

Scientific Research as a Career



Finlay MacRitchie

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CRC Press

Taylor & Francis Group

Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business

CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

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International Standard Book Number-13: 978-1-4398-6967-3 (eBook - PDF)

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Foreword

Non plus ultra (“nothing more beyond”) was the warning to those who sailed the Mediterranean Sea. According to Greek mythology, these words were written on the Pillars of Hercules, at the Strait of Gibraltar, marking the edge of the then-known world.

The attitude was: “Go no further!” “Nothing more to discover!” Today, we might say: “We have hit a brick wall!”

Ignoring the ancient warning, the motto *Plus ultra* (“there is more beyond”) was adopted by Charles V, King of Spain, following the discovery of the Americas.

But is there “more beyond” today? There are no new continents to discover, no new frontiers to colonize, no new chemical elements to be named. We have walked on the moon. We have probed the Solar System and beyond. Is exploration dead?

Have we now exhausted the possibilities for adventure, for discovery, for excitement, for exploration? Have we hit the proverbial “brick wall?” Is there really *Non plus ultra*?

No, no, no! Exploration is not dead. There is much “more beyond.”

Arm yourself with the motto of Charles V: *Plus ultra*. But instead of voyaging beyond the limits of the Mediterranean, voyage beyond the limits of our scientific knowledge. Instead of donning the seaman’s *sou’wester*, assume the mantle of the lab coat.

It is still possible to achieve the thrill of being able to say: “Sometimes I get to feel that I’m the only person in the world who fully understands a particular question.” (See Chapter 1.)

The career in science can still lead us to the point of being able to say: “I am the first ever to demonstrate XXX.” “I am the first ever to elucidate how XXX happens.” What type of XXX do you choose?

Where would you wish the new exploration to lead you?

Just read on!

Colin Wrigley, AM

Preface

This book is intended to present a picture of what is involved in a career in scientific research. The targeted readers are those who are already engaged in as well as those who are contemplating a career in science. It is also hoped that this book will attract readers from the general public and those who influence public policy. Some sections of the book are provocative, and readers will no doubt disagree with many of the opinions expressed. This is the nature of science. Contrary opinions are welcome, and new and valuable insights can often arise from the ensuing debate. This is in great contrast to some other disciplines. In science, precedence counts for nothing. Every theory and interpretation is continually questioned and challenged, regardless of when it was originally put forward. Scientific understanding is a dynamic process and always subject to change. The aim of research is to discover the truth and advance genuine knowledge. Scientific research enriches our culture and drives the technology that has improved the living conditions in which many humans live. It is therefore one of the most noble professions. Science is universal. The pursuit of knowledge should not be affected by national boundaries. This is one of the great attractions of working as a researcher. It enables formation of friendships with colleagues in various parts of the world and provides opportunities for international travel and for the nurturing of these friendships.

The greatest advances have been made by scientists when the conditions have allowed their creativity to flourish. Scientific research is an exploration into the unknown. This is not properly understood by many of those who are in charge. As a result, in recent decades, there has been an increasing encroachment of business management principles into the control of research. One of the themes in the book is to point out the unsuitability of managerial principles to direct science. The arguments are particularly emphasized in Chapter 5.

Chapter 2 describes the qualifications usually required to become a researcher. Chapter 4 proposes some of the attributes that research scientists need to develop to have a successful career.

I tried to include examples of my own experiences as a researcher to illustrate some of the points. I feel that this, in certain cases, is preferable to more abstract discussions. The careers of many people are influenced by chance events that occur during their lives. In my case, I happened to listen to a talk by Sir Peter Medowar, a Nobel Laureate, in which he outlined the views of Sir Karl Popper, one of the foremost philosophers of science. This made me realize the importance of acquiring an understanding of the scientific method for a career in research. Thus, Chapter 3 has been devoted to a discussion of aspects of the scientific method. Popper proposed several areas that pose a danger to scientific progress. One was a lack of motivation for inquiry. The period from the 1950s to the 1970s, was a pinnacle of excitement in science as described in Chapter 8. Many scientific and technological advances were made during this period. Since then, there are signs that some of this excitement has declined. This shows up in the falling enrollments in science courses and the decrease in science's share of high-achieving students, which has been observed in some countries. Hopefully, this will be a passing phase. It will be up to those who take up the profession to bring about a return of this excitement. There is no reason why this should not be achieved. Great discoveries are there, waiting to be made. All that is needed are the conditions for scientific research to be suitable. The creation of these conditions will depend on those who lead. Some thoughts about leadership in science are put forward in Chapter 6. We learn from history, and it is valuable to peruse the careers of individual scientists who have made an impact. A few examples of such scientists are discussed in Chapter 7, to help give insight into how they arrived at their achievements. The final chapter (Chapter 8) turns attention to two related challenges facing the advance of scientific research. The first is the need to free scientists from the constraints that prevent them from realizing their true creativity. The second, which is directly related to the first, concerns the need to achieve a more pleasant working environment for many scientists.

I feel that it is important that scientists do not take themselves too seriously, so at the end of some of the chapters, a few humorous anecdotes are included.