

CAMBRIDGE

## Noteworthy Titles from Cambridge!

### NIST Handbook of Mathematical Functions

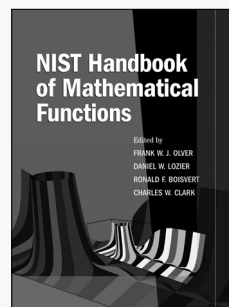
EDITED BY FRANK W. J. OLVER, DANIEL W. LOZIER, RONALD F. BOISVERT,  
AND CHARLES W. CLARK

Modern developments in theoretical and applied science depend on knowledge of the properties of mathematical functions, from elementary trigonometric functions to the multitude of special functions. These functions appear whenever natural phenomena are studied, engineering problems are formulated, and numerical simulations are performed. They also crop up in statistics, financial models, and economic analysis. Using them effectively requires practitioners to have ready access to a reliable collection of their properties.

This handbook results from a 10-year project conducted by the National Institute of Standards and Technology with an international group of expert authors and validators. It is destined to replace its predecessor, the classic but long-outdated *NBS Handbook of Mathematical Functions*, edited by Abramowitz and Stegun.

\$99.00: Hb: 978-0-521-19225-5: 966 pp.

\$50.00: Pb: 978-0-521-14063-8



Forthcoming...

### Modern Plasma Physics Volume 1: Physical Kinetics of Turbulent Plasmas

PATRICK H. DIAMOND,  
SANAE-I. ITOH, AND KIMITAKA ITOH

#### CONTENTS:

1. Introduction
2. Conceptual foundations
3. Quasi-linear theory
4. Nonlinear wave-particle interaction
5. Kinetics of nonlinear wave-wave interaction
6. Closure theory
7. Disparate scale interactions
8. Cascades, structures and transport in phase space turbulence
9. MHD turbulence

Appendixes  
References

Index

\$130.00: Hb: 978-0-521-86920-1: 456 pp.

### Advanced Magnetohydrodynamics With Applications to Laboratory and Astrophysical Plasmas

J. P. GOEDBLOED,  
RONY KEPPENS,  
AND STEFAAN POEDTS

\$190.00: Hb: 978-0-521-87957-6: 648 pp.

\$95.00: Pb: 978-0-521-70524-0

### Power Exhaust in Fusion Plasmas

WOJCIECH FUNDAMENSKI

\$125.00: Hb: 978-0-521-85171-8: 444 pp.

Second Edition!

### The Solar Corona

LEON GOLUB  
AND JAY M. PASACHOFF

\$80.00: Hb: 978-0-521-88201-9: 404 pp.

### The Plasma Universe

CURT SUPLEE

*"The Plasma Universe* is a lively, compact, beautifully illustrated and eminently readable exposition of the amazing scope of modern plasma physics. The common phenomena underlying plasma TV's sunspots and the violent death of stars are lucidly explained at level suitable for a broad audience. I particularly liked the one-page profiles of the scientists who shaped the subject, starting with Irving Langmuir, that are sprinkled throughout the text: they provide welcome historical context and human interest."

—Curtis Callen, Professor of Physics, Princeton University, and President-Elect, American Physical Society

\$20.99: Pb: 978-0-521-51927-4: 88 pp.

Prices subject to change.

www.cambridge.org/us/physics  
800.872.7423



CAMBRIDGE  
UNIVERSITY PRESS

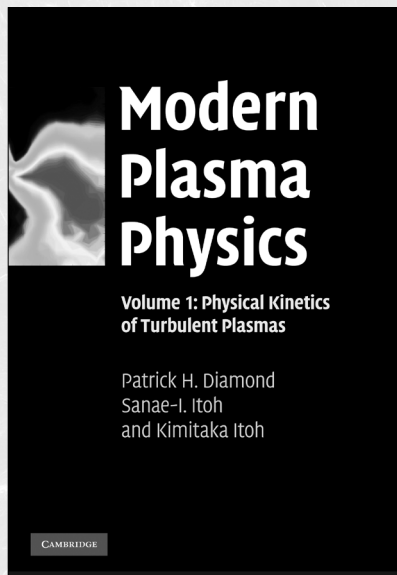
CAMBRIDGE

Noteworthy Title from Cambridge!

## Modern Plasma Physics

Volume 1: Physical Kinetics of Turbulent Plasmas

PATRICK H. DIAMOND, SANAE-I. ITOH, KIMITAKA ITOH



\$130.00: Hardback: 978-0-521-86920-1: 456 pp.

