Preface

This book project has evolved over a long time. During 1997–2003 when I was the Permanent Secretary of the Royal Swedish Academy of Sciences I frequently gave lectures around the world on "A century of Nobel Prizes" later with an added prefix "More than … ." This theme was used for my inaugural lecture at the American Philosophical Society and a short version of the text was published in the journal of the Society (Norrby, E., A century of Nobel Prizes. *Proc. Am. Philos. Soc.* 2002; 146:323–336). Chapter 1 is a markedly expanded version of this article. In particular I have researched Alfred Nobel's contacts with the Royal Swedish Academy of Sciences and with the Karolinska Institute. This was done in order to understand his motivation for the formulations used in his final will. The first chapter also reflects on the process of selection of Nobel Prize recipients and how this has evolved over time. These developments are further illustrated by the different examples of prizes given in later chapters.

Throughout the writing of this book I have used my own experiences of working with Nobel Prizes as a sounding board. These developed after I had become Professor and Chairman of Virology at the Karolinska Institute in 1972. For some 20 years, from 1973 onwards, I was involved in the committee for the prize in Physiology or Medicine in different functions mostly as an adjunct or ordinary member of the committee. The meetings with the committee were the best experiences during my 37 years at the Institute. Everyone on the committee was aware that we were carrying a unique responsibility. We were expected to try to understand all the advancing frontiers of the field of biomedical research and related fields of life sciences. Based on this insight we were to judge priorities, allocate these to the appropriate scientists and compare the relative magnitude of the discoveries proposed. These meetings fostered friendships transgressing the traditional if unfortunate territorial atmosphere

of medical faculties. When I moved on to head the Royal Swedish Academy of Sciences in 1997, I brought with me valuable experiences of the Nobel work at the Karolinska Institute for my supervision of the work with the Nobel Prizes in Physics and Chemistry at the Academy, and in my function as a member of the Board of the Nobel Foundation.

In 2004 I was invited by one of the previous visiting Japanese scientists in my laboratory, Takehiro Togashi from Sapporo, Hokkaido, to give a lecture on "Serendipity and Nobel Prizes." This was an interesting theme to review and it gave me insight into the life of a word from its first introduction. Serendipity has become a popular word in science. It is striking how incidental events may cause unexpected reorientations of the course of science. In fact the experience is that many of the discoveries that have had a major impact on the course of societal developments were not intended, at the time they were made, to provide the opportunities they later were found to offer. The material collected for this lecture was used in the writing of Chapter 2. In some parts of this chapter I have relied extensively on documentation in the book *The Travels and Adventures of Serendipity* by Robert Merton and Elinor Barber. Harriet Zuckerman gave valuable advice for this chapter and also provided important interview material for Chapters 4 and 5. She also made available the picture of Merton, her late husband.

In 2005 I had a meeting with Stanley Prusiner (presented in Chapter 8 on which he also gave good advice), a friend for many years and Nobel Laureate in Physiology or Medicine in 1997. We discovered that we were both interested in the events that led to the Nobel Prize in Physiology or Medicine to John F. Enders, Thomas H. Weller and Frederick C. Robbins for their discovery that polio virus could grow in cells of non-nervous origin. Because of their momentous discovery it became possible to develop effective vaccines and eliminate one of the major epidemic scourges of the first half of the 20th century in industrialized countries. The archives of relevance for this prize had just been released following the 50 years secrecy rule. We obtained permission from the committee for Physiology or Medicine, represented by its then secretary Hans Jörnvall, to review the relevant documents. It should be noted that there are strict rules controlling access to the Nobel archival material. They can be made available after a written application, but only for scholarly work. The documents were put at our disposal at the Nobel secretariat by the kind assistance of Ann-Margreth Jörnvall and Agneta Sjövall. They have continued to provide excellent assistance during my yearly January visits after 2005. In 2010, the new secretary of the committee, Göran Hansson, gave me permission to use the archives.

