

CONTENTS

1	Introduction and Historical Background	1
1.1	Introduction	1
1.2	Natural Products Chemistry – Past and Future	13
2	Fraction and Proof of Structure of Natural Products	27
2.1	Introduction	27
2.2	Novel Techniques and Recent Developments in Fractionation and Isolation	28
2.3	Nuclear Magnetic Resonance Spectroscopy	60
2.4	Other Spectroscopic Techniques	85
2.5	General Conclusions	109
3	Evolution of Natural Products	125
3.1	Convergent Synthesis and Origin of RNA-Based Life	125
3.2	Expansion of the Acetate, Mevalonate, and S-Aminolevulinate Pathways in Bacteria and Algae	127
3.3	Expansion of the Shikimate Pathway in Terrestrial Plants	128
3.4	Phytochemistry and Plant Defense	133
3.5	Oxidation Levels of Angiospermous Micromolecules	137
3.6	Skeletal Specialization of Angiospermous Micromolecules	140
3.7	Quantification of Micromolecular Parameters	145
3.8	Phytochemical Gradients in Angiosperms	146
3.9	Future Perspectives	148
4	Carbohydrates	155
4.1	introduction	155
4.2	Sucrose	156
4.3	Higher Oligosaccharides related to Sucrose	157
4.4	Other Oligosaccharides	158
4.5	Monosaccharides	159
4.6	Alditols	159
4.7	Cyclitols	160
4.8	Plant Glycosides	162
4.9	Starch	162
4.10	Extractable Polysaccharides	163

5 Nitrogenous Extractives	179
5.1 Amino Acids, Proteins, Enzymes, and Nucleic Acids	179
5.2 The Alkaloids	200
6 Aliphatic and Alicyclic Extractives	259
6.1 Simple Organic Acids	259
6.2 Complex Aliphatic and Alicyclic Extractives	274
6.3 Fats and Fatty Acids	299
6.4 Chemistry, Biochemistry, and Function of Suberin and Associated Waxes	304
7 Benzenoid Extractives	369
7.1 Monoaryl Natural Products	369
7.2 Gallic Acid Derivatives and Hydrolyzable Tannins	399
7.3 Lignans	439
7.4 Stilbenes, Conioids, and Other Polyaryl Natural Products	512
7.5 Flavonoids	533
7.6 Biflavonoids and Proanthocyanidins	571
7.7 Condensed Tannins	651