This three-volume series presents the ideas, models and approaches essential to understanding plasma dynamics and self-organization for researchers and graduate students in plasma physics, controlled fusion and related fields such as plasma astrophysics. Volume I develops the physical kinetics of plasma turbulence through a focus on quasi-particle models and dynamics. It discusses the essential physics concepts and theoretical methods for describing weak and strong fluid and phase space turbulence in plasma systems far from equilibrium. The book connects the traditionally 'plasma' topic of weak or wave turbulence theory to more familiar fluid turbulence theory, and extends both to the realm of collisionless phase space turbulence. This gives readers a deeper understanding of these related fields, and builds a foundation for future applications to multi-scale processes of self-organization in tokamaks and other confined plasmas. This book emphasizes the conceptual foundations and physical intuition underpinnings of plasma turbulence theory.

*Price subject to change.*

[www.cambridge.org/us/physics](http://www.cambridge.org/us/physics)  
800.872.7423



**CAMBRIDGE**  
UNIVERSITY PRESS



# Journal of Fluid Mechanics

## **Journal of Fluid Mechanics**

is available online at

<http://journals.cambridge.org/flm>

### **To subscribe contact Customer Services**

#### **in Cambridge:**

Phone +44 (0)1223 326070

Fax +44 (0)1223 325150

Email [journals@cambridge.org](mailto:journals@cambridge.org)

#### **in New York:**

Phone +1 (845) 353 7500

Fax +1 (845) 353 4141

Email

[subscriptions\\_newyork@cambridge.org](mailto:subscriptions_newyork@cambridge.org)

## Editors

S. H. Davis, Northwestern University, USA

M. G. Worster, University of Cambridge, UK

*Journal of Fluid Mechanics* publishes authoritative articles covering theoretical, computational and experimental investigations of all aspects of the mechanics of fluids. Papers discuss both the fundamental aspects of fluid mechanics, and their applications to other fields such as aeronautics, astrophysics, physiology, chemical and mechanical engineering, oceanography, geology, and combustion.

