Forces In Physics A Historical Perspective

The Reader's Guide to the History of Science looks at the literature of science in some 550 entries on individuals (Einstein), institutions and disciplines (Mathematics), general themes (Romantic Science) and central concepts (Paradigm and Fact). The history of science is construed widely to include the history of medicine and technology as is reflected in the range of disciplines from which the international team of 200 contributors are drawn.

A History of Physics in Its Elementary Branches, Including the Evolution of Physical Laboratories by Florian Cajori, first published in 1929, is a rare manuscript, the original residing in one of the great libraries of the world. This book is a reproduction of that original, which has been scanned and cleaned by state-of-the-art publishing tools for better readability and enhanced appreciation. Restoration Editors' mission is to bring long out of print manuscripts back to life. Some smudges, annotations or unclear text may still exist, due to permanent damage to the original work. We believe the literary significance of the text justifies offering this reproduction, allowing a new generation to appreciate it.

While many books have claimed parallels between modern physics and Eastern philosophy, none have dealt with the historical influences of both Chinese traditional thought and non-mechanistic, holistic western thought on the philosophies of the scientists who developed electromagnetic field theory. In The Holistic Inspirations of Physics, R. Valentine Dusek asks: to what extent is classical field theory a product of organic and holistic philosophies and frameworks? Electromagnetic theory has been greatly influenced by holistic worldviews, Dusek posits, and he highlights three alternative scientific systems that made the development of electromagnetic theory possible: medieval Chinese science, Western Renaissance occultism, and the German romantic traditions. He situates these "alternative" approaches in their social context and background, and traces their connection with components of “accepted” physical science in relation to a number of social movements and philosophical theories. Readers will learn of specific contributions made by these alternative traditions, such as the Chinese inventing the compass and discovering the earth's magnetic field and magnetic declination. Western alchemical ideas of active forces and "occult" influences contributed to Newton's theory of gravitation force as action at a distance, rather as a result of purely mechanical collisions and contact action. Dusek also describes the extent to which women's culture supplied (often without credit) the philosophical background ideas that were absorbed into mainstream field theory.

From the ancient world to the present women have been critical to the progress of science, yet their importance is overlooked, their stories lost, distorted, or actively suppressed. Forces of Nature sets the record straight and charts the fascinating history of women’s discoveries in science. In the ancient and medieval world, women served as royal physicians and nurses, taught mathematics, studied the stars, and practiced midwifery. As natural philosophers, physicists, anatomists, and botanists, they were central to the great intellectual flourishing of the Scientific Revolution and the Enlightenment. More recently women have been crucially involved in the Manhattan Project, pioneering space missions and much more. Despite their record of illustrious achievements, even today very few women win Nobel Prizes in science. In this thoroughly researched, authoritative work, you will discover how women have navigated a male-dominated scientific culture – showing themselves to be pioneers and trailblazers, often without any recognition at all. Included in the book are the stories of: Hypatia of Alexandria, one of the earliest recorded female mathematicians Maria Cunitz who corrected errors in Kepler’s work Emmy Noether who discovered fundamental laws of physics Vera Rubin one of the most influential astronomers of the twentieth century Jocelyn Bell Burnell who helped discover pulsars

Christina Jungnickel and Russell McCormmach have created in these two volumes a panoramic history of German theoretical physics. Bridging social, institutional, and intellectual history, they chronicle the work of the researchers who, from the first years of the nineteenth century, strove for an intellectual mastery of nature. Volume 1 opens with an account of physics in Germany at the beginning of the nineteenth century and of German physicists' reception of foreign mathematical and experimental work. Jungnickel and McCormmach follow G. S. Ohm, Wilhelm Weber, Franz Neumann, and others as these scientists work out the new possibilities for physics, introduce student laboratories and instruction in mathematical physics, organize societies and journals, and establish and advance major theories of classical physics. Before the end of the nineteenth century, German physics and its offspring, theoretical physics, had acquired nearly their present organizational forms. The foundations of the classical picture of the physical world had been securely laid, preparing the way for the developments that are the subject of volume 2.

