Twenty-five years of Greek TeXing[*]

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Abstract

The present article is an updated view of all available tools (fonts, systems and more) for typesetting Greek texts with TeX/LaTeX. Unlike the early days of Greek TeX/LaTeX, when the available tools were limited, users now have an abundance of tools available to them. In addition, the emergence of Unicode-aware systems such as XeTeX and luaTeX has allowed for a major breakthrough in the world of TeX: the use of OpenType and system fonts (i.e., fonts used by the operating system of the computer) for typesetting Greek texts.

1 Down history lane

In 1994, the second author of the present article wrote a summary of all tools available at that time for typesetting Greek texts with TeX/LaTeX. That document was posted in the newsgroup `comp.text.tex`, and was immediately archived in CTAN [1]. A few months later, the same document found its way in the newsletter of NTG, the Dutch LUG [2]. In the summer of 1996, the first author wrote an updated summary of Greek TeX/LaTeX tools [3]. Twenty years later, it is high time we produced an updated summary and review of the *current* TeX-like tools available to those who wish to typeset nice Greek documents.

Both reports followed the same format roughly and the presentation of tools for Greek TeXing was divided into the following four sections:

fonts both freely available and commercial ones;

systems or packages containing Greek fonts, TeX macros for Greek output, etc.;

help available at the time over the Internet to TeX users; and

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future predictions which called for a standardization of Greek TEX/LATEX options including the New Font Selection System (NFSS), the introduction of more fonts, and more.

Let us briefly remember what was available back then before we turn our attention to the future.

1.1 Fonts

Before the introduction of somehow comprehensive Greek TEX systems, fonts were the first area where big and exciting changes took place. Naturally, the first Greek fonts were created by the Master himself: Don Knuth. However, his fonts were to be used in TEX's math mode. At that time, some TEXies prepared macros that allowed for typesetting Greek texts using Knuth's math fonts. Hamilton Kelly went one step further and made a set of Greek fonts by bringing Knuth's lowercase Greek math characters to the upright position [4].

The first fonts for Greek text typesetting by TEX those designed more than 25 years ago by Sylvio Levy with METAFONT [5]. Because of encoding limitations and the lack of widespread Greek keyboard availability, Levy had to use a Latin-to-Greek transliteration scheme, with some very obvious correspondances, e.g., a for , b for), and some not so obvious ones, e.g., j for , q for , w for (although w resembles somewhat visually). Users typed in *Greeklish* and it took some time and a lot of practice to read Greeklish input files. Especially, users who used accents, breathing marks or other signs and symbols for multiaccent (*polytonic*) Ancient or Modern Greek produced an almost arcane file for input and processing by TEX/LATEX.

The Levy fonts were drawn according to a historic Didot Greek font, but following Computer Modern metrics. They became the basis of other Didot-like Greek fonts by Haralambous [6, 7], and by MacKay [8]. The latter had an encoding suitable for input from the *Thesaurus Linguæ Græcæ*.

Some non-Didot Greek fonts were also created at that time using META-FONT. These included Malvern [9], a unique sans serif which can be still seen on the cover of *Eutypon*, Euclid [10], a Times–Elsevier Greek font family never released to the public, and lbf [11], which was based on a beautiful 18th century Bodoni Greek design but was released only in 2005. Each of these fonts used its own input Greeklish (Latin-to-Greek) scheme, which made the use of other fonts in the same document very difficult, if not impossible.

1.2 Systems

Back then, when PCs were running on limited amounts of RAM, had floppy disk drives, one processor (rather than multiple cores), and CPU speed was measured in MHz (rather than GHz), typesetting a Greek text was almost a Herculean Labour! The limitations of the ASCII encoding and the lack of Greek keyboards outside Greece made it almost impossible to type directy in Greek and receive Greek output. Users had to employ various transliteration coding schemes in order to achieve their goals.

At that time, two separate and independent GreekTeX systems were made available. Both systems had their positive as well as negative elements. Both systems were introduced almost simultaenously, had almost the same name, but were geared for different types of users and operating systems. Dryllerakis' GreekTeX or kdgreek system [12] was a set of TeX macros and METAFONT fonts created on a Unix platform and based on earlier work by Levy [5] and Haralambous [6, 7]. Separately, Moschovakis produced a greektex system for PC systems running with the Greek version of MS-DOS [13]. Moschovakis' fonts were also based on Levy's original METAFONT work. Of course, these systems were not equivalent as each had its own formatting macros and fonts. Moschovakis' greektex had some tranferability issues between operating systems. Still, they served well many TeX users for several years.