**Price information is available at**  
**<http://journals.cambridge.org/flm>**

### **Free email alerts**

**Keep up-to-date with new material – sign up at**  
**<http://journals.cambridge.org/alerts>**

**For free online content visit**  
**<http://journals.cambridge.org/flm>**



**CAMBRIDGE**  
UNIVERSITY PRESS

CAMBRIDGE

JOURNALS

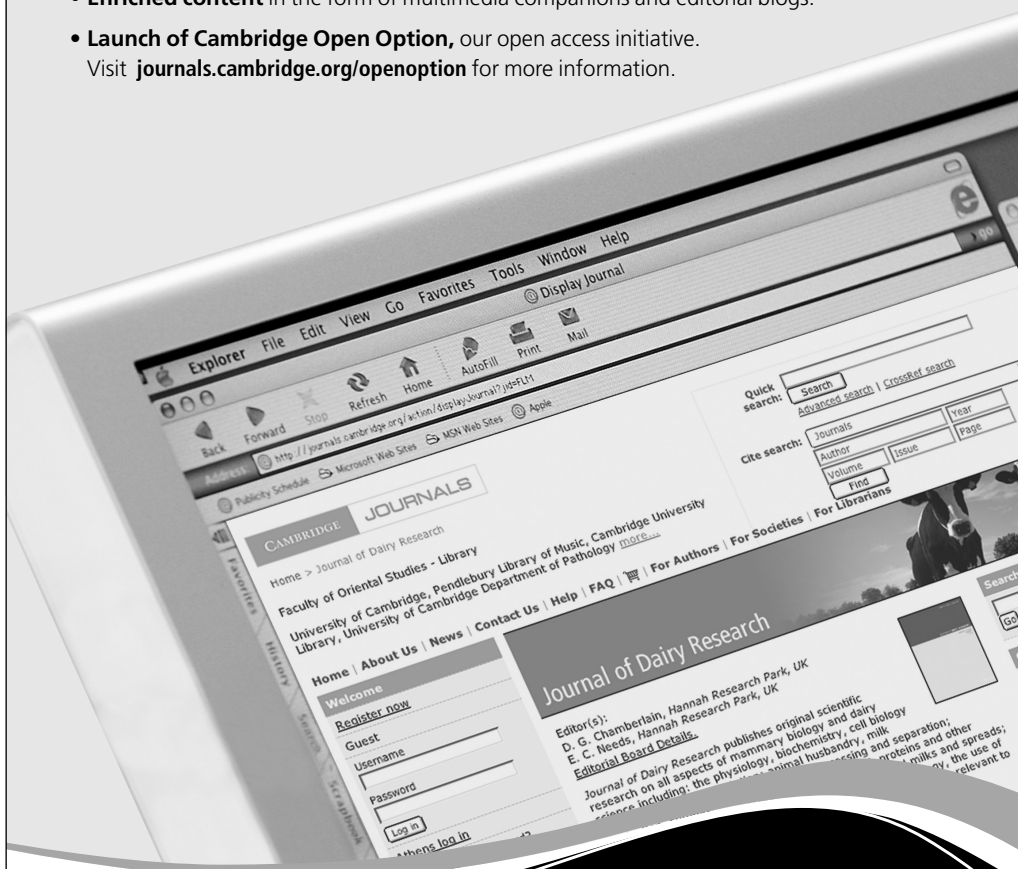
# journals.cambridge.org

Advancing research. Increasing access.

Informed by detailed consultation with the library and research communities, we are constantly developing our industry-leading online journals platform.

Some recent advances include:

- **Refreshed site design**, facilitating rapid access to the most relevant content.
- **New advanced search interface** and a more detailed, fielded quick search function.
- **Enriched content** in the form of multimedia companions and editorial blogs.
- **Launch of Cambridge Open Option**, our open access initiative.  
Visit [journals.cambridge.org/openoption](http://journals.cambridge.org/openoption) for more information.



[journals.cambridge.org](http://journals.cambridge.org)



CAMBRIDGE  
UNIVERSITY PRESS



(Contents continued from back cover)

|   |     |
|---|-----|
| Dusty plasma processes in Earth's environments containing nano- and microscale grains<br><i>Sergey I. Popel</i>   | 525 |
| Lower-hybrid waves generated by anomalous Doppler resonance in auroral plasmas<br><i>R. Bingham, R. A. Cairns, I. Vorgul and V. D. Shapiro</i>  | 539 |
| Revisiting coupled Shukla–Varma and convective cell mode in classical and quantum dusty magnetoplasmas<br><i>W. Masood, Arshad M. Mirza and Shahida Nargis</i>  | 547 |
| Drift-Alfvén waves at the arbitrary ion Larmor radius scale in dusty plasmas<br><i>O. G. Onishchenko, O. A. Pokhotelov and V. V. Krasnoselskikh</i>   | 553 |
| Magnetized plasma-wall transition layer with cold ions<br><i>D. D. Tskhakaya, Sr., F. Bint-E-Munir and S. Kuhn</i>  | 559 |
| Dusty magnetohydrodynamics in star-forming regions<br><i>S. Van Loo, S. A. E. G. Falle, T. W. Hartquist, O. Havnes and G. E. Morfill</i>  | 569 |
| Investigation of non-Newtonian behavior of dusty plasma liquid<br><i>A. V. Gavrikov, D. N. Goranskaya, A. S. Ivanov, O. F. Petrov, R. A. Timirkhanov, N. A. Vorona and V. E. Fortov</i>   | 579 |
| Analysis of the interaction between particles in non-ideal quasi-equilibrium extended systems<br><i>O. S. Vaulina, E. A. Lisin, A. V. Gavrikov, O. F. Petrov and V. E. Fortov</i>   | 593 |
| A note on the electrical potential distribution around a test charge in anisotropic collisional plasmas<br><i>M. Chaudhuri, S. A. Khrapak and G. E. Morfill</i>   | 603 |
| Low-frequency electrostatic defect mode in doped pair-ion plasmas<br><i>I. Kourakis and N. S. Saini</i>   | 607 |
| A new method of solution for one-dimensional quasi-neutral bounded plasmas<br><i>M. Kamran and S. Kuhn</i>  | 617 |
| Transformer recharging with alpha channeling in tokamaks<br><i>N. J. Fisch</i>  | 627 |
| Drift wave driven zonal flows in electron–positron–ion plasmas<br><i>T. D. Kaladze, O. A. Pokhotelov and M. Shad</i>  | 635 |
| On the mapping connecting the cylindrical nonlinear von Neumann equation with the standard von Neumann equation<br><i>Renato Fedele, Sergio De Nicola, Dusan Jovanović, Dan Grecu and Anca Visinescu</i>  | 645 |
| Cavity-hollow cathode-sputtering source for titanium films<br><i>R. Schrittwieser, C. Ionita, A. Murawski, C. Maszl, M. Asandulesa, A. Nastuta, G. Rusu, C. Douat, S. B. Olenici, I. Vojvodic, M. Dobromir, D. Luca, S. Jaksch and P. Scheier</i> | 655 |

