
Contents

Foreword	ix
Preface	xiii
Acknowledgements	xvii
Introduction	xix
Chapter 1. An Introduction to Phyllotaxis	1
1.1. A game of spirals	1
1.2. Fibonacci phyllotaxis	6
1.3. Lucas phyllotaxis	8
1.4. Whorled phyllotaxis	9
Chapter 2. A History of Theoretical Phyllotaxis	13
Chapter 3. The Static Model	25
3.1. Modeling the sunflower capitulum	25
3.2. Packing density	28
3.3. Optimization of light capture	31
3.4. Discussion	33
3.5. Appendix: the golden angle	34

Chapter 4. The Dynamical Model	39
4.1. Description of the model	39
4.2. Phyllotaxis modes (analytical model)	45
Chapter 5. Molecular or Contact Pressure Origin?	51
5.1. The dynamics of phyllotaxis	51
5.2. The molecular origin of phyllotaxis	52
5.3. The history of the contact pressure model of phyllotaxis	61
5.4. Modeling the floral meristem of <i>Illicium</i>	63
5.5. Mechanical forces in floral development	68
5.6. Physical models	69
Chapter 6. Magnoliales and Laurales	73
6.1. Stability of the Fibonacci spiral	73
6.2. Transient regime	77
6.3. Continuity of the Fibonacci spiral	78
6.4. Magnoliales	81
6.4.1. Magnoliaceae	82
6.4.2. Annonaceae	92
6.5. Laurales	97
6.5.1. Atherospermataceae	98
6.5.2. Monimiaceae	105
6.6. Discussion	107
6.6.1. Regular spirals	109
6.6.2. Permuted spirals	109
6.6.3. Quasi-symmetric spirals	110
6.6.4. Whorls	111
6.6.5. Dédoulement	112
6.6.6. Pseudo-whorls	112
6.6.7. Hemicycles	113
6.6.8. Synorganization	113
Chapter 7. Inflorescences	119
7.1. Bracteole theory	119
7.2. Inflorescences	123
7.2.1. Racemes	126
7.2.2. Cymes	131
7.2.3. Involucra and spathes	154

Conclusion	161
References	183
Index	193