication in *Science, Nature,* or a prestigious journal in your field).

What excites you about your research? Sound fresh.

Include preliminary results and how to build on results.

Point out how current faculty may become future partners.

Acknowledge the work of others.

Use language that shows you are an independent researcher.

BUT focus on your research work, not yourself.

Include potential funding partners and industrial collaborations. Be creative!

Provide a summary of your research.

Put in background material to give the context/relevance/significance of your research.

List major findings, outcomes, and implications.

Describe both current and planned (future) research.

Communicate a sense that your research will follow logically from what you have done and that it will be unique, significant, and innovative (and easy to fund).

Describe Your Future Goals or Research Plans

Major problem(s) you want to focus on in your research.

The problem's relevance and significance to the field.

Your specific goals for the next 3–5 years, including potential impact and outcomes.

If you know what a particular agency funds, you can name the agency and briefly outline a proposal.

Give broad enough goals so that if one area doesn't get funded, you can pursue other research goals and funding.

Identify Potential Funding Sources

Almost every institution wants to know whether you'll be able to get external funding for research.

Try to provide some possible sources of funding for the research, such as NIH, NSF, foundations, private agencies.

Mention past funding, if appropriate.

Be Realistic

There is a delicate balance between a realistic Research Statement where you promise to work on problems you really think you can solve and over-reaching or dabbling in too many subject areas. Select an over-arching theme for your Research Statement and leave miscellaneous ideas or projects out. Everyone knows that you will work on more than what you mention in this statement.

Consider Also Preparing a Longer Version:

A longer version (5–15 pages) can be brought to your interview. (Check with your advisor to see if this is necessary.)

You may be asked to describe research plans and budget in detail at the campus interview. Be prepared.

Include laboratory needs (how much budget you need for equipment, how many grad assistants, etc.) to start up the research.

Samples of Research Statements

To find sample Research Statements with content specific to your discipline, search on the Internet for "your discipline" + "Research Statement"

University of Pennsylvania Sample Research Statement: http://www.vpul.upenn.edu/careerservices/gradstud/sciother1.pdf

Advice on writing a Research Statement (Plan) from the journal *Science:* http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2002_07_26/nodoi.4611149009600202486

3 Research Statement – an Example

From Chapter 5, Research as a Graduate Student and Postdoc in the book, Tomorrow's Professor: preparing for Academic Careers in Science and Engineering, IEE Press, 1997, Richard M. Reis

Applying the three-pronged preparation strategy throughout your undergraduate, graduate, postdoc and job search periods is the best possible approach. In the following vignette, we show how this strategy took hold for Professor Shon Pulley of the University of Missouri-Columbia.

Shon Pulley began thinking seriously about research while an honors undergraduate chemistry major at Utah State University. Since then he has moved through graduate school and a postdoctoral appointment, to an assistant professorship at the University of Missouri-Columbia, all the while expanding on his initial research interests. Although perhaps not fully aware of it at the time, Pulley applied much of the three-pronged preparation strategy outlined in this book in his path toward an academic career.

From the start, Pulley was interested in the organic synthesis of natural products. As an undergraduate he worked on a number of projects including the synthesis of polymer supported reagents. During this period he was able to co-author four publications with his undergraduate advisor. At the same time, he was also paying a lot of attention to the way research was being conducted. According to Pulley:

The experience with my undergraduate advisor, while he was starting as an assistant professor, provided insights into getting a group started and developing undergraduate and new graduate students into productive independent researchers. I was able to build on these insights later on as a graduate student and postdoc.

At Colorado State University, Pulley expanded his interests in organic synthesis to include the synthesis of natural and unnatural peptide fragments using optically active chromium carbene complexes. Here he published two papers, one co-authored with his advisor, and the other with his advisor and two other researchers. And, again he was involved in more than just his own research. As he notes:

During my doctoral studies I trained undergraduate researchers and helped new graduate students start on their respective projects. These experiences were very helpful as I began my own academic career.

In addition, Pulley served as a laboratory instructor for general chemistry classes which gave him further insights into the interests of undergraduates, particularly those who did not want to become scientists.

As an American Cancer Society Postdoctoral Fellow at Stanford University, Pulley directed his research toward the asymmetric total synthesis of natural products using enantioselective palladium catalysis. During this time he continued his supervision of undergraduate and graduate students, and in his words, "These experiences demonstrated the commitment required to maintain a productive leading-edge research group, which I fully intend to draw on to develop a vigorous research and teaching program as a professor."

One of the most important things Pulley did as a postdoc was to develop a series of research proposals reflecting possible areas of interest as a future professor or research scientist in industry. He began with a one-page statement, reproduced below, that places his interests in a broad context, making a compelling case for further study. Note how the first paragraph establishes the applicability of his work, the second paragraph his approach and reasons for carrying it out, and the final paragraph, his suggestions for future research directions. The statement is written for an organic chemistry audience but is general enough to be comprehensible to all chemists, thereby placing his work in a broader context while effectively introducing his plans for further study.

The Development of Synthetic Organic/Organometallic Methods and Future Interests

Recently, a synthetic organic renaissance has changed the way we plan synthetic strategy. Governmental regulations demand cost minimization and reduction of hazardous waste streams. The use of enantiomerically pure drugs in chemotherapy is necessary not only to realize enhanced specificity, but also to avoid possible side- effects cause by the other enantiomer. Furthermore, the elucidation of biological processes through structure activity relationship (SAR) studies depends heavily on organic synthesis to identify clinical compounds and improve pharmacological profiles. The development of synthetic methods that meet the regulatory and commercial needs of the chemical industry, especially pharmaceutical interests, requires the training of students in organic synthesis.

In light of these requirements, my research program concentrates on transition metals as a means of achieving efficient and cost-effective organic synthesis. The use of transition metals to effect a desired transformation has several advantages over classical organic methods. First of all, metals can effect reactions catalytically ultimately leading to

> reduced waste and more cost - effective syntheses. Second, enantioselective processes occurring on a metal center containing chiral ligands will afford enantiopure compounds. Finally, the mild and chemoselective reactivity of transition metals allows a more convergent approach to complex organic molecules without the need for cumbersome protection/deprotection strategies. The following projects develop novel synthetic methodologies using transition metals and examine their scope and limitations, the ultimate goal being the efficient and economical asymmetric synthesis of clinically interesting compounds.
>
> Using the methodological studies described below as a foundation, I envision my program expanding into bioorganometallic chemistry as a method of achieving selective chemical transformations. For example, transition metal-catalyzed processes using ligands capable of molecular recognition should be useful as models for naturally occurring metalloenzymes. The design of peptide and carbohydrate based ligands that will impart selectivity as a result of distinctive molecular associations is an area with enormous potential and I present some of my initial interests toward this end in the last proposal of this section. This represents long - term research interests that will allow my group to use its knowledge of organic and organometallic synthesis to make valuable contributions to the field of bioorganometallic chemistry.

This statement was followed by five, 4-5 page proposals outlining possible areas for further investigation. Each proposal contained the following categories; (1) Specific Aims, (2) Background, (3) Significance, (4) Experimental Design and Methods, and (5) References. In Pulley's mind there is no question that it was the careful thought put into these proposals and a well prepared interview presentation that separated him from the pack when it came to the three or four candidates who were called to the University of Missouri for interviews.

There was one more thing that Pulley did as a postdoc. He kept his options open by interacting with industry while doing his research. As he notes:

I was prepared to go either way, industry or academia after my postdoc, but the idea that I could also play a role in developing a teaching, as well as research, program, had a lot of appeal to me.
