

## PERSEPOLIS FORTIFICATION ARCHIVE PROJECT

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The Persepolis Fortification Archive (PFA) Project continues to pursue the two urgent goals stated and repeated in earlier Annual Reports, namely, to make thorough records of the Archive that will sustain future research, and to distribute the records freely and continuously to enable current research. The records include digital images of thousands of tablets and fragments; readings and editions of thousands of complete and fragmentary texts in Achaemenid Elamite and Imperial Aramaic; identifications, catalog entries, collations, digital images and drawings of the impressions of thousands of cylinder seals and stamp seals. The team that compiles and processes these records includes students and faculty from Chicago and other colleges and universities. The means of distributing the results include two on-line applications, InscriptiFact (see <http://www.inscriptifact.com/>) and OCHRE (see <http://ochre.lib.uchicago.edu/>). As of mid-2011, the PFA Project has made usable records of more than 8,000 Persepolis Fortification tablets and fragments, and has made partial or complete records of almost 3,000 of them publicly available. The goal of a comprehensive record of the Archive is within reach. If it is accomplished it will sustain a generation of research on the languages, art, institutions, society, and history of the Achaemenid empire.

### Image Capture

Thanks to continuing support from the Andrew W. Mellon Foundation (<http://www.mellon.org/>) and emergency help from the Farhang Foundation (<http://www.farhang.org/>) during a gap between grants, the collaboration between the PFA Project at the Oriental Institute and the West Semitic Research Project at the University of Southern California (<http://www.usc.edu/dept/LAS/wsrp/>) continues to capture and process very high-quality images of Persepolis Fortification tablets and fragments at increasing rates and with increasing quality. As the previous reports on the Project have described and illustrated — and as readers can see for themselves via InscriptiFact and OCHRE — many of these images are made with Polynomial Texture Mapping (PTM) technology, a kind of Reflectance Transformation Imaging (RTI) that gives the end user dynamic control over the apparent lighting in the image, allowing optimum viewing of features impressed on or in the tablet surface, like cuneiform signs and seal impressions; many others are made with a large-format, high-resolution BetterLight scanning camera, using polarized and filtered light to reveal details not easily seen in ordinary daylight, for example, faded ink traces, or ink obscured by surface discoloration. During 2010–11, Clinton Moyer (PhD 2009, Cornell), Miller Prosser (PhD 2011, NELC), and John Walton (PhD 2011, NELC) documented more than 700 tablets and fragments with one or both of these methods, making more than 6,000 new PTM sets of more than 640 pieces, and more than 3,500 new BetterLight scans of more than 130 pieces.

This phase of the Project gives highest priority to the categories of Fortification documents that have previously not been recorded and published, namely, the tablets with monolingual Aramaic texts accompanied by seal impressions, and the tablets with seal impressions unaccompanied by any texts. By mid-2011 more than 3,100 items were recorded with one or

both of these kinds of imagery, including more than 690 Aramaic tablets, more than 1,800 unscribed tablets, and more than 650 Elamite cuneiform tablets (about 220 of them also bearing short epigraphs in Aramaic).

InscriptiFact team members Marilyn Lundberg and Kenneth Zuckerman came to the Oriental Institute twice to train PFA Project imaging personnel in the use of a recently developed technique called Highlight-RTI. This is a method of capturing PTMs without the domed apparatus that the Project uses for Fortification tablets. Instead, one uses a stationary camera,



Figure 1. Highlight-RTI imaging of Khorsabad relief in the Oriental Institute Museum: Clinton Moyer (left) and Miller Prosser move the light; Kenneth Zuckerman (back to camera) controls camera and light; reflective red ball at base of relief registers light position

