

## New books on physics and related sciences

DOI: 10.3367/UFNe.0185.201502j.0223

**Rubakov V A** *Classical Gauge Fields: Boson Theories* Stereotype ed. (Moscow: Izd-vo URSS, 2014) 296 pp. ISBN 978-5-3970-4249-9.

Based on a lecture course delivered to third- and fourth-year students of the Faculty of Physics of Moscow State University specializing in theoretical physics, the book consists of two parts. Part I provides an understanding of the main ideas of gauge field theory, the construction of gauge-invariant Lagrangians, and a description of the spectra of linear excitations, including the region above the nontrivial ground state. Part II of the book deals with the construction and interpretation of solutions whose existence is entirely due to nonlinearity of the field equations, namely, solitons, ‘Euclidean bubbles’, instantons, and sphalerons. The material presented can be studied in parallel with quantum mechanics and then quantum field theory. In view of this, the book will be useful for both research workers and postgraduates, as well as senior university students. (URSS Publishers: 117335 Moscow, Nakhimovskii prospect 56; tel./fax: +7 (499) 724-25-45; e-mail: [urss@URSS.ru](mailto:urss@URSS.ru); URL: <http://urss.ru/>)

**Rubakov V A** *Classical Gauge Fields: Theories with Fermions. Noncommutative Theories* 5th edition. (Moscow: Izd-vo URSS, 2014) 248 pp. ISBN 978-5-9710-1108-8.

The book evolved from a lecture course delivered to third- and fourth-year students of the Faculty of Physics of Moscow State University engaged in theoretical physics. The first part of the book is devoted to various effects due to the interaction of fermions with topological objects emerging in scalar and gauge field theories, i.e., solitons, instantons, and sphalerons. The second part presents less traditional material concerning classical theories of fields on noncommutative spaces and solitons in such theories. The book has a Supplement discussing briefly the role of instantons as saddle points of the Euclidean functional integral in quantum field theory and some related issues. The material presented can be studied in parallel with quantum mechanics and then quantum field theory. For this reason, the book will be of interest to both research workers and postgraduates, as well as senior university students. (URSS Publishers: 117335 Moscow, Nakhimovskii prospect 56; tel./fax: +7 (499) 724-25-45; e-mail: [urss@URSS.ru](mailto:urss@URSS.ru); URL: <http://urss.ru/>)

**Krasnikov N V, Matveev V A** *New Physics at the Large Hadron Collider* Stereotype ed. (Moscow: Izd-vo URSS, 2014) 208 pp. ISBN 978-5-3960-0629-4.

The monograph gives a review of the most important avenues of inquiry for new physics in forthcoming experiments at the

Large Hadron Collider (LHC) designed by an international team of scientists and experts from many countries on the basis of the European Organization for Nuclear Research (CERN) in Geneva. The main focus in the book is on the search for the Higgs boson, underlying the mechanism of spontaneous gauge symmetry breaking of electroweak interactions. Moreover, the search for supersymmetry and some other exotic phenomena predicted by different extensions of the Standard Model of elementary particles is discussed in detail. The book is intended for research workers, both theorists and experimentalists; for specialists in the field of modeling physical processes in high-energy particle collisions at modern colliders, and for all those involved in learning elementary particle physics, high-energy physics, and quantum field theory. (URSS Publishers: 117335 Moscow, Nakhimovskii prospect 56; tel./fax: +7 (499) 724-25-45; e-mail: [urss@URSS.ru](mailto:urss@URSS.ru); URL: <http://urss.ru/>)

**Bityukov S I, Krasnikov N V** *Application of Statistical Methods to the Search for New Physics at the Large Hadron Collider* (Moscow: Izd-vo URSS, 2014) 272 pp. ISBN 978-5-3960-0605-8.

