

# NUCLEIC ACID METABOLISM CELL DIFFERENTIATION AND CANCER GROWTH

*Proceedings of the Second International Symposium for Cellular  
Chemistry at Biwako Hotel, Ohtsu  
October 17 to 21, 1966*

## *Members of Organizing Committee*

H. ENDO, T. FUJII, M. HANAOKA, S. HIBINO, I. HONJO, T. ISHIKAWA,  
N. KAMIYA, I. KAWAKAMI, R. KINOSITA, S. MAKINO,  
O. MIDORITEAWA, Y. MIURA, H. NAORA, T. OKADA, B. OSOGOE,  
N. SHINKE, M. SUGIYAMA, K. TAKIKAWA, S. TANAKA, H. TERAYAMA,  
G. WAKISAKA AND T. YAMADA

## *Chairman of Organizing Committee*

S. SENO

## *Edited by*

E. V. COWDRY AND S. SENO

*Department of Anatomy  
Washington University  
School of Medicine, St. Louis*

*Department of Pathology  
Okayama University  
Medical School, Okayama*

PERGAMON PRESS

OXFORD · LONDON · EDINBURGH · NEW YORK  
TORONTO · SYDNEY · PARIS · BRAUNSCHWEIG

Pergamon Press Ltd., Headington Hill Hall, Oxford  
4 & 5 Fitzroy Square, London W. 1  
Pergamon Press (Scotland) Ltd., 2 & 3 Teviot Place, Edinburgh 1  
Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, New York 10523  
Pergamon of Canada Ltd., 207 Queen's Quay West, Toronto 1  
Pergamon Press (Aust.) Pty. Ltd., 19a Boundary Street, Rushcutters Bay,  
N. S. W. 2011, Australia  
Pergamon Press S. A. R. L., 24 rue des Écoles, Paris 5<sup>e</sup>  
Vieweg & Sohn GmbH, Burgplatz 1, Braunschweig

Copyright © 1969  
Pergamon Press Ltd

First edition 1969

Library of Congress Catalog Card No. 68-31342

PRINTED IN GERMANY

08 013252 9

## PREFACE

To write a preface to these Proceedings of the Second International Symposium for Cellular Chemistry is to relate the steps taken by our distinguished Secretary General, Dr. Satimaru Seno, Chairman of the Organizing Committee, that have made this Symposium an outstanding success. Although six steps, or stages, are recognizable in the development of this Symposium, these probably overlapped somewhat.

1. The selection of Dr. S. Akabori, President of Osaka University, himself a chemist of the highest reputation, to serve as President of the Symposium, constituted a long step in the right direction.

2. After consultation with the Organizing Committee, Dr. Akabori and others, Dr. Seno announced that the subjects of the Symposium would be *Nucleic Acid Metabolism, Cell Differentiation and Possible Ways to Control Cancer*. This proved a wise selection because it appealed to many organizations and individuals in Japan and abroad as including the most promising basic research made by the newest and most elaborate techniques fundamental to many aspects of human endeavor around the world.

3. In the difficult job of choosing those to be invited, the Executive Committee, the Secretary General, and President demonstrated intimate personal knowledge of leaders in these fruitful fields of enquiry in Japan and elsewhere. These individuals are to be congratulated on the scope and quality of the papers.

4. The subjects to be discussed and the names and reputations of the speakers were of great assistance to Drs. Akabori, Seno and every member of the influential Organizing Committee in obtaining financial support for the Symposium since they were acceptable as guarantees of quality.

5. Despite the fact that the Proceedings of the First International Symposium for Cellular Chemistry were published in Japan in flawless English by the Japan Society of Cell Biology, with illustrations second to none, in an attractive volume as a Katsunuma Memorial Issue, the decision of the Japan Society of Cell Biology to publish these Proceedings of the Second International Symposium by Pergamon Press Ltd. of Oxford was wise and far-sighted. To be consistently advertized with other notable books of the Pergamon Press will almost automatically lead to a large scale use of this

volume. This is important in placing them in the hands of all investigators in the basic and attractive fields of research that it covers.