It is a trite and often lamented fact that every academic discipline suffers from the malady of overspecialization and expertise. Who, in his scholarly experience, has not encountered technical gibberish and the jargon of the pundit? The contributors to this work have aUempted to remove the artifi cial barriers between these respective disciplines. The purpose of this volume is to explore the ever present links between logic, physical reality, and history. Indeed there are not two or three or four cultures: there is only one culture; our generation has lost its awareness of this. Though serious, it is not tragic. All we need is to free ourselves from the fetters of mere "technicalese" and search for a comprehensive interpretation of logical and physical theories. His'torians, logicians, physicists - all are banded in one common enterprise, namely in their desire to weave an enlightened fabric of human knowledge. It is a current, and perhaps weJcome, trend in philosophie inquiry to de-psychologize systems, methods, and theories. However, there is an equally fashionable tendency to minimize or even eschew the historical aspects of logical and physical theories, and analogously, there is a deep seated mistrust among physicists and cosmologists against the seemingly pure abstractions of logical formalisms.

This book brings together a broad spectrum of authors, both from inside and from outside Cuba, who describe the development of Cuba's scientific system from the colonial period to the present. It is a unique documentation of the self-organizing power of a local scientific community engaged in scientific research on an international level. The first part includes several contributions that reconstruct the different stages of the history of physics in Cuba, from its beginnings in the late colonial era to the present. The second part comprises testimonies of Cuban physicists, who offer lively insights from the perspective of the actors themselves. The third part presents a series of testimonies by foreign physicists, some of whom were directly involved in developing Cuban physics, in particular in the development of teaching and research activities in the early years of the Escuela de Física. The fourth part of the volume deals with some of the issues surrounding the publishing of scientific research in Cuba. Cuba’s recent history and current situation are very controversial issues. Little is known about the development and status of higher education and scientific research on the island. However, Cuba has one of the highest proportions in the world of people with a university degree or doctorate and is known for its highly developed medical system. This book focuses on a comprehensive overview of the history of the development of one specific scientific discipline: physics in Cuba. It traces the evolution of an advanced research system in a developing country and shows a striking capacity to link the development of modern research with the concrete needs of the country and its population. A little known aspect is the active participation of several “western” physicists and technicians during the 1960s, the role of summer schools, organized by French, Italian, and other western physicists, as well as the active collaboration with European universities.“p>

This book covers the first 35 years of nuclear physics, especially in the areas of radioactivity and radioactive emissions which were the main discoveries in nuclear physics during its first three decades. It follows the nuclear phenomena step by step, paying special attention to outstanding discoveries, such as Curie's discovery of radium, Rutherford-Soddy law, discovery of isotopes, and Rutherford's artificial transmutations. The author aims to present in a critical approach the growth of nuclear physics as seen by a nuclear physicist and historian. Contents:Part I (1896–1903):Discoveries of Radioactive SubstancesEmanation and Radioactive

