LaTeX as a tool for the typographic reproduction of ancient texts

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Abstract

Modern digital typography makes it possible to reliably reproduce ancient texts. In the TeX world, one usually employs a macro package and one or more PostScript fonts in order to accomplish his/her task. Here we briefly describe some tools that have not been described in the literature and then we give our own response to the important question regarding the suitability of the LaTeX tools that are available for the reproduction of ancient texts. More generally, we are also concerned about the suitability of our typesetting enginees to handle demanding typographic problems. Naturally, an answer cannot be definitive, nevertheless, we conclude that the tools and typesetting engines have provisions to handle all possible forms of ancient documents.

1 Introduction

The reproduction of ancient texts is an important issue, mainly because by digitally reproducing ancient documents we can preserve our cultural heritage. Indeed, digital typography is about culture and art as much it is about science and technology. And it is not surprising that many TeX experts have devoted much time and energy to develop a number of tools for the typesetting of ancient scripts. For instance, Peter Wilson and the present author have created a number of such tools, which are partially described in [1, 2, 3]. Obviously, these tools cannot cover all possible cases, but are good enough for most tasks. However, the really important question is whether tools such as these can be used to digitally reproduce any ancient document. Naturally, an answer to this question cannot be definitive, nevertheless, as it will be demonstrated later on, it seems that these tools can be used to reproduce *any* ancient document.

The purpose of this article is not only to show that modern typesetting tools can be used to reproduce many ancient documents, but also to describe a number of tools that have not been described in the literature so far. For this reason, we will describe the tools developed to typeset the symbols of the disk of Phaistos, the symbols of the Linear A script, the symbols of the Epi-Olmec script, and the staves used in medieval Iceland. In addition, we will briefly discuss our project to provide support for the Cretan hieroglyphics.

In the next section we will review the typesetting tools for various scripts that have not been described in the literature. Then we will discuss whether these tools solve the problem they have been designed to tackle. We conclude with a short discussion regarding our future projects.

2 From ancient Greece through ancient Meso-America to medieval Iceland

The great island of Crete was the site of the Minoan civilisation. On this island Cretans developed their various writing systems, including Linear A and Linear B. Before these scripts gained widespread use and acceptance, a hieroglyphic script was in use. To the best of our knowledge, this script has not been deciphered yet. Also, on the famous Disk of Phaistos is inscribed a text in an undeciphered script. Wilson has created a font and a LaTeX package to typeset Linear B documents, whilst the present author developed a font and a LaTeX package that can be used to typeset Linear A tablets.

2.1 The Disk of Phaistos

The present author and Stratos Doumanis have created a font and an accompanying LaTeX package, named phaistos, that can be used to digitally reproduce both sides of the Disk of Phaistos. The package provides access to the glyphs of the Phaistos font, via commands of the form `\PHxxxx`. The `xxxx` part of the name follows the "*Phaistos Con-Script Unicode Standard*" (`http://www.evertype.com/standards/csur/phaistos.html`. The list of glyph access commands is shown in Table 1.

2.2 Linear A

The package LinearA provides access to the fonts LinearA and LinearACmplxSigns, which contain both the simple and compound symbols of the Linear A

\PHpedestrian =	\PHshield =	\PHbeehive =	\PHvine =
\PHplumedHead =	\PHclub =	\PHship =	\PHpapyrus =
\PHtattooedHead =	\PHmanacles =	\PHhorn =	\PHrosette =
\PHcaptive =	\PHmattock =	\PHhide =	\PHlily =
\PHchild =	\PHsaw =	\PHbullLeg =	\PHoxBack =
\PHwoman =	\PHlid =	\PHcat =	\PHflute =
\PHhelmet =	\PHboomerang =	\PHram =	\PHgrater =
\PHgaunlet =	\PHcarpentryPlane =	\PHeagle =	\PHstrainer =
\PHtiara =	\PHdolium =	\PHdove =	\PHsmallAxe =
\PHarrow =	\PHcomb =	\PHtunny =	\PHwavyBand =
\PHbow =	\PHsling =	\PHbee =	
	\PHcolumn =	\PHplaneTree =	

Table 1: Glyph access commands provided by the phaistos package.

script. The term compound symbol denotes a symbol that consists of two or more simple symbols. For example, the compound symbol is composed of the symbols and . The two fonts contain 389 glyphs and since there are no “official” names for the various glyphs, the glyph access commands have the following general form: `\LinearALLLL`, where `LLLL` is a roman numeral. For example, this Linear A text:

was typeset with the following commands:

```
\LinearAXXIX{\LinearAXLIII}{\LinearAXXXIV}%
\LinearALXVIII{\LinearALX}{\LinearAIV}%
{\LinearAXXII}%
```

Each command is defined using the `\xspace` command, and thus we need to surround the various commands with curly braces to avoid the production of extra white space. If a user does not want to refer to individual glyphs and worry about spacing, he/she can employ the following redefinition after the command that includes the LinearA package:

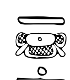
```
\let\xspace\relax
```

In Table 2 the reader can see the glyph access commands provided for the simple symbols of the Linear A script. Of course it would be nice to have this as a package option, and it is planned for inclusion in a future release.