6. I am convinced that the Officers of the Symposium and of the Japan Society of Cell Biology have carried out all matters as the late Seizo Katsunuma would have wished.

July 1967

E. V. COWDRY

## ACKNOWLEDGEMENTS

THE Organizing Committee of the Second International Symposium for Cellular Chemistry gratefully acknowledges help and support from many sources. Among others, we wish to thank deeply.

### 1. Cooperation:

Japan Science Council  
Japan Society for Cellular Chemistry  
Japan Society for the Promotion of Science

### 2. Support for the travelling expense of the American participants:

National Science Foundation, U.S.A.

### 3. Financial support for congress, travel and printing:

Japan Economic Association

Contributors from U.S.A.:

Parke, Davis & Co., Michigan; Schering Corporation, New Jersey; Smith  
Kline & French Overseas Co., Philadelphia; The Squibb Institute for  
Medical Research, New Jersey

Brewery, Food and Chemical Manufacturing Companies:

Sumitomo Chemical Co., Ltd., Osaka; Suntory Ltd., Osaka; Yamasa Shou Co.,  
Ltd., Choshi

Japan Electric Company Association:

The Chubu Electric Power Co., Ltd., Nagoya; The Chugoku Electric Power Co.,  
Ltd., Hiroshima; The Kansai Electric Power Co., Ltd., Osaka; The Tokyo  
Electric Power Co., Ltd., Tokyo

Japan Medical Association

Hospitals in Okayama and Hiroshima:

Arichi Hospital, Hiroshima; Jikeikai Hospital, Okayama; Kawada Hospital,  
Okayama; Kawasaki Hospital and Cancer Institute, Okayama; Kobatake  
Hospital, Hiroshima; Okayama Chuo Hospital, Okayama; Sakakibara Hospital,  
Okayama; Shimotsui Hospital, Okayama

The Life Insurance Association of Japan

Medical and Biological Equipments Manufacturing Companies;

Misuzu Sangyo Co., Ltd., Tokyo; Nichimen Co., Ltd., Osaka;  
Nippon Kogaku K.K., Tokyo; Olympus Optical Co., Ltd., Tokyo;  
Shimazu Seisakusho Ltd., Kyoto

The Nagoya Chamber of Commerce and Industry:

Matsusakaya Co., Ltd., Nagoya; Nagoya Railroad Co., Ltd., Nagoya;  
Toho Gas Co., Ltd., Nagoya; The Tokai Bank Ltd., Nagoya;  
Toyota Motor Co., Ltd., Nagoya

Personal contributors:

Kunishima, Kihachiro, Kyoto; Thuda, Ryotaro, Osaka

The Pharmaceutical Manufacturers of Tokyo, Osaka Pharmaceutical Manufacturers

Association and Related Companies:

Dainippon Pharmaceutical Co., Ltd., Osaka; Eisai Co., Ltd., Tokyo;  
Fujisawa Pharmaceutical Co., Ltd., Osaka; The Green Cross Corporation,  
Osaka; Kyowa Hakko Kogyo Co., Ltd., Tokyo; Nihon Shinyaku Co., Ltd.,  
Kyoto; Nippon Merck-Banyu Co., Ltd., Tokyo; Otsuka Pharmaceutical  
Factory, Tokushima & Okayama; Pfizer Taito Co., Ltd., Tokyo; Research  
Association for Photosensitizing Dyes, Okayama; Shionogi & Co., Ltd., Osaka;  
Takeda Chemical Industries, Ltd., Osaka; Tanabe Seiyaku Co., Ltd., Osaka;  
Toshiba Pharmaceutical Co., Ltd., Kawasaki

