**Big quantum effects in small molecules**

We discover surprising consequences of well-known quantum effects such as zero-point energies, superposition and interferences of quantum states, decoherence. The examples include a new type of chemical bonding: "vibrational bonding" stabilizes BrMuBr due to effects of vibrational zero point energies ( Muonium Mu is the light isotope of hydrogen, mMu= mH/9.)The large mass ratio enables another effect in molecules such as FHF-, CdH2 or OsH4, in femtosecond time domain: Well designed circularly polarized laser pulses excite superposition states with strong ring currents of the nuclei that induce very strong intra-molecular magnetic fields ( > 600 T). By analogy, one can induce charge circulation with strong electronic fluxes in electronic superposition states of molecules such as Mg-porphyrineor benzene. Analogous preparation of interfering electronic states in molecular ions such as H2+or HCCI+ support periodic charge migration, on time scale from few hundred attoseconds to few femtoseconds. In addition to linear (1D) and circular(2D) charge migrations, quantum engineering yields laser pulses which induce helical (3D) charge migration. In general, the laser induced electronic charge migration suffers from decoherence due to nuclear motions. This enemy can be converted to a friend causing partial re-coherences. Laser pulses can break electronic structure symmetry even when the nuclear symmetry is conserved. Complete electronic symmetry breaking generates electronic chirality even in achiral molecules, e. g. in oriented NaK, with periodic chirality flips as new topic in femtosecond and attosecond chemistry.