2.3 Epi-Olmec

The epiolmec package provides the necessary commands to typeset Epi-Olmec texts and numerals. The various glyph access commands are shown in Table 3. The Epi-Olmec people of Meso-America used the vigesimal numbering system (i.e., a base 20 numbering system). The package provides two commands to generate Epi-Olmec numerals, which are identical to the numerals employed by the Mayan people. Specifically, the command `\vigesimal` typesets a number on a horizontal line, while the command `\StackedVigesimal` typesets the same numeral on a vertical line, which is the historical way that the Epi-Olmec people wrote numbers.

For example, the command `\vigesimal{2006}` produces the symbols , while the command `\StackedVigesimal{2006}` produces:



2.4 Icelandic

The package icelandic provides access to the font icelandic. This font contains the Icelandic runes as well as most of the Icelandic sorcery and witchcraft staves. The letters can be accessed by simply typing the lowercase Latin equivalent (see Table 4).

For example, the following text: was typeset with the input ‘`island`’:

To typeset the staves, one uses commands similar to those provided by the LinearA package (see Table 5).

\LinearAI = 𐘀
\LinearAII = 𐘁
\LinearAIII = 𐘂
\LinearAIV = 𐘃
\LinearAV = 𐘄
\LinearAVI = 𐘅
\LinearAVII = 𐘆
\LinearAVIII = 𐘇
\LinearAIX = 𐘈
\LinearAX = 𐘉
\LinearAXI = 𐘊
\LinearAXII = 𐘋
\LinearAXIII = 𐘌
\LinearAXIV = 𐘍
\LinearAXV = 𐘎
\LinearAXVI = 𐘏
\LinearAXVII = 𐘐
\LinearAXVIII = 𐘑
\LinearAXIX = 𐘒
\LinearAXX = 𐘓
\LinearAXXI = 𐘔
\LinearAXXII = 𐘕
\LinearAXXIII = 𐘖
\LinearAXXIV = 𐘗
\LinearAXXV = 𐘘
\LinearAXXVI = 𐘙
\LinearAXXVII = 𐘚
\LinearAXXVIII = 𐘛
\LinearAXXIX = 𐘜
\LinearAXXX = 𐘝
\LinearAXXXI = 𐘞
\LinearAXXXII = 𐘟
\LinearAXXXIII = 𐘠
\LinearAXXXIV = 𐘡
\LinearAXXXV = 𐘢
\LinearAXXXVI = 𐘣
\LinearAXXXVII = 𐘤
\LinearAXXXVIII = 𐘥
\LinearAXXXIX = 𐘦
\LinearAXL = 𐘧
\LinearAXLI = 𐘨
\LinearAXLII = 𐘩
\LinearAXLIII = 𐘪
\LinearAXLIV = 𐘫
\LinearAXLV = 𐘬
\LinearAXLVI = 𐘭
\LinearAXLVII = 𐘮
\LinearAXLVIII = 𐘯
\LinearAXLIX = 𐘰
\LinearAL = 𐘱
\LinearALI = 𐘲
\LinearALII = 𐘳
\LinearALIII = 𐘴
\LinearALIV = 𐘵
\LinearALV = 𐘶
\LinearALVI = 𐘷
\LinearALVII = 𐘸
\LinearALVIII = 𐘹
\LinearALIX = 𐘺
