“Professor Ferry combines, in a masterful way, topics that have represented the leading edge of semiconductor science and engineering. His discussions of engineering questions, as seen from the different viewpoints of Bohr and Einstein respectively, are amusing and will resonate with anyone who is getting tired of hearing that no one can understand quantum mechanics. A must read for the engineering student who is also a science fan.”

Prof. Karl Hess
Author of Einstein Was Right!

This book was derived from a talk that the author gave at the International Conference on Advanced Nanodevices and Nanotechnology in Hawaii. The book is about science and engineering, but is not on science and engineering. It is not a textbook which develops the understanding of a small part of the field, but a book about random encounters and about the strengths and the foibles of living as a physicist and engineer for half a century. It presents the author’s personal views on science, engineering, and life and is illustrated by a number of lively stories about various events, some of which shaped his life.

Written in a style that is at once lucid and engaging, this is an outstanding work that weaves the many threads of science into a rich tapestry.

David K. Ferry is Regents’ Professor in the School of Electrical, Computer, and Energy Engineering at Arizona State University. He is also graduate faculty in the Department of Physics and the Materials Science and Engineering program at ASU, as well as a visiting professor at Chiba University in Japan. He came to ASU in 1983 following shorter stints at Texas Tech University, the Office of Naval Research, and Colorado State University. In the distant past, he received his doctorate from the University of Texas, Austin, and spent a postdoctoral period at the University of Vienna, Austria. He enjoys teaching (which he refers to as “warping young minds”) and research. The latter is focused on semiconductors, particularly as they apply to nanotechnology and integrated circuits, as well as quantum effects in devices. In 1999, he received the Cledo Brunetti Award from the Institute of Electrical and Electronics Engineers, and is a Fellow of this group as well as the American Physical Society and the Institute of Physics, UK. He has been a Tennessee Squire since 1971 and an admiral in the Texas Navy since 1973.
50 Years in the Semiconductor Underground
The author (left), when he was much younger, prepares to join a colleague in the underground salt mines near Salzburg.
50 Years
in the Semiconductor Underground

David K. Ferry
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This book has grown out of a talk I gave at the International Conference on Advanced Nanodevices and Nanotechnology in Hawaii a few years ago. For some reason, the conference was dedicated to me, and so I had to give the introductory lecture, which more or less covered a few of my contributions to the field. The talk was titled the same as this book, and I tried to have a little fun with it. Now, there are two important points about this talk and this book. First, one normally doesn’t dedicate a conference to a living person, but this particular conference has made a habit of doing so. But, in the end, the person did cease to exist within a few months to a few years after the conference, and so never made it back to the conference. The first person honored was Rolf Landauer from IBM in 1998, and he died just a few months later. Rolf was a pioneer in statistical physics and the world we now call mesoscopic or nanoelectronics. Then, they honored Prof. Susumu Namba from Osaka, and he died a couple of years later. Susumu was very important in the development of ion beam processing and again in mesoscopic nanoelectronics. Following this, the conference honored Prof. Gottfried Landwehr from Würzburg (Germany), and he never made it back to Hawaii, finally dying in 2013. Gottfried was quite important in bringing together the world of semiconductor physics in high magnetic fields, and founded the conferences on this topic. Finally, they honored me, I suppose for my longevity in the field. Considering the history of previous honorees, I made a point of saying that it seemed in reality that they were just trying to get rid of me.
But, if you are reading this, it is likely that they have failed and I have returned once again to criticize some of the goings-on of the conference.

The second point that is important is that one cannot talk for less than half an hour and cover the material that makes it into a book like this. Indeed, even this book cannot contain everything, and would likely be boring if it did. The intervening time from the conference to beginning this book was filled at first with doubt about such a book. But then I started thinking about the various confusions and other such things that have occurred in science, as well as my life, in the approximately 50 years that I have actively pursued the issue. It was clear that there were enough interesting events that conceivably could make such a book possible. And then there were the urgings from the publisher, who seemed to think that it would be worthwhile to do the book. So, that is the task I undertook, the results of which fill the following pages. It should be remarked, however, that I have been known to go off on long rants, which if written down and put together clearly would also fill a book. Certainly, some of these appear within the topics that are discussed, and I leave it to the reader to decide which is which.

In some sense, as I write the book, I feel not unlike the aged samurai in *A Book of Five Rings* (Go Rin No Sho) as he sits in his cave writing his memoirs. But his book was rules and advice to be followed by a young samurai. This one is anything but. Instead, this is a book about random encounters and my views on a number of topics. This book is about science and engineering, but is not on science and engineering. It is not a textbook which develops the understanding of a small part of the field. It is really a book about the strengths and the foibles of living as a physicist/engineer for half a century. I should point out that in no way is this book anything close to an autobiography. Such a thing would quite likely be very boring. Rather, the book presents my personal views about science, engineering, and life, illustrated by a number of stories about various events, some of which have
shaped my life. In the telling of these to my colleagues, some have been humorous, so perhaps that will come through the words that make this book. And sometimes, the claims of others, which have stretched the meaning of reality, have seemed so ridiculous as to encourage a bit of laughter. Some of these incidents will also appear, but I will try not to name names where that might demean the participants.

Many friends and colleagues have asked why haven’t I retired and enjoyed life, since I am still very active and un-retired. There are a couple of reasons that I remain so. One is that my wife has refused to let me retire until I give her a “plan.” This plan should give details of how I intend to spend my days after retirement. Since, I don’t have such a plan, I continue to carry on. Secondly, of course, I still enjoy both research and warping the minds of young people (this is called teaching). In a large sense, I am still enjoying myself too much to consider giving it up. I suppose I could retire and play golf, but I gave up golf many years ago when I ran out of clubs. Such a game, which generates so much frustration, holds no great allure to me now. So, perhaps more events will occur in the future and add to my trove of interesting (at least to me) stories.

Thanks go to a great many people who have influenced me through the years, some of whom continue to do so. Not the least is my wife (of more than 50 years) and my family, who have put up with me since the beginning. Then, there are my students, postdocs, and colleagues who have survived my rants and tirades and still have managed to become very competent individuals. Some of them are mentioned, but none of the book would have been possible without them. They should all know that I was thinking of them as I wrote the words, because they made it possible. There have been a few individuals who have made significant contributions to what has become my career that I do need to thank. These include Jon Bird, Steve Goodnick, and Richard Akis in the US; John Barker, Carlo Jacoboni, and Antti Jauho in Europe; and Chihiro Hamaguchi, Koji Ishibashi,
and Yuichi Ochiai in Japan. Very special thanks must also go to Larry Cooper, who was a colleague at the Office of Naval Research, and whose support over the years has made much of my work possible. Finally, I would also like to thank Alex Kirk for reading the manuscript and pointing out my flaws. Finally, thanks to Stanford Chong, who encouraged me to consider doing this project.

Dave Ferry