

journals.cambridge.org

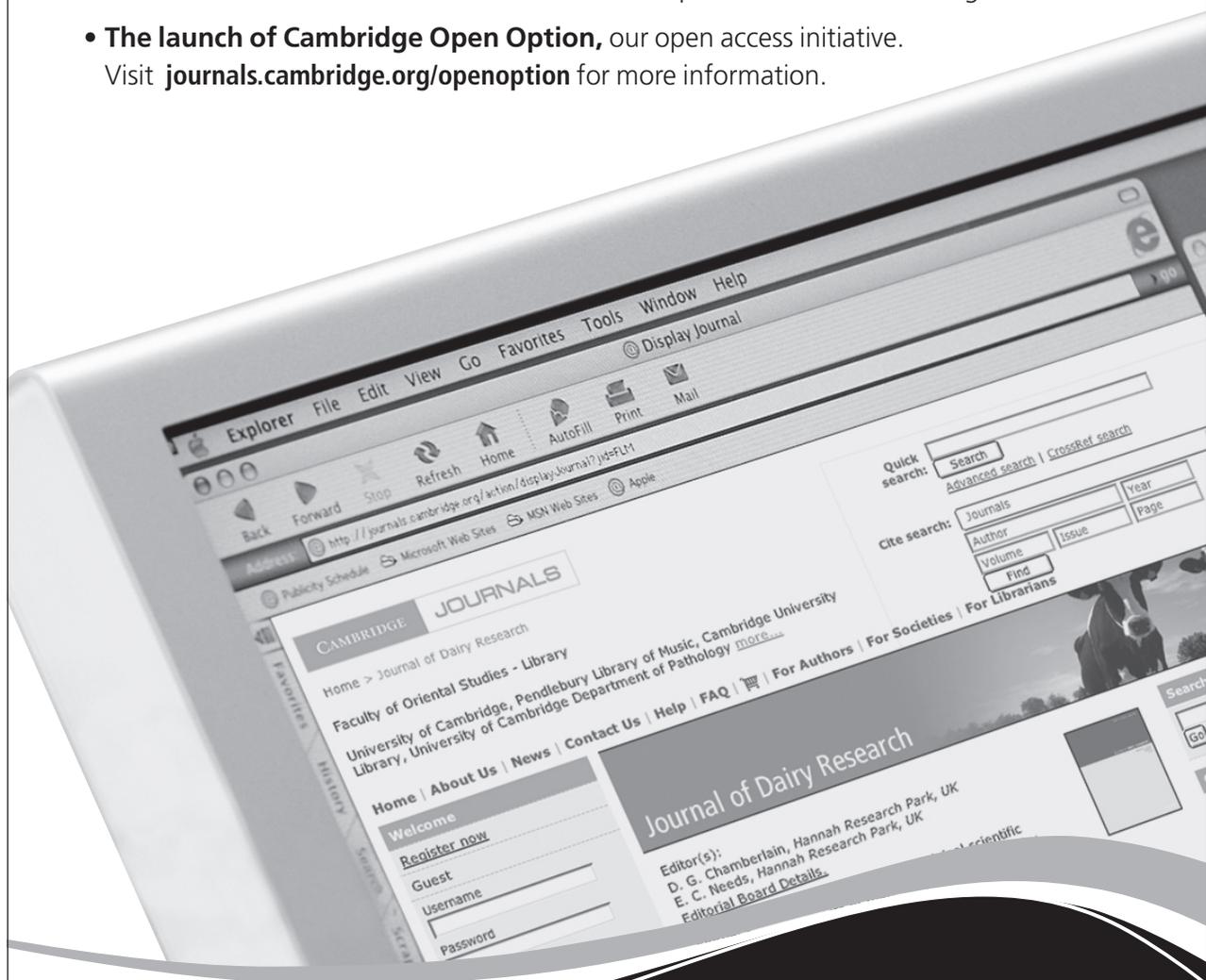
Advancing research. Increasing access.

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.
- **The launch of Cambridge Open Option**, our open access initiative.

Visit journals.cambridge.org/openoption for more information.



