

Bookshelf

COMPILED BY VIRGINIA GRECO, CERN

Gaseous Radiation Detectors: Fundamentals and Applications (Cambridge Monographs on Particle Physics, Nuclear Physics and Cosmology)

By Fabio Sauli

Cambridge University Press

Also available at the CERN bookshop

In the last few decades, fast revolutionary developments have taken place in the field of gaseous detectors. At the start of the 1970s, multiwire proportional chambers were invented. These detectors and their descendants (drift chambers, time-projection chambers, ring-imaging Cherenkov detectors, etc) rapidly replaced cloud and bubble chambers, as well as spark counters, in many high-energy physics experiments. At the end of the last century, resistive-plate chambers and micropattern detectors were introduced, which opened up new avenues in applications.

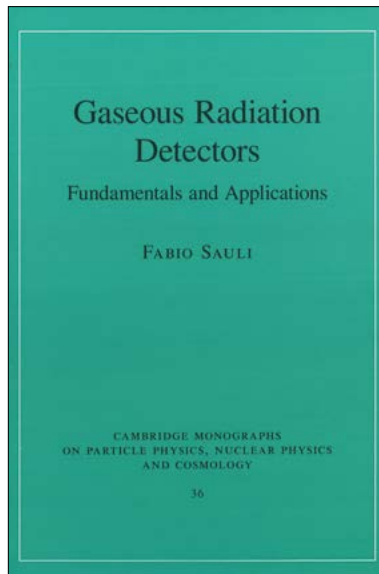
Ironically, for a long time, no books had been published on gaseous detectors and their fast evolution. For this reason, in spite of thousands of scientific publications covering the rapid and exciting developments in the field of gaseous detectors, no simple and analytical description has been made available for a wide audience of non-professionals, including, for example, students.

Suddenly "an explosion" took place: several books dedicated to modern gaseous detectors and their applications appeared on the market, almost all at the same time.

Sauli's book is certainly one of the best of these. The author, a leading figure in the field, has succeeded in writing a remarkable and charming book, which I strongly recommend to anyone interested in learning about recent progress, open questions and future perspectives of gaseous detectors. Throughout its 490 pages, it offers a broad coverage of the subject.

The first five chapters focus on fundamentals: the interaction of charged particles and photons with matter, the drift and diffusion of electrons and ions, and avalanche multiplications. This first part of the book offers a refreshing mix of basic facts and up-to-date research, but avoids giving too much space to formulas and complicated mathematics, so non-specialists can also gain from the reading.

The remaining eight chapters are dedicated to specific detectors, from single-wire proportional counters to state-of-the-art micro-pattern gaseous detectors. This latter part of the book gives exhaustive detail and describes the design and operational features,



including signal development, time and position resolutions, and other important characteristics. The last chapter deals with degeneracy and ageing – serious problems that detectors can experience if the gas composition and construction materials are not chosen carefully.

This fascinating book is easy to read, so it is suitable for everyone, and in particular, I believe, for young people. I was especially impressed by the care with which the author prepared many figures, which in some cases include details that I have not seen in previous texts of this kind. The high-quality figures and photographs contribute significantly to making this book well worth reading. In my opinion, it is not only remarkably complementary to other recently published monographs, but it can also serve as a main textbook for those who are new to the field.

The only omission I have observed in this otherwise wide-ranging and well-researched book, is the lack of discussion on secondary processes and ion back flows, which are very important in the operation of some modern photosensitive detectors, including, for example, ALICE and COMPASS ring-imaging detectors.

There could be a few other improvements in a future edition. For instance, it would be useful to expand the description of the growing applications of gaseous detectors, especially resistive-plate chambers and micropattern detectors.

All in all, this is a highly recommendable book, which provides an interesting guided tour from the past to present day of gaseous detectors and the physics behind their operation.

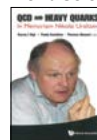
● Vladimir Peskov, CERN.

