

METHODOLOGICAL SURVEYS (B): BIOCHEMISTRY Volume 11

# CANCER-CELL ORGANELLES

edited by E. REID G. COOK D.J. MORRÉ





# CANCER-CELL ORGANELLES

*Edited by*

E. REID, Ph.D., D.Sc.

Head of Wolfson Bioanalytical Unit

Robens Institute of Industrial and Environmental Health and Safety

University of Surrey

G. M. W. COOK, Ph.D.

Department of Pharmacology

University of Cambridge

and

D. J. MORRÉ, Ph.D.

Director, Cancer Center, Purdue University, U.S.A.



**ELLIS HORWOOD LIMITED**  
Publishers · Chichester

Halsted Press: a division of  
**JOHN WILEY & SONS**  
New York · Brisbane · Chichester · Toronto

First published in 1982 by

**ELLIS HORWOOD LIMITED**

Market Cross House, Cooper Street, Chichester, West Sussex, PO19 1EB, England

*The publisher's colophon is reproduced from James Gillison's drawing of the ancient Market Cross, Chichester.*

**Distributors:**

*Australia, New Zealand, South-east Asia:*

Jacaranda-Wiley Ltd., Jacaranda Press,  
JOHN WILEY & SONS INC.,  
G.P.O. Box 859, Brisbane, Queensland 40001, Australia

*Canada:*

JOHN WILEY & SONS CANADA LIMITED  
22 Worcester Road, Rexdale, Ontario, Canada.

*Europe, Africa:*

JOHN WILEY & SONS LIMITED  
Baffins Lane, Chichester, West Sussex, England.

*North and South America and the rest of the world:*

Halsted Press: a division of  
JOHN WILEY & SONS  
605 Third Avenue, New York, N.Y. 10016, U.S.A.

© 1982 E. Reid, G. M. W. Cook, D. J. Morré/Ellis Horwood Limited

**British Library Cataloguing in Publication Data**

Cancer-cell organelles. — (Methodological surveys; vol. 11)

1. Cancer cells

2. Cell organelles

I. Reid, E. II. Cook, G. M. W.

III. Morré, D. J. IV. Series

574.87'6 QH583.2

Library of Congress Card No. 81-6704 AACR2

ISBN 0-85312-344-6 (Ellis Horwood Limited)

ISBN 0-470-27244-9 (Halsted Press)

Typeset in Press Roman by Ellis Horwood Ltd.

Printed in the U.S.A. by The Maple-Vail Book Manufacturing Group, New York.

**COPYRIGHT NOTICE —**

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, photocopying, recording or otherwise, without the permission of Ellis Horwood Limited, Market Cross House, Cooper Street, Chichester, West Sussex, England.

# Table of Contents

---

The NOTES & COMMENTS at the end of each section (headed 'NC') include some comments made at the Forum on which this book is based, together with some supplementary points.

#A	Senior Editor's Preface . . . . .	11
#A-1	List of Authors . . . . .	13
<b>INTACT CELLS DIRECTLY FROM IN VIVO SOURCES</b>		
#A-2	Current tribulations and future prospects for identifying and separating the malignant cells from the normal cells in tumours — PETER ALEXANDER . . . . .	17
#A-3	Isolation of human peripheral blood monocytes — KATHERINE M. WYNNE . . . . .	23
#A-4	Separation and characterization of cells with immune function from peripheral blood — M. R. POTTER . . . . .	32
#A-5	[NC(A)-1 as listed below relates to the foregoing]	
#A-6	Selection and characterization of haemopoietic cell populations— R. SCHOFIELD . . . . .	40
#NC(A)	Separation of tumur and host cell populations from human neoplasms — BRENT M. VOSE . . . . .	45
#NC(A)-1	Identification of cancer cells by their surface antigens — M. R. PRICE, M. J. EMBELTON, B. GUNN, A. W. A. R. AL-SHEIKLY, D. HANNANT & R. W. BALDWIN . . . . .	57
<b>NOTES and COMMENTS related to Section #A (See also #NC(B)-1, below) including Notes on</b>		
#NC(A)-2	Isolation and subfractionation of lymphoid cells by counterflow centrifugal elutriation — CAROLE L. JELSEMA, WILLIAM D. MERRITT, MARILYN HELMSWORTH & JAMES CASPER . . . . .	65
#NC(A)-2	Non-enzymic separation of tumour cells from Lewis lung carcinoma — M. MAGUDIA, JULIA ROBERTS & P. WHUR . . . . .	70