Tokyo Bankers Association

## LIST OF PARTICIPANTS

- AKABORI, S., Institute for Protein Research, Osaka University, Osaka, Japan
- \*AMANO, M., Biology Division, National Cancer Center Research Institute, Tokyo, Japan
- AOKI, I., Department of Physiology, Osaka City University, Medical School, Osaka, Japan
- \*BRAUN, A. C., The Rockefeller University, New York, U.S.A.
- \*BUSCH, H., Department of Pharmacology, Baylor University College of Medicine, Houston, U.S.A.
- EBERT, J. D., Department of Embryology, Carnegie Institute of Washington, Baltimore, U.S.A.
- ENDO, H., Research Institute of Cancer, Faculty of Medicine, Kyūshū University, Fukuoka, Japan
- \*FITZGERALD, P., Department of Pathology, State University of New York, Downstate, Medical Center, Brooklyn, U.S.A.
- FUJIKI, N., Department of Internal Medicine, Kyoto Prefectural University of Medicine, Kyoto, Japan
- FURUSAWA, M., Department of Biology, Faculty of Science, Osaka City University, Osaka, Japan
- \*HAGIWARA, A., Laboratory of Developmental Biology, College of Science, University of Kyoto, Kyoto, Japan
- \*HAMASHIMA, Y., Department of Pathology, Faculty of Medicine, Kyoto University, Kyoto, Japan
- \*HANAFUSA, H., The Public Health Research Institute of the City of New York, New York, U.S.A.
- \*HANAOKA, M., Institute for Virus Research, Kyoto University, Kyoto, Japan
- \*HARUNA, I., Department of Microbiology, University of Illinois, Urbana, U.S.A.
- HIBINO, S., Department of Internal Medicine, Nagoya University, School of Medicine, Nagoya, Japan
- HIRAOKA, T., Department of Botany, Faculty of Science, Kyoto University, Kyoto, Japan
- HONJO, I., Department of Biology, Faculty of Science, Osaka University, Toyonaka, Japan
- \*HORI, S. H., Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan
- HOTTA, Y., Department of Biology, University of California, San Diego, U.S.A.
- ISHIDA, J., Zoological Institute, Faculty of Science, University of Tokyo, Tokyo, Japan
- \*ISHIKAWA, T., Department of Pathology, School of Medicine, Kanazawa University, Kanazawa, Japan
- \*ISHIZAKI, H., Laboratory of Development Biology, Zoological Institute, Kyoto University, Kyoto, Japan
- ITO, N., Nara Technical College, Yamatokoriyama, Japan
- \*IWATA, S., Department of Anatomy, School of Medicine, Tokushima University, Tokushima, Japan
- \*IZAWA, M., Biology Division, National Cancer Center Research Institute, Tokyo, Japan

\* Contributors.