The book provides a comprehensive account of statistical methods applied in the search for new physics in experiments at the Large Hadron Collider. Numerous examples useful for physicists engaged in processing data from the detectors at Large Hadron Collider are given. The book is intended for research workers, both theorists and experimentalists, for specialists in modeling physical processes in collisions of high-energy particles at modern colliders, and for all those involved in extracting physical results from experimental data. (URSS Publishers: 117335 Moscow, Nakhimovskii prospect 56; tel./fax: +7 (499) 724-25-45; e-mail: [urss@URSS.ru](mailto:urss@URSS.ru); URL: <http://urss.ru/>)

**Voloshin M B, Ter-Martirosyan K A** *The Theory of Gauge Interactions of Elementary Particles* 2nd ed. (Moscow: Izd-vo URSS, 2015) 298 pp. ISBN 978-5-9710-1777-6.

The theories of gauge interactions (electromagnetic and weak) among elementary particles and also of the strong interaction described by quantum chromodynamics are expounded in this book. The problems of renormalizations, spontaneous symmetry breaking, and interaction unification schemes are also discussed. The application of quantum chromodynamics to processes with the participation of hadrons is analyzed. First edition of the book (Moscow: Energoatomizdat, 1984) was revised and enlarged. The book is intended for research workers, postgraduates, and students specializing in the physics of elementary particles. (URSS Publishers: 117335 Moscow, Nakhimovskii prospect 56; tel./fax: +7 (499) 724-25-45; e-mail: [urss@URSS.ru](mailto:urss@URSS.ru); URL: <http://urss.ru/>)

**Hawking Stephen, Penrose Roger** *The Nature of Space and Time* (Translation from the English by A Berkov, V Lebedev) (St. Petersburg: Izd-vo Amphora, 2014) 172 pp. ISBN 978-5-3670-2289-6.

The book evolved from a dispute between the well-known scientists Stephen Hawking and Roger Penrose. This polemic became the apex of the program realized in 1994 at the Isaac Newton Institute of Mathematical Sciences at Cambridge University. In the framework of this program, some of the most fundamental ideas about the origin of the Universe were discussed. This was, in a sense, a continuation of the famous controversy between Niels Bohr and Albert Einstein concerning the basic principles of quantum mechanics. The original: Hawking S, Penrose R *The Nature of Space and Time* (Princeton: Princeton Univ. Press, 2010). (St. Petersburg: Amphora Publ.: Admiral Lazarev embankment 20, 197110 St. Petersburg; tel./fax: +7(812) 331-16-91; e-mail: secret@amphora.ru; URL: <http://amphora.ru/>)

**Where Did Cosmology Come From** ('Physics' series. Compiled by V Matsarskii) (Moscow–Izhevsk: Izd-vo RKhD, 2014) 568 pp. ISBN 978-5-9397-2982-6.

This collection of papers includes work performed by the founders of cosmology and published from 1917 to 1949. Most of the papers in the collection have never appeared in the Russian language before. It is of interest for cosmologists, astrophysicists, specialists in general relativity theory, historians of the sciences, and all those interested in problems of the origin and evolution of the Universe.

**Contents:** 1. A Einstein “Cosmological considerations in the general theory of relativity”. 2. W de Sitter “On Einstein’s theory of gravitation and its astronomical consequences”. 3. A Einstein “Critical comment on a solution of the gravitational field equations given by Mr. de Sitter”. 4. A A Friedmann “On the curvature of space”. 5. A Einstein “Remarks on the Paper by A Friedmann: “On the curvature of space””. 6. A Einstein “About A Friedmann’s paper on the curvature of space”. 7. A A Friedmann “On the possibility of a world with constant negative curvature of space”. 8. G Lemaitre “A homogeneous universe of constant mass and growing radius accounting for the radial velocity of extra-galactic nebulae”. 9. J H Jeans “The new outlook in cosmogony”. 10. E Hubble “A relation between distance and radial velocity among extra-galactic nebulae”. 11. R C Tolman “On the astronomical implications of the de Sitter line element for the Universe”. 12. H Weyl “Redshift and relativistic cosmology”. 13. F Zwicky “On the red shift of spectral lines through interstellar space”. 14. A Eddington “On the instability of Einstein’s spherical world”. 15. M P Bronstein “Modern state of relativistic cosmology”. 16. G Lemaitre “The beginning of the world from the point of view of quantum theory”. 17. A Einstein “About the cosmological problem in general relativity”. 18. A Einstein and W de Sitter “On the relation between the expansion and the mean density of the Universe”. 19. E A Miln “World structure and the expansion of the Universe”. 20. H P Robertson “Relativistic cosmology”. 21. A Einstein “Sur la structure cosmologique de l’espace”. 22. W Baade and F Zwicky “On super-novae”. 23. W de Sitter “On the foundations of the theory of relativity with special reference to the theory of the expanding Universe”. 24. W McCrea “Observable relations in relativistic cosmology”. 25. P A M Dirac “Cosmological constants”. 26. P A M Dirac “A new basis for cosmology”.