## Table of Contents

#NC(A)-3	Separation and short-term culture of different cell types from a transplanted hepatoma – PETER J. COX, SUSAN A. HUBBARD, MILOSLAV DOBROTA & RICHARD H. HINTON . . . . .	75
#B	<b>CELL CULTURES</b>	
#B-1	Growth and characterization of normal and leukaemic cell populations <i>in vitro</i> – NYDIA TESTA & T. M. DEXTER . . . . .	83
#B-2	Demonstration of malignant transformation of cells <i>in vitro</i> – M. R. DANIEL & J. M. DEHNEL . . . . .	89
#B-3	Isolation and purification of cell cultures from human tumours – R. I. FRESHNEY, ELAINE HART & J. M. RUSSELL . . . . .	97
#B-4	Characteristics of adult rat hepatocytes in primary culture on collagen gel-nylon mesh – ALPHONSE E. SIRICA, FELIX R. ALTHAUS & GEORGE HAYAO . . . . .	111
#NC(B)	<b>NOTES and COMMENTS related to Section #B (also to #A) <i>including a Note on</i></b>	
#NC(B)-1	Cell isolation for subcellular fractionation: Guidance from preceding articles – G. M. W. COOK . . . . .	124
#C	<b>ORGANELLES FROM CANCER CELLS – GENERAL</b>	
#C-1	Organelle isolation: An over-view – D. J. MORRÉ . . . . .	126
#C-2	Phenotypic markers of hepatic ‘pre-neoplasia’ and neoplasia in the rat – ALPHONSE E. SIRICA & HENRY C. PITOT . . . . .	131
#C-3	Problems in separating membranous cell components from transplanted hepatomas – RICHARD H. HINTON . . . . .	144
#C-4	Separation of mammalian cells and cell organelles at low g-forces – A. TULP, M. G. BARNHOORN, J. G. COLLARD, W. KRAAN, M. SLUYSER, F. POLAK & J. A. ATEN . . . . .	158
#C-5	The use of flow cytometry in the selection of cellular and sub-cellular particles – GEORGE BLACKLEDGE . . . . .	171
#NC(C)	<b>NOTES and COMMENTS related to Section #C and to RNA <i>including Notes on</i></b>	
#NC(C)-1	Analytical centrifugation of normal and transformed human fibroblasts – J. REMACLE & A. HOUBION . . . . .	175
#NC(C)-2	Use of aurintricarboxylic acid as an inhibitor of endogenous ribonucleases: isolation of cytoplasmic polyadenylated RNA from human leukaemic cells – STEPHEN HUGHES, JENNIFER H. BURNS & G. D. BIRNIE . . . . .	178

#D	NUCLEI, MITOCHONDRIA, LYSOSOMES AND PEROXISOMES	
#D-1	Isolation of nuclei from cancer (or carcinogen-treated) cells, and their potential use for studying the altered RNA transport associated with cancer — GARY A. CLAWSON & EDWARD A. SMUCKLER . . . . .	188
#D-2	The nuclear envelope in relation to the metabolic activation of chemical carcinogens — CHARLES B. KASPER & FRANK J. GONZALEZ . . . . .	202
#D-3	Isolation and characterization of mitochondria from malignant cells — JANNA P. WEHRLE & PETER L. PEDERSEN . . . . .	215
#D-4	The mitochondrial inner membrane: Manipulating the lipid bilayer to understand membrane structure and electron transfer — CHARLES R. HACKENBROCK & HEINZ SCHNEIDER . . . . .	226
#D-5	Lysosomes of tumours: Properties, function and isolation — FEDERICO LEIGHTON & DOROTHY M. MORRÉ . . . . .	239