- IZUTSU, K., Department of Pathology, Mie Prefectural University, School of Medicine, Tsu, Japan
- KAIGHN, M.E., Carnegie Institute of Washington, Department of Embryology, Baltimore, U.S.A.
- \*KAMEYAMA, T., Laboratory of Cancer Research, School of Medicine, Kanazawa University, Kanazawa, Japan
- KAMIYA, N., Department of Biology, Faculty of Science, Osaka University, Toyonaka, Japan
- \*KASTEN, F.H., Pasadena Foundation for Medical Research, Pasadena, U.S.A.
- \*KATO, S., Research Institute for Microbial Diseases, Osaka University, Osaka, Japan
- KAWADE, Y., Institute for Virus Research, Kyoto University, Kyoto, Japan
- KAWAI, T., Department of Pathology, Okayama University Medical School, Okayama, Japan
- \*KAWAKAMI, I., Department of Biology, Faculty of Science, Kyūshū University, Fukuoka, Japan
- KAWAKAMI, M., Department of Microbiology, School of Medicine, Gunma University, Maebashi, Japan
- KAWAMATA, J., Research Institute for Microbial Diseases, Osaka University, Osaka, Japan
- \*KIMOTO, T., Department of Pathology, Okayama University Medical School, Okayama, Japan
- KIMURA, K., Department of Biophysics and Biochemistry, Faculty of Science, University of Tokyo, Tokyo, Japan
- \*KINOSITA, R., City of Hope National Medical Center, Duarte, U.S.A.
- KOSHIHARA, H., Department of Zoology, Faculty of Science, Tokyo Kyoiku University, Tokyo, Japan
- KOTANI, M., Department of Biology, Faculty of Science, Osaka City University, Osaka, Japan
- KRATOCHWIL, W.K., Department of Biology, University of California, San Diego, U.S.A.
- \*KURODA, Y., Department of Morphological Genetics, National Institute of Genetics, Mishima, Japan
- \*MARCO, A. DI, Istituto Tumori Nazionale, Milano, Italy
- MATANO, Y., Department of Anatomy, Osaka City University, Medical School, Osaka, Japan
- MATSUMOTO, I., Department of Biochemistry, Faculty of Medicine, Kyūshū University, Fukuoka, Japan
- MIDORIKAWA, O., Department of Pathology, Faculty of Medicine, Kyoto University, Kyoto, Japan
- \*MITSUHASHI, S., Department of Microbiology, School of Medicine, Gunma University, Maebashi, Japan
- \*MIURA, Y., Department of Biochemistry, School of Medicine, Chiba University, Chiba, Japan
- \*MIYAHARA, M., Department of Pathology, Okayama University Medical School, Okayama, Japan
- MONDEN, H., Department of Pathology, Okayama University Medical School, Okayama, Japan
- \*MORIKAWA, S., Department of Pathology, Faculty of Medicine, Kyoto University, Kyoto, Japan
- MURANO, T., Department of Pharmacology, Wakayama Medical College, Wakayama, Japan
- NAKAZAWA, T., Department of Neuropsychiatry, Keio University, School of Medicine, Tokyo, Japan
- \*NAORA, H., Biology Division, National Cancer Center Research Institute, Tokyo, Japan



- NISHI, K., Research Institute for Tuberculosis, Toneyama Hospital, National Sanatorium and Osaka City University, Toyonaka, Japan
- NISHIDA, H., Biological Laboratory, Iwamizawa Branch, Hokkaido College of Education, Iwamizawa, Japan
- OBUCHI, S., Department of Pathology, Okayama University Medical School, Okayama, Japan
- OHTAKA, Y., Institute of Physical and Chemical Research, Tokyo, Japan
- OKADA, S., Department of Pathology, Okayama University Medical School, Okayama, Japan
- \*OKADA, T.S., Zoological Institute, Faculty of Science, Kyoto University, Kyoto, Japan
- OKIGAKI, T., Biology Department, Division of Natural Science, International Christian University, Tokyo, Japan
- ROKUJO, T., Medical Division, Igaku Chosa-bu, Fujisawa Pharmaceutical Co., Ltd., Osaka, Japan
- SATO, A., Technical Research Department, Nichimen Co., Ltd., Osaka, Japan
- SATO, I., Department of Biology, College of General Education, Osaka University, Toyonaka, Japan
- SEIJI, M., Department of Dermatology, Juntendo University School of Medicine, Tokyo, Japan
- \*SENO, S., Department of Pathology, Okayama University Medical School, Okayama, Japan
- SHIBATA, T., Department of Pathology, Okayama University Medical School, Okayama, Japan
- SHIMIZU, M., Dainippon Pharmaceutical Co., Ltd., Osaka, Japan
- \*SHIRAKAWA, S., Department of Internal Medicine, Faculty of Medicine, Kyoto University, Kyoto, Japan
- SOGABE, K., Department of Pathology, Okayama University Medical School, Okayama, Japan
- \*SPIEGELMANN, S., Department of Microbiology, University of Illinois, Urbana, U.S.A.
- SUGINO, Y., Institute for Virus Research, Kyoto University, Kyoto, Japan
- SUGIYAMA, M., Sugashima Marine Biological Station, Nagoya University, Toba, Japan
- \*SUYAMA, T., Department of Pathology, School of Medicine, Kanazawa University, Kanazawa, Japan
- TAKAGI, Y., Department of Biochemistry, School of Medicine, Kyūshū University, Fukuoka, Japan
- TAKAHASHI, T., Laboratory of Biochemistry, Aichi Cancer Center Research Institute, Nagoya, Japan
- TAKAKI, R., Department of Internal Medicine, School of Medicine, Kyūshū University, Fukuoka, Japan
- TAKEBAYASHI, J., Department of Pathology, Okayama University Medical School, Okayama, Japan
- TAKEDA, S., Department of Pathology, School of Medicine, Mie Prefectural University, Tsu, Japan
- \*TAKEUCHI, I., Department of Biology, Faculty of Science, Osaka University, Toyonaka, Japan
- TAKIKAWA, K., Department of Internal Medicine, Nagoya University School of Medicine, Nagoya, Japan
- TANAKA, K., Central Research Laboratory, Sankyo Co., Ltd., Tokyo, Japan
- TANAKA, S., Department of Biological Chemistry, Faculty of Science, Kyoto University, Kyoto, Japan
- TANAKA, T., Laboratory of Tumor Biology, Aichi Cancer Center, Nagoya, Japan
- \*TERAYAMA, H., Department of Biophysics and Biochemistry, Faculty of Science, University of Tokyo, Tokyo, Japan
- \*THORELL, B., Department of Pathology, Karolinska Institute, Stockholm, Sweden

