PRINCIPAL COMPONENET ANALYSIS OF MULTISPECTRAL IMAGES OF UNIDENTIFIED LEAVES FROM THE ARCHIMEDED PALIMPSEST. *Claire MacDonald, Roger L. Easton, Jr., Chester F. Carlson Center for Imaging Science, cxm8113@rit.edu, rlepci@rit.edu*

The Archimedes Palimpsest is a manuscript that was stolen from a library at Constantinople during the 4th crusade and copied over with a prayer book known as the *Euchologion*. This process involved scraping off the original text, refolding the pages, and, along with other similar documents, writing over and rebinding them. Over the past several years, techniques have been developed to recover the original writing through multispectral imaging. In August 2007, the document was imaged at high spatial resolution (>30 pixels per mm) in eleven bands over infrared, visual and ultraviolet wavelengths generated by light-emitting diodes.

The overwritten pages contained the earliest known writings of Archimedes, including several treatises that had not been previously known or fully understood. The manuscript also includes writings from other historical texts that were identified during the course of this work, and also several pages from works that have yet to be ascertained. The ink on the leaves from unidentified sources responded differently from that on the pages from the Archimedes manuscripts and have yet to be fully read. From what scholars can decipher, two of the unidentified pages are now believed to be part of a work on the life of Saint Pantaleon, and an additional six pages may also be from this same work; these pages are the subject of this research.

These pages were studied using principal component analysis (PCA), a technique which is often used to find complex patterns in large sets of data, PCA determines specific sets of orthogonal eigenvectors from the covariance matrix of the image data, orders these eigenvectors based on the magnitudes of the corresponding eigenvalues, and generates images for each eigenvector. The resulting images therefore contain information that is ordered by the variance of the data. Typically, the first image just shows the prayer-book writing, while the underwriting often is more visible in one of the subsequent images.

PCA was performed on small, 1000 × 1000 pixel sections of a stack of images using the ENVI software package (ITT Visual Information Systems). The image sections were then digitally stitched using Adobe Photoshop. The method appears to make the underwriting significantly more readable, though the success of the research can only be fully judged by scholars who are trying to read it.