\LinearALX = 𐘻
\LinearALXI = 𐘼
\LinearALXII = 𐘽
\LinearALXIII = 𐘾
\LinearALXIV = 𐘿
\LinearALXV = 𐙀
\LinearALXVI = 𐙁
\LinearALXVII = 𐙂
\LinearALXVIII = 𐙃
\LinearALXIX = 𐙄
\LinearALXX = 𐙅
\LinearALXXI = 𐙆
\LinearALXXII = 𐙇
\LinearALXXIII = 𐙈
\LinearALXXIV = 𐙉
\LinearALXXV = 𐙊
\LinearALXXVI = 𐙋
\LinearALXXVII = 𐙌
\LinearALXXVIII = 𐙍
\LinearALXXIX = 𐙎
\LinearALXXX = 𐙏
\LinearALXXXI = 𐙐
\LinearALXXXII = 𐙑
\LinearALXXXIII = 𐙒
\LinearALXXXIV = 𐙓
\LinearALXXXV = 𐙔
\LinearALXXXVI = 𐙕
\LinearALXXXVII = 𐙖
\LinearALXXXVIII = 𐙗
\LinearALXXXIX = 𐙘
\LinearALXXXX = 𐙙
\LinearAXCI = 𐙚
\LinearAXCII = 𐙛
\LinearAXCIII = 𐙜
\LinearAXCIV = 𐙝
\LinearAXCV = 𐙞
\LinearAXCVI = 𐙟
\LinearAXCVII = 𐙠
\LinearAXCVIII = 𐙡
\LinearAXCIX = 𐙢
\LinearAC = 𐙣
\LinearACI = 𐙤
\LinearACII = 𐙥
\LinearACIII = 𐙦
\LinearACIV = 𐙧
\LinearACV = 𐙨
\LinearACVI = 𐙩
\LinearACVII = 𐙪
\LinearACVIII = 𐙫
\LinearACIX = 𐙬
\LinearACX = 𐙭
\LinearACXI = 𐙮
\LinearACXII = 𐙯
\LinearACXIII = 𐙰
\LinearACXIV = 𐙱
\LinearACXV = 𐙲
\LinearACXVI = 𐙳
\LinearACXVII = 𐙴
\LinearACXVIII = 𐙵
\LinearACXIX = 𐙶
\LinearACXX = 𐙷
\LinearACXXI = 𐙸
\LinearACXXII = 𐙹
\LinearACXXIII = 𐙺
\LinearACXXIV = 𐙻
\LinearACXXV = 𐙼
\LinearACXXVI = 𐙽
\LinearACXXVII = 𐙾
\LinearACXXVIII = 𐙿
\LinearACXXIX = 𐚀
\LinearACXXX = 𐚁
\LinearACXXXI = 𐚂
\LinearACXXXII = 𐚃
\LinearACXXXIII = 𐚄
\LinearACXXXIV = 𐚅
\LinearACXXXV = 𐚆
\LinearACXXXVI = 𐚇
\LinearACXXXVII = 𐚈
\LinearACXXXVIII = 𐚉
\LinearACXXXIX = 𐚊
\LinearACXL = 𐚋
\LinearACXLI = 𐚌
\LinearACXLII = 𐚍
\LinearACXLIII = 𐚎
\LinearACXLIV = 𐚏
\LinearACXLV = 𐚐
\LinearACXLVI = 𐚑
\LinearACXLVII = 𐚒
\LinearACXLVIII = 𐚓
\LinearACXLIX = 𐚔
\LinearACL = 𐚕
\LinearACLI = 𐚖
\LinearACLII = 𐚗
\LinearACLIII = 𐚘
\LinearACLIV = 𐚙
\LinearACLV = 𐚚
\LinearACLVI = 𐚛
\LinearACLVII = 𐚜
\LinearACLVIII = 𐚝
\LinearACLIX = 𐚞
\LinearACLX = 𐚟
\LinearACLXI = 𐚠
\LinearACLXII = 𐚡
\LinearACLXIII = 𐚢
\LinearACLXIV = 𐚣
\LinearACLXV = 𐚤
\LinearACLXVI = 𐚥
\LinearACLXVII = 𐚦
\LinearACLXVIII = 𐚧
\LinearACLXIX = 𐚨
\LinearACLXX = 𐚩
\LinearACLXXI = 𐚪
\LinearACLXXII = 𐚫
\LinearACLXXIII = 𐚬
\LinearACLXXIV = 𐚭
\LinearACLXXV = 𐚮
\LinearACLXXVI = 𐚯
\LinearACLXXVII = 𐚰
\LinearACLXXVIII = 𐚱

Table 2: Glyph access commands for the simple symbols provided by the linearA package.