Since all the documents of the archives, except some of the nominations, were in Swedish I first had to translate them into English. Hereafter, Prusiner and I could sit down at the Nobel Forum to review them. We made exciting discoveries. I might add that the personalities we encountered in the documents were people that I had met as teachers at the Karolinska Institute or as colleagues during my early career as a virologist. One important person in the polio field was my predecessor as Professor of Virology, Sven Gard, who turned out to have had a major influence not only on the 1954 prize, but also on many other prizes during the 1950s and 1960s. It makes a major difference to write about people, whom one has met and sometimes even learnt to know quite well.

As we were leaving the Nobel Forum after one of our sessions we happened to meet a virology colleague Lennart Philipson. We told him about our project and he then mentioned that in 1954 there was an exceptional leak about discussions concerning the prize in Physiology or Medicine to *The New York Times*, information we could follow up. We eventually summarized our findings in a manuscript which was published in a regular scientific journal (Norrby, E. and Prusiner, S. B., Polio and Nobel Prizes: Looking back 50 years. *Ann. Neurol.* 2007; 61:385–395). This publication provided the core part of Chapter 5, which includes some supplementary material and adjustments to harmonize with other chapters. Many individuals were helpful in the development of the article and hence also this chapter. Not only did we have permission to use the archives at the Karolinska Institute, but also at the Royal Swedish Academy of Sciences. Columbia University Oral History Research Office gave us access to Robbins's reminiscences and our colleagues Margareta Böttiger, Hilary Koprowski, Erik Lycke, Michael Katz, Samuel Katz, Neal Nathanson, Weller himself (still alive at the time) and Julius Youngner gave valuable assistance.

The interesting experience of reviewing the archives of the 1954 prize inspired me to review the 1951 prize to Max Theiler. Again the archives revealed very interesting circumstances and eventually I wrote a comprehensive essay about the history of yellow fever and about the prize. Material for research was made available not only at the Karolinska Institute but also at the American Philosophical Society — where, however, Theiler was not a member — by kind assistance of Marty Levitt, and in particular at the Archives of the Rockefeller Foundation, Sleepy Hollow, New York, where I was well cared for by Lee Hilzik and Darwin Stapleton. Stapleton also generously edited the language of my essay and in addition provided valuable material for Chapter 6. Furthermore the Columbia University Oral History Office again provided help by making Theiler's reminiscences accessible. A number of colleagues read the text and

gave valuable advice; Baruch Blumberg (presented in Chapter 2), Günter Blobel, Purnell Choppin — who himself had reviewed the history of yellow fever — and Rolf Luft. When the final version of the yellow fever essay was shared with Blobel at the Rockefeller University, he suggested that it might be published in *The Journal of Experimental Medicine*. Eventually an article about half the length of Chapter 4 was published after a careful editing by Jennifer Bell (Norrby, E., Yellow fever and Max Theiler: The only Nobel Prize for a virus vaccine. *J. Exp. Med.* 2007; 204: 2779–2784). This publication appeared 70 years after Theiler's original prize-awarded publications in the same journal.

My next project exploring the rich content of the Nobel archives was to review advances in my own field virology. I decided to look into ways in which the prizes might illustrate the major events in the maturation of the virus concept. Archives both at the Karolinska Institute and not least at the Center for the History of Sciences at the Royal Swedish Academy of Sciences, where I have my office, were extensively used. My manuscript was reviewed by Marc H. V. van Regenmortel, Marian Horzinek and Frederick A. Murphy, who gave valuable advice and eventually it was published in a regular scientific journal (Norrby, E., Nobel Prizes and the emerging virus concept, *Arch. Virol.* 2008; 153: 1109–1123). This article with some modifications came to be Chapter 3.

There were peculiarities with both the 1951 and 1954 prizes in Physiology or Medicine. In 1951 there was no external nomination of Theiler, who was therefore proposed by the chairman of the committee, Hilding Bergstrand, and in 1954 Weller and Robbins were nominated for the first time in 1954, the same year in which they were awarded a prize. It seemed that in both these cases the committees were eager to award the prizes and I became curious to know how often similar circumstances had prevailed previously. At this phase of the work it was possible to review the archives of the first 50 out of the total of 100 Nobel Prizes in Physiology or Medicine that have been awarded by 2009. I gave the essay the rubric "Unusual Nobel Prizes," but it turned out that they were not that unusual. There were a total of nine prizes, including 12 prize recipients, who became awarded the same year that they were first nominated — including 1901, when by definition this had to be the case — and there were five prizes, involving six prize recipients, who received a prize without any external nomination. This led to a long essay covering many different fields of biomedicine and it became Chapter 6. I am grateful to a large number of colleagues for advice on different parts of this comprehensive essay; Michael Bliss, Derek Denton, Georg Klein — an invaluable source of information also for Chapters 7 and 8 —, Ulf Ragnarsson and Bengt Saltin.

