

Bookshelf

COMPILED BY VIRGINIA GRECO, CERN

I am the Smartest Man I know: A Nobel Laureate's Difficult Journey

By Ivar Giaever

World Scientific

At the end of his last semester studying mechanical engineering at the Norwegian Institute of Technology, Ivar Giaever gained a grade of 3.5 for a thesis on the efficiency of refrigeration machines – just a little better than the 4.0 needed to pass. The thesis had been hastily written as the machines worked badly, and he and his friend had had little time to collect their data. But they both scraped through and, as Giaever writes, “maybe sometimes life is a little bit fair after all?”

It's a reference to the opening words of his light-hearted autobiography: “Life is not fair, and I, for one, am happy about that.” The title sounds provocative, but the book is a reflection on how life's little twists and turns can have extremely important consequences.

Giaever calls this “luck” and admits that he has had more than his share of it – from relatively humble beginnings in Norway to a Nobel prize and beyond.

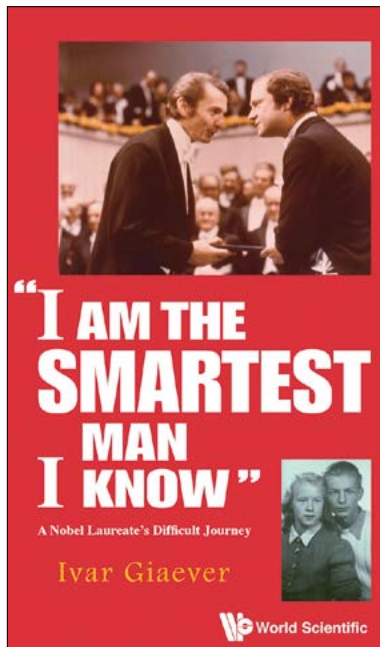
In many respects Giaever had been a “bad” student. Good at cards, billiards, chess – and drinking – he had little interest in mechanical engineering. He finished with a grade of 4.0 in both physics and mathematics; but had at least married Inger, his long-time sweetheart.

His first job was at the patent office in Oslo, but apartments were hard to find, so the couple decided to emigrate to Canada. A few twists led Giaever to General Electric (GE), where he had the chance to study again through the company's “A, B and C” courses.

This second chance to learn proved pivotal. Seeing how the studies related to GE's production of generators, motors and such like, made learning exciting, and Giaever graduated as the best student on the A course. But GE in Canada offered only the A course and, eager to learn more, he moved to GE's Research Laboratory in Schenectady in the US.

There he completed the B and C courses, and also began studying for a master's degree in physics at the Rensselaer Polytechnic Institute (RPI). He was to remain with GE for the next 30 years, after being offered a permanent job, even though he did not yet have a PhD.

As a fully-fledged member of the research lab, Giaever needed a project. John Fisher proposed that he look into



quantum mechanical tunnelling between thin films, which Giaever went on to do with great success in 1959.

Then, during his studies at RPI, he learned about the new Bardeen–Cooper–Schrieffer (BCS) theory of superconductivity, which predicted the appearance of a forbidden energy gap near the Fermi level when a metal becomes superconducting. Giaever realised that he could measure this gap using his tunnelling apparatus, and so provide crucial verification of the BCS theory. He also realised that tunnelling between two superconductors with different energy gaps would produce a negative resistance, and could allow for active devices such as amplifiers. He worried that if he talked about his work, others would realise this before he had done the relevant experiment.

To his surprise nobody did, hence his comment to his family: “I am the smartest man I know!”. His children thought he was being big-headed, but in 1973 the whole family went with him to Stockholm when he was rewarded with a share of the Nobel Prize in Physics in 1973 for his work on tunnelling in superconductors.

Giaever, of course, covers much more of his life story in this book. There is little technical detail, but a plethora of anecdotes that provide fascinating insight into a

person who has made the most of his life.

Two impressions stand out: he is lucky to have found in Inger a partner with whom he has been able to share his long life; and he is lucky to have had a second chance to study and discover that he is smarter than many people thought.

● Christine Sutton, former CERN Courier editor.

Books received

Fermilab at 50

By Swapan Chattopadhyay and Joseph David Lykken (eds.)

World Scientific



On the occasion of the 50th anniversary of its foundation (CERN Courier June 2017 p18), the management of Fermilab asked leading scientists and supporters, whose careers and life paths crossed at the US laboratory, to share their memories and thoughts about its past, present and future. The short essays received have been collected in this commemorative book.

Among the many prestigious contributors are Nobel laureates T D Lee, Burton Richter and Jack Steinberger; in addition to present and former Fermilab directors (Nigel Lockyer, Piermaria Oddone and John Peoples); present and former CERN Directors-General (Fabiola Gianotti and Rolf Heuer), as well as many other important physicists, scientific leaders and even politicians and businessmen.

Through the recollections of the authors, key events in Fermilab's history are brought to life. The milestone of 50 years of research are also retraced in a rich photo gallery.