DepositRadioactive RadiationsFirst InterpretationsPart II (1904–1914):First Nuclear Instruments and MethodsClarification of Alpha-Particle PropertiesOrigin of Beta- and Gamma-RaysRadioactive Series and IsotopesPart III (Atoms and X-Rays 1900–1925):Atoms Before Quantum MechanicsPart IV (Post-War Progress 1919–1931):Artificial TransmutationsMass Spectrometry and IsotopesInterpretation of Beta, Gamma and Alpha Spectra Readership: Nuclear, applied and atomic physicists.
The volume relates the nuclear physics research supported by the Air Force Office of Scientific Research in the areas of experimental high energy physics, experimental nuclear structure physics, cosmic radiation, theoretical nuclear physics and studies of tritium and radiostrontium.
This enlightening book, a sequel to QUIPS, QUOTES, AND QUANTA, helps readers to understand how physicists think about and look at the world. Starting with the discovery and investigation of cosmic rays, the book proceeds to cover some major areas of modern physics in laymen's terms. Unlike other books that deal with the history of physics, this volume concentrates on anecdotes about the physicists who created the new ideas, with a heavy emphasis on personal incidents and quotes. At the same time it presents, in every day language, the ideas created by these physicists. Both thematic and biographical in nature, readers will be entertained with humorous events in the lives of some famous scientists. Readers will also learn quite a lot about modern physics without the mathematical details, but with the important concepts intact.
When a ship's surgeon during a routine episode of bloodletting noticed that the sailors' blood was brighter in the tropics than in the north, he hypothesized that heat was a form of energy. When a young boy tried to visualize what a beam of light would look like by riding alongside it at the same speed, he began thinking along lines that eventually changed our views of space and time. When a student caught hay fever and went to recover on Heligoland, he started a major revolution in physics. These are but just some of the stories covered in this entertaining book that deals with the history of physics from the end of the 19th-century to about 1930. Quips, Quotes and Quanta (2nd Edition) is unique in that it contains anecdotes on physicists creating new ideas. Often the thinking of the creators of what is now called “modern physics” is revealed through quotes. Thematic and biographical in nature, this book also includes many personal incidents. This second edition has been revised to include new material: a prologue, epilogue, glossary and chronology, and photographs as well as additional quotes and anecdotes.
Nebulous Earth explores the history of ideas about the Earth’s interior from the 19th century through the 1960s.
Most young people only study physics through practical applications, such as equations, experiments and observations. This title, contrarily, brings physics to life and engages readers in a way that they've never experienced before. Readers will learn about the evolution of physics, from prehistory to the 21st century, including Newton and Einstein. Along the way, they gain a firm understanding of the laws of the universe, including the subatomic particle and the most vast galaxies.
Here is the essential guide to physics, an authoritative reference book and timeline that examines the foundations upon which all scientific knowledge rests. Without physics, everything else -- from astronomy to zoology -- would be a meaningless conjecture. Our journey begins with the first attempts to understand reality, Mother Nature -- or as the ancient Greeks called it, physics. Follow the journey through history as great scientists, such as Thales, Galileo, Feynman, and many others, gradually unpick the fabric of the Universe, revealing an array of fundamental forces, intangible particles, and indestructible energy. Today, physics discoveries make headline news as we confirm the fresh mysteries of the Higgs boson, supersymmetry, and dark energy.
Every reader interested in understanding the important problems in physics and astrophysics and their historic development over the past 60 years will enjoy this book immensely. The philosophy, history and the individual views of famous scientists of the 20th century known personally to the author, make this book fascinating for non-physicists, too.
This book sheds new light on the biographical approach in the history of physics by including the biographies of scientific objects, institutions, and concepts. What is a biography? Can biographies also be written for non-human subjects like scientific instruments, institutions or concepts? The respective chapters of this book discuss these controversial questions using examples from the history of physics. By approaching biography as metaphor, it transcends the boundaries between various perspectives on the history of physics, and enriches our grasp of the past.
This book presents a perspective on the history of theoretical physics over the past two hundreds years. It comprises essays on the history of pre-Maxwellian electrodynamics, of Maxwell's and Hertz's field theories, and of the present century's relativity and quantum physics. A common thread across the essays is the search for and the exploration of themes that influenced significant con ceptual changes in the great movement of ideas and experiments which heralded the emergence of theoretical physics (hereafter: TP). The fun. damental change involved the recognition of the scien tific validity of theoretical physics. In the second half of the nine teenth century, it was not easy for many physicists to understand the nature and scope of theoretical physics and of its adept, the theoreti cal physicist. A physicist like Ludwig Boltzmann, one of the eminent contributors to the new discipline, confessed in 1895 that, "even the formulation of this concept [of a theoretical physicist] is not entirely without difficulty". 1 Although science had always been divided into theory and experiment, it was only in physics that theoretical work developed into a major research and teaching specialty in its own right. 2 It is true that theoretical physics was mainly a creation of tum of-the century German physics, where it received full institutional recognition, but it is also undeniable that outstanding physicists in other European countries, namely, Ampere, Fourier, and Maxwell, also had an important part in its creation.
Presents a history of physics, examining the theories and experimental practices of the science.
This book provides a comprehensive overview of the history of ideas about the sun and the stars, from antiquity to modern times. Two theoretical astrophysicists who have been active in the field since the early 1960s tell the story in fluent prose. About half of the book covers most of the theoretical research done from 1940 to the close of the twentieth century, a large body of work that has to date been little explored by historians. The first chapter, which outlines the period from about 3000 B.C. to 1700 A.D., shows that at every stage in history human beings have had a particular understanding of the sun and stars, and that this has continually evolved over the centuries. Next the authors systematically address the immense mass of observations astronomy accumulated from the early seventeenth century to the early twentieth. The remaining four chapters examine the history of the field from the physicists perspective, the emphasis being on theoretical work from the mid-1840s to the late 1990s--from thermodynamics to quantum mechanics, from nuclear physics and magnetohydrodynamics to the remarkable advances through to the late 1960s, and finally, to more recent theoretical work. Intended mainly for students and teachers of astronomy, this book will also be a useful reference for practicing astronomers and scientifically curious general readers.
How long did it take to prove. Aristotle's ideas about falling objects wrong ? How did science evolve from Democritus, the first philosopher to talk about the existence of atoms, to today's theories concerning the universe ? Can the world now be explained in the form of equations ? This volume - articulated in three parts: I. Classical Physics II. Modern Physics and III. Questions about the universe - answers all basic questions concerning the history of physics and physics. The approach chosen here is the one adopted by Franscico Chinesta for his Ecole Centrale de Nantes course. Although the content is targeted at top-level engineering students, this volume also addresses a non-scientific audience, giving everyone a chance to marvel at scientific research. Chinesta's chronological approach allows readers to understand how the

