

---

SCOPE 46  
IPCS Joint Symposia 13  
SGOMSEC 5

**Methods for  
Assessing Exposure  
of Human and  
Non-human Biota**

---

## Scientific Committee on Problems of the Environment

### SCOPE

Executive Committee, elected 10 June 1988

#### Officers

*President:* Professor F. di Castri, SCOPE, 51 boulevard de Montmorency, 75016 Paris, France

*Vice-President:* Academician M.V. Ivanov, Institute of Microbiology, USSR Academy of Sciences, GSP-7 Prospekt 60 Ietija Oktjabrja 7-2, 117811 Moscow, USSR

*Vice-President:* Professor C.R. Krishna Murti, Scientific Commission for Continuing Studies on Effects of Bhopal Gas Leakage on Life Systems, Cabinet Secretariat, 2nd Floor, Sardar Patel Bhavan, New Delhi 110001, India

*Treasurer:* Doctor T.E. Lovejoy, Smithsonian Institution, Washington, D.C., 20560, USA

*Secretary-General:* Professor J.W.B. Stewart, Dean, Faculty of Agriculture, University of Saskatchewan, Saskatoon, Saskatchewan S7N 0W0, Canada

#### Members

Professor M.O. Andreae (IUGG representative), Max-Planck-Institut für Chemie, Postfach 3060, D-6500 Mainz, Germany

Professor M.A. Ayyad, Faculty of Science, Alexandria University, Moharram Bey, Alexandria, Egypt

Professor R. Herrera (IUBS representative), Centro de Ecología y Ciencias Ambientales (IVIC), Apartado 21827, Caracas, Venezuela

Professor M. Kecskes, Department of Microbiology, University of Agricultural Sciences, Pater K. utca 1, 2103 Godollo, Hungary

Professor R.O. Slatyer, Chief Scientist, Office of the Prime Minister and Cabinet, 3-5 National Circuit, Barton, ACT 2600, Australia

#### Editor-in-Chief

Professor R.E. Munn, Institute of Environmental Studies, University of Toronto, Toronto, Ontario M5S 1A4, Canada

---

SCOPE 46  
IPCS JOINT SYMPOSIA 13  
SGOMSEC 5

# Methods for Assessing Exposure of Human and Non-human Biota

---

*Edited by*

**ROBERT G. TARDIFF**

*RiskFocus/VERSAR, Springfield, Virginia, USA*

**BERNARD D. GOLDSTEIN**

*University of Medicine and Dentistry of New Jersey, Piscataway, New Jersey, USA*

*Prepared by*

Scientific Group on Methodologies for the Safety Evaluation of  
Chemicals (SGOMSEC)

*Published on behalf of the Scientific Committee on Problems of the Environment  
(SCOPE) of the International Council of Scientific Unions (ICSU), and the  
International Program on Chemical Safety (IPCS) of the World Health  
Organization (WHO), the United Nations Environmental Program (UNEP) and the  
International Labour Organization (ILO)*



by  
**JOHN WILEY & SONS**

Chichester · New York · Brisbane · Toronto · Singapore

Copyright © 1991 by the  
Scientific Committee on Problems of the Environment (SCOPE)

Published by John Wiley & Sons Ltd  
Baffins Lane, Chichester  
West Sussex PO19 1UD, England

All rights reserved

No part of this book may be reproduced by any means, or transmitted, or translated into machine language without the written permission of the copyright holder.

All reproduction permission requests should be directed to the SCOPE Secretariat, 51 Bld de Montmorency, 75016 Paris, France.

*Other Wiley Editorial Offices*

John Wiley & Sons, Inc., 605 Third Avenue,  
New York, NY 10158-0012, USA

Jacaranda Wiley Ltd, G.P.O. Box 859, Brisbane,  
Queensland 4001, Australia

John Wiley & Sons (Canada) Ltd, 22 Worcester Road,  
Rexdale, Ontario M9W 1L1, Canada

John Wiley & Sons (SEA) Pte Ltd, 37 Jalan Pemimpin 05-04,  
Block B, Union Industrial Building, Singapore 2057

***Library of Congress Cataloging-in-Publication Data:***

Methods for assessing exposure of human and non-human biota / edited by Robert G. Tardiff and Bernard D. Goldstein; prepared by Scientific Group on Methodologies for the Safety Evaluation of Chemicals (SGOMSEC).

p. cm.—(IPCS joint symposia; 13) (SCOPE; 46) (SGOMSEC; 5)

Papers of a workshop held at the fifth SGOMSEC meeting in Mexico City, Aug. 12–15, 1985.

Published on behalf of the Scientific Committee on the Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU), and the International Program on Chemical Safety (IPCS) of the World Health Organization (WHO), the United Nations Environmental Program (UNEP) and the International Labour Organization (ILO).

Includes bibliographical references and index.

ISBN 0 471 92954 9

1. Environmental monitoring—Congresses. 2. Biological monitoring—Congresses. I. Tardiff, Robert G. II. Goldstein, Bernard D. III. Scientific Group on Methodologies for the Safety Evaluation of Chemicals. IV. Series. V. Series: SCOPE report; 46. VI. Series: SGOMSEC (Series); 5.

RA1221.M447 1991

574.2'4—dc20

90-24342

CIP

*A catalogue record for this book is available from the British Library*

Typeset by Photo-graphics, Honiton, Devon  
Printed in Great Britain by Courier International, East Kilbride

**International Council of Scientific Unions (ICSU)  
Scientific Committee on Problems of the Environment (SCOPE)**

SCOPE is one of a number of committees established by the non-governmental group of scientific organizations, the International Council of Scientific Unions (ICSU). The membership of ICSU includes representatives from 75 National Academies of Science, 20 International Unions, and 29 other bodies called Scientific Associates. To cover multidisciplinary activities which include the interests of several unions, ICSU has established 13 Scientific Committees, of which SCOPE, founded in 1969, is one. Currently, representatives of 35 member countries and 21 Unions and Scientific Committees participate in the work of SCOPE, which directs particular attention to the needs of developing countries.

The mandate of SCOPE is to assemble, review, and assess the information available on man-made environmental changes and the effects of these changes on man; to assess and evaluate the methodologies of measurement of environmental parameters; to provide an intelligence service on current research; and by the recruitment of the best available scientific information and constructive thinking to establish itself as a corpus of informed advice for the benefit of centres of fundamental research and of organizations and agencies operationally engaged in studies of the environment.

SCOPE is governed by a General Assembly, which meets every three years. Between such meetings its activities are directed by the Executive Committee.

R.E. Munn  
Editor-in-Chief  
SCOPE Publications

Executive Secretary: V. Plocq-Fichelet

Secretariat: 51 boulevard de Montmorency  
75016 Paris, France