

## The biochemistry of natural pigments

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*Cambridge Texts in Chemistry and Biochemistry*

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Cambridge University Press  
978-0-521-10531-6 - The Biochemistry of Natural Pigments  
G. Britton  
Frontmatter  
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G. BRITTON

CAMBRIDGE UNIVERSITY PRESS  
Cambridge  
London New York New Rochelle  
Melbourne Sydney

Cambridge University Press  
978-0-521-10531-6 - The Biochemistry of Natural Pigments  
G. Britton  
Frontmatter  
[More information](#)

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CAMBRIDGE UNIVERSITY PRESS  
Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, Delhi

Cambridge University Press  
The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

[www.cambridge.org](http://www.cambridge.org)  
Information on this title: [www.cambridge.org/9780521105316](http://www.cambridge.org/9780521105316)

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First published 1983  
This digitally printed version 2009

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

*Library of Congress Catalogue Card Number: 82-9512*

ISBN 978-0-521-24892-1 hardback  
ISBN 978-0-521-10531-6 paperback

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Cambridge University Press

978-0-521-10531-6 - The Biochemistry of Natural Pigments

G. Britton

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## Preface

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As I write these words, the leaves on the trees in my garden are changing from their summer green to the yellow, red and brown of autumn, roses and other flowers are still blooming brightly and wading birds on the shore close by are mostly in their winter plumage. These simple observations provide good examples of the manifestations of colour and pattern in the living world, often in ways that are so familiar to us that we take them for granted. Colour and pattern are important for camouflage, to enable animals to escape the notice of predators, they are important in advertising the presence of an animal to potential mates, etc. and bright colours are important in drawing flowers and fruits to the attention of pollinating and seed-dispersing creatures. In our own everyday world, millions of gardeners grow flowers of many vivid or subtle hues to delight the eye, and brightly coloured fruits are displayed in the shops to attract customers. We should not be surprised, therefore, that the interest of scientists turned very early towards investigating the nature of these plant and animal colours and identifying the underlying mechanisms of colour production and display. It is now well known that there are two fundamentally different mechanisms for natural colour production: the physical or optical phenomena based upon the structures of the cells and tissues and giving rise to structural colours, and the presence of light-absorbing substances, pigments, responsible for the pigmentary colours. This book is concerned with the biochemistry of these natural pigments, the molecules responsible for so much of the colour in the living world. But it is not only for their colour that many of these molecules are important; the property of absorbing visible light renders them useful in many ways, for example in such vital processes as light harvesting in photosynthesis, light detection and colour discrimination in vision, and many other light-mediated responses and regulatory mechanisms. All these topics must be included in a book on natural pigments.

This book is divided into two sections. The first section describes the main features of the chemistry and biochemistry of the main groups of natural pigments; the second section is concerned with biological aspects, dealing with



x *Preface*

the main functional roles of pigments in Nature. The approach is descriptive and concentrates on the main features and principles. It cannot be comprehensive; this would lead to each chapter expanding into a several-volume series. The aim is rather to give an overall picture, to draw attention to the main points of interest, to stimulate the appetite and send the reader off in search of the key references quoted. I have had to be very selective about which topics went into the book and in how much detail. Readers may not agree with my choice or may think that I have the emphasis and balance wrong, but this is an overview of the subject as I see it. The writing and preparation of this book have been a new challenge, often enjoyable, sometimes frustrating and demanding time and attention that should really have been employed differently. During the preparation, however, I have read much and learned a lot about natural pigments. This has been very rewarding, and I hope that I have been able to pass on to the reader some of the knowledge and understanding gained and some of the great interest that the subject holds for me.

Finally, and with much pleasure, I must acknowledge the great debt of gratitude that I owe to so many people. First I wish to express my thanks publicly for the first time to my parents for their sacrifices and support during the years of my formal education which allowed me to spend these later years happily studying the world of natural pigments. My thanks are due also to Dr E. Haslam and Professor T. W. Goodwin who stimulated and encouraged my interest in the subject, and from whom I have learned so much. I acknowledge the forbearance of members of my research group over the years when I have devoted to the book time and attention which they could justly claim should have been accorded to them. I also wish to thank Dr Ernest Kirkwood, Mrs Marion Jowett and others at Cambridge University Press for their work in converting my typescript into a book.

My greatest debt of gratitude is, of course, to my family, for the many occasions when I have given in to the demands that the writing and preparation of the book made on my time and energy, when perhaps I should have put them first. My wife, Pat, has borne this with perseverance and patience and given me the added encouragement of producing a virtually perfect typescript from my imperfect and sometimes illegible handwriting. My children, Rebecca and Jonathan, have at times been deprived of the companionship and fatherly guidance to which they are entitled and which I should like to have given. It is to them that this book is dedicated, in the hope that they may derive as much pleasure as I from the world of Nature in which colour plays such a large part.