world has gradually revealed its secrets through scientific observation, hypotheses, counterhypotheses and experimentation. Meanwhile a whole range of scientific phenomena is explained, tram why the sky is blue to what is a black hole. e simple language of the volume and titan . to hundreds of illustrations, physics to non the latest available to all.

This book serves to enhance scientific and technological literacy, by promoting STEM (Science, Technology, Engineering, and Mathematics) education with particular reference to contemporary physics. The study is presented in the form of a repertoire, and it gives the reader a glimpse of the conceptual structure and development of quantum theory along a rational line of thought, whose understanding might be the key to introducing young generations of students to physics. The recurrent theme here is that the conceptual extension of the concept of natural radiation (symbolized by the constant h) allows an easy method of charting the conceptual development of quantum theory. The repertoire focuses on some momentous events of quantum theory, including the discovery of the constant h, which is one of the fundamental constants of nature and the key to understanding quantum mechanics; the discovery of the photon by Albert Einstein; and Niels Bohr's model of the hydrogen atom; the experiments which led to disclosing the structure of atomic nuclei in the 1930s; and the discovery of quantum mechanics and quantum electrodynamics, which constitute the basis of contemporary particle physics.

The history of physics ranges from antiquity to modern string theory. Since early times, human beings have sought to understand the workings of nature--why unsupported objects drop to the ground, why different materials have different properties, and so forth. The emergence of physics as a science, distinct from natural philosophy, began with the scientific revolution of the 16th and 17th centuries when the scientific method came into vogue. Speculation was no longer acceptable; research was required. The beginning of the 20th century marks the start of a more modern physics. Physicists began to study the atom, with its electrons and its nucleus. Then they began to look at the fundamental question of the forces that hold the nucleus together and the particles that account for the natural forces. This book approaches the history of physics from a biographical point of view, considering people to be more interesting than things, and the combination of the two more interesting than the sum of the individual parts. After a brief overview of classical and modern physics, 336 one-page biographies of individuals who have made significant contributions to the field of physics are presented.

