

Contents

<i>List of Contributors</i>	<i>page</i> vii
<i>Preface</i>	ix
<i>Acknowledgments</i>	xi

1	Environmental Changes Impacting on, and Caused by, the Evolution of Photosynthetic Organisms	1
	John A. Raven	

Part I Origins and Consequences of Early Photosynthetic Organisms

2	Early Photosynthetic Organisms	21
	John A. Raven	
3	...And Nothing Was the Same Anymore: The Rise in O₂ and Consequences for Photoautotrophs	43
	John Beardall, Mario Giordano and John A. Raven	
4	The Appearance of Eukaryotic Microalgae	65
	Patricia Sánchez-Baracaldo and John A. Raven	
5	The Appearance of Macroalgae: Evolution and Ecological Consequences of Multicellularity	80
	Olivier De Clerck and Catriona L. Hurd	
6	The Evolution of Aquatic Embryophytes: Secondary Colonisers of Aquatic Environments	96
	Stephen C. Maberly	

Part II Physiology of Photosynthetic Autotrophs in Present-Day Environments

7	Light as a Major Driver of Algal Physiology and Evolution	115
	Ondřej Prášil, John Beardall and John A. Raven	
8	Temperature: Still an Enigmatic Driver in the Evolution and Physiology of Algae	136
	Christian Wilhelm and Heiko Wagner	

9	Nutrient Acquisition by Algae and Aquatic Embryophytes	151
	Antonietta Quigg and John A. Raven	
10	Salinity	194
	Ulf Karsten	
11	Desiccation	209
	Catriona L. Hurd	
12	Trait Trade-Offs in Mixoplankton: An Analysis	227
	Aditee Mitra, Kevin J. Flynn, Diane Stoecker and John A. Raven	
13	Effects of Pollutants on Microalgae	252
	Prachi Varshney and John Beardall	
14	Algae in Extreme and Unusual Environments	272
	John Beardall and John A. Raven	

Part III The Future

15	Aquatic Phototrophs and the Greenhouse Effect	295
	John Beardall and John A. Raven	
16	Ultraviolet Radiation Effects under Climate Change	315
	Anita G. J. Buma, E. Walter Helbling and Michael Y. Roleda	
17	Variation in Nutrient Availability for Aquatic Phototrophs and Its Ecological Consequences	341
	Stephen C. Maberly	
18	Algae: New Products and Applications	369
	Michael A. Borowitzka	
	<i>Index</i>	387

Additional resources for this publication at www.cambridge.org/giordano