27. G Gamow and E Teller “On the origin of large nebulae”. 28. A McKellar “Possible molecular identification of interstellar spectral lines”. 29. A Einstein “On the cosmological problem”. 30. G Gamow “Expanding Universe and the origin of elements”. 31. R A Alpher, H Bethe, and G Gamow “The origin of chemical elements”. 32. H Bondi “Review of cosmology”. 33. H Bondi and T Gold “The steady-state theory of the expanding Universe”. 34. F Hoyle “A new model for the expanding Universe”. 35. G Gamow “The evolution of the Universe”. 36. R A Alpher and R Herman “The evolution of the Universe”. 37. F Hoyle “Stellar evolution and the expanding Universe”. 38. R A Alpher and R Herman “Remarks on the evolution of the expanding Universe”. 39. G Gamow “On relativistic cosmogony”. 40. G Lemaitre “Cosmological application of relativity”. 41. R Tolman “The age of the Universe”, Appendix 1: R A Alpher and R Herman “Reflections on early work on ‘Big Bang’ cosmology”; Appendix 2: H Bondi, T Gold, and F Hoyle “Origins of steady-state theory”. (Research-Publishing Center Regular and Chaotic Dynamics, ul. Universitetskaya 1, 426034 Izhevsk, Russian Federation; tel. +7(3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: <http://shop.rcd.ru/>)

**Shtern B E** *The Breakthrough Beyond the Edge of the World: On the Cosmology of Earthlings and Europeans* (Sci. Ed. V A Rubakov) (Troitsk: The Troitsk version, 2014) 324 pp. ISBN 978-5-8951-3345-3.

The last several years have become the epoch of triumph of cosmological inflation theory explaining the origin of the Universe. This theory originated in the early 1980s at the level of ideas, models, and scenarios, which gave birth to a number of clear verifiable predictions. These predictions are now coming true one after another owing to the precise measurements of relic radiation, digital surveys of the sky, and other observations. The book reflects the development of the basic ideas of cosmology over the last hundred years, the main focus being the cosmological inflation theory. Interviews are presented with scientists who made a decisive contribution to the formation of this theory, namely, with Andrey Linde, Professor at Stanford University and winner of the P A M Dirac medal (2002), the Milner Prize on fundamental physics (2012), and the Kavli Prize on astrophysics (2014); with Professor Vladimir Lukash, head of department at the Astrocosmic Center under the Lebedev Physical Institute, laureate of RAS A A Friedmann Prize (2008); with Vyacheslav Mukhanov, Professor at Ludwig Maximilian University of Munich, Gruber Cosmology Prize winner (2013), and with Aleksey Starobinskii, RAS Academician, Chief Researcher at the L D Landau Institute of Theoretical Physics, winner of the Gruber Cosmology Prize (2013) and the Kavli Prize on astrophysics (2014). The added science-fiction plot of the book illustrates the main line on simpler material, namely, the development of the cosmology of rational beings under the ice of the ocean on Europa, one of Jupiter’s moons. The book is meant for a wide range of readers, although the complexity of the material differs greatly from chapter to chapter. According to the author expectation: “Any reader — from a schoolboy to a professional physicist — will find in the book what is clear and interesting to him.” (For purchase: e-mail: proryvza@yandex.ru; URL: <http://trv-science.ru/proryv-gde-kupit-knigu-proryv-za-krajj-mira/>)

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