

Physics–Uspekhi

Advances in Physical Sciences



April 2019

Volume 62, Number 4

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

April 2019, Volume 189, No. 4



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 Sadvovskii
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,
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, A Radzig, A M Semikhatov
English Language Editor K Franchuk
Desk Editors AV Bobkov, N V Gribkova, OV Morgunova

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 Statement** *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, Leninskii 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

337	Hadron physics in magnetic fields M A Andreichikov, B O Kerbikov, Yu A Simonov	319
359	High-energy electroproduction in an atomic field P A Krachkov, A I Milstein	340
375	On regularities in the spontaneous formation of structural hierarchies in chiral systems of nonliving and living matter V A Tverdislov, E V Malyshko	354
387	Prospects of elementary particle physics D I Kazakov	364
403	Hypothetical signs of life on Venus: revising results of 1975–1982 TV experiments L V Ksanfomality, L M Zelenyi, V N Parmon, V N Snytnikov	378
433	Charge exchange injection into accelerators and storage rings V G Dudnikov	405
441	Electromagnetic analogies in electro- and magnetostatics problems G N Gaidukov, I N Gorbatyi	413
386	Physics news on the Internet Yu N Eroshenko	421

◇ ◇ ◇

In the next issue

Interferometric observations of supermassive black holes in the millimeter wave band

P B Ivanov, E V Mikheeva, V N Lukash, A M Malinovsky, S V Chernov, A S Andrianov, V I Kostenko, S F Likhachev

Experiments at the ILC linear collider: expected physical results

A G Drutskoy

Experimental plasma relativistic microwave electronics

P S Strelkov

Material equations and Maxwell equations for isotropic media; waves with negative group velocity and negative values of $\epsilon(\omega)$ and $\mu(\omega)$

V P Makarov, A A Rukhadze

Green's function method in the theory of Brownian motors

V M Rozenbaum, I V Shapochkina, L I Trakhtenberg

Relaxation of interacting open quantum systems

V Yu Shishkov, E S Andrianov, A A Pukhov, A P Vinogradov, A A Lisyansky

In memory of Viktor Pavlovich Silin

Physics news on the Internet