In perspective, TeXing in Greek depended primarily on the platform one was using. You opted for one of the two available systems, loaded extra fonts, if the in-system fonts were not of your liking, and you were ready to TeX keeping in mind that the source code (your input files) might be unreadable by other TeX users who were not using the same system like yourself.

1.3   Help needed

Back then, the places to look for help were limited. There were two main USENET newsgroups, comp.text.tex and comp.fonts and some discussion lists, such as the venerable BIT.LISTSERV.HELLAS (the major meeting point of Greeks abroad) or the ELLHNIKA mailing list, which was set up specifically for answering Greek TeX/LaTeX questions, but had very little traffic.

1.4   Future as was seen back then

In both the Filippou [1, 2] and the Dimakos [3] reports, there were expectations that the new LaTeX scheme (at the time called LaTeX 2_ε) would introduce the NFSS, the ability to write in multiple languages using the babel mechanisms, and other goodies. Dimakos [3] even reported that there was an initiative in Greece to establish a local TeX users group. Who would have thought that so many years later, the Greek LUG would still be alive!

That was roughly the world of Greek TeX/LaTeX back in the mid 1990s. Although the entire TeX/LaTeX ecosystem was not *old* or dated, some limitations had started to show, primarily in the area of truly multilingual inputing and file preparation. Mind you, some projects were already set up to explore the issue and were indeed the forerunners of today's system. One of these systems was called Ω (Omega), the brain child of Haralambous and Plaice. (A version of Ω was presented by its creators in one of the early issues of *Eutypon* [14].)

2 From the `cb` fonts to Unicode-aware machines

So, what has happened between 1996 and 2015? Well, the changes have been phenomenal. One might even argue that TeX/LaTeX has taken a new life with the introduction of new *machines*, new encodings, and new Greek fonts, of course. But, let us begin with the latter: the introduction of new font families, which can all be found in the `/fonts/greek` directory of any CTAN node.

2.1 New fonts

CB fonts Following the early fonts by Levy and their derivatives included in Dryllerakis' and Moschovakis' systems, the first truly "new" fonts were the CB font family designed and implemented by Beccari [15–18]. These fonts were originally written in METAFONT, and they included several variants—Leipzig-like Greek italics, sans serifs, monospace (typewriter), small caps, etc.—in all TeX/LaTeX typical sizes. Samples of selected CB fonts are shown in Figure 1.

The CB fonts were quickly converted to Type1, and became the *de facto* standard font family in the world of Greek TeXing. They were used for several years in *Eutypon*, and they still are the default Greek fonts of babel. Later they were also integrated into OpenType fonts of the Computer Modern Unicode (CMU) bundle [19]. Syropoulos has also integrated some of Beccari's CB fonts into an OpenType monospace font family [20].

Kerkis This is another family of beautiful Greek font created by Tsolomytis [21]. The serif version is based on Bookman, while the accompanying sans serif font is based on Avant Garde (Figure 1). In addition to Type1, Tsolomytis produced versions of the fonts in TrueType and OpenType formats to be used beyond TeX/LaTeX [22].

Greek Font Society Perhaps the biggest contributor and a rather late entry into the game has been the Greek Font Society (GFS). Since 2005, GFS offers for free a large selection of Greek font families for both TeX/LaTeX systems and in OpenType form. On its website (`http://www.greekfontsociety.gr`), interested users can find fonts like GFS Didot (a modern Didot-like variant), GFS Porson, GFS Neohellenic, and more. Tsolomytis [23] has created Type1 versions of most of GFS fonts for use with babel (Figure 1).

Other options The CTAN directory available at `http://www.ctan.org/tex-archive/fonts/greek` is the place to look for a few more fonts available in METAFONT or Type1 formats. However, as will be seen later in this report, currently available TeX machines have already made these fonts rather obsolete.

