Journal of Pharmaceutical and Biomedical Analysis

Editor-in-Chief

Professor Anthony F. Fell Pharmaceutical Chemistry, School of Pharmacy, University of Bradford, Bradford, West Yorkshire, BD7 1DP, UK

Editor (North America)

Dr Christopher M. Riley Center for Bioanalytical Research, University of Kansas, 2095 Constant Avenue, Lawrence, KS 66046-2535, USA

Associate Editors

G. P. R. Carr Medgenix Group, Pharmaceutical Development, Zoning Industriel, B-6220, Fleurus, Belgium A. G. Davidson Medicines Testing Laboratory, 36 York Place, Edinburgh, EH1 3HU, UK

M. B. Evans School of Natural Sciences, Hatfield Polytechnic, P.O. Box 109, College Lane, Hatfield, Herts, AL10

T. M. Jefferies University of Bath, School of Pharmacy and Pharmacology, Claverton Down, Bath, BA27AY, UK M. A. Kral Merrell-Dow Pharmaceuticals, 2110 East Galbraith Road, Cincinnati, OH 45215-6300, USA

F. L. Mitchell The Sycamores, 11 Borrowcop Lane, Lichfield, Staffs, WS14 9DF, UK
G. Smith 11a The Garlands, Scarborough, North Yorkshire, YQ11 2SU, UK
J. F. Stobaugh School of Pharmacy, University of Kansas, 3006 Malott Hall, Lawrence, KS 66045-2504, USA

T. D. Wilson Sterling-Winthrop Research Institute, Columbia Pike, Rensselaer, NY 12144, USA

Regional Advisory Editors

G. A. Brewer Director, Analytical Research, E. R. Squibb & Sons, Inc., Georges Road, New Brunswick, NJ 08903, **USA**

J. Crommen Institute of Pharmacy, University of Liège, Rue Fusch 5, B-4000 Liège, Belgium

E. Gelpí Department of Neurochemistry, CID-CSIL, Jorge Girona Salgado 18-26 08034 Barcelona, Spain S. Görög Chemical Works of Gedeon Richter Ltd, P.O. Box 27 H-1475, Budapest 10, Hungary

T. Nambara Pharmaceutical Institute, Tohoku University, Aobayama, Sendai 980, Japan

S. Pinzauti Department of Pharmaceutical Sciences, University of Florence, Via G. Capponi 9, 50121 Firenze, Italy D. Westerlund University of Uppsala, Biomedical Centre, Department of Analytical Pharmaceutical Chemistry, Box 574, S-751 23 Uppsala, Sweden

Editorial Advisory Board

D. H. Calam (Hertfordshire) Chairman

D. H. Calam (Hertfordshire) Chai D. W. Armstrong (Rolla, MO) W. R. G. Baeyens (Ghent) A. E. Beezer (Surrey) J. C. Berridge (Sandwich) G. Blaschke (Münster) U. A. Th. Brinkman (Amsterdam) G. D. Christian (Seattle, WA) P. Devaux (Romaineille)

P. Devaux (Romaineille)
F. Erni (Basel)

H. Frank (Tübingen)

T. Greibrokk (Oslo)

S. H. Hansen (Copenhagen)

J. Hermansson (Stockholm)

J. Hoogmartens (Leuven) J. F. K. Huber (Vienna)

K. Imai (Tokyo)

Jellum (Oslo)

J. W. Jorgenson (Chapel Hill, NC)

J. Kirschbaum (New Brunswick, NJ) J. H. Knox (Edinburgh)

I. S. Krull (Boston, MA)

W. Lindner (Graz)

H. Lingeman (Amsterdam)
D. Littlejohn (Glasgow)

A. Li Wan Po (Belfast)

K. Markides (Uppsala)
M. Martin Smith (Ware)
R. D. McDowall (Kent)

J. M. Midgley (Glasgow)
J. N. Miller (Loughborough)

Joint Founding Editor

D. E. Moore (Sydney, NSW)

J. W. Munson (Kalamazoo, MI)

J. K. Nicholson (London)

G. J. Patriarche (Brussels) B.-A. Persson (Mölndal)

M. Polášek (Hradec Králové)

M. L. Rabouhans (London) F. E. Regnier (West Lafayette, IN)

V. A. Semenov (Moscow)

J. A. F. de Silva (Washington, DC)

M. R. Smyth (Dublin)
J. T. Stewart (Athens, GA)

J. I. Stewart (Atnens, GA)
G. Szepesi (Budapest)
M. Valcárcel (Córdoba)
K. Valkó (Budapest)
J. Vessman (Gothenburg)
A. Vigevani (Milan)
I. W. Wainer (Memphis, TN)
I. D. Watson (Glasgow)
S. G. Weber (Pittsburgh, PA)
L. D. Wilson (Macclesfield)

I. D. Wilson (Macclesfield)

J. D. Winefordner (Gainesville, FL)

S. H.-Y. Wong (Farmington, CT)
R. A. de Zeeuw (Groningen)

Published as 12 issues/annum. Publishing and Advertising Offices: Headington Hill Hall, Oxford OX3 0BW.

Annual institutional subscription rate (1990) DM 870.00; two-year institutional rate (1990/91) DM 1653.00. Personal subscription rate for those whose library subscribes at the regular rate (1990) DM 191.00 (including postage and insurance). Prices subject to change without notice. Payment must be made in advance. Subscription enquiries from customers in North America should be sent to PERGAMON PRESS INC., MAXWELL HOUSE, FAIRVIEW PARK, ELMSFORD, NY 10523, USA, and for the remainder of the world to PERGAMON PRESS PLC, HEADINGTON HILL HALL, OXFORD OX3 0BW, UK

Back issues of all previously published volumes, in both hard copy and on microform are available direct from Pergamon Press offices.

Copyright © 1990 Pergamon Press plc

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

Photocopying information for users in the USA The Item-fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying, beyond that permitted by Section 107 or 108 of the United States Copyright Law, is paid. The appropriate remittance of \$3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 27 Congress Street, Salem, MA 01970.

Permission for other use. The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for such copying.

The Item-fee Code for this publication is: 0731-7085/90 \$3.00+0.00.

The paper used in this publication meets the minimum requirements of the American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984.