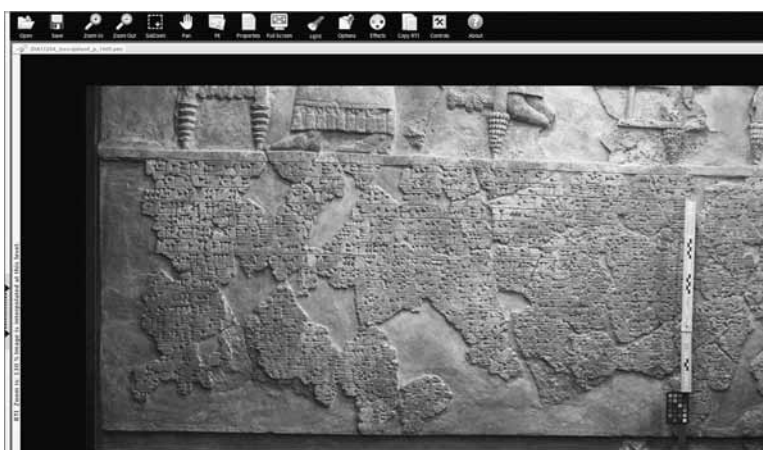


Figure 2. PTM image of inscription from Khorsabad relief in the Oriental Institute Museum, obtained by Highlight-RTI method and displayed with InscriptiFact's stand-alone PTM Viewer (described in last year's Annual Report)

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a moving hand-held light, and a shiny black or red ball placed near the object. In a series of shots made with different lighting angles, the shiny ball registers a reflection, which software uses to establish the light positions, allowing PTM processing software to combine a series of shots into the final interactive PTM image. This technique is especially suitable for recording larger objects and immovable objects, like the Oriental Institute's Assyrian reliefs (figs. 1–2).

As mentioned in last year's *Annual Report*, grants from the Iran Heritage Foundation (<http://www.iranheritage.org/>) allowed the PFA Project to install two PTM post-processing stations at the Oriental Institute, where student workers Lori Calabria, Megaera Lorenz, Gregory Hebda (all NELC), Joshua Elek (Divinity), Amy Genova, and Daniel Whittington (both Classics) at Chicago complemented image processing done at USC by Bekir Gurdil, Claire Shriver, and Ashley Sands. By mid-2011, about 85 percent of the high-quality images had been processed, all but eliminating a backlog of several years' standing.

Calabria, Elek, Genova, Hebda, Lorenz, and Whittington, as well as Alexander Kornienko (History) and Tytus Mikołajczak (NELC), also made and edited about 10,000 new conventional digital images of about 1,650 more Elamite cuneiform tablets and fragments. Among them are some of those designated PF, published by the late Richard T. Hallock in his magisterial *Persepolis Fortification Tablets* (OIP 92 [1969]), many of those designated PF-NN, which the Project is preparing for publication, and many of those designated Fort., hitherto entirely unrecorded. By mid-2011, more than 5,500 Elamite documents had been recorded with ten to twenty conventional digital images each. After a complete review of earlier conventional images, these workers also continue the supplementary re-photography mentioned in last year's *Annual Report* to fill in gaps in the image record.

## Conservation and Storage

A timely grant from the PARSA Community Foundation (<http://www.parsacf.org/>) allowed the PFA Project to address two urgent concerns, tablet conservation and data storage.

Since autumn 2009, when the Project lost the services of seasoned conservator Monica Hudak, we have been without a full-time tablet conservator. This was a grave problem, since many of the Persepolis tablets can be recorded only after skilled cleaning and stabilization. Robyn Haynie joined the Project in May 2011 to close this gap. She comes to the Project with a degree from the eminent conservation program of the Institute of Archaeology, University College London, academic background in Egyptology, and field experience in Greece and Turkey. A backlog of several hundred Persepolis items was waiting for her attention, and she began immediately to process the first batch and return the tablets and fragments to the editorial and imaging stream (fig. 3).



