PRINCIPAL COMPONENT ANALYSIS OF COMBINED IMAGING MODALITIES OF LEAF 57 VERSO IN THE ARCHIMEDES PALIMPSEST.

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The Archimedes Palimpsest is a tenth-century manuscript containing the oldest known copies of seven treatises by Archimedes, as well as partial copies of other historical writings. Two of the treatises, the *Method of Mechanical Theorems*, and the *Stomachion*, exist only in this manuscript. For this reason, the palimpsest is judged to be one of the most important texts in the history of science. During the thirteenth century, the several manuscripts now included in the palimpsest were disbound, the original texts were erased, and the pages were overwritten with a Christian prayer book.

Johan Ludwig Heiberg identified and studied the partial Archimedes texts in Constantinople in 1906 and had several pages photographed, including f.057 verso that includes text from the *Method*. This page was erased yet again and the opposite side overpainted with a forged icon, probably during World War II.

After the manuscript was purchased at auction by an anonymous collector in 1998, several modern imaging techniques have been utilized to recover the original writings. The two most successful techniques were multispectral reflectance/fluorescence imaging and X-ray fluorescence (XRF) imaging. This paper investigates whether useful additional information about the undertexts may be extracted from multispectral images formed from combinations of these modalities. This was studied briefly early this year without significant improvements, but this work includes additional images and a much-improved registration technique for images from the different modalities.

The image of this folio taken under Heiberg's direction, the modern spectral images, and the XRF images were registered using a rubber-sheet transform in ERDAS Imagine. The images were combined to form a spectral image "cube" using ENVI from ITT Visual Information Solutions. Principal component analysis (PCA) was performed on the cube in ENVI; PCA applies a linear transform to display the image data along orthogonal coordinate axes determined by the variances of the spectral data. Results of the processing are shown.