

Bookshelf

To Explain the World: The Discovery of Modern Science

By Steven Weinberg

Harper Collins/Allen Lane

Hardback: £20 \$28.99

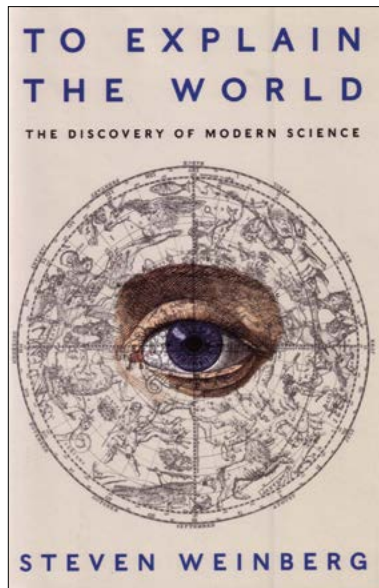
Also available at the CERN bookshop

Steven Weinberg's most recent effort is neither a treatise on the history of science nor a philosophical essay. The author presents instead his own panoramic view of the meandering roads leading to the Newtonian synthesis between terrestrial and celestial physics, rightfully considered as the beginning of a qualitatively new era in the development of basic science.

The first and second parts of the book deal, respectively, with Greek physics and astronomy. The remaining two parts are dedicated to the Middle Ages and to the scientific revolution of Copernicus, Galileo and Newton. The aim is to distil those elements that are germane to the development of modern science. The style is more persuasive than assertive: excerpts of philosophers, poets and historians are abundantly quoted and reproduced, with the aim of corroborating the specific viewpoints conveyed in the text. A similar strategy is employed when dealing with the scientific concepts involved in the discussion. More than a third of the 416 pages of the book contain a series of 35 "technical notes" – a quick reminder of a variety of geometric, physical and astronomical themes (the Thales theorem, the careful explanation of epicycles for inner and outer planets, the theory of rainbows and various other topics relevant to the main discussion of the text).

Passing before you through the pages, you will see not only Plato and Aristotle, but also Omar Khayyam, Albertus Magnus, Robert Grosseteste and many other progenitors of modern scientists. Nearly 2000 years separate the natural philosophy of the "Timaeus" from the birth of the scientific method. Many elements contributed serendipitously to the evolution leading from Plato to Galileo and Newton: the development of algebra and geometry, the divorce between science and religion, and an improved attitude of abstract thinkers towards technology. All of these aspects have certainly been important for the tortuous emergence of modern science. But are they sufficient to explain it? Scientists, historians and laymen will be able to draw their own lessons from the past as presented here, and this is just one of the intriguing aspects of this interdisciplinary book.

After reading this book quietly, you might



be led to conclude that good scientific ideas and daring conjectures take a long time to mature. It has been an essential feature of scientific progress to understand which problems are ripe to study and which are not. No one could have made progress in understanding the nature of the electron, before the advent of quantum mechanics. The plans for tomorrow require not only boldness and fantasy, but also a certain realism that can be trained by looking at the lessons of the past. Today's most interesting questions may not be scientifically answerable tomorrow, and lasting progress does not come by looking along a single line of sight, but all around, where there are mature phenomena to be scrutinized. This seems to be true for science as a whole, and in particular for physics.

● Massimo Giovannini, CERN and INFN Milan-Bicocca.

The Oskar Klein Memorial Lectures 1988–1999

By Gösta Ekspång (ed.)

World Scientific

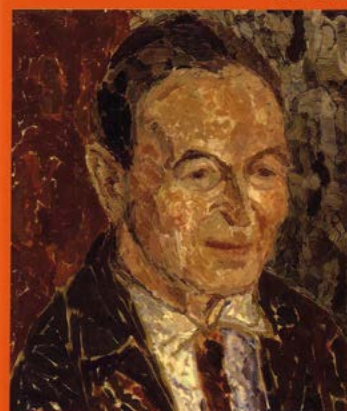
Hardback: £45

E-book: £34

Perhaps every reader of *CERN Courier* has heard about the Klein–Gordon equation, the Klein–Nishina (Compton effect) cross-section, the Klein paradox and the Kaluza–Klein compactified five-dimensional unified theory of gravity,

THE OSKAR KLEIN MEMORIAL LECTURES

1988–1999



Editor: Gösta Ekspång

electricity and magnetism. However, few will know about the scientist, Oskar Klein (1894–1977), the pre-eminent and visionary Swedish theoretical physicist from Stockholm whose work continues to influence us to this day.

This book is needed. The reason is described eloquently in the contribution by Alan Guth, whose words I paraphrase: how many recognize Oskar as the first name of "this" Klein? Compare here (by birth year, within 10 years): Niels B (1885), Hermann W (1885), Erwin S (1887), Satyendra N B (1894), Wolfgang P (1900), Enrico F (1901), Werner H (1901), Paul A M D (1902), Eugene W (1902), Robert O (1904). Thanks to this book, Oskar K (1894) will take his place on this short list.

