CONTENTS

List of	text-figures		ix
List of tables		x	
Preface to Second Edition			xi
Preface to First Edition			xiv
I	Introduction		1
II	PHYSICAL AND CHEMICAL FOUNDATIO	ns of Colotr	8
III	STRUCTURAL COLOURS OF ANIMALS General considerations, 13 Whiteness, 15		13
IV	TYNDALL SCATTERING AND DIFFRACT	ION COLOURS	21
V	IRIDESCENT COLOURS		41
VI	CAROTENOIDS Chemical structure, 64 Chemical properties; general methods of analysis, 67 Carotenoids in the animal phyla, 76 Protozoa, 76 Sponges, 80 Coelenterates, 82 Worms and Bryozoa, 92 Echinoderms, 94	separation and	63
	Molluscs, 107 Arthropods, 117 Chordates, 138		
	Formation of vitamin A, 181 Natural deposits in the environment, 184 Summary, 188	•	
VII	CHROMOLIPOIDS OR LIPOFUSCINES	1	191
VIII	Quinones	*	195
	Naphthoquinones, 195)	

CONTENTS

IX	TEAVONES	209
	Anthocyans Common sources, physical and all all all all all all all all all al	
	Common sources, physical and chemical properties, 200	
	Occurrence in animals, 210	
	Flavones	
	Common sources, physical and chemical	
	properties, 211	
	Occurrence in animals, 212	
X	INDOLE PIGMENTS: INDIGOIDS AND MELANINS	215
	Indigoids, 215	3
	Melanins, 220	
	Distribution, 222	
	Chemical properties, 223	
	Extraction and determination, 225	
	Disposition in tissues and tissue derivatives, 225	
	Tyrosinase, 232	
	Other protein catabolites, 236	
XI	TETRAPYRROLES: PORPHINS AND BILINS	241
	General biochemical considerations, 241	
	Porphins, 242	
	Haem proteins in organisms, 246	
	Miscellaneous porphyrins, 258	
	Bilins, 271	
XII	FLAVINS OR LYOCHROMES	282
	Occurrence, properties and distribution, 282 Summary, 288	
Ш	PURINES AND PTERINS	289
	Purines, 289	
	Pterins, 293	
XIV	Some Miscellaneous Animal Biochromes	53.5544
	Haemocyanins, 301; haemerythrins, 303; vanadium	301
	chromogens, 304; actiniochrome, 306; adenochrome, 307;	*
	aphins, 310	
Bibliog	raphy	3
		312
ndex	of subjects	341
nder	of authors	
1646.4	oj autnors	373

CONTENTS

Supplement	381
Supplementary Index of Subjects	429
Supplementary Index of Authors	433

TEXT-FIGURES

1	Ranges of colours in the visible spectrum	page 10
2	Absorption production of colour	10
3	Visibility curve. Relative brightness of equal spectral energy	11
4	Uric acid granules in the tentacular endoderm of Metridium	17
5	Disposition of black and brown melanin in a brown-with-grey Metridium	1 25
6	Melanophores and iridocytes in the skin of the guppy, Lebistes reticulatu	s 26
7	Dispersion and aggregation of melanophores and xanthophores in the skin of the killifish, Fundulus parvipinnis	27
8	Colour-producing factors in the skin of the 'Florida chameleon', Anoli carolinensis	28
9	Diagram of Tyndall scattering of short light-waves	31
10	Sectional view of early feather development	35
11	Stereogram of advanced feather development	35
12	Stereogram of contour feather parts	35
13	Cross-sectional views of blue feather barbs from various species	37
14	Diagram of interference of light	43
15	Iridescent scale from the green hairstreak, Thecla rubi	48
16	Various shapes of lepidopteran wing-scales	48
17	Fine structures of lepidopteran wing-scales	49
18	Diagram of films and vanes in Morpho type of wing-scale	54
19	Diagram of multiple films and ridges in Urania type of wing-scale	54
20	Schematic reconstruction of an iridescent wing-scale	56
21	Wave-length distribution of light intensities correlated with distance between multiple thin films	e 56
22	Relation of wave-length and colour to laminar thickness, interlamellar air spaces and angle of incidence	- 57
23	Schematic representation of multiple thin films in a beetle-scale	58
24	Chart of principal colour varieties of Metridium senile	90
25	Disposition of carotenoids in tissues of Metridium	91
26	Green and red pied lobster	131
27	Metabolic paths of carotenoids in animals (diagram)	189
28	Echinochrome aggregations in spines of Dendraster excentricus	196
29	Echinochrome masses in pedicellarial skin of Dendraster excentricus	196
30	Echinochrome and brown pigment in tube-foot of Dendraster excentricus	197
31	Brown tissues and echinochrome aggregations in stomach wall of Den draster excentricus	197
32	Aligned strands of echinochrome pigment in radial nerve of Dendraste excentricus	r 197
33	Echinochrome aggregations in egg-jelly of Dendraster excentricus	197
34	Pigment and scales of a human hair (section)	227
35	Scales and melanophores of Lebistes reticulatus	230
36	Genesis and disposition of indole biochromes in animals (diagram)	239
37	Adenochrome spheroids in glandular cells of Octopus branchial hearts	307