

This is a free sample of content from *Mutation: The History of an Idea from Darwin to Genomics*.
Click here for more information or to buy the book.

Mutation

THE HISTORY OF AN IDEA
FROM DARWIN TO GENOMICS

ALSO FROM COLD SPRING HARBOR LABORATORY PRESS

Davenport's Dream: 21st Century Reflections on Heredity and Eugenics
edited by Jan A. Witkowski and John R. Inglis

Evolution by Nicholas H. Barton, Derek E.G. Briggs, Jonathan A. Eisen,
David B. Goldstein, and Nipam H. Patel

Francis Crick: Hunter of Life's Secrets by Robert Olby

Max Perutz and the Secret of Life by Georgina Ferry

Mendel's Legacy: The Origin of Classical Genetics by Elof Axel Carlson

Times of Triumph, Times of Doubt: Science and the Battle for Public Trust
by Elof Axel Carlson

What a Time I Am Having: Selected Letters of Max Perutz edited by Vivien Perutz

This is a free sample of content from *Mutation: The History of an Idea from Darwin to Genomics*.
Click here for more information or to buy the book.

Mutation

THE HISTORY OF AN IDEA
FROM DARWIN TO GENOMICS



Elof Axel Carlson



COLD SPRING HARBOR LABORATORY PRESS
Cold Spring Harbor, New York • www.cshlpress.com

© 2011 by Cold Spring Harbor Laboratory Press

Mutation

THE HISTORY OF AN IDEA FROM DARWIN TO GENOMICS

All rights reserved.

© 2011 by Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York
Printed in the United States of America

Publisher	John Inglis
Acquisition Editor	Judy Cuddihy
Director of Development, Marketing, & Sales	Jan Argentine
Developmental Editor	Judy Cuddihy
Project Manager	Inez Sialiano
Permissions Coordinator	Carol Brown
Production Editor	Kathleen Bubbeo
Production Manager	Denise Weiss
Marketing & Sales Manager	Elizabeth Powers
Cover Designer	Ed Atkeson

Front cover artwork: The rediscovery in 1900 of Gregor Mendel's mid-19th century breeding experiments with pea plants initiated a major shift in thinking about the nature of mutation from Darwin's fluctuating variations to a discontinuous model of evolution by mutation. Cover image source: VectorStock/Mombeka.

Library of Congress Cataloging-in-Publication Data

Carlson, Elof Axel.

Mutation : the history of an idea from Darwin to genomics / Elof Axel Carlson.
p. cm.

Includes bibliographical references and index.

ISBN 978-1-936113-30-9 (hardcover : alk. paper)

1. Mutation (Biology) 2. Mutation (Biology)—Research. 3. Genomics. I. Title.

QH460.C37 2011

576.5'49—dc22

2011007489

10 9 8 7 6 5 4 3 2

All World Wide Web addresses are accurate to the best of our knowledge at the time of printing.

Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Cold Spring Harbor Laboratory Press, provided that the appropriate fee is paid directly to the Copyright Clearance Center (CCC). Write or call CCC at 222 Rosewood Drive, Danvers, MA 01923 (978-750-8400) for information about fees and regulations. Prior to photocopying items for educational classroom use, contact CCC at the above address. Additional information on CCC can be obtained at CCC Online at <http://www.copyright.com/>.

All Cold Spring Harbor Laboratory Press publications may be ordered directly from Cold Spring Harbor Laboratory Press, 500 Sunnyside Blvd., Woodbury, New York 11797-2924. Phone: 1-800-843-4388 in Continental U.S. and Canada. All other locations: (516) 422-4100. FAX: (516) 422-4097. E-mail: cshpress@cshl.edu. For a complete catalog of all Cold Spring Harbor Laboratory Press publications, visit our website at <http://www.cshlpress.org/>.

Contents

Preface, vii

- 1 A Brief Overview of the Concept of Mutation, 1
 - 2 Ideas of Mutation before There Was a Mendelian Basis for Genetics, 11
 - 3 Cytological and Mendelian Aspects of Mutation, 23
 - 4 The Fly Lab Redefines Mutation, 41
 - 5 Radiation and the Analysis of Mutation by Mutagenesis, 55
 - 6 Using Biochemical Approaches to Study Mutation, 69
 - 7 Mutation in Relation to Gene Structure, 85
 - 8 Mutation in Relation to Evolution, 97
 - 9 Mutation in Relation to Genetic Engineering, 115
 - 10 Mutation in Relation to Society, 127
 - 11 Mutation in Relation to History and Philosophy of Science, 139
- Glossary of Terms Associated with Mutation, 147
- Index, 159

Preface

IN MY FIRST BOOK ON THE HISTORY of genetics, *The Gene: A Critical History*, I showed how the concept of the gene emerged from a series of contending views and how each of about one dozen disputes was resolved with the preservation of one view and the disappearance of the other. This, my fourth book on historical issues, once again traces the development of a concept, this time “mutation,” a term that has undergone significant change in the hands of professional scientists and also become significant in popular culture.

The idea of mutation is rooted in our awareness of change over time. In the life sciences, consideration of change is essential to evolutionary biology and also, perhaps less obviously, to the study of genetics. Ideas or concepts also change, or evolve, over time. Each generation of scholars is bound by the terminology and ideas current in its period but as new tools and approaches generate new findings, the scholars’ vocabulary changes to accommodate what has been discovered. This book examines the meaning of mutation when the term was first adopted, how the meaning changed, and why that alteration was forced on the terminology. Among professional scientists, there is further complexity, with the coexistence of contending terms for the same phenomenon used in different fields (e.g., microbial and *Drosophila* genetics). I also show that a somewhat different sense of the term mutation prevails among the general public.

Many scientists tend to be unaware of how their colleagues of many generations ago conceived their field. Examination of this process is the task of an historian but has the added benefit of informing us about the way ideas help or hinder the development of a field of science.

I am grateful to Jan Witkowski for organizing a conference on mutation in May 2010 at the Banbury Center of Cold Spring Harbor Laboratory. It inspired me to think about my own contribution to that conference and

to reflect on the history of the concept of mutation. This book is a result of that reflection and research.

I thank the staff of Cold Spring Harbor Laboratory Press for the outstanding work they have done in making this book possible: John Inglis, Publisher; Judy Cuddihy, Acquisition and Developmental Editor; Jan Argentine, Director of Development, Marketing, and Sales; Inez Sialiano, Project Manager; Carol Brown, Permissions Coordinator; Kathleen Bubbeo, Production Editor; Denise Weiss, Production Manager; and Elizabeth Powers, Marketing and Sales Manager. I am especially grateful to Judy Cuddihy and Kathleen Bubbeo for their useful suggestions as my manuscript shifted from a working manuscript to final page proofs. I also thank Krishna Dronamraju, Michael Lynch, and Evelyn Witkin for their helpful discussions about mutation. The Biology Library at Jordan Hall and the Wells Library, both at Indiana University in Bloomington, had the references I needed and provided the comfort to take notes.

ELOF AXEL CARLSON