Book Review

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Lewis acids in organic synthesis

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In many respects, hydrogen and metals show equivalent behaviour, and it is sometimes helpful to regard hydrogen as a pseudo metal. An important example of this equivalence was put forward by G. N. Lewis in his book *Valence* in 1923, when he extended Brønsted's picture of protic acids to cover derivatives of metals such as BF_3, $AlCl_3$, $SnCl_4$ or $TiCl_4$, which act in an equivalent way towards bases.

The significance of this is obvious. A proton is a proton, whereas there are some 80 different metals of various valencies, electronegativities, radii and stereochemistries, and whose Lewis acidities can be further controlled by assembling round them a limitless variety of ligands. Most importantly, if these ligands are chiral, the Lewis acids can be used, even in catalytic amounts, to induce asymmetric synthesis, which is so important in the preparation of compounds of potential biological activity.

The use of these Lewis acids in organic synthesis is a large and rapidly expanding field, and a further authoritative book is very welcome. All but six of the 29 authors of the 21 chapters are Japanese. Most of the chapters focus on one metal or a related group of metals. For example, Chapter 1, by S. Saito, covers Li(I), Na(I) and K(I), Chapter 5, by K. Ishihara, covers chiral B(III) Lewis acids, and Chapter 19, by S. Kobayashi, covers Sc(III) Lewis acids. The one chapter out of this mould is that by James Marshall, which deals with the preparation and Lewis acid-promoted addition reactions of allylic and allenic tin and indium reagents; additions to aldehydes are covered at length, but not the ene reactions that allyltin compounds can show with other enophiles.

There is a consistency in the presentation of the various chapters that is often missing in an edited book. Each chapter is clearly written, and very few errors in the text or the equations have escaped capture in proofreading. The referencing is thorough, and there is a good subject index.

All in all, this is a book that can be delved into with pleasure and profit by anyone who is concerned with organic synthesis.

My one complaint concerns matters of omission rather than of commission. In his introduction, Yamamoto says that he has attempted to cover comprehensively the use of Lewis acids in organic synthesis, but this should be taken in the same sense as a politician's pre-election promises: well-meaning, but impossible to achieve. Thus, there is nothing on Ziegler's reactions involving organoaluminiums and alkenes, or Brown's use of organoboranes, or Stille's palladium-catalysed joining of two carbon centres, or Sharpless' asymmetric epoxidations, or oxymercuration, or thallium reagents, or zeolites. One could go on.

It is unfair to criticize a book for what it does not cover, but, what there is, is so good that one is left wanting more. Perhaps, when he has caught his breath, Yamamoto might be persuaded to produce two further volumes to fill the more important gaps.

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