Preface

Aromatic compounds are present everywhere, in the foods we eat, the medicines we take, the clothes we wear, and materials we use on a daily basis. To organic chemists, aromatic compounds feature prominently in natural products, synthetic pharmaceuticals, and materials such as dyes and displays. As such, understanding the reactivity of aromatic compounds and applying this understanding to the synthesis of aromatic compounds is an important endeavor.

This book was developed from a specialized graduate course on the chemistry of aromatic compounds and is targeted at an advanced undergraduate or introductory graduate student level. The hope is that this book will also serve as a useful resource for practicing organic chemists and a source of inspiration for those with an interest in the synthetic organic chemistry. The book begins with some topics that should be review for most students of organic chemistry and builds on this foundation to introduce new reactions, concepts, and structurally interesting targets. An attempt is made to highlight the applications of reactions in the multistep synthesis of complex targets, including natural products, dyes, pharmaceuticals, materials, and structurally challenging aromatic compounds. As we progress through the chapters, the number of examples increases as the number of tools at our disposal is developed.

Chapter 1 begins with a general discussion on the importance of aromatic compounds, their history, and some of the features of aromatic compounds. The question of “what is aromaticity” is an ongoing debate and is not resolved in these pages. Instead, some of the properties and features of aromatic compounds are discussed. Chapter 2 focuses on electrophilic aromatic substitution—a topic that should be mostly review from introductory courses, but which hopefully provides some more depth of coverage. Chapter 3 turns to nucleophilic aromatic substitution and the chemistry of aryldiazonium salts—while some of the topics are likely review, several sections focus on aspects of nucleophilic aromatic substitution that are not usually covered in introductory courses. Chapters 4 and 5 focus on the chemistry of aryllithiums (including directed ortho metallation) and benzynes, respectively. While these are sometimes introduced in early organic chemistry courses, these chapters present new reactivity for many readers. Chapters 6 and 7 focus on transition metal-mediated reactions of aromatic compounds—reactions that have become indispensable tools for organic chemists and have modernized the chemistry of aromatic compounds. Chapter 8 explores approaches for constructing aromatic and heteroaromatic rings from nonaromatic precursors. This concept then sets the stage for Chapters 9 and 10, which focus on the reactivity and synthesis of polycyclic aromatic hydrocarbons. The final chapter turns to the synthesis of nonplanar polycyclic aromatic hydrocarbons. The last two chapters highlight some of the fascinating and challenging structures that can be achieved using the reactivity described in earlier chapters.
My hope is that readers will not only further their understanding of aromatic compounds and synthetic methods but also appreciate the importance and complexity of aromatic structures as well as their beauty.