

Contributed article to the Dickson Herald

Dickson County Native Helps Discover New Reaction Pathway

Dr. Wesley Allen, son of Norris and Fran Allen of the Mt. Lebanon community, is a member of a team of scientists from the University of Georgia and universities in Germany and Hungary that synthesized and characterized an important parent molecule to a host of important chemical compounds. The research, published in June in the prestigious scientific journal *Nature*, details the synthesis of a small molecule hydroxymethylene which belongs to a class of carbon containing compounds called carbenes. Carbenes are interesting carbon compounds because carbon usually forms compounds with eight electrons in the outer shell and in a carbene there are only six. This makes carbenes very reactive and in fact many are now used to speed up chemical reactions. They also have a central role in combustion and atmospheric chemistry.

The hydroxymethylene molecule was synthesized in Europe and supposedly trapped at 11 degrees Kelvin, just above absolute zero. To the scientists' surprise the next day the molecule had rearranged to the more stable molecule formaldehyde. It was surprising because of the huge energy barrier for the carbene to rearrange to formaldehyde, and the low temperature should have made it impossible for the molecule to have enough energy to do this. Allen, who is a computational chemist of some fame at UGA, used the huge computing facility there to prove that the molecule's reaction was something entirely different from a regular chemical reaction and something never seen before. The rearrangement was because of something called "quantum mechanical tunneling" – one of the very strange properties of very small subatomic particles like electrons. This "tunneling" had never been observed for a hydrogen atom in a molecule.

The research into this molecule began with NASA, which is interested in the chemistry of the atmosphere and outer space. Some have theorized that this small molecule might exist in space and catalyze other chemical reactions in interstellar clouds to form larger carbon

containing (organic) molecules. Allen and the other scientists in Europe have now opened a door to a totally new reaction pathway in chemistry.

Dr. Allen graduated from Dickson County High School in 1979 where he received many prestigious awards for science research. He attended Vanderbilt University on a Harold Stirling Scholarship and started his computational chemistry work there leading to a *summa cum laude* degree and a double major in chemistry and physics. He attended graduate school at the University of California, Berkeley, receiving his Ph.D. in 1987. After a short stint at the Sandia National Laboratory he joined the faculty at Stanford University. Since 1995 Allen has been at the Center for Computational Chemistry at the University of Georgia. He has authored over 85 publications in the scientific literature during his career. Allen and his wife Anne are proud parents of 2 children, Ashley Margaret and Andrew David.

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