43rd Symposium of the Society
for Developmental Biology

Molecular Developmental Biology

Edited by
Lawrence Bogorad

Alan R. Liss, Inc., New York

Molecular Developmental Biology

Lawrence Bogorad
Editor
Harvard University
Biological Laboratories
Cambridge, Massachusetts

Alan R. Liss, Inc. • New York

Address all Inquiries to the Publisher
Alan R. Liss, Inc., 41 East 11th Street, New York, NY 10003

Copyright © 1986 Alan R. Liss, Inc.

Printed in the United States of America

Under the conditions stated below the owner of copyright for this book hereby grants permission to users to make photocopy reproductions of any part or all of its contents for personal or internal organizational use, or for personal or internal use of specific clients. This consent is given on the condition that the copier pay the stated per-copy fee through the Copyright Clearance Center, Incorporated, 27 Congress Street, Salem, MA 01970, as listed in the most current issue of "Permissions to Photocopy" (Publisher's Fee List, distributed by CCC, Inc.), for copying beyond that permitted by sections 107 or 108 of the US Copyright Law. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale.

Library of Congress Cataloging-in-Publication Data

Main entry under title:

Molecular developmental biology.

"43rd Symposium of the Society for Developmental Biology, Columbia University, June 18–20, 1984, New York."

Includes index.

1. Developmental biology—Congresses. 2. Molecular biology—Congresses. I. Bogorad, Lawrence, 1921–
QH491.M644 1986 574.3 85-23808
ISBN 0-8451-1504-9

Molecular Developmental Biology

The Forty-Third Symposium of
The Society for Developmental Biology
Columbia University, June 18–20, 1984

Executive Committee
1983–84

Lawrence Bogorad, Harvard University, President
Robert L. Trelstad, Rutgers Medical School, Past President
Joseph G. Gall, Carnegie Institution of Washington, Baltimore, President-Elect
Susan Heyner, Philadelphia College of Pharmacy and Science, Secretary
Ralph S. Quatrano, Oregon State University, Treasurer
Richard L. Nuccitelli, University of California at Davis, Member-at-Large

1984–85

Joseph G. Gall, Carnegie Institution of Washington, Baltimore, President
Lawrence Bogorad, Harvard University, Past President
William Loomis, University of California, San Diego at La Jolla, President-Elect
Susan Heyner, Philadelphia College of Pharmacy and Science, Secretary
Gail Waring, Marquette University, Milwaukee, Treasurer
Richard L. Nuccitelli, University of California at Davis, Member-at-Large

Business Manager
Holly Schauer
P.O. Box 40741
Washington, D.C. 20016

试读结束：需要全本请在线购买： www.ertongbook.com

Contributors

Gerard F. Barry, Monsanto Company, 700 Chesterfield Village Parkway, St. Louis, MO 63198 **[15]**

Elizabeth H. Blackburn, Department of Molecular Biology, University of California, Berkeley, CA 94720 **[69]**

Lawrence Bogorad, Harvard University, Biological Laboratories, 16 Divinity Avenue, Cambridge, MA 02138 **[ix]**

Ralph L. Brinster, Laboratory of Reproductive Physiology, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, PA 19104 **[149]**

Pierre Chambon, Laboratoire de Génétique Moléculaire des Eucaryotes du CNRS, Unité 184 de Biologie Moléculaire et de Génie Génétique de l'INSERM, Faculté de Médecine, 11 rue Humann, 67085 Strasbourg Cedex, France **[117]**

Howard Y. Chen, Laboratory of Reproductive Physiology, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, PA 19104 **[149]**

Christos Delidakis, Department of Cellular and Developmental Biology, Harvard University, Cambridge, MA 02138 **[85]**

Karl M. Ebert, Laboratory of Reproductive Physiology, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, PA 19104 **[149]**

Jeanne Erickson, Departments of Molecular Biology and Plant Biology, University of Geneva, 30 quai Ernest-Ansermet, CH-1211 Geneva 4, Switzerland **[27]**

Robert T. Fraley, Monsanto Company, 700 Chesterfield Village Parkway, St. Louis, MO 63198 **[15]**

Michel Goldschmidt-Clermont, Departments of Molecular Biology and Plant Biology, University of Geneva, 30, quai Ernest-Ansermet, CH-1211 Geneva 4, Switzerland **[27]**

Leonard Guarente, Department of Biology, Massachusetts Institute of Technology, Cambridge, MA 02139 **[57]**

Muriel Herz, Departments of Molecular Biology and Plant Biology, University of Geneva, 30, quai Ernest-Ansermet, CH-1211 Geneva 4, Switzerland **[27]**

J. Hirsh, Department of Biological Chemistry, Harvard Medical School, 25 Shattuck St., Boston, MA 02115 **[103]**

Robert B. Horsch, Monsanto Company, 700 Chesterfield Village Parkway, St. Louis, MO 63198 **[15]**

The number in brackets is the opening page number of the contributor's article.