As the twentieth century drew to a close, computers, the Internet, and nanotechnology were central to modern American life. Yet the advances in physics underlying these applications are poorly understood and widely underappreciated by U.S. citizens today. In this concise overview, David C. Cassidy sharpens our perspective on modern physics by viewing this foundational science through the lens of America's engagement with the political events of a tumultuous century. American physics first stirred in the 1890s-around the time x-rays and radioactivity were discovered in Germany-with the founding of graduate schools on the German model. Yet American research lagged behind the great European laboratories until highly effective domestic policies, together with the exodus of physicists from fascist countries, brought the nation into the first ranks of world research in the 1930s. The creation of the atomic bomb and radar during World War II ensured lavish government support for particle physics, along with computation, solid-state physics, and military communication. These advances facilitated space exploration and led to the global expansion of the Internet. Well into the 1960s, physicists bolstered the United States' international status, and the nation repaid the favor through massive outlays of federal, military, and philanthropic funding. But gradually America relinquished its postwar commitment to scientific leadership, and the nation found itself struggling to maintain a competitive edge in science education and research. Today, American physicists, relying primarily on industrial funding, must compete with smaller, scrappier nations intent on writing their own brief history of physics in the twenty-first century.

Deep Learning in Introductory Physics: Exploratory Studies of Model?Based Reasoning is concerned with the broad question of how students learn physics in a model?centered classroom. The diverse, creative, and sometimes unexpected ways students construct models, and deal with intellectual conflict, provide valuable insights into student learning and cast a new vision for physics teaching. This book is the first publication in several years to thoroughly address the "coherence versus fragmentation" debate in science education, and the first to advance and explore the hypothesis that deep science learning is regressive and revolutionary. Deep Learning in Introductory Physics also contributes to a growing literature on the use of history and philosophy of science to confront difficult theoretical and practical issues in science teaching, and addresses current international concern over the state of science education and appropriate standards for science teaching and learning. The book is divided into three parts. Part I introduces the framework, agenda, and educational context of the book. An initial study of student modeling raises a number of questions about the nature and goals of physics education. Part II presents the results of four exploratory case studies. These studies reproduce the results of Part I with a more diverse sample of students; under new conditions (a public debate, peer discussions, and group interviews); and with new research prompts (model?building software, bridging tasks, and elicitation strategies). Part III significantly advances the emergent themes of Parts I and II through historical analysis and a review of physics education research. ENDORSEMENTS: "In Deep Learning in Introductory Physics, Lattery describes his extremely innovative course in which students' ideas about motion are elicited, evaluated with peers, and revised through experiment and discussion. The reader can see the students' deep engagement in constructive scientific modeling, while students deal with counter-intuitive ideas about motion that challenged Galileo in many of the same ways. Lattery captures students engaging in scientific thinking skills, and building difficult conceptual understandings at the same time. This is the 'double outcome' that many science educators have been searching for. The case studies provide inspiring examples of innovative course design, student sensemaking and reasoning, and deep conceptual change." ~ John Clement, University of Massachusetts—Amherst, Scientific Reasoning Research Institute "Deep Learning in Introductory Physics is an extraordinary book and an important intellectual achievement in many senses. It offers new perspectives on science education that will be of interest to practitioners, to education researchers, as well as to philosophers and historians of science. Lattery combines insights into model-based thinking with instructive examples from the history of science, such as Galileo's struggles with understanding accelerated motion, to introduce new ways of teaching science. The book is based on first-hand experiences with innovative teaching methods, reporting student's ideas and discussions about motion as an illustration of how modeling and model-building can help understanding science. Its lively descriptions of these experiences and its concise presentations of insights backed by a rich literature on education, cognitive science, and the history and philosophy of science make it a great read for everybody interested in how models shape thinking processes." ~ Dr. Jürgen Renn, Director, Max Planck Institute for the History of Science