\EOi =
\EOii =
\EOiii =
\EOiv =
\EOv =
\EOvi =
\EOvii =
\EOviii =
\EOix =
\EOx =
\EOxi =
\EOxii =
\EOxiii =
\EOxiv =
\EOxv =
\EOxvi =
\EOxvii =
\EOxviii =
\EOxix =
\EOxx =
\EOzero =
\EOSpan =
\EOJI =
\EOvarji =
\EOvarki =
\EOpi =
\EOpe =
\EOpuu =
\EOpa =
\EOvarpa =
\EOpu =
\EOpo =
\EOti =
\EOte =
\EOtuu =
\EOta =
\EOtu =
\EOto =
\EOtzi =
\EOtze =
\EOtzuu =
\EOtza =
\EOvartza =
\EOtzu =
\EOki =
\EOke =
\EOkuu =
\EOvarkuu =
\EOku =
\EOko =
\EOSi =
\EOvarSi =
\EOSuu =
\EOSa =
\EOSu =
\EOSo =
\EOsi =
\EOvarsi =
\EOsuu =
\EOsa =
\EOsu =
\EOji =
\EOje =
\EOja =
\EOvarja =
\EOju =
\EOjo =
\EOmi =
\EOme =
\EOmuu =
\EOma =
\EOni =
\EOvarni =
\EOne =
\EOnuu =
\EOna =
\EOnu =
\EOwi =
\EOwe =
\EOwuu =
\EOvarwuu =
\EOwa =
\EOwo =
\EOye =
\EOyuu =
\EOya =
\EOkak =
\EOpak =
\EOpuuk =
\EOyaj =
\EOScorpius =
\EODealWith =
\EOYear =
\EOBeardMask =
\EOBlood =
\EOBundle =
\EOChop =
\EOCloth =
\EOSaw =
\EOGuise =
\EOofficerI =
\EOofficerII =
\EOofficerIII =
\EOofficerIV =
\EOKing =
\EOloinCloth =
\EOlongLipII =
\EOLose =
\EOmexNew =
\EOMiddle =
\EOPlant =
\EOPlay =
\EOPrince =
\EOSky =
\EOskyPillar =
\EOSprinkle =
\EOstarWarrior =
\EOTitleII =
\EOtuki =
\EOtzetze =
\EOChronI =
\EOPatron =
\EOandThen =
\EOAppear =
\EODeer =
\EOeat =
\EOPatronII =
\EOPierce =
\EOkij =
\EOstar =
\EOsnake =
\EOtime =
\EOtukpa =
\EOflint =
\EOafter =
\EOvarBeardMask =
\EOBedeck =
\EObrace =
\EOflower =
\EOGod =
\EOMountain =
\EOgovernor =
\EOHallow =
\EOjaguar =
\EOSini =
\EOknottedCloth =
\EOknottedClothStraps =
\EOLord =
\EOmacaw =
\EOmonster =
\EOmacawI =
\EOskyAnimal =
\EOnow =
\EOTitleIV =
\EOpenis =
\EOpriest =
\EOstep =
\EOsing =
\EOskin =
\EOStarWarrior =
\EOsun =
\EOthrone =
\EOTime =
\EOHallow =
\EOTitle =
\EOturtle =
\EOundef =
\EOGoUp =
\EOLetBlood =
\EORain =
\EOset =
\EOvarYear =
\EOFold =
\EOsacrifice =
\EObuilding =

Table 3: Glyph access commands provided by the epiolmec package.

Unicode name	Access character
RUNIC LETTER ANSUZ A	a
RUNIC LETTER BERKANAN BEORC RJARKAN B	b
RUNIC LETTER IWAZ EOH	c
RUNIC LETTER D	d
RUNIC LETTER E	e
RUNIC LETTER FEHU FEOH FE F	f
RUNIC LETTER GEBO GYFU G	g
RUNIC LETTER HAGLAZ H	h
RUNIC LETTER ISAZ IS ISS I	i
RUNIC LETTER THURISAZ THURS THORN	j
RUNIC LETTER KAUNA	k
RUNIC LETTER LAUKAZ LAGU LOGR L	l
RUNIC LETTER MANNAZ MAN M	m
RUNIC LETTER NAUDIZ NYD NAUD N	n
RUNIC LETTER OTHALAN ETHEL O	o
RUNIC LETTER PERTHO PEORTH P	p
RUNIC LETTER INGWAZ	q
RUNIC LETTER RAIDO RAD REID R	r
RUNIC LETTER SIGEL LONG-BRANCH-SOL S	s
RUNIC LETTER TIWAZ TIR TYR T	t
RUNIC LETTER URUZ UR U	u

Table 4: Runic letters supported by the staves package.

3 Are our tools good enough?

The suitability of any tool, in general, is a tantalizing question that every designer should consider when creating his/her tools.

In our case, we need to know whether our tools can be used to reproduce any ancient document they were intended to be able to reproduce. The various scripts presented so far are not especially complicated, and one can safely say that the tools can reliably reproduce documents writen in these scripts.