Books received

QCD and Heavy Quarks: In Memoriam Nikolai Uraltsev

By I I Bigi, P Gambino and T Mannel (eds)

World Scientific



The book collects together articles on QCD and heavy-quark physics written in memory of Nikolai Uraltsev, who passed away unexpectedly in February 2013. Uraltsev was

an excellent theorist with acute intuition, who dedicated his career to the study of phenomenological particle physics, in particular quantum chromodynamics and its non-perturbative properties. He is also considered one of the fathers of heavy-quark expansion. By writing this book, Uraltsev's closest colleagues and friends intended to honour his groundbreaking work, as well as give testimonies of their personal relationships with him.

The text gives an overview of some aspects of QCD, including CP violation in hadronic processes and hadronic matrix elements in weak decays. Three selected works by Uraltsev are also reproduced in the appendix.

Quantum Field Theory and the Standard Model

By Matthew D Schwartz

Cambridge University Press

Also available at the CERN bookshop



Providing a comprehensive and modern introduction to quantum field theory, this textbook covers the development of particle physics from its foundations to the recent discovery of the Brout–Englert–Higgs boson. Based on a course taught by the author at Harvard University for many years, the text starts from the principle that quantum field theory (QFT) is primarily a theory of physics and, as such, it provides a set of tools for performing practical calculations. The book develops field theory, quantum electrodynamics, renormalisation and the Standard Model, including modern approaches and state-of-the-art calculation techniques.

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With a combination of intuitive explanations of abstract concepts, experimental data and mathematical rigour, the author makes the subject accessible to students with different backgrounds and interests.

Particle and Astroparticle Physics, Gravitation and Cosmology: Predictions, Observation and New Projects – Proceedings of the XXXth International Workshop on High Energy Physics

By V Petrov and R Rytin (eds)

World Scientific



The most interesting talks delivered at the XXXth International Workshop on High Energy Physics, held in Protvino, Russia, in June 2014, are collected in this volume, along with the minutes of the six panel discussions. As the full title suggests, this conference not only focused on high-energy physics, but addressed a wide range of fundamental issues of modern particle and astroparticle physics, gravitation and cosmology.

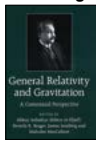
The major subjects presented included the discovery and interpretation of the Brout–Englert–Higgs boson at the LHC, heavy-quark physics, quark–gluon plasma studies, diffractive scattering at high energies, neutrino oscillations, and theoretical interpretations of cosmological data on the evolution of the universe.

The panel discussions, in turn, highlighted difficult points in the various domains of modern physics, and identified possible research paths.

General Relativity and Gravitation: A Centennial Perspective

By A Ashtekar et al (eds)

Cambridge University Press



On the occasion of the centennial of Einstein's discovery of general relativity, the International Society on General Relativity and Gravitation commissioned a team of leading international researchers to write about the advances that have occurred in all of the branches of physics during the last three decades. Through 12 comprehensive chapters, the volume gives an overview of key topics in relativistic astrophysics, cosmology and gravitational-wave theories, as well as mathematics and computational science. The book is intended both for beginners, who could use it as an introduction to the entire field, and for more advanced researchers, especially if they are interested in subjects that are outside of their field of

expertise. Organised in four parts, each of about five chapters, the book guides the reader on a journey from the triumph of Einstein's theory of relativity through the phenomenon of gravitational waves, to quantum gravity.

Nuclear and Particle Physics

By Claude Amsler

IOP Publishing



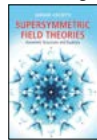
This textbook provides an introductory course on nuclear and particle physics for undergraduate and early graduate students. It originated from a series of lectures given at the Physics Institute of the University of Zurich by the author. The subjects are presented following their historical development. The explanations are experimentally and phenomenologically orientated, and often make use of intuitive arguments. In addition, many concepts and phenomena are derived with inductive rather than deductive thinking.

Originally published in German, this new version in English has been enriched with several modern topics, such as the Higgs boson, updates on neutrinos, the top quark and bottom-quark physics.

Supersymmetric Field Theories: Geometric Structures and Dualities

By Sergio Cecotti

Cambridge University Press



An unconventional and elegant geometrical approach is adopted in this book to explain supersymmetric field theories, and describe intuitive methods for understanding the logic underlying such concepts. Aimed at graduate students and researchers, the collection of lectures provides an advanced course in supergravity and supersymmetry, which requires knowledge of the basic concepts and fundamental tools of these fields. The author shows how complex results and formulae obtained from the more classical approaches to SUSY can be simplified dramatically when translated to a geometric setting.

