THE BEASTS OF FONTS ARE STILL ALIVE AND KICKING

Bogusław Jackowski
BachoTEX 2025

ENTANGLEMENT

MISCONCEPTION

THE BEASTS OF FONTS ARE STILL ALIVE AND KICKING

IDIOSYNCRASY

RELICS

Bogusław Jackowski, BachoTEX 2025 (30 IV – 4 V)

INTRO – RECOLLECTIONS

In 2011, the GUST e-Foundry team (Piotr Pianowski, Piotr Strzelczyk, and I) released a pilot version of the Latin Modern Math font, which, after five years, resulted in a stable collection of six math fonts.

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In 2011, the GUST e-Foundry team (Piotr Pianowski, Piotr Strzelczyk, and I) released a pilot version of the Latin Modern Math font, which, after five years, resulted in a stable collection of six math fonts:

- Latin Modern Math (2011)
- TEX Gyre Bonum Math (2014)
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Interestingly, none of these fonts – except for Latin Modern, which is rightly mentioned as a variant of Computer Modern – is listed on the relevant Wikipedia page:

`https://en.wikipedia.org/wiki/Category:Mathematical_OpenType_typefaces`

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We weren’t exactly thrilled with the options for typesetting mathematical formulas available in OpenType fonts (mostly via the MATH table). Piotr Strzelczyk and I shared our thoughts on the currently available font technology in the publication “How to make more than one math OpenType font, or the Beasts of Fonts”.

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And I agree with them, as the beasts of fonts described in our publication apparently still happily dwell in the Realm of Fonts.

WELCOME TO OUR REALM

OUR CURRENT GOAL

The fonts released by GUST e-Foundry are freely available; however, the sources (mainly METAPOST scripts, along with the necessary tools to convert the METAPOST output into a widely accepted format) changed so frequently that we were unable to publish them.

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Snaglog: Notes from the Trenches of OpenType

TEXT–BINARY CONVERSION

As you may recall, the GUST e-Foundry font engine uses METAPOST to produce EPS text files. These are processed by a set of Python scripts (Fontplant) and then passed to FontForge to generate binary OpenType and/or Type 1 PostScript fonts.

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Such reversible conversions are quite standard in the TeX world – for example, disassembling and assembling tools by DEK for TFM files (tftopl and pltotf), or by Geoffrey Tobin for DVI files (dv2dt and dt2dv).

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TEXT–BINARY CONVERSION: A SETBACK

OpenType fonts can also be converted into a textual format using FontForge – namely, to the Spline Font Database (SFD) format – which can then be loaded back into FontForge. However, the SFD file isn’t particularly readable for humans, and the round-trip conversion doesn’t exactly meet our expectations.

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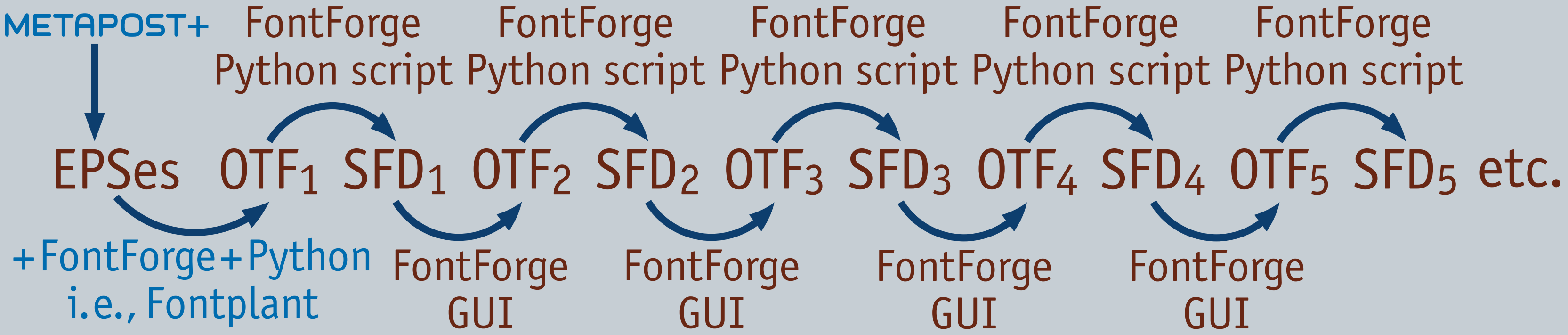

METAPOST+

FontForge Python script FontForge Python script FontForge Python script FontForge Python script FontForge Python script

EPSes OTF$_1$ SFD$_1$ OTF$_2$ SFD$_2$ OTF$_3$ SFD$_3$ OTF$_4$ SFD$_4$ OTF$_5$ SFD$_5$ etc.

