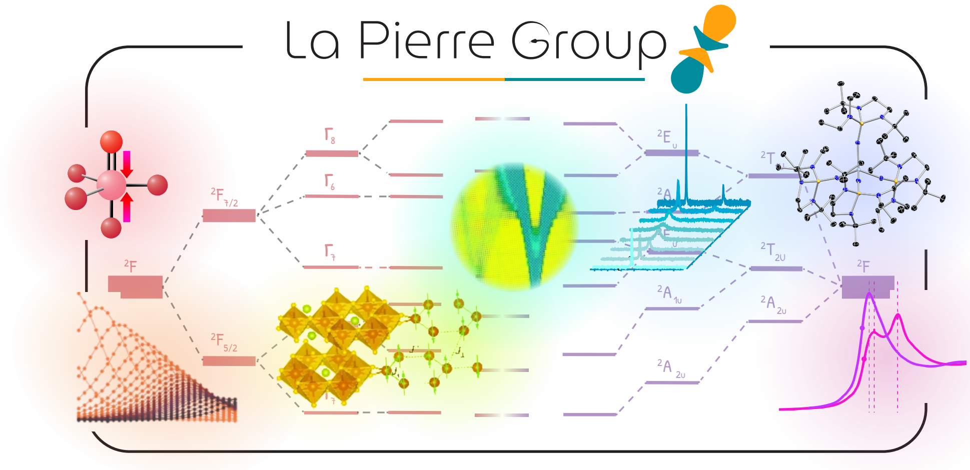
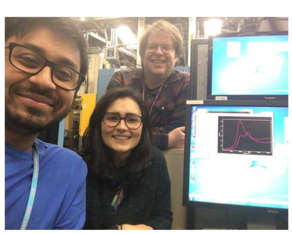
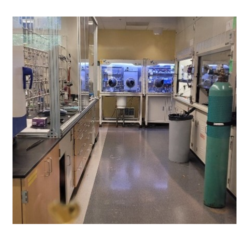
Georgia Tech College of Sciences
School of Chemistry and Biochemistry



The La Pierre Group studies how collective magnetic, physical, and chemical properties arise from electron (de)localization phenomena in f-element systems. Our studies include the development of solid-state and solution methodologies for the synthesis of novel lanthanide and actinide (Th – Am) materials and complexes. These synthetic efforts are paired with synchrotron and neutron spectroscopies and physical property studies to break down the challenge of understanding the electronic structure of f-element systems. These materials and complexes present unique valence electronic structures due the near degeneracies engendered in these systems and strong electron correlation. Our efforts to-date have focused on the synthesis and analysis of molecular and solid-state systems governed by one of three phenomena: multi-configurational electronic structures (ground state degeneracy including hybridization with ligand/band states), mixed-valence metal ions (i.e. mixed f/d occupancy and mixed-oxidation states), and magnetic exchange. Understanding and controlling the manifestation of these phenomena in molecular systems is crucial for understanding the interplay of these phenomena underpinning topological insulators such as SmB_6 and PuB_6 and superconductors such as $CeCoIn_5$ and $PuCoGa_5$. In turn, the group has employed this expanded fundamental understanding of f-element electronic structure and redox chemistry to construct components of quantum information technologies (e.g. quantum bits (qubits), single-molecule magnets).

The research program is currently supported by the NSF-Chemical Synthesis Program, DOE – Heavy Element Chemistry Program, DOE – Quantum Information Science Program, the Arnold and Mabel Beckman Foundation, the Alfred P. Sloan Foundation, and the NNSA Transuranic Chemistry Center of Excellence. The members of the group routinely travel (2-3 times a year) to the National High Magnetic Field Laboratory (Tallahassee, FL), Stanford Synchrotron Research Laboratory (Palo Alto, CA), and the Advanced Photon Source (Chicago. IL). There are new opportunities for research internships/collaborations at Pacific Northwest National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, Lawrence Livermore National Laboratory and Savannah River National Laboratory. The research group currently consists of six graduate students, two postdocs, and a research scientist. Recent Ph.D. graduates have started postdoctoral positions at Los Alamos National Laboratory (2 graduates), Lawrence Berkeley National Laboratory/ University of California, Berkeley, Columbia University, and the University of Chicago.
See the group website for details and more photos.



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