

Coping with Change: Charting a Course for Tomorrow's Research Careers*

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The author helped launch in 1971 the International Potato Center (CIP), an international research center akin to ICLARM, and served as its Director General for 20 years. On his retirement, CIP asked that he write this article as a guide to young scientists now beginning their careers in international agricultural development. The wisdom it contains applies equally well to the aquatic sciences. We hope many readers will draw inspiration from the article.

Scientists who are now setting their course towards careers in research require talents and training that are different from what used to be required many years - or even a decade - ago. But the landmarks and guide lights leading them towards scientific accomplishment are much the same as before and promise to remain so tomorrow.

When I finished my Ph.D. in the 1950s, the status areas for research were haploids, wide crosses, growth regulators, and the peaceful use of atomic energy. The buzz words of today include sustainability, biotechnology, and perhaps strategic planning and modelling. These buzz words reflect a wider, faster-moving

stream of science that will demand strong navigational skills in keeping careers on a straight course. The winds of change stem from population pressures on plants, land, food, water, and air.

William Ernest Henley in his famous poem "Invictus" proclaims: "I am the master of my fate, I am the captain of my soul," a philosophy that serves well in guiding careers. Strategic career planning recognizes that it is we ourselves who set our own course: not our superiors, nor our facilities, nor our equipment, nor our teachers. The "Guidelines"

suggested here are intended for use by young scientists, as well as by their mentors.

Early Learning - The Yeoman Years

Successful research careers are goal-driven, but also require planning and the setting of objectives within time frames to meet specific needs. Ideally, we should know our career choice at the start of our undergraduate training. Unfortunately, most of us chart our path as we develop our skills. We do not always begin with the knowledge of our final port of call. But we should always at least try to have a clear idea of the direction in which we are heading. Some basic points of the career compass include the development of:

- a missionary zeal for accomplishment;
- an active mind, open and thirsty for knowledge, and

hands willing to work;

- a willingness to persist in the process of learning and doing, no matter what obstacles and storm winds we encounter.

Exploring and learning are continuing processes for the successful research scientist of today or tomorrow. During the early years of formal training, students who expect to become scientists should "hang loose", training across many fronts, and keeping their options open. Tunnel-vision training of the recent past cannot produce flexible scientists capable of



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adjusting to the changing research needs and changing job responsibilities that are required for 21st-century science. For a productive research career:

Do not hurry the training and make sure there is an adequate balance between depth of training along lines of particular interest and capability, and breadth of training across many fronts to prepare you for the political, social, and economic changes rapidly taking place across the world.

In recent years, science has been knocked from its pedestal, and research is now both a service and a product that must be sold to the many audiences on which it depends for funding. During the lifetime of today's young scientists, the world of research will become an integrated community spreading throughout the developed and developing world to include national and international programs in both the public and private sectors. Good scientists must make sure they acquire good communication skills in their training, so that they can adequately explain the value of what they are doing to the general public. Many institutions today expect their scientists to be able to attract the funding for their research and their salaries. This means scientists have to be able to sell research as a product or service.

First Jobs

Years one and two on the first job require many critical adjustments. For many young scientists who have spent several years concentrating on very specific thesis projects, the move to new research projects can be difficult. In fact, many scientists stay with their thesis work for the rest of their careers.

Quickly chart a well-balanced work program that considers the priority problems of your institution, your community, and your country.

The thesis is important and demonstrates an ability to do creative research. However,

the thesis research should open your mind and help set your course towards other challenges.

For young scientists who have gone abroad for training, the return home can be traumatic. Many of you expect to come back to the country you left. But both you and the country will have changed tremendously; thus the social, political, and economic adjustments required of you come at a time when you need to be establishing scientific credibility in your first research job. The sophisticated research equipment on which you depended for your thesis may not be available at the institution to which you have returned. (This could well be a blessing in disguise, because it could help cut the cord on thesis research dependency.)

International scientists going to a new country for their first research job expect to face new situations and may find the adjustment easier than those who are returning home from abroad. There are, however, many family adjustments - to school systems, languages, cultures, social structure - that occur at the same time you are mapping the first stop on your research career. While sharing in the adjustment process of your family, you must persist in your research efforts.

Balance of Work

As a beginning scientist, quick visibility to management and clients is essential to the quality of your research, your caliber as a scientist, and your dependability as a person. You need to start a research process that will lead to a steady flow of research papers to be published in scientific journals and provide recognition among your peers throughout the research world. You also will want to start the research that could possibly lead to a major scientific breakthrough that will ensure job opportunities for a major portion of your research career. Such breakthroughs are rare, but lead to golden opportunities and many career alternatives.