- \*VALLADARES, Y., Laboratory of Biology and Biochemistry of Cancer, Instituto Nacional de Oncologia, Madrid, Spain
- \*WAKISAKA, G., Department of Internal Medicine, Faculty of Medicine, Kyoto University, Kyoto, Japan
- \*WATANABE, R., Department of Pathology, School of Medicine, Kanazawa University, Kanazawa, Japan
- \*WATANABE, Y., Department of Pathology, National Institute of Health, Tokyo, Japan
- \*YAMADA, M., Department of Pathology, National Institute of Health, Tokyo, Japan
- \*YAMADA, M., Department of Anatomy, School of Medicine, Tokushima University, Tokushima, Japan
- YAMAGATA, K., Department of Anatomy, Osaka City University, Medical School, Osaka, Japan
- YAMAGATA, S., Department of Obstetrics and Gynecology, Osaka City University, Medical School, Osaka, Japan
- YAMAMOTO, K., Faculty of Fisheries, Hokkaido University, Hakodate, Japan
- \*YAMAMOTO, T., Institute for Infectious Diseases, University of Tokyo, Tokyo, Japan
- YAMANAKA, M., Department of Microbiology, Osaka Medical College, Takatsuki, Japan
- YAMANE, I., Research Institute for TB, Leprosy and Cancer, Tōhoku University, Sendai, Japan
- \*YANAGITA, T., Institute of Applied Microbiology, University of Tokyo, Tokyo, Japan
- YASUMASU, I., Department of Biology, College of Education, Waseda University, Tokyo, Japan
- YOKOMURA, E., Department of Pathology, Okayama University Medical School, Okayama, Japan
- \*ZEUTHEN, E., Carlsberg Foundation Biological Institute, Copenhagen, Denmark

## OPENING ADDRESS

S. AKABORI

Distinguished guests, ladies and gentlemen:

It is a great honor and pleasure for me to have the privilege of delivering a welcome address to you on the opening of the Second International Symposium for Cellular Chemistry.

It was at this same place in March 1963, when the First International Symposium was held with the theme of "Intracellular Membraneous Structure". The First Symposium was sponsored by the late President Seizo Katsunuma of Nagoya University with the collaboration of Dr. E. V. Cowdry of the United States. It was my privilege to attend this First Symposium, which was so very successful that President Katsunuma started planning a Second Symposium with the officers of the Japan Society for Cellular Chemistry, now called the Japan Society for Cell Biology. However, to our great regret, he suddenly passed away in the fall of 1963.

To cope with this difficult situation, the Japan Society for Cell Biology asked me to act as President of the Second International Symposium. Though I am not a cell biologist, I fully understand that cellular chemistry, binding together biochemistry and cell biology, is an exceedingly important and promising discipline for the understanding of the basic aspects of life and the causes of diseases like cancer at the cellular as well as the molecular level. It was indeed a great privilege for me to do what I could in organizing this Symposium.