#NC(D)	NOTES and COMMENTS related to Section #D <i>including Notes on</i>	
#NC(D)-1	Lysosomes in transplanted hepatomas of the rat — DOROTHY M. MORRÉ & A. L. ROSENTHAL . . . . .	249
#NC(D)-2	Proteolysis in isolated autophagosomes — J. AHLBERG, F. HENELL, L. MARZELLA & H. GLAUMANN . . . . .	252
#NC(D)-3	Peroxisomes of cancer cells — FEDERICO LEIGHTON . . . . .	257

#E	ENDOMEMBRANES	
#E-1	Preparation of functional rough microsomes from WI-38 human diploid fibroblasts, HeLa cells and rat liver — R. A. FELDMAN, S. GAETANI & T. MORIMOTO . . . . .	263
#E-2	Differences among microsomal subfractions in normal and transformed cells obtained after cell disruption by nitrogen cavitation — IAN F. PRYME, ASBJØRN M. SVARDAL, JON SKORVE & JOHAN R. LILLEHAUG . . . . .	293
#E-3	Isolation of Golgi apparatus: problems in adapting normal-cell methods to leukaemic cells — GEOFFREY M. W. COOK . . . . .	299
#E-4	Preparation and characterization of endoplasmic reticulum and Golgi apparatus membranes from preneoplastic liver nodules — LENNART C. ERIKSSON . . . . .	310
#E-5	Isolation of Golgi apparatus from hepatomas and cultured cells — D. JAMES MORRÉ & KIM E. CREEK . . . . .	321

#NC(E)	<b>NOTE and COMMENTS related to Section #E including a Note on</b>	
#NC(E)-1	Identification of ribophorins in rough microsomes from different organs and species — E. MARCANTONIO, D. D. SABATINI & G. KREIBICH . . . . .	335
<b>#F</b>	<b>PLASMA MEMBRANES AND CELL SURFACES</b>	
#F-1	Preparation of plasma membrane from tissue culture cells — JOHN M. GRAHAM . . . . .	342
#F-2	Isolation and characterization of plasma membrane from cultured cancer cells — GEORGE A. BAUMBACH, MICHAEL N. HORST, MICHAEL A. OLYMPHIO, HENRY C. ALDRICH & R. MICHAEL ROBERTS . . . . .	351
#F-3	Plasma membrane recycling: significance for isolation of plasma membrane fractions — RICHARD P. KITSON & CHRISTOPHER C. WIDNELL . . . . .	371
#F-4	Use of membrane maturing viruses for study of synthesis and expression of specific membrane molecules — PAUL H. ATKINSON, JOYCE TSANG LEE, SHIRLEY JANKELEVICH & JOHN HAKIMI . . . . .	379
#F-5	Turnover of plasma membrane polypeptides in transformed and normal cells using $^{125}\text{I}/^{131}\text{I}$ double-label techniques — JOHN B. DENNY & R. MICHAEL ROBERTS . . . . .	388
#NC(F)	<b>NOTES and COMMENTS related to Section #F including Notes on</b>	
#NC(F)-1	Isolation of plasma membranes from transplanted rat hepatomas — V. P. WALTER & D. J. MORRÉ . . . . .	396
#NC(F)-2	Some new procedures for isolation of platelets and leucocyte surface membranes — N. CRAWFORD, SUZANNE MENASHI & D. I. H. STEWART . . . . .	402
#NC(F)-3	Cell surface and extracellular glycosaminoglycan — JOHN GALLAGHER . . . . .	403
A Retrospect — E. REID . . . . .		406