Fotis C. Kafatos, Department of Cellular and Developmental Biology, Harvard University, Cambridge, MA 02138, and Institute of Molecular Biology and Biotechnology and Department of Biology, University of Crete, Heraclio, Crete, Greece **[85]**

Katia Komitopoulou, Department of Biochemistry, Cell and Molecular Biology and Genetics, University of Athens, Panepistimiopolis, Kouponia, Athens 15701, Greece **[85]**

Pal Maliga, Advanced Genetic Sciences, Inc., 6701 San Pablo Avenue, Oakland, CA 94608 **[45]**

William Orr, Department of Cellular and Developmental Biology, Harvard University, Cambridge, MA 02138 **[85]**

Richard D. Palmiter, Howard Hughes Medical Institute, Department of Biochemistry, University of Washington, Seattle, WA 98195 **[149]**

Jean-David Rochaix, Departments of Molecular Biology and Plant Biology, University of Geneva, 30, quai Ernest-Ansermet, CH-1211 Geneva 4, Switzerland **[27]**

Stephen G. Rogers, Monsanto Company, 700 Chesterfield Village Parkway, St. Louis, MO 63198 **[15]**

Paolo Sassone-Corsi, Laboratoire de Génétique Moléculaire des Eucaryotes du CNRS, Unité 184 de Biologie Moléculaire et de Génie Génétique de l' INSERM, Faculté de Médecine, 11 rue Humann, 67085 Strasbourg Cedex, France **[117]**

Jeff Schell, Max-Planck-Institut für Züchtungsforschung, D-5000 Köln, Federal Republic of Germany, and Laboratorium voor Genetica, Rijksuniversiteit Gent, B-9000 Gent, Belgium **[3]**

Robert J. Spreitzer, Departments of Molecular Biology and Plant Biology, University of Geneva, 30, quai Ernest-Ansermet, CH-1211 Geneva 4, Switzerland **[27]**

George Thireos, Institute of Molecular Biology and Biotechnology and Department of Biology, University of Crete, Heraclio, Crete, Greece **[85]**

Myrna E. Trumbauer, Laboratory of Reproductive Physiology, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, PA 19104 **[149]**

Jean-Marie Vallet, Departments of Molecular Biology and Plant Biology, University of Geneva, 30, quai Ernest-Ansermet, CH-1211 Geneva 4, Switzerland **[27]**

Marc Van Montagu, Laboratorium voor Genetica, Rijksuniversiteit Gent, B-9000 Gent, Belgium, and Laboratorium voor Genetische Virologie, Vrije Universiteit Brussel, B-1640 St.-Genesius-Rode, Belgium **[3]**

Alan Wildeman, Laboratoire de Génétique Moléculaire des Eucaryotes du CNRS, Unité 184 de Biologie Moléculaire et de Génie Génétique de l'INSERM, Faculté de Médecine, 11 rue Humann, 67085 Strasbourg Cedex, France **[117]**

Yuk-Chor Wong, Department of Cellular and Developmental Biology, Harvard University, Cambridge, MA 02138 **[85]**

Keith R. Yamamoto, Department of Biochemistry and Biophysics, University of California, San Francisco, CA 94143 **[131]**

Preface

The 25th Annual Symposium of the Society was convened in June of 1966 at Haverford, Pennsylvania as a celebration and stock-taking. Its prospective tone was set by its title: "Major Problems in Developmental Biology". Jane M. Oppenheimer, the first speaker of the first session sounded the retrospective chord. Her contribution was entitled "The Growth and Development of Developmental Biology". In this article she reviewed the state of embryology in 1938 and 1939 (the first symposium of the present series was held in August 7–11, 1939 in the Truro Central school at North Truro, Massachusetts). That the study of embryology was the overwhelming component of development in the late 1930's was clear, for the remainder of her discussion of the state of the biology underlying development was lumped under the subtitle "The state of some non-embryological areas of biology from 1938 to 1940." But as Jane Oppenheimer pointed out;

