

The

Chlamydomonas

Sourcebook

Second Edition

*Introduction to Chlamydomonas
and Its Laboratory Use*

Volume 1



Elizabeth H. Harris



Contents of Volume 1

Preface.....	ix
Acknowledgments.....	xi
Conventions Used.....	xiii
Abbreviations.....	xv
List of Tables.....	xvii
List of Figures.....	xix
Contents of Volume 2.....	xxiii
Contents of Volume 3.....	xxxiii

CHAPTER 1 The Genus <i>Chlamydomonas</i>.....	1
I. Introduction.....	1
II. Description of the genus.....	1
III. <i>Chlamydomonas</i> genetics: 1830–1960.....	9
IV. Origins of the major laboratory strains of <i>C. reinhardtii</i>	11
V. Other isolates of <i>C. reinhardtii</i>	16
VI. Other <i>Chlamydomonas</i> species used experimentally.....	18

CHAPTER 2 Cell Architecture.....	25
I. Introduction.....	25
II. Early ultrastructural studies.....	27
III. The cell wall.....	27
IV. Basal bodies, flagellar roots, and cellular filaments.....	44
V. The nucleus.....	49
VI. Golgi and endoplasmic reticulum.....	50
VII. Contractile vacuoles.....	51
VIII. Microbodies and other membrane-bound structures.....	53
IX. Mitochondria.....	54
X. The chloroplast.....	57
XI. The eyespot.....	60

CHAPTER 3	Cell Division	65
	I. Introduction	65
	II. Mitosis.....	65
	III. Meiosis	74
	IV. Chromosome cytology	76
	V. The cell cycle	78
CHAPTER 4	Motility and Behavior.....	89
	I. Introduction	89
	II. Flagellar structure and organization	90
	III. Assembly and maintenance of the flagella	99
	IV. Motility	105
	V. Cell behavior	108
CHAPTER 5	The Sexual Cycle.....	119
	I. Introduction	119
	II. Types of sexual reproduction within the genus <i>Chlamydomonas</i>	120
	III. Stages in the reproductive process.....	130
	IV. Vegetative diploids and cytoduction	152
	V. Genetic control of sexuality	153
	VI. Perturbations of the mating process.....	155
CHAPTER 6	The Life of an Acetate Flagellate.....	159
	I. Introduction	160
	II. Nucleic acids and protein synthesis	160
	III. Metabolic processes	176
	IV. Photosynthesis.....	197
	V. Respiration.....	206
	VI. Hydrogen production	208
CHAPTER 7	Organelle Heredity.....	211
	I. Introduction	211
	II. Uniparental inheritance	212
	III. Organelle DNA.....	228
	IV. RNA and protein synthesis in the chloroplast.....	235
	V. Coordination of nuclear and organelle genomes in organelle biogenesis	238
CHAPTER 8	<i>Chlamydomonas</i> in the Laboratory.....	241
	I. Introduction	242
	II. Culture media.....	242
	III. Culture conditions.....	248
	IV. Harvesting and fractionating cultures.....	260
	V. Histological techniques.....	260

VI. Isolation of <i>Chlamydomonas</i> species from nature.....	261
VII. Storage of <i>Chlamydomonas</i> strains	262
VIII. Genetic analysis	267
IX. The molecular toolkit	292
APPENDIX: Resources for the Investigator	303
REFERENCES	309
Index	435