

# Physics–Uspekhi



**April 2026**  
**Volume 69, Number 4**

**Translation of the Russian journal**

**Успехи физических наук, Uspekhi Fizicheskikh Nauk**

**April 2026, Volume 196, No. 4**

**БАЗИС**



# PHYSICS- USPEKHI

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

CODEN: PHUSEY

## Uspekhi Fizicheskikh Nauk

**Uspekhi Fizicheskikh Nauk (UFN)** (*Успехи физических наук* (*УФН*), [www.ufn.ru](http://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.

**Editor-in-Chief** 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  
Olga A Kocharovskaya  
Gennadii N Kulipanov  
Aleksandr G Litvak  
Gennadii A Mesyats  
Rashid A Sunyaev  
Aleksei R Khokhlov  
Anatolii M Cherepashchuk

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

## Physics – Uspekhi

**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.

**Scientific Editors**  
MS Aksent'eva, VL Derbov, IA Ulitkin

**Scientific and Staff Editors**  
MS Aksent'eva, SM Apenko,  
EA Frimer, EV Zakharova

**Desk Editors**  
AV Bobkov, MA Morgunova

**Online services**  
The electronic version of the journal is available at <http://ufn.ru/en/>. All questions regarding online access should be sent to customer services at [ufn@ufn.ru](mailto:ufn@ufn.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,  
Leninskiy prospekt 53, 119991 Moscow,  
Russian Federation  
Tel. (7-499) 190 34 52  
Tel./Fax (7-499) 190 42 44.  
E-mail: [ufn@ufn.ru](mailto:ufn@ufn.ru)

## Contents

|     |                                                                                                                                                                                                                                                                                                          |     |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 333 | <b>Atom in intense laser fields: from the generation of coherent short-wavelength radiation to the nonlinear properties of a gas medium</b><br>K.V. Lvov, S.Yu. Stremoukhov                                                                                                                              | 311 |
| 369 | <b>Memristors for neuromorphic computing systems: basic parameters and methods of their optimization</b><br>A.S. Ilin, A.N. Matsukatova, M.N. Martyshev,<br>A.V. Emelyanov, V.V. Rylkov, V.A. Demin,<br>P.A. Forsh, P.K. Kashkarov, M.V. Kovalchuk                                                       | 344 |
| 383 | <b>Commissioning of Collider NICA and formation of first heavy ion beams</b><br>A.V. Butenko, V.A. Lebedev, E.M. Syresin, G.V. Trubnikov                                                                                                                                                                 | 357 |
| 388 | <b>Compact neutron source DARIA in Russian strategy for developing neutron research</b><br>T.V. Kulevoy, S.V. Grigoriev, N.A. Kovalenko,<br>K.A. Pavlov, E.V. Moskvina, N.A. Grigoryeva,<br>E.A. Kravtsov, V.A. Skalyga, I.V. Izotov,<br>G.N. Kropachev, A.L. Sitnikov, N.V. Mushnikov,<br>L.V. Kravchuk | 362 |
| 403 | <b>Superresolution effect and resolvability criterion for the waves in anisotropic media</b><br>E.H. Lock, S.V. Gerus, A.V. Sadovnikov                                                                                                                                                                   | 375 |
| 422 | <b>From Kepler's ellipses — to R-toroids</b><br>B.P. Kondratyev                                                                                                                                                                                                                                          | 392 |
| 436 | <b>Synchrotron radiation in nonuniform magnetic field</b><br>V.S. Beskin, A.Yu. Istomin, F.A. Kniazev, T.I. Khalilov                                                                                                                                                                                     | 406 |
| 447 | <b>Grigory Gennadievich Denisov (on his 70th birthday)</b>                                                                                                                                                                                                                                               | 415 |
| 446 | <b>Physics news on the Internet: April 2026</b><br>Yu.N. Eroshenko                                                                                                                                                                                                                                       | 417 |

◇ ◇ ◇

## In the next issue

### Problems of Condensed Matter Physics

(Scientific Session of the Physical Sciences Division of the Russian Academy of Sciences (PSD RAS) on April 23, 2025)

*Phase transformations at grain boundaries and with their participation*

B.B. Straumal, O.A. Kogtenkova, A.S. Gornakova

*Topological semimetals: surface transport and spin effects*

E.V. Deviatov

*Exciton condensates in integer and fractional quantum Hall dielectrics*

A.V. Larionov, A.V. Gorbunov, L.V. Kulik

*Griffiths phases and anomalous increase in the Curie temperature in systems with magnetic disorder*

S.V. Demishev, V.V. Brazhkin, A.V. Bokov,  
O.S. Volkova, R.M. Eremina, V.N. Krasnorussky,  
I.K. Shamova, A.V. Tsvyashchenko

*Physics of phase transitions in two dimensions:*

*Berezinskii–Kosterlitz–Thouless and beyond*

V.N. Ryzhov, V.V. Brazhkin, E.E. Tareyeva,  
Yu.D. Fomin, E.N. Tsiok

*Physics news on the Internet: May 2026 (Yu.N. Eroshenko)*