The first Organizing Committee meeting of this Symposium was held at Osaka in March 1965. After repeated meetings, during which suggestions from many authorities were carefully considered, the Japan Society for Cell Biology decided the theme of this symposium should be "Nucleic Acid Metabolism, Cell Differentiation and Possible Ways to Control Cancer". The Science Council of Japan and the Japanese Association for the Promotion of Sciences have approved the preparation of this Symposium. Generous financial assistance from various sources, both domestic and foreign, has been thankfully received.

Taking this opportunity, it is a pleasure to express my sincere appreciation to Dr. Cowdry who has greatly encouraged the opening of this Symposium through his enthusiasm and suggestions to the officers of the Organizing Committee headed by Dr. Seno, who worked assiduously throughout

the preparatory stages. I also wish to express my hearty thanks to all sponsors for their support as well as to authorities from foreign countries for their whole-hearted cooperation in this Symposium. I am convinced that it is your enthusiasm for research and also your friendship which have brought you here.

On behalf of the organizer, the Japan Society for Cell Biology, I should like to express our gratitude for your participation and extend to you a most hearty welcome. We sincerely hope that our distinguished guests from abroad find these scientific discussions profitable and will enjoy their stay in Japan. Thank you.



The late Dr. Seizo Katsunuma (1886–1963) the President of the First International Symposium for Cellular Chemistry (March, 1963). He had been also appointed the President of the Second International Symposium for Cellular Chemistry (1966) but he passed away from a cerebral hemorrhage in November, 1963, and he was succeeded by Dr. S. Akabori, President of Osaka University. Dr. Katsunuma, an authority in internal medicine, was President of Nagoya University from 1949 to 1959. He received numerous awards and prizes for his cytochemical studies of oxidase as early as in the twenties of this century, and is considered the Father of modern cell biology and cell chemistry.



**Dr. Shiro Akabori, President of the Second International Symposium for Cellular Chemistry, Professor Emeritus of Biochemistry, Osaka University, formerly President of the same university (1960–1966), made a great contribution to research in amino acid and protein chemistry.**

# CONTENTS

Preface	ix
Acknowledgements	xi
List of Participants	xiii
Opening Address. By S. AKABORI	xvii

## I. TRANSCRIPTION

Studies on the synthesis of a viral nucleic acid with a purified enzyme. By S. SPIEGEL-MAN, I. HARUNA and N. R. PACE	3
The molecular structures and functions of RNA polymerase of <i>Escherichia coli</i> . By T. KAMEYAMA, Y. KITANO, H. KAWAKAMI, Y. IIDA, S. MURAKAMI, Y. TANAKA and A. ISHIHAMA	29
Protein synthesis in the nuclear ribosome system. By H. NAORA	47
Ultrastructure of mammalian chromosomes. By R. KINOSITA	55
RNA of nucleoli of Walker tumor and liver cells. By H. BUSCH, J. ARENDELL, K. HIGASHI, L. HODNETT, T. NAKAMURA, R. NEOGY, S. M. SCHWARTZ and S. J. SMITH	73
An <i>in vivo</i> synthesis of RNA in the nucleoli of mouse ascites tumor cells. By M. IZAWA	91
RNA synthesis in the chromatin fraction of rat liver and ascites hepatoma AH-130 cells. By M. AMANO and T. FUKUDA	103
The maintenance of RNA synthesis in isolated rat liver nuclei. By M. YAMADA and S. IWATA	111