When this essay was finished the idea emerged that a book containing the different materials for the lectures and for the essays might be developed. I put this idea to Professor Kok Khoo Phua in Singapore in February 2009. His immediate response was that he would be happy to publish the material through his company World Scientific Publishing, which had already produced a large number of books related to the Nobel Prizes.

In order to form a bridge to present day science, which had already been attempted to varying degrees in Chapters 3–6, I decided to add two chapters.

It had become clear already from my work on Chapter 3 that one of the most dramatic revolutions in scientific comprehension was the eventual insight that DNA represented the genetic material. This started to emerge already in the mid 1940s thanks to the epoch-making work of Oswald T. Avery at the Rockefeller Institute. Eventually my research into the area and into relevant Nobel archives, including the background documents relating to prizes in Chemistry to Alexander R. Todd in 1957, in Physiology or Medicine in 1958 to George W. Beadle, Edward L. Tatum and Joshua Lederberg, and in 1959 to Severo Ochoa and Arthur Kornberg, allowed me to write Chapter 7. However, this chapter does not end in 1959; it also discusses later developments in the rapidly growing field of molecular biology. It reflects in particular on how the emphasis on nucleic acids and proteins as the hegemonic molecules of life has shifted over time. Hence it was given the subtitle *A drama in five acts*. Few fields have been so well reviewed as our fascinating growing insight into the structure and function of the genetic material and my main emphasis therefore is on the shifts in opinions and interpretations of the field. For some years I have been the Vice Chairman of the Board of Trustees of the J. Craig Venter Institute, a highly dynamic private research enterprise located in Rockville, Maryland and La Jolla, California. My contacts with scientists at this Institute and other members of the Board have provided important insights into the rapidly moving field of molecular genetics.

The last chapter of the book is different. No Nobel archival material was used in its preparation. It discusses a field of research with which I am personally well acquainted and where I have befriended the two main actors. It was particularly delicate to write since I also wanted to reflect on personality traits of successful scientists. The field includes some of the most unexpected turns in our comprehension of knowledge, in this case the identification of a remarkable new form of infectious agents. Insights into their mechanisms of causing tissue damage have led to the identification of a previously unrecognized category of protein aggregation diseases of great relevance to human medicine. It has

also brought to light a new field of previously unknown information exchanges between protein molecules. Many people have provided material and given advice of importance for the structure of Chapter 8; Annica Arnberg and collaborators, Paul Brown, Bruce Chesebro, David Eisenberg, Susan Lindquist, Dorrie Runman — Carleton Gajdusek's daughter-in-law — and Rolf Seljelid. Runman gave particularly valuable information about the Gajdusek household and provided useful pictures.

The pictures used in the book are drawn from many sources, but I would like to particularly thank Jonna Persson at the Nobel Foundation and, not mentioned above, Richard Krause, Ulf Lagerkvist, Jan Lindsten, Nils Ringertz, Lennart Stjärne and Hamilton Smith. Since English is not my native tongue I have had all the chapters in their final form read by Harry D. Watson to secure the use of idiomatic language.

Colleagues at the Center for the History of Science have contributed to this book in many ways. Its Director Karl Grandin gave me permission to examine the Nobel archives of the Academy and spent many hours with me working on illustrations. Maria Asp, Anne Miche de Malleray, Jonas Häggblom and Bengt Jangfeldt — a richly endowed humanist and successful author — have provided joy, inspiration and invaluable intellectual as well as practical support.

This book is dedicated to Margareta, my wife — and love — for more than 50 years. Without her unfailing support it is questionable if it would ever have been finished.