Figure 3. PFA Project conservator Robyn Haynie cleans a Persepolis Fortification tablet under binocular microscope (acquired with an earlier grant from the PARSA Community Foundation)



*Figure 4. Left: extended basement storage of processed Fortification tablets. Right: PFA Project editor Annalisa Azzoni at work in subterranean seclusion*

By the autumn of 2010, the accumulation of thirty-eight terabytes of editorial and image data had exceeded the capacity of the Project's dedicated server, maintained by systems administrator Elijah Buck at Humanities Computing. At the beginning of 2011, the addition of more than twenty terabytes of storage relieved the strain. As of mid-2011 the server holds about forty-five terabytes of Project data. This includes not only processed images and editions for online distribution, but also raw and intermediate images, scanned manuscripts and documents, and other tools used by Project editorial staff.

The growing number and volume of tablets and fragments recorded by imaging and editorial teams also began to strain the Project's physical storage capacity. Oriental Institute archivist John Larson and preparator Erik Lindahl made several banks of storage drawers available for PFA Project use, and in June 2011 Project editors Annalisa Azzoni, Mark Garrison, and Wouter Henkleman reorganized tablet storage in the Project's basement workspace (adding some decorative color to relieve the spartan gloom of the former photographic darkroom, fig. 4).

Digital storage capacity and physical storage capacity will both be recurrent problems, but they are welcome problems in the sense that they are the consequences of progress toward the Project's foremost goals.

## Editorial

During two more spells of work at the Oriental Institute, PFA Project editor Wouter Henkelman (Free University of Amsterdam) continued to collate Elamite Fortification documents known from preliminary editions by Richard Hallock (PF-NN), preparing corrected, annotated editions and translations. The last such texts to be treated are the complex registers, documents that belong to formal types that Hallock designated as "journals" and "accounts." These registers compile, tabulate, and digest large amounts of information transferred from

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shorter memoranda in simpler formats on smaller tablets. Being larger, the registers are often more severely damaged than the memoranda; being denser and more complex, their damaged passages are often harder to reconstruct; being produced by the later phases of the information stream that the Fortification Archive records, they are of prime importance to understanding the Archive as a whole. For all these reasons, collating and editing these documents is slow going. By mid-2011, Henkelman had processed all but the last thirty-five of them in preparation for final publication. Editions and images of many are available on OCHRE.

I supplement these finished editions with preliminary editions of previously unexamined Elamite tablets and fragments, to be revised and collated with Henkelman. I give greatest attention to the journals and accounts, because they are numerically underrepresented in the published sample of the PFA. As of mid-2011, I had recorded about 750 new Elamite texts, among them about 400 registers. NELC student worker Tytus Mikołajczak reread about forty-five of these with me, making corrections, adding editorial and analytical notes, and supplying or verifying identifications of seals. Such new documents fill in more and more slots in the dense matrix of PFA data, and they also continue to yield surprises to delight the philologist, historian, and general tablet nerd — rare or entirely new Elamite and Old Iranian words, phrases, constructions and contents, and/or new seals.

I also continue to pore over the boxes of unrecorded tablets and fragments in a process of triage, to select Elamite tablets and fragments for conservation, photography, and/or reading.

The extraordinary harvest of Achaemenid art from the impressions of seals on Persepolis Fortification tablets continues to flourish under the overall supervision of PFA Project editor Mark Garrison (Trinity University). During six more visits to the Oriental Institute, Garrison systematically examined 275 more of the boxes of unprocessed tablets and fragments and selected 800 more uninscribed, sealed tablets that merit cataloging and recording. By mid-2011, he had examined more than two-thirds of the approximately 2,600 boxes and accumulated a collection of nearly 3,000 analytically useful tablets. Post-doctoral researcher Sabrina Maras (University of California, Berkeley) continues to catalog some of this material under Garrison's direction, processing about 170 tablets during 2010–11. Student workers visiting from other institutions are also doing preliminary cataloging under Garrison's direction: Jenn Finn (PhD candidate, Interdepartmental Program in Classical Art and Archaeology, University of Michigan) in July and August 2010, Jenny Kreiger (PhD candidate in the same program at Michigan), and Erin Daly (undergraduate, Cornell College) beginning in June 2011 (fig. 5).