## II. RNA-PROTEIN SYNTHESSES AND CELL DIFFERENTIATION

Messenger RNA for fibroin synthesis in posterior silk glands. By Y. MIURA and H. ITOH	123
On the glucose-6-phosphate dehydrogenase activity and isozyme of rats. By S. H. HORI and S. MAKINO	131
Primary induction in amphibian development, active groups of the effective agents and heterogeneous cell composition of the reactor tissues. By I. KAWAKAMI, K. AVE, N. SASAKI and M. SAMESHIMA	143
Mode of action of insect brain hormone—an electron microscopic study. By H. ISHIZAKI	153
The effect of 5-bromo-deoxyuridine on the synthesis of 7S and 19S antibodies. By Y. NAMBA and M. HANAOKA	159
Antibody formation in cultured mouse lymphoid cells. By A. HAGIWARA	173
<i>In vitro</i> transfer of cellular immunity by transfer agent of RNA nature. By S. MITSUHASHI, K. SAITO and S. KURASHIGE	179
Histochemical and immunochemical studies on some nucleases. By S. MORIKAWA and Y. HAMASHIMA	191
Division-limiting morphogenetic processes in <i>Tetrahymena</i> . By E. ZEUTHEN and N. E. WILLIAMS	203
Nuclear control of cell specialization—viewed from the studies of differentiation of mammalian erythroid cell. By S. SENO, M. MIYAHARA and K. UTSUMI	219

## III. CELL MULTIPLICATION AND DIFFERENTIATION

The regulation of DNA replication in chromosomes of higher cells. By J. H. TAYLOR	231
The mechanism of antimitotic activity of Daunomycin. By A. DI MARCO and R. SIL- VESTRINI	241
Action of mitomycin C on cultured salamander cells—a phase-contrast and cyto- chemical study. By F. H. KASTEN and C. WOOD	253
Expression of some antigenic characteristics in embryonic kidney cells cultured <i>in</i> <i>vitro</i> . By T. S. OKADA	267
Differentiation of the cell-free materials with aggregate-forming activity from embry- onic chick liver cells. By Y. KURODA	277
Organ culture of the rat pancreas anlage as a model for the study of differentiation. I. Techniques and comparison of <i>in utero</i> (embryonic) and <i>in vitro</i> (organ culture) morphogenesis. By I. PARSA, W. H. MARSH and P. J. FITZGERALD	287
Establishment of polar organization during slime mold development. By I. TAKEUCHI	297
Physiological and biochemical studies on the fruit body formation in <i>Basidiomycetes</i> . By T. YANAGITA, Y. TSUSUÉ, F. KOGANÉ and S. SUTO	305
On the transformation and recovery of the crown-gall tumor cell. By A. C. BRAUN	317

IV. CONTROL OF CELL GROWTH, CELL TRANSFORMATION  
AND CANCER INDUCTION BY VIRUS

Molecular aspects of the release of tumor cells from the control of proliferation. By H. TERAYAMA, H. OTSUKA, K. SAKUMA and H. YAMAGATA	327
Growth potency of individual human diploid cells <i>in vitro</i> . By M. YAMADA	337
Studies on the nucleic acid metabolism of leukemic cells. By G. WAKISAKA, T. NAKA- MURA, S. SHIRAKAWA, Y. YOSHIDA, A. TODO, A. KANO and H. SAWADA	349
Purification of "division protein" of <i>Tetrahymena pyriformis</i> . By Y. WATANABE, M. IKEDA and S. TAMURA	371
Some biological activity of basic nuclear proteins in relation to cancer. By T. ISHI- KAWA, S. ODASHIMA, S. FUKUDA and T. SUYAMA	383
Cell autoradiography and biochemical studies of cancerigenic viral infections. By Y. VALLADARES	401
Oncogenic properties of DNA derived from SV-40 virus. By T. KIMOTO and J. T. GRACE	421
Virus-host cell interaction in cellular proliferation induced by poxvirus. By S. KATO, H. MIYAMOTO, K. ONO, H. TSURU, M. MANTANI and T. TANIGAKI	433
Absence of infectious virus in chicken and mammalian tumors induced by Rous sar- coma virus. By H. HANAFUSA and T. HANAFUSA	443
Cytochemistry of virus-induced cell transformation <i>in vitro</i> . By B. THORELL	457
Mouse ascites sarcomas induced by Rous sarcoma virus. By T. YAMAMOTO	461
Closing remarks. By J. D. EBERT	469
Subject Index	471



## I. TRANSCRIPTION