Of late, Bader and Gatti [1] showed that the electron density $\rho$ at any point $r$ within a molecule may be viewed as consisting of contributions from a local source (LS) operating at all other points $r'$. When the LS is integrated over regions $\Omega$ satisfying the QTAIM definition of an atom in a molecule, $\rho(r)$ may be equated to a sum of atomic contributions $SF(r;\Omega)$, each of which is termed as the source function (SF) from the atom $\Omega$ to $\rho(r)$. Such a decomposition enables one to view the properties of the density from a new perspective and establishes the source function (SF) as a potentially interesting tool to provide chemical insight [1,2]. For instance, application of the SF to hydrogen bonded systems has shown how this function is able to markedly distinguish hydrogen bonds of different strength [2]. The SF is a measure of the relative importance of an atom's or a group's contribution to the density at any point and the bond critical points (BCP) have been generally taken as the least biased choice for points representative of bonding interactions [1,2]. Analysis of LS(BCP, $r'$), along a bond path, introduces further detail [3].

The SF and a number of previous exemplar applications is reviewed. We then present new results [4] on the SF analysis for a set of saturated [$M_2(CO)_x$, $M=$ Mn, Fe, Co, Ni, $x = 10, 9, 8, 7$] and unsaturated [$Co_2(CO)_x$, $x=8-5$] binuclear 3$d$ metal carbonyls, and for the $M_2$(formamidinate)$_4$ ($M=$Nb, Mo, Tc, Ru, Rh, and Pd) binuclear 4$d$ metal complexes, using ab-initio electron densities. A description of the metal-metal bonding closely related to that provided by the localization/delocalization indices is afforded. The agreement persists even when the metal-metal bond bond is lacking and the internuclear metal-metal midpoint is taken as a reference point for evaluating the SF contributions. However, use of LS(BCP, $r'$) along the bond path, unveils interesting differences as for how the charge density originates at the metal-metal midpoint when the system is metal-metal “bonded” or not. Most of the topological indices conventionally adopted to describe metal-metal bonds fail in reproducing the expected chemical trends for the set of investigated systems, with the adimensional $|V_b/G_b|$ ratio and the $V^2\rho_b$ value being particularly inadequate. One major advantage of the SF is that it is directly applicable to electron density distributions derived from experiment. Recent progresses [5] in deriving an ambiguity-free full population analysis from the SF are also mentioned.