(Contents continued from back cover)

|  |     |
|--|-----|
| Full-scale simulation study of stimulated electromagnetic emissions:<br>The first ten milliseconds<br><i>Bengt Eliasson and Lennart Stenflo</i>  | 369 |
| Dust in fusion devices: The state of theory and modeling<br><i>S. I. Krasheninnikov, R. D. Smirnov, A. Yu. Pigarov, T. K. Soboleva<br/>and D. A. Mendis</i>  | 377 |
| On quantum plasma kinetic equations with a Bohmian force<br><i>Fernando Haas</i>   | 389 |
| Transition between Raman and Compton regimes in laser pulse<br>amplification<br><i>R. A. Cairns</i>  | 395 |
| Excitation of longitudinal waves in a degenerate isotropic quantum plasma<br><i>Levan N. Tsintsadze and Nodar L. Tsintsadze</i>  | 403 |
| Solitary waves in a dusty adiabatic electronegative plasma<br><i>A. A. Mamun, K. S. Ashrafi and M. G. M. Anwar</i>   | 409 |
| An electron model with elementary charge<br><i>B. Lehnert and L. J. Höök</i>   | 419 |
| Ion acoustic double layers forming behind irradiated solid objects in<br>streaming plasmas<br><i>W. J. Miloch, V. L. Rekaa, H. L. Pécseli and J. Trulsen</i>   | 429 |
| Arbitrary amplitude solitary waves in plasmas with dust grains of opposite<br>polarity and non-thermal ions<br><i>S. K. Maharaj, R. Bharuthram, S. V. Singh, S. R. Pillay and G. S. Lakhina</i>        | 441 |
| Three-dimensional cylindrical Kadomtsev–Petviashvili equation in a dusty<br>electronegative plasma<br><i>W. M. Moslem, U. M. Abdelsalam, R. Sabry, E. F. El-Shamy and<br/>S. K. El-Labany</i>          | 453 |
| Stable localized electromagnetic pulses in asymmetric pair plasmas<br><i>V. I. Berezhiani, S. M. Mahajan and N. L. Shatashvili</i>   | 467 |
| Effects of vortex-like (trapped) electron distribution on non-linear<br>dust-acoustic waves with positive dust charge fluctuation<br><i>M. R. Amin, Sanjit K. Paul, Gurudas Mandal and A. A. Mamun</i> | 477 |
| Nonlinear condensation modes<br><i>Jan Weiland</i>   | 487 |
| Avinash–Shukla mass limit for the maximum dust mass supported against<br>gravity by electric fields<br><i>K. Avinash</i>   | 493 |
| Levitated dust particles subjected to plasma jet<br><i>C. M. Ticoş, I. Jepu, C. P. Lungu, P. Chiru, V. Zaroschi and A. M. Lungu</i>  | 501 |
| New aspects on plasma wave and instability phenomena in basic-plasma<br>experiments<br><i>R. Hatakeyama, T. Kaneko and W. Oohara</i>   | 513 |



## Instructions for Authors

**Editorial policy** The journal welcomes submissions in any of the areas of plasma physics. Its scope includes experimental and theoretical work on basic plasma physics, the plasma physics of magnetic and inertial fusion, laser–plasma interactions, industrial plasmas, plasma devices and plasmas in space and astrophysics. This list is, of course, merely illustrative of the wide range of topics on which papers are invited, and is not intended to exclude any aspect of plasma physics that is not explicitly mentioned.

Authors are urged to ensure that their papers are written clearly and attractively, in order that their work will be readily accessible to readers. Manuscripts must be written in English. *Journal of Plasma Physics* employs a rigorous peer-review process whereby all submitted manuscripts are sent to recognized experts in their subjects for evaluation. The Editors' decision on the suitability of a manuscript for publication is final.

**Submission of manuscripts** Papers may be submitted to the Editor or any of the Associate Editors, preferably by email in pdf format. When a paper is accepted, the authors will be asked to supply source files in LaTeX or Word. Instructions for the preparation of these files and LaTeX style files are given in the Instructions for Contributors link at [journals.cambridge.org/pla](http://journals.cambridge.org/pla).

