Parris Studying Charge Transport in Polymers

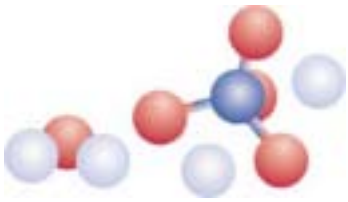
UMR Physics' Chair **Paul Parris's** research into how electrical charge moves through organic materials could lead to improved flat-screen computer displays, credit card-sized smart cards, and the development of other applications in the rapidly-growing field of plastic electronics. Parris recently received a $150,000 grant from the National Science Foundation for a theoretical study on "Quasiparticle Transport in Organic Materials: Vibrational and Static Disorder, Nanoscale Confinement, and Quantum Effects." One of the biggest current uses of materials of this type are molecularly-doped polymers used in copying machines and laser printers. Closely related materials will appear in new light-emitting devices, like computer screens.

Parris is studying how charge transport in these devices is related to basic properties of the polymer material they're made from. "Typical polymers are disordered", Parris says. By understanding this disorder, researchers can predict electrical properties and aid in the design of new devices. "Our goal is the fundamental physics of the process," Parris says. As a charge moves through a polymer, it is attracted to molecules in the polymer and causes them to distort, much like a bowling ball rolling across a mattress distorts the springs of a mattress as it crosses. Along with physics graduate student **Alex Silvius** (BS '00) Parris is studying this "polaron", which he says is "the combination of the charge carrier and the distortion around it."

Inorganic materials like silicon are widely used in electronics and computer equipment. Parris's research focuses on the growing field of organic electronics. "People are finding that ultra-pure organics can conduct charge as well as many inorganic semiconductors," he says.

Parris's research group is currently gearing up for the early stages of the research, analyzing recent experiments. "There are fundamental things we don't know about charge transport in organics," Parris says. "By studying the most recent experiments we isolate different physical effects that occur when charge moves through these systems."

Parris's research is part of a collaborative three-year, project with researchers from the University of New Mexico, funded by the National Science Foundation at a combined level of $500,000.



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