The 'COMMENTS' in NOTES & COMMENTS largely represent remarks made at the Forum on which this book is based. Insofar as they refer to particular contributions or groups of contributions, the following page guide will assist retrieval: #A-2 & #A-3, p. 73; #A-4, #A-5, #A-6 & #NC(A)-2, p. 74; #B-2 & #B-3, p. 122; #C-2, p. 186; #C-4, #C-5 & #NC(C)-1, p. 187; #D-1, p. 259; #D-2, p. 261; #D-3, #D-5 & #NC(D)-3, p. 262; #E-2, p. 340; #E-3 & #NC(E)-1, p. 341; #F-1, #F-2, #F-3 & #NC(F)-1, p. 404; #F-4, p. 405.

**Table of Contents**

9

**Subject Index . . . . .** 411

**Corrections to earlier Volumes . . . . .** 417

## CANCER-CELL ORGANELLES



*The series now titled*  
**METHODOLOGICAL SURVEYS  
in BIOCHEMISTRY and ANALYSIS**

*Below: Sub-series (B): Biochemistry*

- 1971 SEPARATIONS WITH ZONAL ROTORS  
[ranks as Vol. 1]  
published ('Wolfson' imprint)  
at Guildford

**METHODOLOGICAL DEVELOPMENTS IN BIOCHEMISTRY**

*(Original Series title)*

published by Longman Group Limited (Vols. 2-4; available only via the Editor)  
or North-Holland Publishing Company (Vol. 5)

- 1973 PREPARATIVE TECHNIQUES (Vol. 2)  
1973 ADVANCES WITH ZONAL ROTORS  
(Vol. 3)  
1974 SUBCELLULAR STUDIES (Vol. 4)

**Sub-series (A): Analysis (trace-organic)**

- 1976 ASSAY OF DRUGS AND OTHER  
TRACE COMPOUNDS IN  
BIOLOGICAL FLUIDS (Vol. 5)

*Thereafter METHODOLOGICAL SURVEYS as amended title*

- 1977 MEMBRANOUS ELEMENTS  
AND MOVEMENT OF MOLECULES  
(Vol. 6; *including muscle*)  
1979 CELL POPULATIONS (Vol. 8)  
1979 PLANT ORGANELLES (Vol. 9)  
1981 (*this vol.*) CANCER-CELL  
ORGANELLES (Vol. 11)

- 1978 BLOOD DRUGS AND OTHER  
ANALYTICAL CHALLENGES  
(Vol. 7)  
1981 TRACE-ORGANIC SAMPLE  
HANDLING  
(Vol. 10; *including environmental*)

*Series Editor:* Eric Reid

who should be contacted  
*c/o address on right*  
for information on future volumes  
or for procurement of Vols. 1-4.

Vol. 5 is available from Elsevier, and  
Vols. 6-11 (publ. Ellis Horwood) from  
John Wiley or, in America, Halsted Press

Wolfson Bioanalytical Unit  
Robens Institute  
of Industrial  
& Environmental  
Health & Safety  
University of Surrey  
Guildford GU2 5XH  
U.K.



# CANCER-CELL ORGANELLES

*Edited by*

**E. REID, Ph.D., D.Sc.**

Head of Wolfson Bioanalytical Unit

Robens Institute of Industrial and Environmental Health and Safety

University of Surrey

**G. M. W. COOK, Ph.D.**

Department of Pharmacology

University of Cambridge

and

**D. J. MORRÉ, Ph.D.**

Director, Cancer Center, Purdue University, U.S.A.