Force is one of the most elementary concepts that must be understood in order to understand modern science; it is discussed extensively in textbooks at all levels and is a requirement in most science guidelines. It is also one of the most challenging - how could one idea be involved in such disparate physical phenomena as gravity and radioactivity? Forces in Physics helps the science student by explaining how these ideas originally were developed and provides context to the stunning conclusions that scientists over the centuries have arrived at. It covers the history of all of the four traditional fundamental forces - gravity, electromagnetism, weak nuclear force, and the strong nuclear force - and shows how these forces have, over the years, allowed physicists to better understand the nature of the physical world. Forces in Physics: A Historical Perspective traces the evolution of the concept from the earliest days of the Ancient Greeks to the contemporary attempt to form a GUT (Grand Unified Theory): Aristotle and others in Ancient Greece who developed ideas about physical laws and the introduction of forces into nature; Newton and others in the Scientific Revolution who discovered that forces like gravity applied throughout the universe; the 19th century examinations of thermodynamics and the forces of the very small; and 20th century developments—relativity, quantum mechanics, and more advanced physics—that revolutionized the way we understand force. The volume includes a glossary of terms, a timeline of important events, and a bibliography of resources useful for further research.

While the physical sciences are a continuously evolving source of technology and of understanding about our world, they have become so specialized and rely on so much prerequisite knowledge that for many people today the divide between the sciences and the humanities seems even greater than it was when C. P. Snow delivered his famous 1959 lecture, "The Two Cultures." In A Cultural History of Physics, Hungarian scientist and educator Károly Simonyi succeeds in bridging this chasm by describing the experimental methods and theoretical interpretations that created scientific knowledge, from ancient times to the present day, within the cultural environment in which it was formed. Unlike any other work of its kind, Simonyi's seminal opus explores the interplay of science and the humanities to convey the wonder and excitement of scientific development throughout the ages. These pages contain an abundance of excerpts from original resources, a wide array of clear and straightforward explanations, and an astonishing wealth of insight, revealing the historical progress of science and inviting readers into a dialogue with the great scientific minds that shaped our current understanding of physics. Beautifully illustrated, accurate in its scientific content and broad in its historical and cultural perspective, this book will be a valuable reference for scholars and an inspiration to aspiring scientists and humanists who believe that science is an integral part of our culture.

Forces and Fields by Mary Hesse is a history of physics surrounding the question: "How do bodies act on one another across space?" Hesse illustrates this through various answers, discussing period of transition in fundamental physics in which new concepts and ideas have been introduced and made scientifically testable, and makes a certain philosophical interpretation of science from the beginning. Some topics include the logical status of theories, primitive analogies, mechanism in Greek science, the Greek inheritance, Corpuscular Philosophy, The Theory of Gravitation and The Theory of Relativity, as well as others. Mary B. Hesse (born 1924) was a contemporary English philosopher of science. She is now professor emerita of the philosophy of science at Cambridge University. Her publication Models and Analogies in Science is a widely cited and accessible introduction to the topic. Hesse argues, contra Duhem, that models and analogies are integral to understanding scientific practice in general and scientific advancement in particular, especially how the domain of a scientific theory is extended and how theories generate genuinely novel predictions. Examples of such models include the famous billiard ball model of the dynamical theory of gases and models of light based on analogies to sound and water waves. Hesse thinks that, in order help us understand a new system or phenomenon, we will often create an analogical model that compares this new system or phenomenon with a more familiar system or phenomenon. In her book, Hesse makes a distinction between three types of analogues in scientific models: positive analogies, negative analogies, and neutral analogies. Positive analogies are those features which are known or thought to be shared by both systems, negative analogies are those features which are known or thought to be present in one system but absent in the other, and neutral analogies are those features whose status as positive or negative analogies is uncertain at present. Neutral analogies are by far the most interesting of the three types of analogies, for they suggest ways to test the limits of our models, guiding the way for scientific advancement. In the late 19th century, for example, the idea that light-waves have a physical medium called the luminiferous ether would have been best thought of as a neutral analogy with water and sound waves. Eventually, due to a null result in the Michelson-Morley and Trouton-Noble experiments, as well as other similar experiments, this analogy came to be accepted as a negative analogy - we now accept that light has no physical medium, unlike sound and water waves. The discovery of this negative analogy led to further advancement, including the unification of electro-magnetic theory with optics, and the eventual creation of new and more informative models of light.

