

Superconductivity: Basics and Applications to Magnets, Second Edition. R. G. Sharma. Springer Nature, Switzerland AG, Gewerbestrasse 11, 6330 Cham, Switzerland. 2021. 649 pages. Price: Rs 8017. ISBN 978-3-030-75671-0.

The book under review is one of the very few textbooks in the field of applied superconductivity. It covers low-temperature physics and experimental techniques, superconductivity, and high-field superconducting magnets. The book is based on the author's years of academic and scientific research experience, love and passion for low-temperature physics and high-field magnet-related technology development. The most important feature of this book is that it covers fundamental aspects of producing low temperature, low-temperature physics and superconductivity with relevant experimental techniques. The book is divided into 12 chapters. Chapter 1 provides a brief overview of low-temperature physics and production of liquefaction of cryogenic fluids by different processes starting with the classic Linde–Hampson cycle to the modern-day Collin's cycle used in helium refrigerators. Superconducting phenomenon and behaviour of different physical properties are discussed in detail in chapter 2. This chapter also covers elaborately the basic concepts of superconductivity such as Meissner effect, two-fluid model, thermodynamic property of superconductors, concept of energy gap, flux quantization, Josephson tunnelling, superconducting quantum interference device magnetometer, type-II superconductors, etc. Details of the large family of high-temperature cuprate superconductors, especially BSCCO-2221, BSCCO-2223 and YBCO-123, along with the newly developed MgB2 superconductors, are covered in chapter 3.

Correlation of crystal structure with superconductor critical parameters and anisotropic behaviour of high-temperature superconductor (HTS) materials are also explained in this chapter. Theoretical basis of the superconducting phenomenon for low-temperature superconductor (LTS) and HTS materials, including the London theory, Ginzburg–Landau concept and BCS theory, are covered in detail in chapter 4. Practical aspects of superconducting materials such as thermal instability, flux jump and dynamic stability, multi-filamentary conductor concept, AC loss and measurement technique, etc. relevant to magnet applications are highlighted in chapter 5. Development of different types of practical superconductors such as cryostable single strand for laboratory-scale high-field DC magnet, high current-carrying capacity multi-strand Rutherford-type cable for accelerator use and CICC-type for fusion research are also discussed in chapter 5. Commercial production processes of the most popular HTS (such as ReBCO (Y-123), Bi-2223 and Bi-2212), along with their critical parameters and mechanical properties, are covered in detail in chapter 6. Chapter 7 provides an overview of the properties of MgB2, a superconducting material of transition temperature of 39 K, which is a probable alternative in the near future to the commonly used LTS NbTi. The author has also highlighted the most popular techniques for manufacturing MgB2 multi-filamentary wires/cables in this chapter. Recently developed iron-based practical superconductors along with their phase diagram and wire fabrication technique are described in chapter 8. Chapter 9 is probably the most important chapter on magnet design. It provides useful information about design, development and operation of superconducting magnets in the laboratory. Superconducting magnets for cyclotrons, linear accelerators and their historic development are discussed in chapter 10. Pictorial representation of the basic concepts for different types of superconducting magnets in cyclotrons, accelerators and colliders, along with their photographs is provided in this chapter, adding to the clarity of the description.

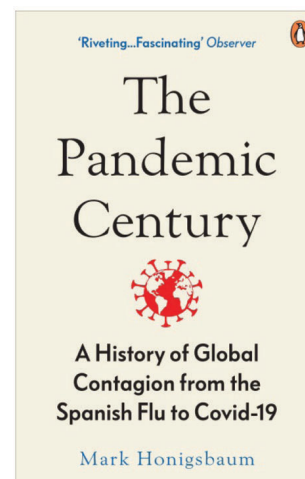
Chapter 11 covers the fusion mechanism and tokamak concept used for fusion research by different laboratories worldwide (such as T7 of Russia, Tore Supra of France, JT-60 SA of Japan, KSTAR of Korea, EAST of China and SST-1 of India and finally in International Nuclear Fusion Research and Engineering Megaproject

ITER). This chapter also includes comprehensive design details of superconducting magnets used in thermonuclear fusion applications. Finally, application of superconducting magnets in other fields of research and medical applications such as NMR, MRI, superconducting magnetic energy storage devices for large-scale dynamic load levelling, mitigating short-duration voltage fluctuation for critical loads, etc. are discussed in chapter 12.

