essere presentata. Due esempi. A p. 21 viene pubblicata, oltre al programma elettorale *CIL* IV 2993x, un'interessante iscrizione greca, una specie di acclamazione: 2993y, pubblicata dallo Zangemeister nella forma seguente: CATPIΩ | OYAΛєNTI | OγOYΣTΩ | NHP ΦHΛIKITερ. Zangemeister stesso non ha visto l'iscrizione, di cui riproduce il testo in base all'apografo di De Petra (correggendo solo all'inizio di 3 OI in Ὀγ-). Importante notare che il testo fu collazionato subito dopo la scoperta sulle orme del de Petra da Matz che, secondo Zangemeister, *ipse vestigia vidit*. L'iscrizione è tuttavia ancora conservata (nel Museo partenopeo), anche se in parte rovinata; e l'osservazione del Matz fa pensare che la rovina fosse cominciata subito dopo la scoperta. Ora, dalla foto pubblicata nel volume e da un'altra foto dell'Istituto di Paleografia dell'Università di Roma "La Sapienza" non riesco a confermare la lettura delle ultime due righe. Si pone la questione su quanto sia attendibile la lettura del de Petra. Sembra che fino ai nostri giorni nessuno abbia collazionato il testo del dipinto, e chi sa quanto sia diventato di difficile lettura in queste due righe già nell'immediato periodo dopo la scoperta. In ogni caso la lettura è dubbia: una grafia Ὀγουστ- per Αὐγουστ- sarebbe quanto mai inaudita, e Νηρ- per Νερ- un po' dura. Forse va letto, in queste righe, una tutt'altra cosa. Forse un'autopsia potrebbe promuovere ulteriormente l'esegesi dell'iscrizione.

A p. 198 si riproduce una non cattiva foto di *CIL* IV 7534. Da essa si può desumere che la lettura *Amplus alumnus Tiburs* presentata dall'editore Della Corte è estremamente incerta. *Amplus* è difficile accettare, e anche se si leggesse così, resterebbe aperto se si tratti di nome o appellativo. Neanche *alumnus* riesco a distinguere. E *Tiburs*: la fine sembra debba essere letta BVRIS.

Ho pochissimo da criticare: p. 21 con *CIL* IV 2993x: non so se si possa parlare di un nesso di L e I, piuttosto penserei a un'omissione erronea di I. – p. 130 con *CIL* IV 7356: la lettura proposta con nomi di gladiatori resta un po' incerta; perché non una donna *Philete* invece di *Philete(rus)*? – p. 144: si tratta veramente di *CIL* IV 9852? – p. 207 con *CIL* IV 7574: la lettura con le integrazioni proposte resta incerta; item p. 214; e ancora p. 477 (osta la nomenclatura). – p. 485–486, 502: vedi sulla lettura *Gnomon* 1973, 265.

Tirando le somme, si deve dire che Varone e Stefani, con i loro collaboratori, hanno creato uno strumento di lavoro di estrema importanza. Ora abbiamo a disposizione degli studiosi una raccolta di fotografie delle iscrizioni dipinte vesuviane che permetteranno di aprire nuovi orizzonti su vari temi pompeiani. Auguriamoci che con questo volume l'interesse verso le testimonianze epigrafiche di tipo pompeiano cresca continuamente. Gli autori hanno meritato il ringraziamento più profondo di tutti coloro che si occupano delle antichità non solo pompeiane, ma romane in genere.

Heikki Solin

Melissa M. Terras: *Image to Interpretation. An Intelligent System to Aid Historians in Reading the Vindolanda Texts*. Oxford Studies in Ancient Documents. Oxford University Press, Oxford 2006. ISBN 978-0-19-920455-7. XII, 252 pp. GBP 50.

This study presents an extraordinary piece of research. Based on the author's doctoral thesis (Department of Engineering Science, University of Oxford), it is an attempt at designing a computer aided method to help papyrologists in reading the Vindolanda tablets. This formula-

tion is important. The goal is not to produce an automatic reading program, but a device that would help the papyrologist by suggesting possible solutions. The work is highly interdisciplinary in nature, and an interesting read to anyone who has tried to read a papyrological text. Two types of tablets have been recovered from Vindolanda: texts written on wooden tablets in ink, and wax tablets where the writing was done with a stylus. The latter type is particularly difficult to decipher, since all that is left are traces of letters on the wooden surface on which the wax once was spread. It is with the reading of the Vindolanda stylus tablets that this research project principally aims to provide help.