CAMBRIDGE

JOURNALS



**POLAR
RECORD**

A Journal of Arctic and Antarctic Research
VOLUME 41 NUMBER 002 JANUARY 2009
CAMBRIDGE
UNIVERSITY PRESS

POLAR RECORD

Official journal of the
Scott Polar Research Institute, Cambridge, UK

Polar Record

is available online at:
<http://journals.cambridge.org/pol>

**To subscribe contact
Customer Services**

in Cambridge:

Phone +44 (0)1223 326070
Fax +44 (0)1223 325150
Email journals@cambridge.org

in New York:

Phone +1 (845) 353 7500
Fax +1 (845) 353 4141
Email
subscriptions_newyork@cambridge.org

Editor

Ian R. Stone, Scott Polar Research Institute, Cambridge, UK

Polar Record publishes results from a wide variety of areas of polar research: original primary research papers in the humanities, social sciences, physical sciences, life sciences, and polar technology are included, as are papers concerning current political, economic, legal, and environmental issues in the Arctic or Antarctic.

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

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/pol>



**CAMBRIDGE
UNIVERSITY PRESS**

CAMBRIDGE

JOURNALS



ANTARCTIC SCIENCE

Published for Antarctic Science Ltd, Cambridge

Antarctic Science

is available online at:
<http://journals.cambridge.org/ans>

To subscribe contact Customer Services

in Cambridge:
Phone +44 (0)1223 326070
Fax +44 (0)1223 325150
Email journals@cambridge.org

in New York:
Phone +1 (845) 353 7500
Fax +1 (845) 353 4141
Email
subscriptions_newyork@cambridge.org

Editors

David W. H. Walton, British Antarctic Survey, Cambridge, UK
Christina L. Hulbe, Portland State University, USA
Alan P. M. Vaughan, British Antarctic Survey, Cambridge, UK

Antarctic Science provides a truly international forum for the broad spread of studies that increasingly characterize scientific research in the Antarctic. These, together with an Editorial discussing broader aspects of science, provide a rich mixture of items to interest researchers in all areas of science.

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

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/ans>



CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE

JOURNALS



The Journal of Navigation

Published for the Royal Institute of Navigation

The Journal of Navigation

available online at:
<http://journals.cambridge.org/nav>

**To subscribe contact
Customer Services**

in Cambridge:
Phone +44 (0)1223 326070
Fax +44 (0)1223 325150
Email journals@cambridge.org

in New York:
Phone +1 (845) 353 7500
Fax +1 (845) 353 4141
Email
subscriptions_newyork@cambridge.org

Editor

Norman Hughes, The Royal Institute of Navigation, UK

The Journal of Navigation contains original papers on the science of navigation by man and animals over land, on sea, in air and in space, including a selection of papers presented at meetings of the Institute and other organisations associated with navigation. Papers cover every aspect of navigation, from the highly technical to the descriptive and historical. Subjects include electronics, astronomy, mathematics, cartography, command and control, psychology and zoology, operational research, risk analysis, theoretical physics, operation in hostile environments, instrumentation, ergonomics, financial planning and law.

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

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/nav>



**CAMBRIDGE
UNIVERSITY PRESS**

Knowledge is no longer shelved

The *Cambridge Journals Digital Archive* contains more than 160 journals, more than 3 million pages and more than 8 million linked references. Knowledge is now more visible and more searchable than ever.



journals.cambridge.org/archives



Advertising Opportunities

To advertise in this journal and for details of pricing, availability and discount opportunities please contact:

Advertising in UK, Europe and rest of world

The Advertising Sales Team
Cambridge University Press
The Edinburgh Building,
Shaftesbury Road,
Cambridge, UK, CB2 8RU
Tel: +44 (0)1223 325083

Email: ad_sales@cambridge.org

Advertising in USA, Mexico and Canada

Journals Advertising Coordinator
32 Avenue of the Americas,
New York,
NY 10013-2473, USA

Tel: +1 (212) 337 5053 Fax: +1 (212) 337 5959

E-mail: journals_advertising@cambridge.org



CAMBRIDGE
UNIVERSITY PRESS

AIMS AND SCOPE

International Journal of Astrobiology publishes original papers and review articles on Astrobiology Science. News of interest to the astrobiology community and book reviews will also feature. Contact one of the editors if you have questions regarding suitability of a subject area, news submission or book review.

