Introduction
The atom probe instrument field evaporates atoms from a specimen of interest and these atoms (now ions) are collected on a position-sensitive, mass-spectrum detector. By reconstructing the trajectory path and impact position of each ion from the field evaporation event, a volumetric reconstructed rendering of the material is generated with near atomic precision for each individual atom. Modern atom probes are able to collect 0.25 to 100 million atoms in hours, with price--generation atom probe instruments, it took days. The tool offers a wide field of view (typically 50–100 µm in lateral dimensions) which enables a diversity of features to be studied within a microstructure. In May 2006, The University of Alabama installed an Imago Scientific Instrument Local Electrode Atom Probe (LEAP) shown in Fig.1 below. In May 2007, UA won an National Science Foundation Major Research Instrumentation (MRI) grant (NSF-DMR-072263) for a laser attachment upgrade.

One of the critical requirements for atom probe is that the specimen be hemispherical in shape with a radius of curvature of ~50 to 100 nm. Consequently, a few thousands volts is able to produce a sufficient electric field at the tip to field evaporate the atoms for the surface. These atoms (now ions) are collected on a position-sensitive, mass-spectrum detector. Fig. 2 illustrates how atoms are collected from the tip.

By reconstructing the trajectory path and impact position of each ion from the field evaporation event, a volumetric reconstructed rendering of the material is generated with near atomic precision for each individual atom. In order to measure the time-of-flight of each ion from the surface to the detector, the evaporation process is pulsed either electrically or, more recently, with a low energy thermal laser pulse under a standing voltage.

Recent instrumental developments have helped to significantly reduce or eliminate several of the perceived experimental difficulties of atom probe tomography. This includes new tools for site-specific specimen preparation (FIB). This poster describes the procedure commonly employed in the extraction and sculpting of atom probe tips for UA’s LEAP.

Experimental Apparatus
An FEI Quanta 3D Dual Beam (FIB) is used to mill and extract regions of interest and prepare them as LEAP tips. This tool has both an electron beam, for standard SEM operations, and an ion beam for milling. Represented in Fig. 3a-b) are photos of the FIB instrument. For the extraction process an Omniprobe micromanipulator was used.

A limitation of the FIB is the damage along the tip sample caused by the high energy Ga+ ions. To reduce the amount of damage inflicted a low kV clean-up method is applied. The ion beams voltage is reduced to 5kV and an annular mill pattern is placed on top of the tip.

Summary and Conclusion
Utilizing a FIB the preparation of an atom probe specimen has been completed via an in-situ lift out technique. One advantage of this method is site-specific analysis. Also demonstrated were sample preparation methods. To protect the region of interest Pt is deposited via the ion beam and Ga+ damage was reduced using low-energy Ga+ ions. A FeP-Ag sample was finally extracted from a Si wafer, mounted to a silicon posts, sharpened, and cleaned. Extensive use of FIB-based sample preparation techniques and Ga+ clean up processes is likely to improve the quality of future atom probe microanalysis.

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