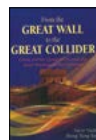
Covering a wide range of topics and offering rigorous, in-depth explanations, this text would be an extremely valuable resource for theoretical physicists.

From the Great Wall to the Great Collider: China and the Quest to Uncover the Inner Workings of the Universe

By S Nadis and S T Yau

International Press of Boston

The volume presents the reasons behind



the ambitious project pursued by a group of distinguished Chinese scientists, led by Shing-Tung Yau, professor of mathematics and physics at Harvard University, to

build the next biggest particle collider in China, to continue the quest to identify the fundamental building blocks of nature.

The discovery of the Brout–Englert–Higgs boson put in place the long-sought-after missing piece of the Standard Model of particle physics. Although this model can describe the behaviour of particles with remarkable accuracy, it is actually incomplete, because it is not able to explain a range of phenomena.

Several centuries ago, Chinese emperors erected a majestic ring of fortification – the Great Wall. Today, Chinese researchers are contributing to particle physics with a project of almost comparable magnificence: the building of a giant accelerator, the Great Collider.

The book explains the scientific issues at stake, discusses the history of particle physics, and tells the story of the birth and development of the Great Collider project.

Inflation and String Theory

By D Baumann and L McAllister

Cambridge University Press



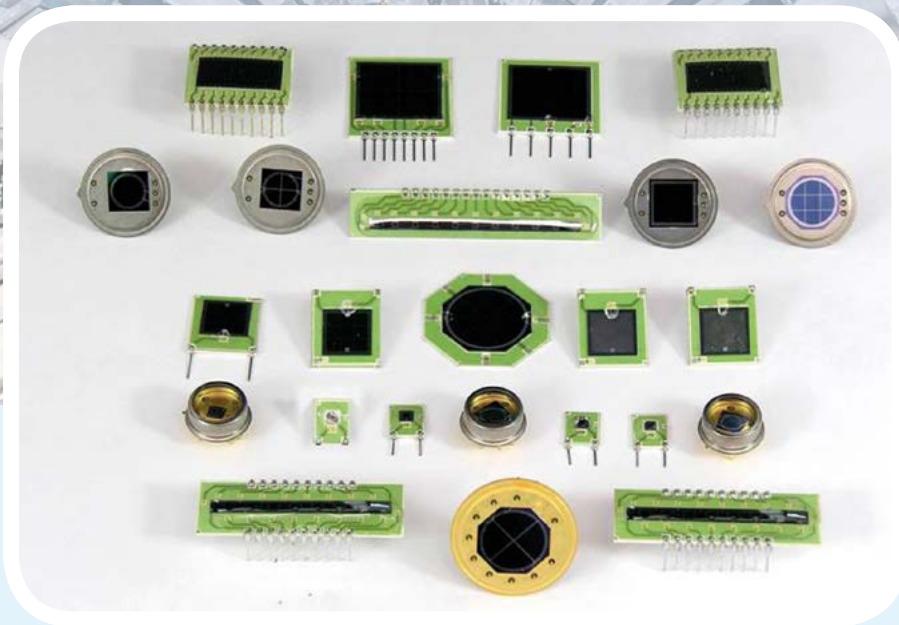
This complete and accessible text, written by two of the leading researchers in the field, provides a modern treatment of inflationary cosmology and its connection to string theory and elementary particle theory.

The past two decades of advances in observational cosmology have brought about a revolution in our understanding of the universe. In particular, deeper studies of the cosmic microwave background have revealed strong evidence for a period of inflationary expansion in the very early universe. At the same time, new developments in string theory have led to a better understanding of inflation in a framework that unifies quantum mechanics and general relativity.

After a brief introduction about observations in favour of the inflationary hypothesis, the volume provides an overview of effective field theory, string theory, and string compactifications. Finally, several classes of models of inflation in string theory are examined in detail.

The background material in geometry and cosmological perturbation theory included in the appendices makes the book self-contained and accessible not only to experienced researchers, but also to graduate students and readers who are new to the field.