The fields covered include:

- * Cosmic prebiotic chemistry
- * Planetary evolution
- * Search for planetary systems and habitable zones
- * Origins, evolution and distribution of life
- * Extremophile biology and experimental simulation of extraterrestrial environments
- * Life detection in our solar system and beyond
- * Technologies and space missions for astrobiology, and planetary protection
- * Human expansion, ecosystems beyond Earth and terraforming
- * Ecosystems beyond Earth
- * Intelligent life and societal aspects of astrobiology

There are no page charges or length restrictions. All articles are submitted to peer-review.

SUBMISSION OF MANUSCRIPTS

Contributions for consideration for publication should be submitted via our online website at http://mc.manuscriptcentral.com/submit_ija

During the submission process authors will be asked to select an appropriate Editor for their paper. Areas of interest for the Editors are as follows:

Dr. Simon Mitton – General Papers, Philosophy, Astronomy

Dr. Rocco Mancinelli – Extremophiles, Microbiology, Nitrogen Cycling

Dr. Frances Westall – Origin of Life in a Geological Context, Search for Life on Mars, Biosignatures of Early Earth Sediments.

The *initial* submission should preferably be in Word or PDF format. If your paper is accepted you will need to submit a Word document with illustrations as separate eps or tif files. LateX files can also be accepted for the final version; however a PDF must also be supplied for printing.

For papers with high resolution figures or micrographs please *also* submit a hard copy version – in colour if appropriate. Black and White halftones and colour illustrations have to be scanned at a high resolution (minimum 300dpi). For very large files contact our production department for further instruction.

Please consult our full Instructions for Contributors at journals.cambridge.org/ija

Cover Photograph: The Orion Nebula (ESO PR Photos 03a-d/01) obtained with the ISAAC multi-mode instrument at the VLT ANTU 8.2-m telescope at the ESO Paranal Observatory. Photograph courtesy of and reproduced with permission of Mark McCaughrean and the European Southern Observatory (ESO).

CONTENTS

Research papers

- 63 **Laboratory simulation of ultraviolet irradiation from the Sun on amino acids. III. irradiation of glycine-tyrosine**
F. Scappini, M. L. Capobianco, F. Casadei & R. Zamboni
- 69 **Did nature also choose arsenic?**
Felisa Wolfe-Simon, Paul C. W. Davies & Ariel D. Anbar
- 75 **Jupiter – friend or foe? II: the Centaurs**
J. Horner & B. W. Jones
- 81 **The Earth as an extrasolar planet: the vegetation spectral signature today and during the last Quaternary climatic extrema**
Luc Arnold, François-Marie Bréon & Simon Brewer
- 95 **On the astrobiological relevance of viruses in extraterrestrial ecosystems**
Matti Jalasvuori, Anni-Maria Örmälä & Jaana K. H. Bamford
- 101 **Broadcasting but not receiving: density dependence considerations for SETI signals**
Reginald D. Smith
- 107 **Heat-initiated prebiotic formation of peptides from glycine/aspartic acid and glycine/valine in aqueous environment and clay suspension**
Chandra Kala Pant, Hem Lata, Hari Datt Pathak & Mohan Singh Mehata
- 117 **Mars polar cap: a habitat for elementary life**
M. K. Wallis, J. T. Wickramasinghe & N. C. Wickramasinghe
- 121 **A numerical testbed for hypotheses of extraterrestrial life and intelligence**
D. H. Forgan
- 133 **Scytonemin: molecular structural studies of a key extremophilic biomarker for astrobiology**
Tereza Varnali, Howell G. M. Edwards & Michael D. Hargreaves
- 141 **Bacteria in amber coal and clay in relation to lithopanspermia**
Milton Wainwright, Amar Laswd & Fawaz Alshammari