Pressures in the gigapascal range can drastically modify the behaviour of some materials, for example turning insulators into metals, or metallic magnets into superconductors. These modifications can provide insight into the physics of high temperature superconductivity, and other effects originating in many-body interactions. To reach such high pressures, however, the size of the crystal being measured is limited to fractions of a millimeter, making important quantites such as electrical resistivity difficult to measure. This project will explore an alternative to conventional resistance measurements, which is to measure the skin-depth in high frequency alternating magnetic fields. We have been developing electronics for this purpose, using tunnel diodes to drive resonant LC circuits in which the sample is enclosed in the inductor. This project will apply the TDO method to samples at both ambient and high pressure, and at cryogenic temperature, to search for novel metallic states.

Requirements:
Some knowledge of electronics would be helpful, but it is not essential.