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Editorial: The Nature of the Chemical Bond Revisited

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The idea for the present volume appeared during a meeting evaluating proposals to be supported by scientific foundations. After one lecture a physicist was asked by a chemist about some details of the bonding within some of the described substances. His reply was contradicted by a theoretical chemist and immediately three descriptions of the same thing gave half the audience the impression "funny, I would describe this differently". Not only do (fortunately for us scientists) several correct approaches to such a problem exist, they are also often obscured by the use of different "languages", thereby increasing confusion. Wouldn't it be wonderful if one could say, unambiguously: "A chemical bond is . . . ". But imagine what would happen, if a first year student asked to explain chemical bonding – lets say in an examination about organic chemistry – replies: "The chemical bond is a result of the acceleration of electrons by a joint potential of several nuclei . . . ". On second thoughts, it is probably better *not* to imagine what might happen!

Obviously, it is rather difficult to give a complete picture of chemical bonding today as was possible in the case of *Pauling*'s famous book, "*The Nature of the Chemical Bond*". Looking into the latter a very carefully structured language becomes visible, for example in the well-known definition of electronegativity. Revisiting this concept might well be done *via* the ideas that today's density functional theory (DFT) provides. In a similar way today's 'state of play' like topological, relativistic, graphtheoretical, and other methods may give new insights. Some rare applications to systems such as seaborgium carbonyl, $Sg(CO)_6$, and rare gas compounds round off our revisiting tour of the chemical bond.

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