During 2010–11 Garrison and his team identified almost 200 new seals from impressions on the uninscribed tablets, for a running total of almost 500 new seals in this subcorpus. Working with Mikołajczak, Garrison also examined about 300 more of the Elamite tablets texts being edited by Henkelman to verify seal identifications. They cataloged more than 140 more new seals, for a running total of nearly 600 new seals from review of about two-thirds of this subcorpus. Almost 2,800 distinct seals have been identified so far from impressions on Persepolis Fortification tablets. As last year's *Annual Report* emphasized, each of these seals represents the activity of a distinct individual or office, as distinct as a signature, and the whole corpus of seals is a collection of Achaemenid art without parallel for its size, range and precise context.

Working with research assistants at Trinity University, Garrison scanned final drawings of seals known from impressions on published tablets. All the scans of final drawings (and some of preliminary drawings) are available on the Project server to Project members work-



Figure 5. Jenny Kreiger (University of Michigan, foreground) and Erin Daly (Cornell College) classifying and cataloging uninscribed, sealed Fortification tablets

ing on all the subcorpora of the Archive. Garrison and his assistants have also begun to upload the drawings, accompanied with iconographic data, to OCHRE, where they can be linked to online display of the tablets. By mid-2011, they had entered about 320 of the seals, mostly those that appear in the two as-yet unpublished volumes of the ongoing publication of the seals on published Elamite Fortification tablets (the first volume, Oriental Institute Publication 117, by Garrison and Margaret Cool Root [University of Michigan], is available at <http://oi.uchicago.edu/research/pubs/catalog/oip/>).

During five more visits to the Oriental Institute, Project editor Annalisa Azzoni (Vanderbilt University) cataloged seventy more monolingual Aramaic tablets and fragments, for a running total of 738, all entered in OCHRE with preliminary readings and notes. Azzoni reviewed and formatted editions of fifty more of these for public distribution on OCHRE. Project editor Elspeth Dusinberre (University of Colorado), assisted in Chicago by student worker Emily Wilson (Clas-

sics), updated OCHRE records of 475 seals identified from impressions on the first 530 of the monolingual Aramaic Fortification texts (that is, all the Aramaic tablets recorded with autographed copies and draft editions by the late Raymond A. Bowman), completed final inked drawings of twenty of them and template drawings of more than forty more. Azzoni also examined all the known Aramaic epigraphs on Elamite Fortification tablets, the second major Aramaic subcorpus of the PFA. Of more than 220 epigraphs identified so far, she entered ninety for public distribution on OCHRE.

## Distribution

During 2010–11, InscriptiFact Project members Marilyn Lundberg and Leta Hunt cataloged and uploaded more than 7,400 BetterLight scans and more than 2,700 PTM sets to display more than 530 additional Fortification tablets to the InscriptiFact database application. InscriptiFact is available for free download on application at <http://www.inscriptifact.com/>. As of mid-2011, users can view online or download for local use more than 17,000 high-resolution static images and more than 4,000 high-resolution PTM sets, documenting 1,060 Persepolis Fortification tablets. These include most of the Aramaic texts in the Archive (apart from Aramaic inscriptions in seal impressions): 688 of the 738 monolingual Aramaic tablets identified so far, and 185 of about 220 Aramaic epigraphs identified so far on cuneiform texts.

Oriental Institute post-doctoral worker Dennis Campbell continues to carry out the cluster of interlocking tasks involved in uploading, error-checking, and linking PFA texts, images and cataloging information for display in the On-Line Cultural Heritage Environment (OCHRE, available for free download at [http://ochre.lib.uchicago.edu/index\\_files/Page494.htm](http://ochre.lib.uchicago.edu/index_files/Page494.htm)), as-

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sisted by student workers Seunghee Yie (NELC), Wayne Munsch (Divinity), and Özgün Sak (History). More than 4,000 Elamite texts have been entered, more than 2,250 of them now publicly available. All of the known monolingual Aramaic tablets have been entered. More than 2,000 of the Elamite and Aramaic texts have associated images. More than 1,700 of the uninscribed tablets have been entered with basic cataloging and descriptive information, and more than 1,000 of them with linked screen-resolution PTM images.