2.2 Working with the old encoding

As mentioned above, the old Latin-to-Greek transliteration scheme that Sylvio Levy used with his fonts was subsequently adopted by Haralambous, Dryllerakis

CB Serif	Ἄνδρα μοι ἔννεπε, Μοῦσα, πολύτροπον, ὃς μάλα πολλὰ πλάγχθη, ἐπεὶ Τροίης ἱερὸν πτολίεθρον ἔπερσε· πολλῶν δ' ἀνθρώπων ἴδεν ἄστεα καὶ νόον ἔγνω.
CB Sans Serif	Ἄνδρα μοι ἔννεπε, Μοῦσα, πολύτροπον, ὃς μάλα πολλὰ πλάγχθη, ἐπεὶ Τροίης ἱερὸν πτολίεθρον ἔπερσε· πολλῶν δ' ἀνθρώπων ἴδεν ἄστεα καὶ νόον ἔγνω.
CB Typewriter	Ἄνδρα μοι ἔννεπε, Μοῦσα, πολύτροπον, ὃς μάλα πολλὰ πλάγχθη, ἐπεὶ Τροίης ἱερὸν πτολίεθρον ἔπερσε· πολλῶν δ' ἀνθρώπων ἴδεν ἄστεα καὶ νόον ἔγνω.
Kerkis	Ἄνδρα μοι ἔννεπε, Μοῦσα, πολύτροπον, ὃς μάλα πολλὰ πλάγχθη, ἐπεὶ Τροίης ἱερὸν πτολίεθρον ἔπερσε· πολλῶν δ' ἀνθρώπων ἴδεν ἄστεα καὶ νόον ἔγνω.
Kerkis Sans	Ἄνδρα μοι ἔννεπε, Μοῦσα, πολύτροπον, ὃς μάλα πολλὰ πλάγχθη, ἐπεὶ Τροίης ἱερὸν πτολίεθρον ἔπερσε· πολλῶν δ' ἀνθρώπων ἴδεν ἄστεα καὶ νόον ἔγνω.
GFS Didot	Ἄνδρα μοι ἔννεπε, Μοῦσα, πολύτροπον, ὃς μάλα πολλὰ πλάγχθη, ἐπεὶ Τροίης ἱερὸν πτολίεθρον ἔπερσε· πολλῶν δ' ἀνθρώπων ἴδεν ἄστεα καὶ νόον ἔγνω.
GFS Porson	Ἄνδρα μοι ἔννεπε, Μοῦσα, πολύτροπον, ὃς μάλα πολλὰ πλάγχθη, ἐπεὶ Τροίης ἱερὸν πτολίεθρον ἔπερσε· πολλῶν δ' ἀνθρώπων ἴδεν ἄστεα καὶ νόον ἔγνω.
GFS Neohellenic	Ἄνδρα μοι ἔννεπε, Μοῦσα, πολύτροπον, ὃς μάλα πολλὰ πλάγχθη, ἐπεὶ Τροίης ἱερὸν πτολίεθρον ἔπερσε· πολλῶν δ' ἀνθρώπων ἴδεν ἄστεα καὶ νόον ἔγνω.

Figure 1: Samples of selected Greek fonts available to TeX/LaTeX users starting from 1998. All these fonts exist in Type1 and Truetype/OpenType formats. The verses from Homer's *Odyssey* were typeset at 10 pt with 12 pt leading.

and Beccari in their respective fonts. Beccari's character positioning in his Greek fonts became the *de facto* "Local Greek" encoding, now known as `LGR`, and the CB bundle became the basic font set of the `greek` option of `babel`.

Syropoulos was the maintainer of the `greek` option of `babel` for several years (and he also contributed in code and fonts for other texts as well [24, 25]). Starting from earlier work by Haralambous and Beccari, Filippou created complete sets of LGR-encoded hyphenation patterns for Ancient and Modern Greek [26, 27].

Since 2013, Milde [28] has taken over the maintenance of the `greek` option of `babel`. So it is still possible to use LaTeX with the LGR encoding. The obvious advantage of this approach is backwards compatibility, i.e., one can still continue using its old Greek TeX texts. However, as already said, writing Greeklish to typeset multiaccent Greek texts (such as in Ancient Greek) makes the input almost unreadable.

2.3 Typing Greek for Greek

2.3.1 The pre-Unicode way

In 1993, the `inputenc` package appeared to make life easier for those who wanted to input directly accentuated Latin characters like á, ă, etc. without having to type commands `\'a`, `\v{a}`, etc. Around 1998, Syropoulos created the `iso-8859-7` option of `inputenc` so as to allow for direct input of uniaccent (*monotonic*) Modern Greek. Of course, users had to employ also the `babel` package, which loaded the necessary language hyphenation patterns and macros. Writing multilingual texts required switching from one language to the other using commands such as

`\selectlanguage{...}`

Needless to say such an approach complicated the use of multilingual bibliography sections, indexing and other language-specific sections of a text. At that time, it was still possible to go the DVI-to-PS and PS-to-PDF way of producing output, although the introduction of pdfTeX helped in making things just a little bit faster.

