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Prize for a Faculty Member for Research in an Undergraduate Institution Lecture: Studies of the Structure and Properties of Oxide Glasses with Applications[1]

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This presentation will summarize the research work carried out by Prof. Affatigato and his undergraduate students over the past eighteen years. It will focus on some highlighted projects, namely: the determination of glass structure using laser ionization time of flight mass spectrometry; studies of glass modification by laser irradiation; bactericidal glass; and, most recently, glass manufacturing by aerolevitation and glasses for particle detection. The work on mass spectrometry will cover a broad range of oxide glass systems, including the borates, borosilicates, germanate, and gallate families. It has provided novel insights into the structure of glasses at intermediate length scales, measurements that are hard to obtain by any other techniques. The studies of glass structure modification will primarily center on vanadate glasses, which also form the basis for more recent electronic conductivity work at the heart of new particle calorimeter detectors. This project shows the power of serendipity and the strong capabilities of undergraduate students involved in advanced work and state of the art instrumentation. Bactericidal glass illustrates a nice collaborative project that involved simple borate glasses and helped pioneer their use in the human body—work that has led to significant medical developments by other colleagues and researchers. Finally, the aerolevitation project gives new insight into the crystallization and property behavior of glasses and melts at very high temperatures (from 2000 °C to 3000 °C).

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