Munsch has imported and edited images of about 400 Elamite tablets on OCHRE, and tagged about 2,000 of the images, linking the texts sign-by-sign to edited transliterations, and linking seal impressions to catalog entries and collated drawings of the seals. As new texts are entered, Yie continually revises and corrects Elamite glossary entries and the underlying text editions, and Campbell revises and corrects Aramaic glossary entries and the underlying text editions. This process underscores a notable property of the languages of the Fortification texts: of more than 3,000 lemmas in the Elamite and Aramaic glossaries so far, more than 70 percent are proper names. Considering that the texts are terse administrative records, this comes as no surprise, but it is startling to realize that this large corpus — the largest in Achaemenid Elamite and one of the largest in Imperial Aramaic — relies on scarcely a thousand items of common Elamite, Iranian-Elamite, Aramaic, and Iranian-Aramaic vocabulary, and it is sobering to recognize how much more of these languages we cannot know.

As the texts are cleaned up, those with explicit dates are linked to time periods (regnal years of Darius I, month when explicit, and modern expressions of ancient dates). This will allow users to include time as a variable in complex searches when examining patterns in choice of signs, choice of words, syntactic choices, volumes of commodities, and other matters.

The University of Chicago Library has upgraded the hardware that powers the PFA on OCHRE, and Internet data specialist Sandra Schloen, one of the creators of OCHRE, has upgraded the software. The results include faster processing, better internal indexing, and new

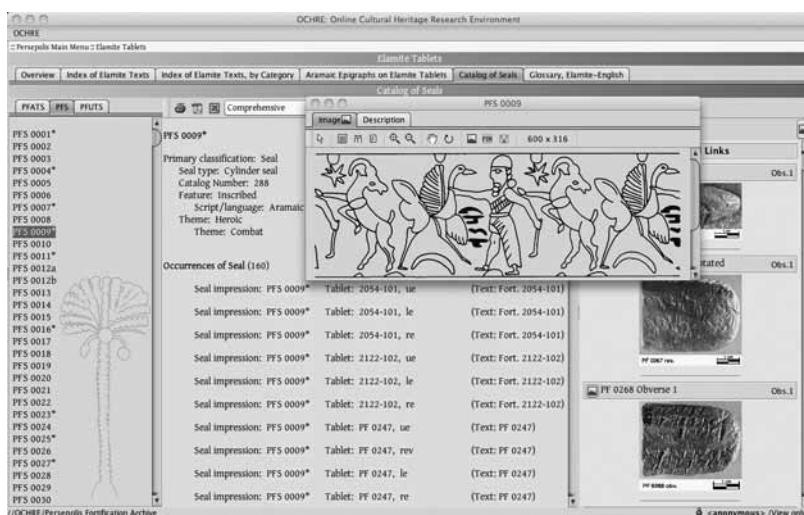


Figure 6. OCHRE Comprehensive View of PFS 0009\*, a seal of Parnaka, the chief administrator of the Fortification administration, with his name in Aramaic engraved in the seal scene. The View shows a list of 160 impressions by tablet number and surface and by text number (left), with thumbnails of available images (right), and an opened link to show the collated seal drawing (center). Clicking on a text link opens an edition of the text associated with the particular impression