**ELLIS HORWOOD LIMITED**  
Publishers · Chichester

Halsted Press: a division of

**JOHN WILEY & SONS**

New York · Brisbane · Chichester · Toronto

First published in 1982 by  
**ELLIS HORWOOD LIMITED**  
Market Cross House, Cooper Street, Chichester, West Sussex, PO19 1EB, England

*The publisher's colophon is reproduced from James Gillison's drawing of the ancient Market Cross, Chichester.*

**Distributors:**

*Australia, New Zealand, South-east Asia:*  
Jacaranda-Wiley Ltd., Jacaranda Press,  
JOHN WILEY & SONS INC.,  
G.P.O. Box 859, Brisbane, Queensland 40001, Australia

*Canada:*  
JOHN WILEY & SONS CANADA LIMITED  
22 Worcester Road, Rexdale, Ontario, Canada.

*Europe, Africa:*  
JOHN WILEY & SONS LIMITED  
Baffins Lane, Chichester, West Sussex, England.  
*North and South America and the rest of the world:*  
Halsted Press: a division of  
JOHN WILEY & SONS  
605 Third Avenue, New York, N.Y. 10016, U.S.A.

© 1982 E. Reid, G. M. W. Cook, D. J. Morré/Ellis Horwood Limited

**British Library Cataloguing in Publication Data**  
Cancer-cell organelles. — (Methodological surveys; vol. 11)  
1. Cancer cells  
2. Cell organelles  
I. Reid, E. II. Cook, G. M. W.  
III. Morré, D. J. IV. Series  
574.87'6 QH583.2

Library of Congress Card No. 81-6704 AACR2  
ISBN 0-85312-344-6 (Ellis Horwood Limited)  
ISBN 0-470-27244-9 (Halsted Press)

Typeset in Press Roman by Ellis Horwood Ltd.  
Printed in the U.S.A. by The Maple-Vail Book Manufacturing Group, New York.

**COPYRIGHT NOTICE —**

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, photocopying, recording or otherwise, without the permission of Ellis Horwood Limited, Market Cross House, Cooper Street, Chichester, West Sussex, England.

# Table of Contents

---

The NOTES & COMMENTS at the end of each section (headed 'NC') include some comments made at the Forum on which this book is based, together with some supplementary points.

	Senior Editor's Preface . . . . .	11
	List of Authors . . . . .	13
#A	<b>INTACT CELLS DIRECTLY FROM IN VIVO SOURCES</b>	
#A-1	Current tribulations and future prospects for identifying and separating the malignant cells from the normal cells in tumours – PETER ALEXANDER . . . . .	17
#A-2	Isolation of human peripheral blood monocytes – KATHERINE M. WYNNE . . . . .	23
#A-3	Separation and characterization of cells with immune function from peripheral blood – M. R. POTTER . . . . .	32
	[NC(A)-1 as listed below relates to the foregoing]	
#A-4	Selection and characterization of haemopoietic cell populations – R. SCHOFIELD . . . . .	40
#A-5	Separation of tumur and host cell populations from human neoplasms – BRENT M. VOSE . . . . .	45
#A-6	Identification of cancer cells by their surface antigens – M. R. PRICE, M. J. EMBELTON, B. GUNN, A. W. A. R. AL-SHEIKLY, D. HANNANT & R. W. BALDWIN . . . . .	57
#NC(A)	NOTES and COMMENTS related to Section #A (See also #NC(B)-1, below) including Notes on	
#NC(A)-1	Isolation and subfractionation of lymphoid cells by counterflow centrifugal elutriation – CAROLE L. JELSEMA, WILLIAM D. MERRITT, MARILYN HELMSWORTH & JAMES CASPER . . . . .	65
#NC(A)-2	Non-enzymic separation of tumour cells from Lewis lung carcinoma – M. MAGUDIA, JULIA ROBERTS & P. WHUR . . . . .	70