Part of the book collects together all of the Oskar Klein Memorial Lectures given since the series began at Stockholm University in 1988, through to 1999, by many well-known theoreticians, from Chen Ning Yang to Gerard 't Hooft. Some of these lectures relate to Klein because he often happened to "be there" at the beginning of a new field in physics. For example, in early 1948, Klein recognized immediately, following the disambiguation of the pion and muon, that muon decay and common beta decay can be described by the same four-fermion interaction (see the contribution by T D Lee).

The other part of the book – a third of the 450 pages – is a biographical collection

Bookshelf

about Klein and his pivotal scientific articles (about a fifth of the volume), all presented in English, although Klein published in Danish, French, English, German and Swedish, as a check of the titles in his publication list reveals. Having Klein's important work all in one place can lead to interesting insights: for me, finding that 24 December 1928 was a special birthday.

On this day, just eight weeks after the Klein–Nishina paper on the interaction of radiation with electrons, the paper on the Klein paradox reached the editors of *Zeitschrift für Physik*. Klein concludes: "... (the) difficulty of the relativistic quantum mechanics emphasized by Dirac can appear already in purely mechanical problems where no radiation processes are involved." The yet-to-be-recognized and discovered antiparticle – the positron – was the "difficulty", allowing for both radiative and field-instigated pair production (the "paradox"), when vacuum instability is inherent in a prescribed external field configuration.

The Klein-paradox result resurfaced soon in the work by Werner Heisenberg and Hans Euler, and Julian Schwinger on the vacuum properties of QED. Today, as we head towards the centenary of the Klein paradox, pair production in strong fields is being addressed as a priority within the large community interested in ultra-intense laser pulses.

Oskar Klein was always a colleague I wished I could meet, and finally, I have. Thank you, Gösta Ekspong, for this introduction to my new-found hero. While at first my profound personal interest in this book arose from curiosity originating from many years of working out the consequences of the Klein paradox in heavy-ion collisions, I now see how Klein can serve as a role model. This is the book to own for anyone interested in seeing further by "standing on the shoulders of giants".

● Johann Rafelski, *The University of Arizona*.

Crackle and Fizz: Essential Communication and Pitching Skills for Scientists

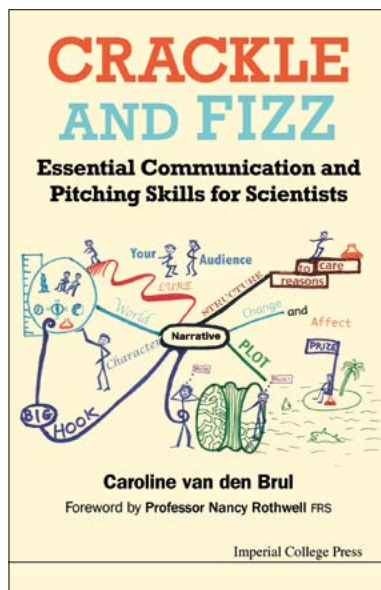
By Caroline van den Brul
Imperial College Press

Hardback: £35

Paperback: £15

E-book: £11

The introduction of *Crackle and Fizz* sets out a trope that may sound familiar: a decade-old social *faux pas* between scientists and journalists at a dinner party, where the speed-dating format for presenting science was met with ire, derision and altogether not having a nice time. The claim is made that this could



have been a chance to start over, to reframe science communication and realign the expectations of those involved. To do so misses out on the past few decades of development in the science-communication field, which is now reaching a reflective maturity and presence between academia, industry and media. Unfortunately, the same erasure is a leitmotif in many of the chapters that follow.

Caroline van den Brul's credentials are impressive, with years at the helm of BBC productions and engagement workshops. This history forms the backbone of the book, setting an anecdote-per-chapter rate that reads more like an autobiography than an attempt to impart any lessons or experience to the reader. The remaining space is given over to consideration of narrative devices useful in contextualizing topics and engagement from a practitioner's perspective. However, these are only superficially explored and offer little in variation. After many pages promoting the importance of clarity, the titular "Crackle" is eventually revealed in the final chapter to be a (somewhat forced) acronym that summarizes and distils all preceding guidance. Had this been the starting point from which each aspect was explored in depth, the tone and flow of the book may have made for a more compelling read. When used as the conclusion, it feels condescendingly simplified. It's a shame that, considering van den Brul's history, the final chapter is the main one worth reading.

Overall, the book feels less like the

anticipated dive into years of experience, and more like a pre-lunch conference workshop. If you are in the first stages of incorporating engagement and communication into your current practice, working through each chapter's closing questions could be of some use. Or, should you feel like refreshing your current framework, they might give you a moment's pause and adjustment, but no more than any other evaluation.