BEL, an integral part of the Big Bang experiment



Solid State silicon detectors from BEL

Bharat Electronics Ltd (BEL), India's leading Defence electronics company, has developed state-of-the-art solid state silicon detectors for the CMS experiment at CERN, Geneva.

BEL's initiative started with the development of large area silicon sensors to be used in the pre-shower detector of the CMS experiment in 1999. Since then, BEL has developed and manufactured silicon detectors of various sizes, geometries and characteristics for applications such as position sensing, charge particle detection, gamma detection, photo-detection, X-ray detection, pocket dosimetry and spectroscopy.

BEL now offers a range of silicon detectors such as PIN Diodes, strip detectors, photo diode detectors, linear array photo diode detectors, quadrant detectors and double-sided strip detectors. Apart from these there are other detectors under development such as Delta E-E detector, MOSFET detector and Silicon photo multiplier detector. These detectors are used in nuclear, medical & safety applications.

Bharat Electronics Limited

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News from
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CAEN SY4527 and SY5527 - The Universal Multichannel Power Supply System



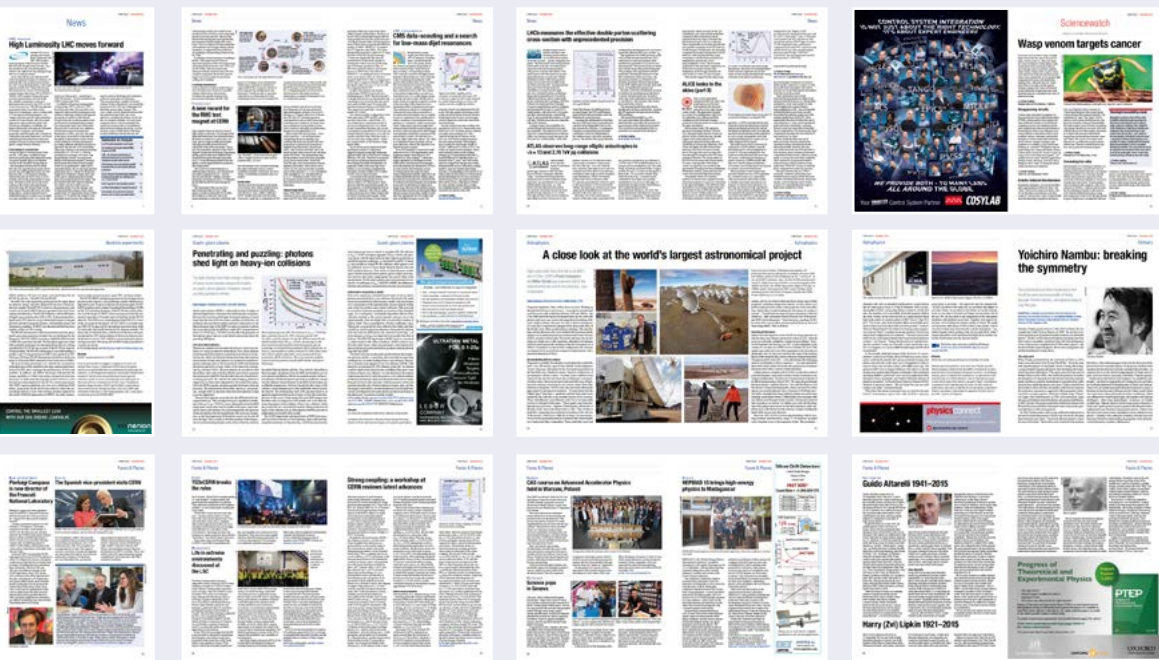
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BOOKSHELF

WELCOME

CERN Courier – digital edition

Welcome to the digital edition of the December 2015 issue of *CERN Courier*.

Eight years after their first visit to ALMA's site in Chile, CERN's Paola Catapano and Mike Struik pay a second visit to the experimental site and its 66 antennas, now in operation. For the past four years, anything ALMA has observed has been a press release, and more is certainly to come for the world's largest astronomical project. Closer to the field of particle physics, in this issue we feature the role of photons as probes to investigate the properties of quark–gluon plasma, and we discover DUNE, the flagship neutrino experiment gaining global interest from an increasingly large community. Finally, we pay tribute to a giant of physics, Nobel laureate Yoichiro Nambu, who passed away in July.

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