

Physics–Uspekhi

Advances in Physical Sciences



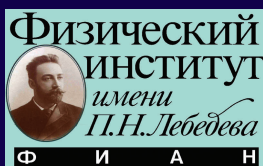
100th ANNIVERSARY OF THE IOFFE INSTITUTE

August 2019

Volume 62, Number 8

Translation of the Russian journal
Успехи физических наук, Uspekhi Fizicheskikh Nauk

August 2019, Volume 189, No. 8



Turpion

IOP Publishing



PHYSICS- USPEKHI

ISSN 1063-7869 (Print)
ISSN 1468-4780 (Online)

CODEN: PHUSEY

Uspekhi Fizicheskikh Nauk

Editor Valery A Rubakov
Associate Editors Lev P Pitaevskii, Oleg V Rudenko
Managing Editor Maria S Aksent'eva
Advisory Board Evgenii B Aleksandrov
Fazly I Ataullakhanov
Yurii V Gulyaev
Sergei P Denisov
Lev M Zelenyi
Aleksandr A Kaplyanskii
Olga A Kocharovskaya
Gennadii N Kulipanov
Aleksandr G Litvak
Gennadii A Mesyats
Rashid A Sunyaev
Vladimir E Fortov
Aleksandr R Khokhlov
Anatolii M Cherepashchuk

Editorial Board

Petr I Arseev
Vasily S Beskin
Aleksandr E Bondar'
Vadim V Brazhkin
Sergei V Bulanov
Mikhail A Vasil'ev
Mikhail I Vysotskii
Igor M Dremin
Aleksandr M Zheltikov
Genrikh R Ivanitskii
Dmitrii I Kazakov
Vitalii V Kveder
Nikolai N Kolachevskii
Zakhar'ii F Krasil'nik
Evgenii A Kuznetsov
Sergei A Nikitov
Vladimir F Obraztsov
Pavel N Pakhlov
Konstantin A Postnov
Vladimir I Ritus
Grigorii I Rubtsov
Mikhail V Sadovskii
Aleksandr M Sergeev
Boris M Smirnov
Robert A Suris
Dmitrii R Khokhlov
Maria V Chekhova
Evgenii M Churazov

Scientific and Staff Editors

MS Aksent'eva, EA Frimer, TB Larionova, TG Orekhova,
TP Romanova, EV Zakharova

Uspekhi Fizicheskikh Nauk (Успехи Физических Наук, www.ufn.ru) publishes reviews of the current state of the most topical problems in physics and in associated fields under the general headings: reviews of topical problems, physics of our days, instruments and methods of investigation, methodological notes, from the history of physics, conferences and symposia, personalia, physics news on the Internet, and bibliography. The journal was founded in 1918 and is published monthly.

Physics – Uspekhi

Scientific Editors
MS Aksent'eva, VL Derbov, AM Semikhatov

English Language Editor

K Franchuk

Desk Editors

AV Bobkov, NV Gribkova, OV Morgunova,
SN Losev (emblem *Ioffe Institute-100*)

Physics–Uspekhi (Advances in Physical Sciences) is the English edition of the Russian monthly journal *Uspekhi Fizicheskikh Nauk*. Translation into English started with Russian volume 66. From 1958 until 1992 the journal was published by American Institute of Physics under the title *Soviet Physics–Uspekhi* and in 1993 under its current title *Physics–Uspekhi*. Since 1994 *Physics–Uspekhi* has been published jointly by Uspekhi Fizicheskikh Nauk and Turpion Ltd. From the beginning of 1996 *Physics–Uspekhi* is being translated, typeset and edited in Moscow by Uspekhi Fizicheskikh Nauk (UFN), from 2009 published by Uspekhi Fizicheskikh Nauk, Moscow, printed by Page Bros, Norwich, UK.

Institutional subscription information (volume 62, 2019, monthly)

For all countries, except the United States, Canada, Central and South America, the subscription rates are: Print + Online (1958 – 2019) £ 1953; Online only (1958 – 2019) £ 1757. Delivery is by air-speeded mail from the UK.

Orders, back issues, change of address to: Physics–Uspekhi, Journals Subscription Fulfilment, IOP Publishing, Temple Circus, Temple Way, Bristol BS1 6HG, United Kingdom

For the United States, Canada, Central and South America, the subscription rates are:

Print + Online (1958 – 2019) US \$3515; Online only (1958 – 2019) US \$3160. Delivery is by transatlantic airfreight and onward mailing.

United States Postal Identification Physics – Uspekhi, volume 62, published monthly. Periodicals Postage Paid at Continental Station, PA and additional mailing offices.

POSTMASTER: Send orders, address changes to *Physics – Uspekhi*, IOP Publishing, PO Box 320, Congers, NY 10920-0320, USA.

Online services: Since 2008 electronic access to the journal content is hosted by IOP Publishing. All subscriptions to the journal include electronic access dating from the first English translation volume. The electronic version of the journal is available at <http://iopscience.org/phu>. All questions regarding online access should be sent to customer services at customerservices@iopublishing.org or custserv@turpion.ru

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form, or by any means, electronic, mechanical, photographic, recording, or otherwise, without the prior permission of *Uspekhi Fizicheskikh Nauk*.

Editorial Office: P N Lebedev Physical Institute, RAS, Leninskiĭ prospekt 53, 119991 Moscow, Russian Federation
Tel. (7-499) 132 62 65, (7-499) 190 34 52
Tel./Fax (7-499) 190 42 44. E-mail: ufn@ufn.ru

Contents

	100th ANNIVERSARY OF THE IOFFE INSTITUTE	737
785	Cosmic gamma-ray bursts and soft gamma-repeaters — observations and modeling of extreme astrophysical phenomena (100th anniversary of the Ioffe Institute) R L Aptekar, A M Bykov, S V Golenetskii, D D Frederiks, D S Svinkin, M V Ulanov, A E Tsvetkova, A V Kozlova, A L Lysenko	739
803	SiC-based electronics (100th anniversary of the Ioffe Institute) A A Lebedev, P A Ivanov, M E Levinshtein, E N Mokhov, S S Nagalyuk, A N Anisimov, P G Baranov	754
849	Spintronics of semiconductor, metallic, dielectric, and hybrid structures (100th anniversary of the Ioffe Institute) P G Baranov, A M Kalashnikova, V I Kozub, V L Korenev, Yu G Kusrayev, R V Pisarev, V F Sapega, I A Akimov, M Bayer, A V Scherbakov, D R Yakovlev	795
881	Resonance effects in photonic crystals and metamaterials (100th anniversary of the Ioffe Institute) M V Rybin, M F Limonov	823
899	In memory of Zhores Ivanovich Alferov	839
901	In memory of Vadim Vasil'evich Afrosimov	841
903	Physics news on the Internet Yu N Eroshenko	845

◇ ◇ ◇

In the next issue

Mass ejections from the solar atmosphere
B P Filippov

Spin excitations in two-dimensional electron gas, their relaxation, photoexcitation and detection methods, and the role of Coulomb correlations
L V Kulik, A V Gorbunov, S M Dickmann, V B Timofeev

Topological defects in active liquid crystals
I S Aranson

Equivalent photons in proton and ion–ion collisions at the LHC
M I Vysotsky, E V Zhemchugov

The Higgs program and open questions in particle physics and cosmology
B Heinemann, Y Nir

Molybdenum-99 production via lead and bismuth moderators and milli-structure-⁹⁸Mo samples by indirect production technique using Monte Carlo method
A Khorshidi

Personalia

Letters to the editors

Physics news on the Internet