However, there are much more esoteric writing systems, such as the Mayan writing system, that seem quite challenging. The Mayan writing system is a two-dimensional system, in the sense that there is a main sign surrounded by other signs. The main sign is larger than the other signs, which are affixes. There are four kinds of affixes: prefixes, which are placed to the left of the main sign, superfixes, which are placed above the main sign, subfixes, which are placed below the main sign, and postfixes, which are placed at the right of the main sign. Affixes can also be fused within the main glyph and are called infixes. So this is a vastly more complicated writing system, and it would be quite challenging to develop a tool for mechanically typesetting Mayan documents from sources in some Latinized transliterated form. It would seem this is a typographic job particularly well-suited for advanced typesetting engines such as Ω, ℵ, and/or XeTeX.[1]

On the other hand, to merely literally reproduce a Mayan script, one could use the picture enviroment or define some other environment/command to build these complicated compounds. Of course, this is an unintelligent solution. An appealing solution would be quite difficult to implement.

So where are we? The answer is that we need advanced typesetting engines to be able to typeset complicated writing systems easily. So far, it seems that most cases can be handled by existing tools, but it is necessary to make sure that these tools are reliable and give always the expected results. This is quite feasible, but demands a clear design and one that will not be based on previous programming approaches and design principles..

4 Epilog

We have presented work that we have done over the last few years in the field of digital typography. Specifically, we presented the tools we developed to typeset ancient documents. This work and other similar projects prompted us to ponder about the suitability of our typesetting engines as typographic tools capable to handle any ancient script. We concluded that an unintelligent design is possible for any imaginable writing system, but the recreation of an ancient document from "raw" data is something that demands very sophisticated typesetting engines. Thus, we need to examine all writing systems and to adapt our tools so as to be able to handle all possible cases. This will prompt researchers and developers to work toward the creation of new tools and/or the improvement of existing tools.

Acknowledgements

I would like to thank the *TUGboat* reviewers for their comments and suggestions.

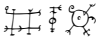
References

[1] Apostolos Syropoulos. Replicating Archaic Documents: A Typographic Challenge. *TUGboat*, 24(3):319–322, 2003.

[2] Apostolos Syropoulos, Antonis Tsolomitis, and Nick Sofroniou. *Digital Typography Using LaTeX*. Springer Professional Computing. Springer-Verlag, New York, 2003.

[3] Peter Wilson. The alphabet tree. *TUGboat*, 26(3):199–214, 2005.

[1] Ω is the last letter of the Greek alphabet, while ℵ is the first letter of the Hebrew alphabet, which makes me think that Ω was supposed to be the ultimate typesetting engine, but ℵ showed that probably there is still a long way to the end... A belief that was verified with the emergence of XeTeX!

\staveI = 
\staveII = 
\staveIII = 
\staveIV = 
\staveV = 
\staveVI = 
\staveVII = 
\staveVIII = 
\staveIX = 
\staveX = 
\staveXI = 
\staveXII = 
\staveXIII = 
\staveXIV = 
\staveXV = 
\staveXVI = 
\staveXVII = 
\staveXVIII = 
\staveXIX = 
\staveXX = 
\staveXXI =
\staveXXII = 
\staveXXIII = 
\staveXXIV = 
\staveXXV = 
\staveXXVI = 
\staveXXVII = 
\staveXXVIII = 

\staveXXIX = 
\staveXXX = 
\staveXXXI = 
\staveXXXII = 
\staveXXXIII = 
\staveXXXIV = 
\staveXXXV = 
\staveXXXVI = 
\staveXXXVII = 
\staveXXXVIII = 
\staveXXXIX = 
\staveXL = 
\staveXLI =
\staveXLII =
\staveXLIII =
\staveXLIV =
\staveXLV =
\staveXLVI =
\staveXLVII =
\staveXLVIII =
\staveXLIX =
\staveL =
\staveLI =
\staveLII =
\staveLIII =
\staveLIV =
\staveLV =
\staveLVI =

\staveLVII =
\staveLVIII =
\staveLIX =
\staveLX =
\staveLXI =
\staveLXII =
\staveLXIII =
\staveLXIV =
\staveLXV =
\staveLXVI =
\staveLXVII =
\staveLXVIII =
a =
b =
c =
d =
e =
f =
g =
h =
i =
j =
k =
l =
m =
n =
o =
p =
q =
r =
s =
t =
u =

Table 5: Glyph access commands provided by the staves package.