

# Physics-Uspekhi



November 2025  
Volume 68, Number 11

Translation of the Russian journal

Успехи физических наук, Uspekhi Fizicheskikh Nauk

November 2025, Volume 195, No. 11

БАЗИС



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

CODEN: PHUSEY

# PHYSICS-USPEKHI

## 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 Ataullakhhanov  
Yuriii 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 Ritus  
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**  
M S Aksent'eva, VL Derbov, A M Semikhatov

**English Language Editor**  
K Franchuk

**Scientific and Staff Editors**  
M S Aksent'eva, EA Frimer, TB Larionova,  
TV Smolina, EV Zakharova

**Desk Editors**  
AV Bobkov, N V Gribkova, M A Morgunova

**Online services**  
The electronic version of the journal is available at <http://ufn.ru/en/> and <http://iopscience.org/phu>. All questions regarding online access should be sent to customer services at [ufn@ufn.ru](mailto:ufn@ufn.ru) and [customerservices@ioppublishing.org](mailto:customerservices@ioppublishing.org)

**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](mailto:ufn@ufn.ru)

## Contents

### 60th ANNIVERSARY OF L.D. LANDAU INSTITUTE FOR THEORETICAL PHYSICS, RAS

ii	<b>60th anniversary of L.D. Landau Institute for Theoretical Physics of Russian Academy of Sciences</b>	1071
1135	<b>Landau Institute for Theoretical Physics turns 60</b> I.S. Burmistrov, I.V. Kolokolov, V.V. Lebedev	1072
1137	<b>From Landau two-fluid model to de Sitter Universe</b> G.E. Volovik	1074
1157	<b>Effect of Pearl vortices on shape and position of Néel-type skyrmions in superconductor–chiral ferromagnet heterostructures</b> S.S. Apostoloff, E.S. Andriyakhina, I.S. Burmistrov	1092
1179	<b>High intensity statistics of light propagating in turbulent fluid</b> I.V. Kolokolov, V.V. Lebedev	1112
1199	<b>Nonlinear generation of currents by waves on liquid surface</b> S.S. Vergeles, A.A. Levchenko, V.M. Parfenyev	1131
1221	<b>Toroid, altermagnetic, and noncentrosymmetric ordering in metals</b> V.P. Mineev	1151
1232	<b>About 2025 Nobel Prize in Physics</b> V.P. Mineev	1161
1235	<b>Noether formalism for constructing conserved quantities in teleparallel equivalents of general relativity</b> E.D. Emtsova, A.N. Petrov, A.V. Toporensky	1164
1245	<b>In memory of Yurii Nikolaevich Ovchinnikov</b>	1173
1247	<b>Vladimir Vladilenovich Kocharovskiy (on his 70th birthday)</b>	1175
1249	<b>Efim Arkad'evich Khazanov (on his 60th birthday)</b>	1178
1251	<b>Physics news on the Internet: November 2025</b> Yu.N. Eroshenko	1180

◊

◊

◊

## In the next issue

### TO THE 80th ANNIVERSARY OF VICTORY IN THE GREAT PATRIOTIC WAR

**On the 80th Anniversary of the Great Victory: Contribution of Russian Physicists**  
(Scientific Session of the Physical Sciences Division of the Russian Academy of Sciences (PSD RAS) on May 14, 2025)

*Kurchatov Institute for science of the Great Victory*  
M.V. Kovalchuk, I.V. Fedoseeva, E.B. Yatsishina

*Acoustics and the Defense of the Fatherland*  
O.V. Rudenko

*Academician V.A. Kotelnikov's works (1932–1946) — the basis of research fields in encryption, cryptography, and potential noise immunity*  
S.A. Nikitov, L.E. Nazarov

*Role of Academy of Sciences in Atomic Project*  
A.K. Chernyshev

*Radical pair mechanism in magnetobiology: state of the art*  
V.N. Binhi

*X-ray Cherenkov radiation near photoabsorption edge*  
A.P. Potylitsyn, A.V. Vukolov, S.R. Uglov, M.V. Shevelev

*V.P. Neznamov. Mathematical paradoxes of Dirac equation representations*

*Ibragimkhan Kamilovich Kamilov (on his 90th birthday)*

*Physics news on the Internet: December 2025 (Yu.N. Eroshenko)*