After the Introduction that presents the method used, chapter two concerns the papyrologist at work, and eliciting knowledge from papyrologists in order to understand how they work, and where they need help. Although this part contains no new information to a papyrologist, it is interesting in explicating the process that papyrologists use when they see a new text and try to read it. Three experts were consulted. Material was gathered using Think Aloud Protocols whereby the expert, while undertaking a specified task, is urged to utter every thought that comes to mind during the process. The fact, not in any way surprising to a specialist, that becomes evident is that reading an ancient text is a recursive process. Papyrologists do not proceed linearly, by establishing the reading of one letter firmly and then proceeding to the next one, but keep going through all levels of the text in a cyclic reasoning process (individual strokes – letters forms – possible words – meaning of the whole text and type of document). An analysis of the material from the Think Aloud Protocols shows (p. 63) that the levels of features of strokes, identification of individual characters and possible words are the levels most frequently discussed by the experts. On the basis of this, a model of the papyrology process is proposed (p.81).

While this chapter is highly interesting in the way it makes the process of reading an ancient text explicit, it must be said that its contribution to the actual target, building a computer aided system to help in the reading process, remains rather vague to the reader.

Chapter three studies the palaeography of the Vindolanda texts. It presents a method of describing the character forms (consisting of different types of strokes) so that the information can be encoded in a computer program. Nine Vindolanda texts (seven ink texts and two stylus texts) were annotated according to this encoding scheme using a program that was originally developed to handle aerial satellite images. Results of this annotation were written in a file in XML (Extensible Markup Language). The author points out (p. 106) that this was the first known instance of textual encoding in the humanities on a stroke-based level.

Chapter four describes the computer system that was adapted to analyse the character images and "read" them (originally the system was built to read a handwritten phrase in English). The chosen program is based on the principle that the shortest and simplest solution is most likely the correct one. This principle is called the Minimum Description Length (MDL) in computer science terms. For computer scientists, the technical details of the program are explained in Appendix A. Character models, representing prototypes of letter forms, were constructed on the basis of the annotated texts. The program (or a part of it, the "Character Agent") compares the unknown letter with the character models, and finds the best fit(s). These are then passed on to the next level, the "word agent" that compares the suggested strings of characters to a word list containing all words attested in the Vindolanda corpus. Appendix C contains a corpus of all letter forms in the training corpus (the nine annotated texts).

In chapter five, the computer system is put to the test. A section of the ink tablet 255

was input to the system. It contained annotations of each letter done by hand. The solution that had the Minimum Description Length was the correct solution and was produced on the eighth run of the system.

So far the study has worked on the assumption that ink and stylus letter forms, although different from each other, are nevertheless similar enough so that when the program has been trained on a corpus with ink letter forms it will be able to recognize letters on a stylus tablet. This is tested in Chapter five on a section of stylus tablet 797 (again, a hand annotated text). The program was able to reach the correct reading both using ink character models, as well as the very much smaller sample of stylus character models, but performed (not unsurprisingly) considerably better with the latter.

Next a notable problem is addressed. In order to be of real help, the program should be able to cope with annotation data that has been produced automatically, and not by hand. The results show that it is much harder for the program to find the correct solution in this case, although in this test an ink text was used (and not a stylus text that is the actual target of this research, and much more difficult to read).

The author concludes that the research has shown the applicability of the chosen methods, including the suitability of the computer architecture. However, she acknowledges that much work still has to be done in order to enhance the image processing methods to come up with useful automatically annotated data, and to develop the system to handle this data. A number of ways of improving the system are presented in the concluding chapter, but at least to a non-specialist, the essential problem of how to develop an image processing tool that would be able to analyze the faint traces on stylus tablets in a meaningful way, seems not to be given much space. This is, after all, specifically the problem that papyrologists face when they try to read a stylus tablet: to identify and interpret those marks that are traces of letters from all the "noise" that surrounds them.

The book contains many photographs that illustrate well the methods that were used when annotating texts. There are, however, some signs of hasty production in the volume. For example, on p. 70, note 24 where the Leiden system is explained, the subdot is missing before its explanation; on p. 143 USSIBUS is printed instead of USSIBUSS (illustrating a mistake in annotation); the same person is referred to as Dr. Xiao-Bo Pan and Dr. Xiabo Pan (on p. 130 and p. 148, respectively); Bowman and Thomas (2004) (p. 156, note 1) is not in the bibliography (it should possibly be Bowman and Thomas 1994), and the same applies to Bowman and Tomlin (2005) (p. 72, note 27) that is erroneously given as Bowman, Brady and Tomlin (2005) in the bibliography.

This monograph opens up promising new paths that in the future will hopefully help papyrologists in their task. A consequence of the pioneering nature of the work is that a number of problems remain unsolved – but, one hopes – only for the time being.

Hilla Halla-aho