## Table of Contents

#NC(A)-3	Separation and short-term culture of different cell types from a transplanted hepatoma – PETER J. COX, SUSAN A. HUBBARD, MIOSLAV DOBROTA & RICHARD H. HINTON . . . . .	75
<b>#B</b>	<b>CELL CULTURES</b>	
#B-1	Growth and characterization of normal and leukaemic cell populations <i>in vitro</i> – NYDIA TESTA & T. M. DEXTER . . . . .	83
#B-2	Demonstration of malignant transformation of cells <i>in vitro</i> – M. R. DANIEL & J. M. DEHNEL . . . . .	89
#B-3	Isolation and purification of cell cultures from human tumours – R. I. FRESHNEY, ELAINE HART & J. M. RUSSELL . . . . .	97
#B-4	Characteristics of adult rat hepatocytes in primary culture on collagen gel-nylon mesh – ALPHONSE E. SIRICA, FELIX R. ALTHAUS & GEORGE HAYAO . . . . .	111
<b>#NC(B)</b>	<b>NOTES and COMMENTS related to Section #B (also to #A) including a Note on</b>	
#NC(B)-1	Cell isolation for subcellular fractionation: Guidance from preceding articles – G. M. W. COOK . . . . .	124
<b>#C</b>	<b>ORGANELLES FROM CANCER CELLS – GENERAL</b>	
#C-1	Organelle isolation: An over-view – D. J. MORRÉ . . . . .	126
#C-2	Phenotypic markers of hepatic ‘pre-neoplasia’ and neoplasia in the rat – ALPHONSE E. SIRICA & HENRY C. PITOT . . . . .	131
#C-3	Problems in separating membranous cell components from transplanted hepatomas – RICHARD H. HINTON . . . . .	144
#C-4	Separation of mammalian cells and cell organelles at low g-forces – A. TULP, M. G. BARNHOORN, J. G. COLLARD, W. KRAAN, M. SLUYSER, F. POLAK & J. A. ATEN . . . . .	158
#C-5	The use of flow cytometry in the selection of cellular and sub-cellular particles – GEORGE BLACKLEDGE . . . . .	171
<b>#NC(C)</b>	<b>NOTES and COMMENTS related to Section #C and to RNA including Notes on</b>	
#NC(C)-1	Analytical centrifugation of normal and transformed human fibroblasts – J. REMACLE & A. HOUBION . . . . .	175
#NC(C)-2	Use of aurintricarboxylic acid as an inhibitor of endogenous ribonucleases: isolation of cytoplasmic polyadenylated RNA from human leukaemic cells – STEPHEN HUGHES, JENNIFER H. BURNS & G. D. BIRNIE . . . . .	178

#D	NUCLEI, MITOCHONDRIA, LYSOSOMES AND PEROXISOMES
#D-1	Isolation of nuclei from cancer (or carcinogen-treated) cells, and their potential use for studying the altered RNA transport associated with cancer — GARY A. CLAWSON & EDWARD A. SMUCKLER . . . . . 188
#D-2	The nuclear envelope in relation to the metabolic activation of chemical carcinogens — CHARLES B. KASPER & FRANK J. GONZALEZ . . . . . 202
#D-3	Isolation and characterization of mitochondria from malignant cells — JANNA P. WEHRLE & PETER L. PEDERSEN . . . . . 215
#D-4	The mitochondrial inner membrane: Manipulating the lipid bilayer to understand membrane structure and electron transfer — CHARLES R. HACKENBROCK & HEINZ SCHNEIDER . . . . . 226
#D-5	Lysosomes of tumours: Properties, function and isolation — FEDERICO LEIGHTON & DOROTHY M. MORRÉ . . . . . 239

## #NC(D) NOTES and COMMENTS related to Section #D

*including Notes on*

#NC(D)-1	Lysosomes in transplanted hepatomas of the rat — DOROTHY M. MORRÉ & A. L. ROSENTHAL . . . . . 249
#NC(D)-2	Proteolysis in isolated autophagosomes — J. AHLBERG, F. HENELL, L. MARZELLA & H. GLAUMANN . . . . . 252
#NC(D)-3	Peroxisomes of cancer cells — FEDERICO LEIGHTON . . . . . 257

