Despite the fact that compounds that feature metal–metal bonds have been known for many decades, interesting discoveries continue to be made at a rapid pace. The purpose of this volume is to highlight some of these recent advances in both main group and transition metal chemistry, and an overview of the topics covered is provided here.

Berry describes transition metal compounds in which there are chains of metal atoms. Such compounds are often considered as potential molecular wires for molecular electronic applications and the conductance of these compounds at the molecular level is discussed. In addition to compounds that feature homometallic chains, those with heterometallic chains are also described.

Chisholm describes a different approach to linking together metal centers, namely one in which quadruply bonded dimolybdenum and ditungsten moieties are electronically coupled via a conjugated \( \pi \)-system of an organic bridging ligand. The types of structures obtained include loops, triangles and squares of the dinuclear moieties.

Ni and Power describe the use of sterically demanding terphenyl ligands to synthesize transition metal dinuclear compounds of type ArMMAr that have exceptionally short M–M bonds and high M–M bond orders. For example, ArCrCrAr is described as possessing a quintuple Cr–Cr bond.

The evaluation of the metal–metal bond order is often an important component in the description of compounds with metal–metal bonds, and Parkin evaluates the various electron-counting procedures that are used to predict metal–metal bond orders in transition metal compounds that feature bridging hydride and alkyl ligands.

At the interface of main group and transition metal chemistry, Frenking, Fischer et al. describe recent developments in which monovalent gallium species can serve as ligands for transition metals, thereby affording a variety of compounds that feature M–Ga bonds. Furthermore, many of these compounds with M–Ga bonds can be converted into compounds that feature M–Zn bonds. Also, with respect to main group chemistry, Hill discusses catenated compounds of Group 13–15 elements, which feature chains of M–M bonds.
Finally, the concept of aromaticity and antiaromaticity in compounds that feature rings of metal atoms is discussed by Tsipis, who focuses on rings of main group metal atoms, and by Boldyrev et al., who focus on transition metal compounds.

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