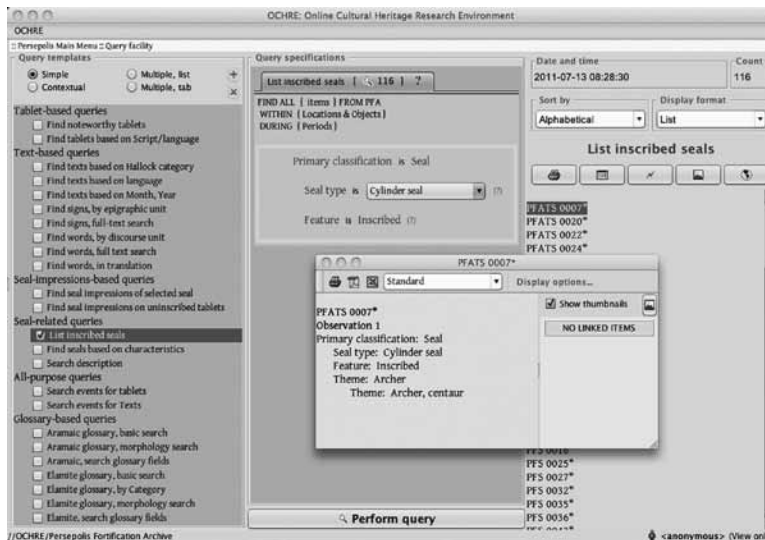


Figure 7. OCHRE query facility under development: search produces list of all inscribed cylinder seals; clicking on first-entry, PFATS 0007\* (an inscribed seal first documented on Aramaic Fortification tablets), opens a terse catalog entry

functionality. New view formats include the “Comprehensive View,” available for each seal in the Catalog of Seals, offering a concise presentation of each documented impression of the seal (including images) on tablets of all types, along with linked details of each tablet and its textual contents (if any) (fig. 6). A new query facility, still under development, allows a wide and flexible range of complex searches of properties of tablets, scripts, transliterations, translations, glossaries, seal impressions, seals, seal inscriptions, etc. (fig. 7).

## Publications and Presentations

PFA Project staff members completed more than thirty-five articles, book chapters, and books based largely or entirely on PFA Project results. Publications that appeared in 2010–11 include Garrison’s article on “The Seal of ‘Kuraš the Anzanite, Son of Šešpeš (Teispes),’ PFS 93\*<sup>1</sup>: Susa–Anšan–Persepolis,” and Henkelman’s article on “Parnaka’s Feast: *šip* in Parsa and Elam,” both in *Elam and Persia*, edited by J. Alvarez-Mon and Mark Garrison (Eisenbrauns, 2011), Henkelman’s article on “‘Consumed Before the King,’ the Table of Darius, that of Irdabama and Irtaštuna, and that of his Satrap, Karkiš,” in the conference volume *Der Achämenidenhof/ The Achaemenid Court*, edited by Bruno Jacobs and Robert Rollinger, *Classica et Orientalia 2* (Harrassowitz, 2010), and “The First Achaemenid Administrative Document Discovered at Persepolis,” by Charles E. Jones (Institute for the Study of the Ancient World, New York University) and Seunghee Yie, mentioned in last year’s *Annual Report* and now available online at <http://www.achemenet.com/document/2011.003-Jones&Yie.pdf>.

The Project’s weblog (<http://persepolistablets.blogspot.com/>), or on Facebook at <http://www.facebook.com/pages/Persepolis-Fortification-Archive-Project/116290391782963>), with sixteen new posts, was viewed more than 16,000 times during 2010–11 by more than 10,000 unique visitors.

Academic lectures and conference presentations by PFA Project members during 2010–11 included Azzoni’s talk on “Aramaic at Persepolis” at the annual meetings of the American



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Schools of Oriental Research and the Society for Biblical Literature in Atlanta, November 2010, and her lecture on “Digitizing the Past” at Loyola University of New Orleans in March 2011; a presentation by Garrison on “Observations on Persepolitan Glyptic and the Seal of Aršama,” and six presentations by Henkelman on the PFA, its contents, its historical and sociolinguistic implications, all at series of workshops at Oxford in January, February, and May 2011; papers by Mikołajczak on “Visual Aspects of the Accounting Seals of the PFA” and by me on “‘His Own Death’ at Bisotun and Persepolis,” both at the annual meeting of the American Oriental Society in Chicago in March 2011; and my keynote lecture on the PFA and the Project at a symposium on “Archaeologies of Text: Archaeology, Technology and Ethics,” at the Joukowsky Institute for Archaeology and the Ancient World, Brown University, December 2010.