> "The papers in the first symposium [sponsored by the journal "Growth"] were all rather closely related to what in the old days might have been called embryology. This was not to be true for long. As early as 1940, in the second symposium [the first sponsored by the Society for the Study of Development and Growth], every paper dealt with an aspect of what we would call molecular biology. Although most of the speakers . . . addressed themselves to the examination of chemical or physical factors in specific relation to growth and development, O.L. Sponsler in his talk on proteins, and Rudolph Schoenheimer in his on the synthesis of protoplasmic constitutents, made no direct reference to development . . . . "

(To emphasize the antiquity of the term "molecular biology" she goes on elsewhere to point out that W.T. Astbury, in discussing viruses, stated in 1939 that "to the molecular biologist [speaking of himself], the most thrilling discovery of the century is that of the nature of the tobacco mosaic virus; . . . . it is but a nucleoprotein.")

All of this is simply to emphasize that almost from its beginning, the Society for the Study of Development and Growth, which later became the Society for Developmental Biology, has been concerned with the broadest range of biological problems at the level of the single organism from the molecular to the integrated whole. The 43rd Annual Symposium centered on the former with an eye toward the enormous steps forward that knowledge of molecular biology is likely to provide for understanding the development of the latter.

The 41st Symposium held in June 1982, was entitled "Gene Structure and Regulation in Development." Most of the papers dealt with physical characterizations of genes and the monitoring of accumulated RNA and protein products of genes during the development in a variety of organisms—essentially descriptive molecular developmental biology. But among the papers, two pointed to the road leading to the subject of the 43rd Symposium: a paper by Beatrice Mintz entitled "Manipulating the genotype of developing mice" and another by Richard D. Palmiter and Ralph L. Brinster entitled "Inheritable expression of fusion genes microinjected into mouse eggs." In the Society's records these papers mark the sliding transition from descriptive toward experimental molecular developmental biology.

The 43rd Annual Symposium, held at Columbia University in New York June 18–20, 1984 was entitled "Molecular Developmental Biology" but in its earliest, formative times, it had the working subtitle "Watching Foreign Genes at Work." This symposium, with more than 400 people in attendance, examined the state of the opening of the developmental biologist's long dream—a dream that an older generation of developmental biologists hardly imagined having or didn't even know they could have. The dream opens with the possibility of understanding developmental processes by deliberately and specifically altering the genetic make up of an organism and of dissecting the activities of a single gene across developmental time. The sessions of the symposia were entitled Foreign Genes in Eukaryotic Cells; The Expression of Foreign Genes in Plants and Plant Cells; Transformations of Lower Eukaryotes; Transformation Studies Using *Drosophila*; and Vertebrate Transformations. As faint echos of 1982 (only echos because of the exciting new data presented from the same laboratories) Ralph Brinster participated and spoke on "Introduction of new genes into mice" and Beatrice Mintz presented more data along the lines of research she described two years earlier in a paper entitled "Mutagenesis by DNA insertion in developing mice". But the startling difference from a few years earlier was the enormous explosion of transformation studies in cells of plants and animals and of whole organisms. Oh yes, this time things were different from 1940 for the Sponslers and Schoenheimers of 1984 addressed developmental problems!

The breadth of developmental biology and of the interests of members of the Society has been reflected over the years in the subject matter of the Symposia. Until the 10th Symposium in 1951, each symposium was entitled simply "Development and Growth". After that, a single subject was selected for attention. The titles of earlier Symposia are listed elsewhere in this volume. Thus the diversity can be recognized by looking at titles over a number of years but a reflection of the diversity and breadth of Developmental Biology has been provided during the past few Symposia in the posters that are presented. A glimpse of that reflection is provided in this volume in the four abstracts for the prize winning posters presented by graduate students.

The Society is grateful to the National Science Foundation for its financial support of this Symposium. We are also grateful to Joyce E. Jackson, conference housing manager at Columbia University, for her enormous contribution to our intellectual and physical welfare and to Dr. Diane M. Robins of Columbia University who was a one person local committee. Personally, I am grateful to Anne H. Schauer, the Executive Officer of the Society, for her support and assistance during the period that the Symposium was being organized as well as during the meeting itself. I am also indebted to Mr. George Adelman for his assistance in various matters relating to the published proceedings of this Symposium.

Finally, I want to convey my gratitude to those who participated in the Symposium and especially to the speakers who have provided manuscripts which appear here to give those who were not in attendance a feeling for the new avenues opening to students of developmental biology and to remind those who did attend of the continuing excitement of the study.