Our understanding of nature, and in particular of physics and the laws governing it, has changed radically since the days of the ancient Greek natural philosophers. This book explains how and why these changes occurred, through landmark experiments as well as theories that - for their time - were revolutionary. The presentation covers Mechanics, Optics, Electromagnetism, Thermodynamics, Relativity Theory, Atomic Physics and Quantum Physics. The book places emphasis on ideas and on a qualitative presentation, rather than on mathematics and equations. Thus, although primarily addressed to those who are studying or have studied science, it can also be read by non-specialists. The author concludes with a discussion of the evolution and organization of universities, from ancient times until today, and of the organization and dissemination of knowledge through scientific publications and conferences.

This state of the art book takes an applications based approach to teaching mathematics to engineering and applied sciences students. The book lays emphasis on associating mathematical concepts with their physical counterparts, training students of engineering in mathematics to help them learn how things work. The book covers the concepts of number systems, algebra equations and calculus through discussions on mathematics and physics, discussing their intertwined history in a chronological order. The book includes examples, homework problems, and exercises. This book can be used to teach a first course in engineering mathematics or as a refresher on basic mathematical physics. Besides serving as core textbook, this book will also appeal to undergraduate students with cross-disciplinary interests as a supplementary text or reader.

Historical surveys of the concept of space considers Judeo-Christian ideas about space, Newton's concept of absolute space, space from 18th century to the present. Numerous original quotations and bibliographical references. "Admirably compact and swiftly paced style." — Philosophy of Science. Foreword by Albert Einstein.

The two comprehensive reviews in this volume address two fundamental problems that have been of long-standing interest and are the focus of current effort in contemporary nuclear physics: exploring experimentally the density distributions of constituents within the nucleus and understand ing nuclear structure and interactions in terms of hadronic degrees of freedom. One of the major goals of experimental probes of atomic nuclei has been to discover the spatial distribution of the constituents within the nucleus. As the energy and specificity of probes have increased over the years, the degree of spatial resolution and ability to select specific charge, current, spin, and isospin densities have correspondingly increased. In the first chapter, Batty, Friedman, Gils, and Rebel provide a thorough review of what has been learned about nuclear density distributions using electrons, muons, nucleons, antinucleons, pions, alpha particles, and kaons as probes. This current understanding, and the limitations thereof, are crucial in framing the questions that motivate the next generation of experimental facilities to study atomic nuclei with electromagnetic and hadronic probes. The second chapter, by Machleidt, reviews our current understanding of nuclear forces and structure in terms of hadronic degrees of freedom, that is, in terms of mesons and nucleons. Such an understanding in terms of hadronic variables is crucial for two reasons. First, since effective hadronic theories are quite successful in describing a broad range of phenomena in low-energy nuclear physics, and there are clear experimental signatures of meson exchange currents in nuclei, we must understand their foundations.

Forces of the Quantum Vacuum presents a number of theoretical approaches to Casimir, van der Waals and Casimir–Polder forces that have been fruitfully employed in mainstream research, and also reviews the experimental evidence for Casimir forces. Beginning with basic ideas in quantum mechanics and building its way to a sophisticated form of macroscopic QED, the book provides an inspiring training manual for graduate students to develop in a natural progression the ideas needed for modern theoretical research on Casimir forces.

The research in Physics Education has to do with the search of solutions to the complex problem of how to improve the learning and teaching of physics. The complexity of the problem lies in the different fields of knowledge that need to be considered in the research. In fact, besides the disciplinary knowledge in physics (which must be considered from the conceptual, the historical, and the epistemological framework), one has to take into account some basic knowledge in the context of psychology and the cognitive sciences (for the general and contextual aspects of learning) and some basic knowledge in education and comunication (for what concerns teaching skills and strategies). Looking back at the historical development of the research one may recognize that the complexity of the endeavour was not clear at first but became clear in its development, which shifted the focus of the research in the course of time from physics to learning to teaching. We may say that the research started, more than 30 years ago, with a focus on disciplinary knowledge. Physicists in different parts of the western world, after research work in some field of physics, decided to concentrate on the didactical comunication of physical knowledge.