The research process needs to be attended to as soon as possible during your early years, along with any other assignments such as teaching, advising, or consulting.

Ideally, I suggest the following balance for research time:

Type of research	% of research time
Progress-report	33%
Refereed journal	33%
Breakthrough	33%

Progress-report research will give you fast visibility as a scientist and produce quick results about which you can talk to managers and clients. It gives your administration results that can be used in their annual publications and provides extension workers with material for use in discussions with growers. Progress-report research includes variety trials, herbicide testing, screening of new potential varieties for resistance to pests and diseases, fertilizer trials leading to recommendations for farmers, and screening of chemicals for a variety of agricultural uses.

The research reported in *refereed journals* usually requires 3 to 5 years to obtain results sufficient for acceptance. This research may require multilocational verification in the testing as well as the accumulation of knowledge on seasonal or climatic variation. The emergence of a new variety, a new control measure for a disease or insect, the finding and verification of a new plant species, or the development of a better screening technique, are examples of research accomplishments that need to be shared with your peers in scientific journals and can lead to visibility in the national and international scientific communities. Excellent examples of such research are found in CIP Thrust reports.

For most scientists, the time available for *breakthrough* research is limited during the early years. Most initial research will probably be associated with their customary research responsibilities, usually in well explored areas. Breakthrough research may not be listed among the priority objectives of your parent institution, but it should come within the framework of the institution's

mandate. It will challenge your thinking, keep you abreast of current research literature, and start an interchange of ideas with your peers through correspondence and discussions at scientific meetings. The true-seed (TPS) research with potatoes and the development of the potato for the warm tropics are good examples of breakthrough research at CIP. This research impacts directly on global agriculture and people of the developing world. You should phase into breakthrough research gradually over the early years: however, many scientists may never advance to this type of research in their career. Their capabilities will direct them to other research or proposal opportunities.

Seasoned Scientists

By the time you have been on your first job for 5 to 7 years, your research should be reflected in a steady flow of papers published in refereed journals. These should lead to queries as to your availability for vacancies in other institutions. A scientist should take these queries seriously, since periodic changes are very important for advancing research careers. Most scientists will find that at least two or three changes in institutions during their first 15 years will be beneficial to their career. Sometimes such changes occur in a single institution through a change of job responsibility.

Career positions in advanced research institutions such as CIP are maintained for scientists who have moved into breakthrough research and have developed a good national and international image during their first 10 years in research. If you have not demonstrated such ability within this time frame, you should seriously consider moving on, before the institution starts nudging you along. By the age of 45, scientists should find themselves on a correct course for the years that

should be the most productive of their careers.

Many of you who have achieved the most visibility as scientists will be challenged by the possibility of going into management and some of the job offers you receive will be for management positions. Before making this change, make sure you have the personality and flexibility to become a good manager. I strongly urge scientists to take a good course in management early in their research career.

Even though you may never choose to enter a management position, such training will help you to better manage your research career and your life.

Many scientists throw away their most productive research years by moving into management positions for which they are not suited. Some of the questions

Take a management course early in your career to identify your natural inclinations, capabilities, and limitations, and thus strengthen them through study and carefully selected experience.

you should ask yourself before making such a change are: Do you take criticism readily and give criticism gracefully? Do you like people? Do you settle personality problems without getting emotionally involved? How stable are you emotionally? Do you want to go into management, because you feel it is more important than research? Would you feel productive in a situation where you no longer had a flow of research

papers? The markers for success in management are very different from those in research. They are more indirect and depend on the institution and staff being well managed.

No matter the stage of your career, you should periodically check your course setting, and ask yourself questions about the past and present and what you expect for the future. Do you have a good balance of work among your present research projects? Are you sufficiently productive in present research to deserve some freedom of choice for a portion of your research time? Have you taken the time to train technicians to approach your research as you would? Do you feel locked into a situation where you are no longer "the master of your fate?"

The answers to these questions will indicate the career track that you should

be considering, the training you should be getting or giving, and the kinds of discussions you should be having with management and your family in order to make the most of your research center.

In the first twenty years of CIP, a research environment has been developed and maintained wherein the greatest contributing factors to scientists' careers are their individual capabilities - not bench space, research equipment, attendance at scientific meetings, or their supervisors or management. The mandate and priority research objectives of the institution have served as the guiding principles for all of CIP's activities with concern for each individual career as well as for the institution as a whole.

The duty of all parent institutions and their management is to provide a sound vessel for their scientific careers. Whatever journey you may choose in your career; smooth sailing to each of you.

