# Preface

Colors are ubiquitous in nature, particularly in living organisms ranging from bacteria and fungi to plants and animals. Many organisms have developed their own characteristic colors that vary by parts and developmental stage. These colors are not just visually decorative and attractive, but biologically essential in reproduction, coevolution, and ecosystem sustenance. Colors in plants, flowers, and fruits attract animals for pollination to produce seeds and for consumption to disperse seeds, which both help in species reproduction and diversification. Coloration-based camouflage in ecosystems to enhance survival is a good example of coevolution. The importance of colors in living organisms cannot be overstated. An old saying is apt: Colors can please the eye, gladden the heart, and nurture the mind. Biological pigments, the chemical components able to generate a full spectrum of visual colors in nature, are in fact much more important and valuable; they are biosynthesized behind the scene in living organisms and ultimately ingested in our daily diet.

Pigments produced in plants include four major classes: chlorophylls, carotenoids, flavonoids, and betalains. Chlorophylls are the primary green pigments for photosynthesis. The latter three are complementary nongreen pigments with diverse functions. Extensive research on the genetic mechanisms of their biosynthesis has yielded many exciting and insightful results over the last decades. On the other hand, many pigment-rich fruits and vegetables are consumed daily by human and animals. Potential nutritional and medicinal benefits from these pigments in fruits and vegetables have attracted nutritionists and clinical functional food researchers to study their health effects and encourage people to increase the daily consumption of these pigment-abundant foods.

Colorful fruits and vegetables attract visitors and eaters. Eating freshly harvested colorful vegetables while helping in my parents' vegetable garden remains among the most memorable moments in my childhood. Green cucumber and pea, red tomato and radish, and orange carrot and sweet potato, to name a few, are my favorites. My horticultural career might have started when I helped and wondered in the garden. Not only did the vegetables constantly attract me with their vibrant colors, but also ultimately nourished a future garden lover by their abundant tastes and nutrients. A time in the garden remained a joyful routine during every hometown visit. A small garden has been a must in my own family residence. If we believe there is

a connection between an early childhood wonder and a later adulthood career, this book may give a casual explanation on it, and a delayed answer as well to my early curiosities about the distinct colors and tastes of the vegetables I ate in the garden.

This comprehensive treatise provides a systemic and insightful overview of current advances in the biosynthetic genomics/genetics and preventive dietetics of carotenoids, flavonoids, and betalains, from a general perspective, and in specific fruits and vegetables as well. Genomics/genetics focuses on what and how enzymatic and regulatory genes are involved in pigment biosynthesis. Dietetics emphasizes how these pigments contribute nutritional/medical benefits to health, prevent diseases, and act as potential nutraceuticals in the diet. The goal is to provide research scientists, nutrition specialists, healthy food advocates, students, and rainbow food (fruit and vegetable) lovers with an integrated resource on the biosynthetic and dietetic mechanisms of these pigments.

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