## #E ENDOMEMBRANES

#E-1	Preparation of functional rough microsomes from WI-38 human diploid fibroblasts, HeLa cells and rat liver — R. A. FELDMAN, S. GAETANI & T. MORIMOTO . . . . . 263
#E-2	Differences among microsomal subfractions in normal and transformed cells obtained after cell disruption by nitrogen cavitation — IAN F. PRYME, ASBJØRN M. SVARDAL, JON SKORVE & JOHAN R. LILLEHAUG . . . . . 293
#E-3	Isolation of Golgi apparatus: problems in adapting normal-cell methods to leukaemic cells — GEOFFREY M. W. COOK . . . . . 299
#E-4	Preparation and characterization of endoplasmic reticulum and Golgi apparatus membranes from preneoplastic liver nodules — LENNART C. ERIKSSON . . . . . 310
#E-5	Isolation of Golgi apparatus from hepatomas and cultured cells — D. JAMES MORRÉ & KIM E. CREEK . . . . . 321

#NC(E)	<b>NOTE and COMMENTS related to Section #E</b> <i>including a Note on</i>	
#NC(E)-1	Identification of ribophorins in rough microsomes from different organs and species — E. MARCANTONIO, D. D. SABATINI & G. KREIBICH.....	335
#F	<b>PLASMA MEMBRANES AND CELL SURFACES</b>	
#F-1	Preparation of plasma membrane from tissue culture cells — JOHN M. GRAHAM .....	342
#F-2	Isolation and characterization of plasma membrane from cultured cancer cells — GEORGE A. BAUMBACH, MICHAEL N. HORST, MICHAEL A. OLYMPHIO, HENRY C. ALDRICH & R. MICHAEL ROBERTS .....	351
#F-3	Plasma membrane recycling: significance for isolation of plasma membrane fractions — RICHARD P. KITSON & CHRISTOPHER C. WIDNELL.....	371
#F-4	Use of membrane maturing viruses for study of synthesis and expression of specific membrane molecules — PAUL H. ATKINSON, JOYCE TSANG LEE, SHIRLEY JANKELEVICH & JOHN HAKIMI.....	379
#F-5	Turnover of plasma membrane polypeptides in transformed and normal cells using $^{125}\text{I}/^{131}\text{I}$ double-label techniques — JOHN B. DENNY & R. MICHAEL ROBERTS.....	388
#NC(F)	<b>NOTES and COMMENTS related to Section #F</b> <i>including Notes on</i>	
#NC(F)-1	Isolation of plasma membranes from transplanted rat hepatomas — V. P. WALTER & D. J. MORRÉ.....	396
#NC(F)-2	Some new procedures for isolation of platelets and leucocyte surface membranes — N. CRAWFORD, SUZANNE MENASHI & D. I. H. STEWART .....	402
#NC(F)-3	Cell surface and extracellular glycosaminoglycan — JOHN GALLAGHER.....	403
A Retrospect	— E. REID.....	406

The 'COMMENTS' in NOTES & COMMENTS largely represent remarks made at the Forum on which this book is based. Insofar as they refer to particular contributions or groups of contributions, the following page guide will assist retrieval: #A-2 & #A-3, p. 73; #A-4, #A-5, #A-6 & #NC(A)-2, p. 74; #B-2 & #B-3, p. 122; #C-2, p. 186; #C-4, #C-5 & #NC(C)-1, p. 187; #D-1, p. 259; #D-2, p. 261; #D-3, #D-5 & #NC(D)-3, p. 262; #E-2, p. 340; #E-3 & #NC(E)-1, p. 341; #F-1, #F-2, #F-3 & #NC(F)-1, p. 404; #F-4, p. 405.

**Table of Contents**

9

<b>Subject Index . . . . .</b>	<b>411</b>
<b>Corrections to earlier Volumes . . . . .</b>	<b>417</b>