● Will Davies, *Live Science Team, @Bristol*.

Books received

A Chorus of Bells and Other Scientific Inquiries

By Jeremy Bernstein

World Scientific

Hardback: £25



E-book: £19

In this volume of essays, written across a decade, Bernstein covers a breadth of subject matter. The first part, on the foundations of quantum theory,

reflects the author's conversations with the late John Bell, who persuaded him that there is still no satisfactory interpretation of the theory. The second part deals with nuclear weapons, and includes an essay on the creation of the modern gas centrifuge by German prisoners of war in the Soviet Union. Two shorter sections follow: the first on financial engineering, with a profile of Louis Bachelier, the French mathematician who created the subject at the beginning of the 20th century; the second and final part is on the Higgs boson, and how it is used for generating mass.

The Beauty of Physics: Patterns, Principles, and Perspectives

By A R P Rau

Oxford University Press

Hardback: £25



Also available as an e-book

The selection of topics in this book reflects the author's four-decade career in research physics and his resultant perspective on the subject.

While aimed primarily at physicists, including junior students, it also addresses other readers who are willing to think with symbols and simple algebra in understanding the physical world. Each chapter, on themes such as dimensions, transformations, symmetries, or maps, begins with simple examples accessible to all, while connecting them later to more sophisticated realizations in more advanced topics of physics.

THE NEW TWISTORR 84 FS AGILENT QUALITY ASSURED



Agilent TwisTorr FS Turbo Pumps

The new generation turbo pumps with
Agilent Floating Suspension

- Agilent Quality and Reliability
- Quiet operation & low-vibration
- Stability over time
- Superior performance
- Easy system integration

The Measure of Confidence



Make Agilent Your Vacuum-Choice. Discover our Special Offers.

www.vacuum-choice.com



Scan the QR code
with your smartphone
for more information





CAEN Educational Kit

The CAEN Educational Kit is a modular, digital, flexible platform for teaching the fundamentals of Modern Physics

SPECIAL OFFER!

CONTACT YOUR LOCAL DEALERS FOR DETAILS!

Two versions available:

SP5600A - Educational Kit:

The full-size version includes three different light sources, allowing for a variety of applications covering different Physics fields, from Statistics to Spectroscopy

Kit Content

- 1 DT5720A - 2 Channels 250 MS/s, 12-bit Digitizer **③**
- 1 SP5600 - 2 Channels Power Supply and Amplification Unit **②**
- 1 SP5601 - Ultra Fast LED Driver **⑤**
- 1 SP5602 - Scintillating Tile **①**
- 1 SP5603 - Mini Spectrometer with 3 Crystals included **④**
- 2 SP5650A - Sensor Holders with SiPMs included **⑥**

SP5600B - Evaluation Kit:

The basic version is offered with the ultra fast LED Driver only. It is particularly suited for exploring the nature of light and developing Counting and Statistics exercises

Kit Content

- 1 DT5720A - 2 Channels 250 MS/s, 12-bit Digitizer **③**
- 1 SP5600 - 2 Channels Power Supply and Amplification Unit **②**
- 1 SP5601 - Ultra Fast LED Driver **⑤**
- 1 SP5650A - Sensor Holder with SiPMs included **⑥**
- 1 SP5650B - Sensor Holder with SiPMs included **⑥**



Delivered in a tailored case!

EDUCATIONAL NOTES AVAILABLE 





CERN COURIER

VOLUME 55 NUMBER 6 JULY/AUGUST 2015

Contents

5 NEWS

- *LHCf makes the most of a special run* ● *Stable beams at 13 TeV*
- *Fifth event signals discovery of ν_τ appearance* ● *HL-LHC begins the move from paper to hardware* ● *Korean Tier-1 link upgrades to 10 Gbps* ● *STAR helps to pin down a key phenomenon in gold collisions* ● *B^0 decay reveals an intriguing anomaly* ● *LHCb observes top production in the forward region* ● *On the trail of long-lived particles* ● *CMS and the continuing quest to unveil dark matter* ● *EuroCirCol: a key to new physics*