Overall, this book is more or less self-contained. Its most feature is adequate introduction and explanation of the physical concepts. The book is highly recommended for postgraduate students and young researchers interested in experimental low-temperature physics, applied superconductivity and high-field magnet technology. It should find a place in the libraries of all academic and research institutions.

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The Pandemic Century: A History of Global Contagion from the Spanish Flu to Covid-19. Mark Honigsbaum. Penguin Books, Cambridge, UK. 2020. 384 pages. Price: \$ 17.15. ISBN 9780753558287.

Beginning with the famous quote by Albert Camus from *The Plague* published in 1947, 'There have been as many plagues as wars in history; yet always plagues and wars take people equally by surprise', the author of this book, Mark Honigsbaum

draws parallels between the ‘sudden’ shark attacks and disease outbreak. He is a journalist, medical historian and a lecturer at the City University, London, UK. Honigsbaum has authored several books and his TED-Ed animation, ‘How pandemics spread’ is widely viewed. This book is an updated version of *The Pandemic Century: One Hundred Years of Panic, Hysteria* published in 2019. The element of ‘suddenness’ and ‘surprise’ is central to this book. Honigsbaum revisits causes, spread and how previous pandemics were handled or managed during the last century. Despite advancements in scientific knowledge and epidemiology, the book underscores that medical researchers and specialists become prisoners to existing theories and paradigms of how pathogens would behave. They fail to acknowledge varied ways in which disease-causing microbes may interact with the immune system, and a pathogen that may diversely affect different people. Therefore, it is pertinent to understand the wider environment, ecology, immunology as well in the social, cultural and behavioural context for understanding varied patterns of disease outbreaks.

Honigsbaum’s powerful description helps readers visualize the gruesome realities of previous outbreaks. The book enables us to draw parallels and relate with how various governments, the World Health Organization (WHO) and the scientific community responded and handled such disease outbreaks in the past. It explores why despite our best efforts and advanced knowledge, they continue to surprise us and provoke panic, hysteria and dread. At the same time, ‘hyperawareness’ and ‘media’ contribute to a constant state of fear of future pandemics. Globalization, expansion of global trade and international travel enable swift movement of people and pathogens, furthering the spread of pathogens and the scope for interaction with varied ecological and immunological conditions, diversifying the nature of disease and mutation in pathogens.

Through its ten chapters, each focusing on a specific disease, the book vividly captures a continuum of outbreaks in the last century until the recent COVID-19 pandemic. Emphasizing the long association between wars and epidemics, the author identifies overcrowded spaces, large-scale intermixing at training camps and travel of American recruits to and from Europe for the spread of the ‘mother of all outbreaks’ during World War I. Introduction of quarantines, restrictions to public gatherings,

use of masks, shortage of medical staff and mass burial became imminent. The author gives important insights on its origins, modes of transmission and spread to different parts of the world and why it came to be known as the ‘Spanish Flu’. The second chapter describes the plague outbreak in the ‘City of Angels’ in 1924 and reiterates how it falsified the assumptions of plague experts. Mexico’s overcrowded living conditions and burial rituals accelerated the outbreak. The book provides a glimpse of the protests against quarantine measures. It also indicates how human intervention into wild habitats could cause plague outbreaks in future. The third chapter dwells on the parrot fever pandemic of 1929–1930, which spread across different parts of the world. The author also throws light on the press coverage of the connections between psittacosis and parrots, and the efforts made by several researchers in tackling the outbreak. Rapid economic and industrial change, over-population, international trade and jet travel as well as stubborn insistence of bird breeders to administer drugs/antibiotics, failing to understand the link of this outbreak with birds were central to its origin and spread.

