PREFACE

大學

物有本末、事有終始、知所先後則近道矣

Every entity has Roots and Tips of branches
And every entity has a Beginning and an End
The one who is putting his mind to the Former
and to the Latter
He is Approaching the WAY!

(From the DA XUE – The Great Learning, one of the Four Books of the Chinese cultural heritage)

"Alle Theile der Pflanze – Stengel und Wurzel ausgenommen – können auf die Form des Blattes zurückgeführt werden; sie sind nichts anderes als Modifikationen derselben."

All parts of the plant – except the shoot and the root – can be attributed to the structure of the leaf; they are nothing but modifications of leaves.

(From the Doctoral Thesis of Caspar Friedrich Wolff, submitted in 1759 to the University of Halle, Germany, in Latin; the German version is of 1812).
Places and times may have strange associations: shortly after this German version was published in Leipzig there was the great defeat of Napoleon at the "Battle of the Nations" ... in Leipzig).

These two mottos represent two extremely different lines of thought. In the Chinese motto, the tips of the branches and roots were used as metaphors. It was probably intended to bring up two issues. One is that the entities should be studied thoroughly, from the roots to branch tips. The other issue is that a thorough knowledge can lead a person to the WAY. The Way has several meanings. Kung fu-Tze (Confucius) meant by Way morality and value. The Way can also mean all the events happening between the first step and the final goal.

In the German motto, from Caspar Friedrich Wolff, the plant is not a metaphor. It serves as an example of an approach to understand the development of organisms. Wolff was a pioneer in this approach, although he was ignored in the recent literature on plant development. This literature cites the claim of Goethe that floral members are leaves that underwent metamorphosis. Goethe's claim was made several years *after* the statement of Wolff.

This book aims to serve to bridge the gap between the metaphoric approach of Da Xue and the "down-to-earth" approach of Wolff. I shall attempt to update a wide range of readers on what we know about the processes that regulate the formation of patterns in plants. I shall also indicate clearly what is not yet known. By "plants" I mean angiosperm plants. Other, lower plants, will be mentioned only rarely. The deliberations will be on different levels of complexity, such as single cells, meristems, tissues and plant organs (e.g. roots, shoots, floral members). Wherever applicable the use of methodologies such as genetics, molecular biology and structural analyses will be described, and I shall attempt to show how the application of these methodologies led to additional knowledge on the control of plant patterning.

As with my previous books (Galun and Breiman, 1997; Galun and Galun, 2001; Galun, 2003; Galun, 2005a) the present book is aimed at a wide range of readers. Basic knowledge of plant biology, genetics and molecular biology should be helpful for the readers. However, where required, the various studies on patterning and the methodologies that were used in these studies, will be introduced and explained. Thus, the book should be of interest and useful for the novice in molecular developmental biology as well.

Because the book is comprehensive with respect to its topics (dealing with different plant components), scholars who are engaged in the study of specific aspects of plant differentiation, may benefit from the overall view of the present book. On the other hand, this book should also be useful as a companion-text for courses on plant development.

I am grateful to my wife, Professor Margalith Galun, and to my son, Professor Eithan Galun, who read parts of the manuscript and provided useful remarks. I am also grateful to the staff members of my Plant Sciences Department for useful discussion, among them Professor Dan Atsmon and Professor Moshe Feldman, and especially Dr. Yuval Eshed, who provided very useful advice throughout the whole process of writing this book. I thank professor Dr. Rudolf Hagemann, of the University of Halle (Germany), for the German motto from thesis of C. F. Wolff. Thanks are due to Mrs. Suzanne Trauffer Ramakrishna for her professional typing. I very much appreciate the efforts of my publisher, World Scientific Publishing Co., especially of Ms. Sook Cheng Lim, scientific editor at WSPC, for the editing and production of this book. I acknowledge the professional work of the Graphic Arts Department of the Weizmann Institute of Science for performing very professional work on the figures and on the cover. I further acknowledge the permissions to use figures and tables that were granted by the respective publishers and authors. I provided the sources of these figures and tables below each figure or table and the full citations are listed in the list of references. These citations should mean that I am grateful for the consents of the publishers to use their copyright material in this book. My special gratitude goes to Dr. Nillie Weinstein. Dr. Weinstein showed great interest in my writing throughout my last four books and since then has become an inseparable component of my writings. She encouraged me to go on writing this book. I and the book benefitted immensely from her wisdom and knowledge, especially, but not only, in philosophy.

Esra Galun
Rehovot, Israel
7th April 2007