13 SCIENCEWATCH

15 ASTROWATCH

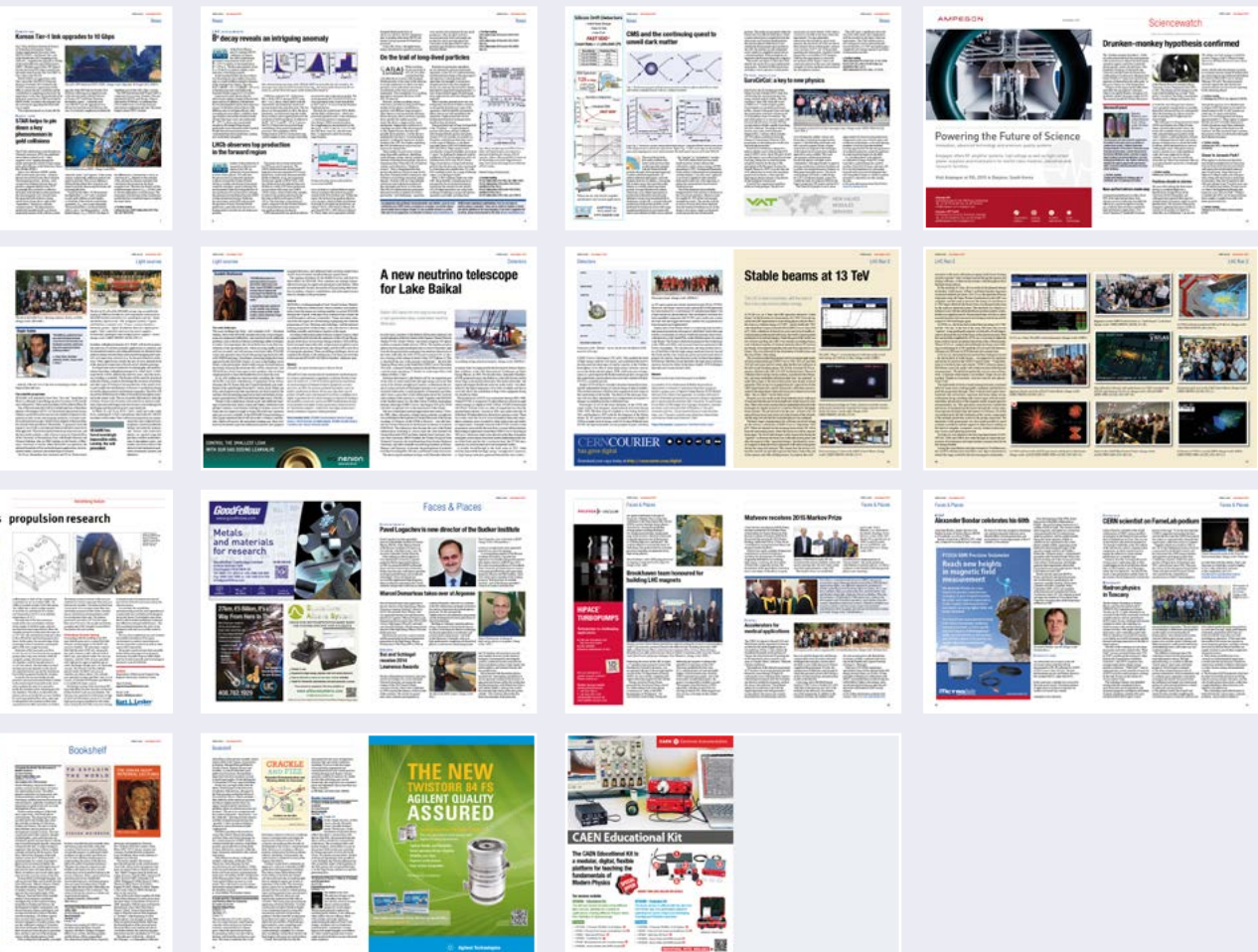
17 ARCHIVE

19 FEATURES

SESAME: a bright hope for the Middle East
The story of the Middle East's first synchrotron

A new neutrino telescope for Lake Baikal
The first step towards a next-generation world's deepest freshwater lab

Stable beams at 13 TeV
The LHC is back in business.



Middle East
first light source.

Lake Baikal
generation neutrino telescope in the
lake.

29 **LHC and Planck: where two ends meet**
Links between research at opposite ends of the distance scale.

31 **Frontier detectors for the future**
Progress in detector technology is alive and well.

37 **FACES&PLACES**

46 **RECRUITMENT**

49 **BOOKSHELF**

WELCOME

CERN Courier – digital edition

Welcome to the digital edition of the July/August 2015 issue of *CERN Courier*.

Appropriately in the International Year of Light, SESAME, the first light source for the Middle East, is coming together in preparation for commissioning in 2016. The project is a working example of Arab–Israeli–Iranian–Turkish–Cypriot–Pakistani collaboration, and is already on its way to becoming the region’s first truly international centre of excellence. Meanwhile, in Russia, Lake Baikal is on its way to becoming one of the world’s largest neutrino telescopes, thanks to the detection of Cherenkov light in its deep, clear water. And out in space, the Planck mission detects the oldest light in the universe, and complements experiments at the LHC by studying fundamental phenomena at the opposite end of the distance scale.

To sign up to the new-issue alert, please visit:

<http://cerncourier.com/cws/sign-up>.

To subscribe to the magazine, the e-mail new-issue alert, please visit:

<http://cerncourier.com/cws/how-to-subscribe>.