Lawrence Bogorad

Young Investigators Awards—1984

First Place Award

Vassie C. Ware
Department of Biology
Brown University
Providence, RI 02912

rRNA Processing: Structure of the "Gap" Between α and β 28S rRNA of Sciara coprophila.

Second Place Awards

Peter A. Merrifield
Department of Biology
University of Virginia
Charlottesville, VA 22901

Myosin Light Chain Switching is Nerve-Dependent in Developing Limb Musculature

Antonis Hatzopoulos
Department of Biochemistry
Northwestern University
Evanston, IL 60201

Regional Expression of Silkmoth Chorion Genes

David C. Schwartz
Department of Human Genetics and Development
Columbia University
New York, NY 10032

Electrophoretic Separation of Yeast Chromosomal DNAs

试读结束：需要全本请在线购买： www.ertongbook.com

Abstract of the First Place Young Investigator Award—1984

rRNA Processing: Structure of the "Gap" Between α and β 28S rRNA of *Sciara coprophila*. V.C. Ware, R. Renkawitz*, and S.A. Gerbi. Division of Biology and Medicine, Brown University, Providence, RI; *German Cancer Research Center, D-6900, Heidelberg-1, West Germany

In many organisms (e.g., *Protozoa*, *Mollusca*, *Annelida*, *Arthropoda*) mature 28S ribosomal RNA (rRNA) exhibits a central break which divides the rRNA into α and β chains. This rRNA is not colinear with the rDNA, as the "gap" sequence separating the two chains has been removed during RNA processing. Unlike intervening sequences which have been localized in some systems within the β chain coding region, there is no splicing reaction to covalently link the α and β halves together; instead, the two halves are held together by hydrogen bonds. It is unclear why the scission is not a universal phenomenon and how this processing step might alter ribosome function. We have been interested in determining the "gap" structure to learn about its evolutionary origin and possible processing mechanism.

We have determined the sequence of the rDNA region coding for the 28S "gap" in the fungus fly, *Sciara coprophila*, and have used S1 nuclease mapping to define the 5′ and 3′ boundaries of the "gap". Our data show that only nineteen (19) bases found in rDNA at the "gap" region are absent from mature 28S rRNA. We present a model for the secondary structure of *Sciara* 28S rRNA in the "gap" region based on experiments using S1 nuclease as a probe for single stranded areas in rRNA and reverse transcriptase to direct the synthesis of cDNAs from partially digested rRNAs (Qu *et al.*, 1983. NAR *11*, 5903). By comparison of this model with a model proposed for *Xenopus laevis* 28S rRNA (which lacks a central break) in the counterpart region, clues for processing signals for excision of the "gap" transcript may be revealed.

Contents

I. Expression of Foreign Genes in Plants

Molecular Developmental Biology, pages 3–13
© 1986 Alan R. Liss, Inc.

Regulated Expression of Foreign Genes of Plants

Jeff Schell and Marc Van Montagu

Max-Planck-Institut für Züchtungsforschung, D-5000 Köln, Federal Republic of Germany (J.S.), Laboratorium voor Genetica, Rijksuniversiteit Gent, B-9000 Gent, Belgium (J.S., M.V.M.), and Laboratorium voor Genetische Virologie, Vrije Universiteit Brussel, B-1640 St.-Genesius-Rode, Belgium (M.V.M.)

I. INTRODUCTION

With the development of efficient gene vector systems for plants, we have acquired an added experimental capacity to study the molecular organization of plant genes. In this paper, we review and briefly discuss some recent progress in research aimed at identifying the regulatory mechanisms that underly differential and regulated gene expression in plants. The general strategy has been to identify regulatory sequences by fusing DNA subfragments suspected to be involved in regulation to DNAs coding for marker proteins. These chimeric gene constructs are subsequently introduced into the genomes of plant cell cultures and into fully regenerated plants in which their expression can be monitored.

The general feasibility of this approach was demonstrated not only by analogous approaches successfully used in prokaryotes, plants, and animal cells but specifically for plants by the use of chimeric genes, coding for enzymes conferring a dominant selectible phenotype on transformed plant cell cultures and whole plants [Herrera-Estrella et al., 1983a,b; Fraley et al., 1983; Bevan et al., 1983; De Block et al., 1984; Horsch et al., 1984].

II. PLANT GENE VECTORS

A variety of attempts to transform plant cells using techniques applicable to animal cell cultures were only marginally successful [Sarkar et al., 1974;

试读结束：需要全本请在线购买： www.ertongbook.com