Among several local presentations, my keynote presentation on “Electronic Epigraphy to the Rescue of the Persepolis Fortification Archive,” at the Umbrella Initiative Faculty Technology, tried to let members of the University of Chicago community who are not part of the Oriental Institute’s ordinary constituency know that the work of the Oriental Institute belongs to the mainstream of the University’s research mission in terms that are both technically adept and culturally responsible.

## Conclusion

Another way in which the PFA Project carries out the University’s mission is by supporting students who will populate the next generation of scholarship. Six graduate student workers have completed PhDs during the life of the Project, in fields that include Assyriology, Hittitology, Northwest Semitic philology (including Miller Prosser in 2011) and Hebrew Bible (including John Walton in 2011). In 2011, Tytus Mikołajczak completed an MA thesis on PFA material (including entirely original documentation), already the basis for two presentations at national meetings. Siwei Wang (Computer Science, PhD 2011) surmises that her investigation of PTM technology while volunteering for the PFA Project helped her earn a post-doctoral fellowship working on the Advanced Photon Source at Argonne National Laboratories. Undergraduate Project workers have gone on to graduate programs elsewhere, and in 2010–11 at least two of them (Elizabeth Davidson, Coptic and Early Christianity, Yale University; Ivan Cangemi, Anthropology and Interdisciplinary Program in Classical Art and Archaeology, University of Michigan) have reached PhD candidacy. As already mentioned, students from other colleges and universities have come to Chicago for summer work on the Project.

In this way, the aims, methods, accomplishments and temperament of the PFA Project contribute to the formation of scholars whose careers will take them far beyond the Project’s topical focus. Unfortunately, some of them are moving forward in their careers before the Project is complete. This year, Clinton Moyer, the senior member of the high-resolution imaging team, who has been a key to developing and implementing its growing repertoire of methods, leaves to take up a post-doctoral fellowship at Wake Forest University, and John Walton, also part of the high-resolution imaging group, leaves for a teaching post at the University of Northern Iowa (fig. 8).

In spring 2011 came two pieces of good news that underscore the priorities of the PFA Project and that bode well for accomplishing the Project’s goals. First, after long deliberation, a Federal appellate court panel handed down rulings on two motions in the lawsuit that still looms over the future of the tablets (see David Glenn, “U. of Chicago and Museums Win Key



Figure 8. PFA Project staff at farewell reception for departing workers. Left to right: Ben Thomas (NELC), Miller Prosser (PhD NELC, 2011), Annalisa Azzoni (Vanderbilt University), Stolper and Baxter, Clinton Moyer (PhD Cornell, 2009), Erin Daly (Cornell College), Wouter Henkelman (Free University of Amsterdam), and John Walton (PhD NELC, 2011). Walton's shirt shows the emblem of the Persepolis Football Club

Ruling in Legal Battle over Iranian Antiquities," *Chronicle of Higher Education* (<http://chronicle.com/article/U-of-ChicagoMuseums-Win/126923/>). Although these rulings are favorable to the Oriental Institute's position, it is important to realize that they concern procedural issues. The substantive legal issue remains to be determined by a trial on the merits and the date of that trial is not yet fixed. Thus, the urgency of the threat to the PFA is diminished but the substance of the threat remains. Whatever the outcome, the Oriental Institute will ultimately surrender custodial control of the Persepolis Fortification tablets, so a complete record of the PFA remains a compelling need.

Second, the Andrew W. Mellon Foundation, the PARSA Community Foundation, and the National Endowment for the Humanities (<http://www.neh.gov/>) renewed large grants to the PFA Project. These, along with supporting grants from the Iran Heritage Foundation and the Farhang Foundation and gifts from individual donors, will sustain our work at the present levels for the immediate future, bringing the goal of a complete record of the PFA within reach. As we proceed, the PFA Project continues to reveal the rich potential of the Archive's data for understanding the languages, art, and society of the Achaemenid Persian empire, and the intimate connections among them.