**Incremental publishing and DOIs** In order to make articles which have been accepted for publication in *Journal of Plasma Physics* available as quickly as possible, they are now published incrementally online (at Cambridge Journals Online; [journals.cambridge.org](http://journals.cambridge.org)) The online version is available as soon as author corrections have been completed and before the article appears in a printed issue. A reference is added to the first page of the article in the journal catchline. This is the DOI – Digital Object Identifier. This is a global publishers' standard. A unique DOI number is created for each published item. It can be used for citation purposes instead of volume, issue and page numbers. It therefore suits the early citation of articles which are published on the web before they have appeared in a printed issue. See [journals.cambridge.org/pla](http://journals.cambridge.org/pla).

**Proof reading** Only typographical or factual errors may be changed at proof stage. The publisher reserves the right to charge authors for correction of non-typographical errors.

**Offprints** Corresponding authors will receive a PDF of their article upon publication. Print offprints may be purchased from the publisher if ordered at first proof stage.

**Copying** This journal is registered with the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. Organizations in the USA who are also registered with C.C.C. may therefore copy material (beyond the limits permitted by sections 107 and 108 of US copyright law) subject to payment to C.C.C. of the per copy fee of \$16.00. This consent does not extend to multiple copying for promotional or commercial purposes. Code 0022–3778/2010 \$16.00.

*ISI Tear Sheet Service*, 3501 Market Street, Philadelphia, Pennsylvania 19104, USA, is authorized to supply single copies of separate articles for private use only.

Organizations authorized by the Copyright Licensing Agency may also copy material subject to the usual conditions.

*For all other use*, permission should be sought from Cambridge or the American Branch of Cambridge University Press.



# JOURNAL OF PLASMA PHYSICS

VOLUME 76 • PARTS 3 & 4 • JUNE/AUGUST 2010

Guest Editors: B. Eliasson, L. Stenflo, R. Bingham, J. T. Mendonça, A. A. Mamun and D. Shaikh

|  |     |
|--|-----|
| <b>Preface</b>   | 257 |
| Tribute to Professor Padma Kant Shukla on the occasion of his 60th birthday<br><i>Asoka Mendis</i>   | 259 |
| <b>Main Articles</b>   |     |
| Large amplitude circularly polarized waves in quantum plasmas<br><i>L. Stenflo and G. Brodin</i>   | 261 |
| Fully nonlinear electrostatic waves in electron–positron plasmas<br><i>Gaimin Lu, Yue Liu, Youmei Wang, L. Stenflo, S. I. Popel and M. Y. Yu</i> | 267 |
| Ion-acoustic solitons in plasmas with two adiabatic constituents<br><i>Frank Verheest and Manfred A. Hellberg</i>                                | 277 |
| Effective charge of photons and plasmons<br><i>J. T. Mendonça, A. Serbeto and S. Ali</i>   | 287 |
| Rogue waves in the atmosphere<br><i>Lennart Stenflo and Mattias Marklund</i>   | 293 |
| The electrical effects of micrometeoroids entering the terrestrial atmosphere at different speeds<br><i>D. A. Mendis and D. Maravilla</i>        | 297 |
| Dynamics of Alfvén waves in partially ionized astrophysical plasmas<br><i>Dastgeer Shaikh</i>  | 305 |
| Cosmic ray transport in non-uniform magnetic fields: consequences of gradient and curvature drifts<br><i>R. Schlickeiser and F. Jenko</i>        | 317 |
| Energy coupling among the degrees of freedom in an electron–positron plasma<br><i>Wenmin Zhang, M. Y. Yu, A. R. Karimov and L. Stenflo</i>       | 329 |
| Drift eigenmodes in plasmas with negative ions<br><i>Hamid Saleem</i>  | 337 |
| Interaction between gravitational waves and plasma waves in the Vlasov description<br><i>G. Brodin, M. Forsberg, M. Marklund and D. Eriksson</i> | 345 |
| Some surprising manifestations of charged particle dynamics in a magnetic field<br><i>Ram K. Varma</i>   | 355 |

(Contents continued facing inside back cover)

Cambridge Journals Online

For further information about this journal please  
go to the journal web site at:

[journals.cambridge.org/pla](http://journals.cambridge.org/pla)



Mixed Sources

Product group from well-managed  
forests and other controlled sources  
[www.fsc.org](http://www.fsc.org) Cert no. SA-COC-1527  
© 1996 Forest Stewardship Council

CAMBRIDGE  
UNIVERSITY PRESS