All these changed when the UTF-8 (Unicode) encoding started surpassing the ISO-8859-7 and other encodings as the "go-to" choice of LaTeX users.

2.3.2 The Unicode way

The introduction of the Unicode encoding (UTF-8) allowed the typing of "foreign" characters beyond the 127 characters of the old ASCII, or the 256 characters of the extended ASCIIs (ISO-8859-7, etc.). Actually, there are two ways to type Greek texts:

  (i) using the combination of `babel` and `inputenc` with the `utf8` or `utf8x` options, or

 (ii) using a Unicode-aware machine such XƎTeX or luaTeX.

The new old way Milde [29, 30] has gone to great lengthts to provide UTF-8 support for the Greek script based on *LATEX internal character representation* macros (LICR). These macros are contained in a file named `lgrenc.dfu` and map all Greek characters onto a set of LATEX internal commands such as:

```
\DeclareUnicodeCharacter{03B1}{\textalpha} % lowerecase alpha
...
\DeclareUnicodeCharacter{1F00}{\accpsili\textalpha} % lowercase alpha + psili
...
```

A LATEX user does not have to bother with the LCIRs. All he/she has to do is to include in his/her preamble the following lines:

```
\usepackage[LGR,T1]{fontenc}
\usepackage[utf8]{inputenc}
\usepackage[greek,english]{babel}
```

The package inputenc, with the `utf-8` option, is for the recognition of Unicode Greek input (in general of any UTF-8 encoded input). The package fontspec, with the `LGR` and `T1` options, ensures proper hyphenation and proper Greek/Latin encoding of the output file (DVI, PS or PDF).

This approach is useful if one has a large library of old files to input although some re-encoding and conversion may be required (e.g., the Greek question mark ; is mapped onto the Greek semicolon ·). The user is also limited to METAFONT or Type1 Greek fonts, which are not so many.

The totally new way The introduction of Unicode-aware machines like X∃TEX and luaTEX changed the game completely. Here was the opportunity to truly type directly in Greek and in any other language with no need to *switch* input encodings, or to set the language one way or another. Users can type their texts in any language they want and the system will take care of all the other details. Of course, it is necessary to declare the language and the font families that will be used in the text to be produced. This adds extra flexibility because it allows users to request multiple fonts and even specify specific fonts for specific needs.

Also important is the fact that X∃TEX and luaTEX are able to access the system fonts available to the user. So, users are not limited to the Greek Type1 fonts available via the CTAN, but can have access to all varieties of TrueType or OpenType fonts there are.

Syropoulos was the first to create a small package called xgreek, with some useful X∃LATEX macros for typesetting Greek texts with X∃LATEX [31]. The package polyglossia followed as potential replacement of babel for typesetting multilingual texts with X∃LATEX or luaLATEX [32]. Filippou's Greek hyphenation patterns were converted into Unicode encoding and they are included in all standard TEX distributions—thus they can be used directly by X∃TEX or luaTEX.

2.4 Asking for help

Are there still newsgroups in operation? Is there a USENET anymore? In fact USENET is still alive as "Google Groups," but who needs all these relics when the answer is just a few keystrokes away from the nearest available Google screen?

Beyond Google, there are multiple sources of help available to the new or the seasoned user. The dedicated site `tex.stackexchange.com` provides answers to all kinds of TEX/LATEX questions. As always, questions and the answers they get vary from the very simplistic to the overly esoteric. Still, it is an excellent site to turn to for suggestions.

Another option is the CTAN itself. Now, the CTAN has its own web (`http`) rather than `ftp` interface and allows for easier access to files, FAQs, documentation and so on.

Finally, there are now dozens of local and national TEX users's groups which have their own online presence. In our case, $*\epsilon\phi\tau*$, the Greek LUG publishes a small journal called *Eutypon* and has a dedicated website available at `www.eutypon.gr`. In addition, several books have become available documenting and explaining in Greek TEX and its many derivatives.

3 The future

Looking back to so many years of progress, one can say that the entire TEX ecosystem has evolved and has adapted to a multilingual world. Still, there is work to be done, new fonts to be included, new hyphenation patterns to be added for mixed LGR and Unicode input, etc. in order to make Greek typesetting an even better experience.

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