While celebrating its glorious past, Fermilab is also looking towards its future, as highlighted in the book. Many experiments are ongoing, or planned at the laboratory and its scientific programme includes research on neutrinos; accelerator science; quantum computing; dark matter and the cosmic background radiation, as well as a continuous participation in the LHC physics, especially in the CMS experiment.

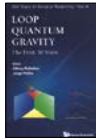
A light read, this book will appeal to all the scientists who at some point in their career stepped on the floor of Fermilab. It will also appeal to those readers who are interested in discovering more about the history of the laboratory through the records of the people who participated in it, whether it was directly or indirectly.

Bookshelf

Loop Quantum Gravity: The First 30 Years

By Abhay Ashtekar and Jorge Pullin (eds.)

World Scientific



This book, which is part of the “100 Years of General Relativity” series of monographs, aims to provide an overview of the foundations and recent developments of loop quantum gravity (LQG).

This is a theory that merges quantum mechanics and general relativity in an effort to unify gravity with the other three fundamental forces. In the approach of LQG, space–time is not a continuum, but it is quantised, and is considered as a dynamic entity. Different from string theory, loop quantum gravity is a “background-independent” theory, which aims to explain space and time instead of being plugged into an already existing space–time structure.

The book comprises eight chapters, distributed in three parts. The first is a general introduction that sets the scene and anticipates what will be discussed in detail in the following sections. The second

part, comprising five chapters, introduces the conceptual, mathematical and physical foundation of LQG. In part three, the application of this theory to cosmology and black holes is discussed, also introducing predictions that might be testable in the foreseeable future.

Written by young theoretical physicists who are expert in the field, this volume is meant both to provide an introduction to the field and to offer a review of the latest developments, not discussed in many other existing books, for senior researchers. It will also appeal to scientists who do not work directly on LQG but are interested in issues at the interface of general relativity and quantum physics.

Exact Solutions in Three-Dimensional Gravity

By Alberto A García-Díaz



Cambridge University Press

As stated by the author himself, this book is the result of many years of work and has the purpose of providing a comprehensive,

but concise, account of exact solutions in three-dimensional (or 2+1) Einstein gravity. It presents the theoretical frameworks and the general physical and geometrical characteristics of each class of solutions, and includes information about the researchers who discovered or studied them.

These solutions are identified and ordered on the basis of their geometrical invariant properties, their symmetries and their algebraic classifications, or according to their physical nature. They are also examined from different perspectives.

Emphasis is given to solutions to the Einstein equation in the presence of matter and fields, such as: point particle solutions, perfect fluids, dilatons, inflatons and cosmological space-times.

The second part of the book discusses solutions to vacuum topologically massive gravity with a cosmological constant.

Overall, this text serves as a thorough catalogue of exact solutions in (2+1) Einstein gravity and is a very valuable resource for graduate students, as well as researchers in gravitational physics.

Mosquitoes

A play by Lucy Kirkwood

National Theatre, London 18 July–28 Sept 2017

Lucy Kirkwood’s play *Mosquitoes* is an ambitious piece of theatre. It combines the telling of an eclectic family drama with the asking of a variety of questions ranging from personal relationships to the remit of science. *Mosquitoes* tells the story of CERN scientist Alice (Olivia Williams), and the fractious relationship she has with her sister Jenny (Olivia Colman). After working for 11 years at CERN on the French–Swiss border, Alice is visited by Jenny just as work on discovering the Higgs boson is nearing its peak. Conflict between Jenny and Alice’s challenged son, Luke (Joseph Quinn), drives much of the plot.

Domestic scenes between these three characters are interspersed with glimpses of Luke’s absent father, who momentarily turns the theatre into a planetarium while waxing lyrical over the science which the play is set against.

The spectacle of these brief moments is a highlight of the play; contrasting wonderfully with the often mundane lives of the characters. Kirkwood also makes a poignant contrast between the characters’ personal and professional lives. Alice, despite exuding a certain confidence in



her professional life as a scientist, often struggles to relate personally to those around her. Chief amongst those is her son Luke who, despite showing the occasional interest in his mother’s work, is ultimately critical of it for a number of reasons. He questions the

environmental impact of what she is doing, believing that the LHC poses existential risks. He also frequently bemoans his mother’s commitment to her work, which he believes comes at the expense of himself. Through the play, it becomes apparent that Luke and his mother previously lived in the UK, and that he was made to follow her to Switzerland, but he would like to go back to England.

These personal relationships are played out in front of the sisters’ ailing mother Karen (Amanda Boxer). A former physicist herself now suffering from dementia, Karen frequently laments missing out on her chances at winning a Nobel Prize. Karen’s character, who provides the audience with a glimpse of her daughter Alice’s future, adds a sense of futility to Alice’s work.

Overall, *Mosquitoes* – the title coming from a line of dialogue in which protons smashing in the Large Hadron Collider are compared to mosquitoes hitting each other head on – is a stunning piece of work.

Not just for the way it weaves together story lines to explore a range of complex questions, but also for the immensely high quality of acting talent which it boasts. This is bettered only by the faultless light, sound, and set design, which complement each other perfectly during the play’s most dramatic moments.

● Mack Grenfell, Brainlabs, UK.

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