Artificial Molecules: connecting dots to form advanced materials for future technologies. **(Mentor: Michael Scheibner)** Many is not just more, it's different. For example, atoms are different from molecules, are different from crystals. Similarly, artificial atoms so called quantum dots exhibit different properties when coupled together. Previous research on double dot quantum dot molecules shows that control over the dot to dot interaction is important for both gaining a deeper understanding of fundamental physics as well as the development of future quantum technology applications such as logical quantum gates.

REU students, having taken a quantum mechanics course, will acquire essential skills to jumpstart careers in applied nano- and quantum technologies and beyond. In small teams, together with graduate students, postgraduates and guided by Prof. Scheibner, students will research fundamental interaction mechanisms between quantum dots and the effects thereof. Students have the option to work in experimental or theory teams, where strong interaction between experiment and theory is encouraged and facilitated through the weekly group meetings. Students will collect information via optical spectroscopy techniques or theoretical modeling from the single quantum dot level up to reveal interaction mechanisms between quantum dots. Students will study the response of non-interacting and interacting systems to a variety of externally applied parameters such as electric and magnetic fields, temperature, continuous and ultrafast, pulsed optical fields. They will identify signs of interaction, and classify their findings in context of known coupling mechanisms, to build a deeper understanding of nanoscale and quantum physics and to be able to identify potential for transforming fundamental science into future technology.