The fourth chapter articulates the challenges and limitations of scientists, while referring to the Philadelphia outbreak (the ‘Philly Killer’, later named Legionnaire’s disease) as the greatest puzzle of the century. Despite advancements in medicine, the Legionnaire’s was seen as the first of a series of ‘emerging infectious diseases’. Further to the Philadelphia outbreak, the author adds that new technologies like indoor plumbing and hot water systems used to improve hygiene and living conditions gave rise to new public health threats forcing researchers to diversify their research and study the different forms of interaction between pathogens and humans. The sixth chapter deals with the emergence of the ‘new’ widespread and AIDS-causing virus as an agent of the largest pandemics in history. The outbreak coincided with the much-celebrated eradication of small pox, emergence of new medical technologies, intellectual tools, vaccines and antibiotics, which once again challenged the contours of medical sciences. HIV spread across continents and was attenuated by better road, rail and jet travel connections.

The next chapter focuses on the outbreak of SARS and its spread to various countries, which led to global travel alerts by WHO. Its effects on financial markets, hospitality and entertainment industries are

highlighted. The resolution of the mystery of SARS necessitated mobilization of scientists and laboratories from all over the world. It required microbiologists to review their assumptions about coronaviruses, which were often considered as ‘Cinderellas of the virus world, beautiful to look at after work, but too insignificant to take up microbiologists’ daylight hours’. The author discusses the role of WHO and the importance of its Global Outbreak Alert and Response Network, apprehensions of the medical workers and how SARS impacted the lives of people. The book underlines that WHO’s handling of SARS restored faith in the United Nations and that low transmissibility of SARS and introduction of draconian public health measures like home isolation and mass quarantine by China and other Asian countries averted the disaster.

The eighth and ninth chapters focus on Ebola and Zika virus outbreak respectively, and also hint at the failure of the international community. Similarly, after disturbing photographs of ‘unusual’ congenital syndrome among newborn babies surfaced on social media platforms, the Centers for Disease Control and Prevention (CDC) was forced to issue travel advisories for pregnant women. Despite these fears, the Rio Olympics continued. The author discusses several vaccine candidates for Zika and their relevance, problems in trials on pregnant women and other ethical issues. The ninth chapter further discusses initiatives taken by the Brazilian Government like cash transfer programmes and rehabilitation centres for the affected babies and their impact on women, who continued to face several challenges. It is difficult to restrict global travel and commerce; however, political will of the local government is central to check social, environmental and sanitary conditions that provide a breeding ground for *Aedes* and other Zika-bearing mosquitoes. Contrasting the speed of transmission of the 1918 Flu, and given our previous experience and knowledge of the science of coronavirus, the final chapter delves into the politics of the origins and spread of the present COVID-19 pandemic. Our ignorance of warning signs pointed by virologists, complacency of politicians, and lack of coordinated preparation and actions led to the outbreak, which has claimed thousands of lives and caused severe economic and financial impacts across the world. The author considers the 43 vaccine candidates that were in pipeline for development and use, as a ray

BOOK REVIEWS

of hope. Certainly, vaccines were critical in tackling COVID-19, but issues and challenges of access and TRIPS waiver continue to date, and this needs coordinated international efforts.

This book studies epidemic outbreaks during the last hundred years and explores the recurrence of new plagues and pandemics in future. The author identifies several reasons for such outbreaks, such as globalization, urbanization, technological advan-

cements, international travel, etc. Like shark attacks, disease outbreaks are sudden. It may be difficult to predict future pandemics and know exactly when they will occur, but we certainly know that they will. The book effectively underlines the unpredictable nature of such outbreaks, which will continue to challenge the presumptions of the international scientific community and institutions, and test the limits of medical prognostication in future.

This book is a timely and significant contribution. It will be of interest to a wide range of readers, especially as we are living through a pandemic.

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