

# PiAutoStage: Accessible digital microscopy through open-source robotic image capture

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We present a new open-source and 3D printed mechanism for the capture and display of microscope-derived optical imagery: PiAutoStage [1]. Commercial methods for the capture of microscope imagery provide elegant and user-friendly solutions, however these systems are platform specific and require significant financial resources for installation. Such limitations provide challenges for the wide adoption of image archiving within the geosciences, and limit the penetration of such technologies. We sought to create a transparent and user modifiable stage mechanism that could be attached to any optical microscope. By pairing a 3D printed frame with a microcontroller and inexpensive servo motors, we created a mechanism that would permit the automated movement of a microscope slide around the stage. These dynamic components were connected to a Raspberry Pi computer system equipped with the latest camera attachment. Finally, a Python based script was written to both control the motion of the slide around the stage and capture overlapping imagery. This imagery can then be recombined using various stitching methods and delivered to the end user as a single mosaic image or series of aligned mosaic images under various optical conditions (e.g., plain polarized and cross polarized light). In this presentation we introduce the operation and explore future potential of PiAutoStage for the creation of microscope imagery in the geosciences and invite discussion from interested end users in identifying potential use cases (e.g., in recording laser ablation location information).

[1] Steiner, R.A., and Rooney, T.O., 2021, PiAutoStage: An Open-Source 3D Printed Tool for the Automatic Collection of High-Resolution Microscope Imagery: *Geochemistry, Geophysics, Geosystems*, v. 22, e2021GC009693.