+FontForge+Python i.e., Fontplant

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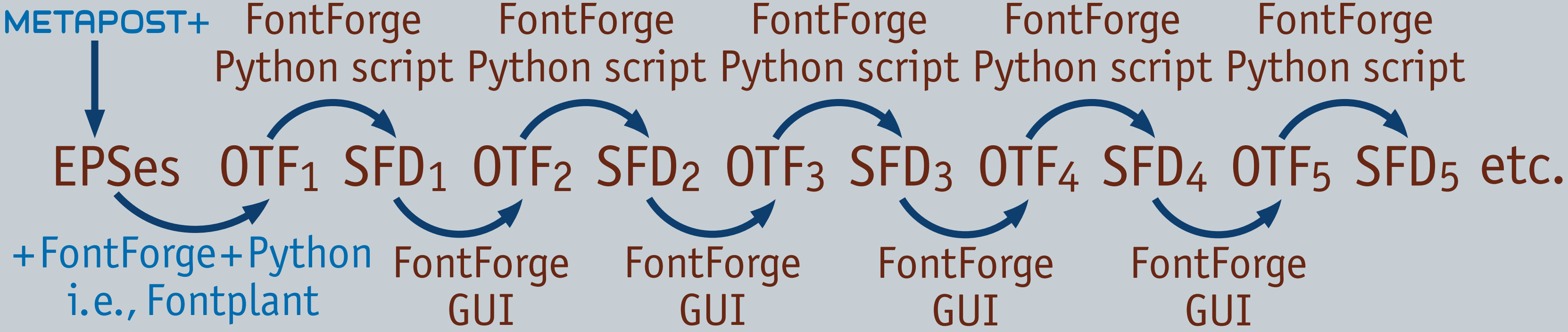
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Somewhat surprisingly, $\text{OTF}_1 \neq \text{OTF}_2 \neq \text{OTF}_3 = \text{OTF}_4 = \text{OTF}_5 = \ldots$, and $\text{SFD}_1 \neq \text{SFD}_2 \neq \text{SFD}_3 \neq \text{SFD}_4 \neq \text{SFD}_5 \neq \ldots$ It should be noted that the files SFD_3, SFD_4, SFD_5, etc., differ only in a comment regarding the XUID. Incidentally, Adobe stopped using UniqueIDs and XUIDs in their OpenType CFF fonts at the latest around 2005.

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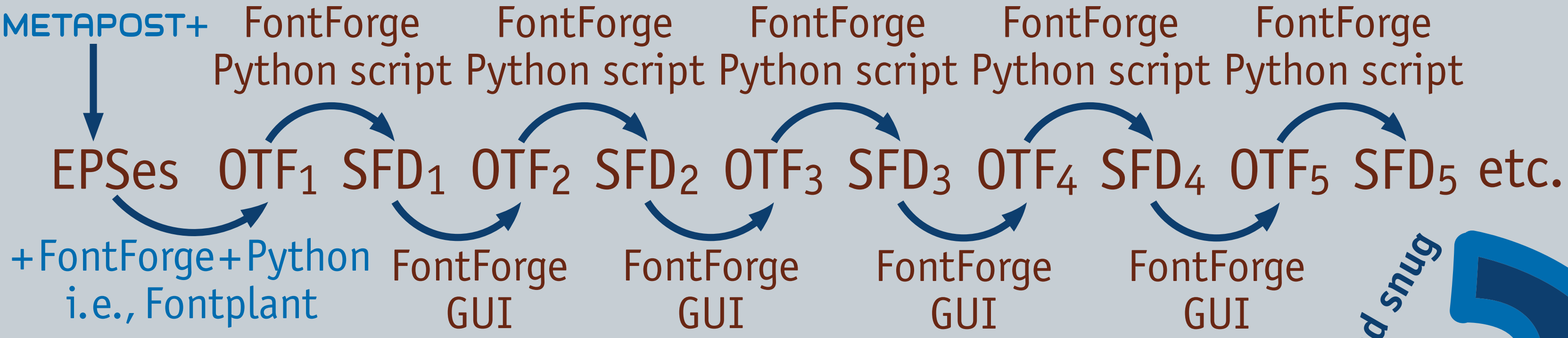

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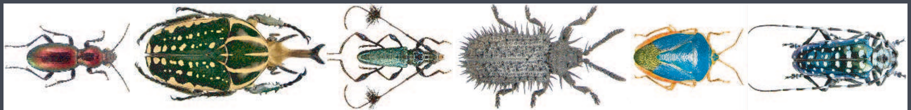
FEATURES

I’ll now turn to a crucial – yet still poorly documented – component of OpenType fonts: features. These structures are specific to OpenType and have no counterpart in the Type 1 format.



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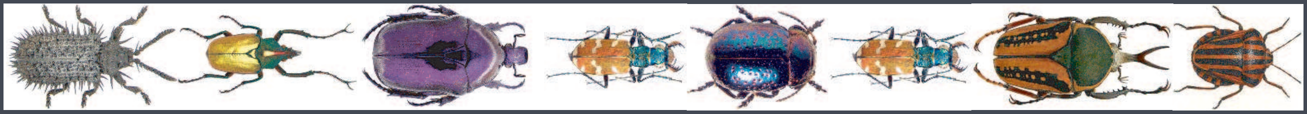
In LuaTeX, one activates a feature by writing the name of the feature preceded by a plus in a declaration of a font, e.g.:

```
\font\F="[Antykwa-regular]:mode=node;+liga" at 20pt
```

FEATURES: A NEXT SETBACK

I wasn’t able to figure out how the ‘liga’ feature is represented in SFD files. Fortunately, FontForge allows you to export a feature file that uses the syntax mentioned earlier. The result is formally correct, but pretty unfriendly to humans.



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TO OTF

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FROM OTF

Why on earth was the order of rules messed up? Misconception? Misimplementation? Ayway, the rule '`sub f f l by f_f_l;`' is applied first – as shown in the freshly presented example). But why?

FEATURES: MISDOCUMENTING?

This brings up several key questions: what is the actual order in which rules are applied? How are the lookups – the sets of rules – ordered? And finally, in what order are features applied?

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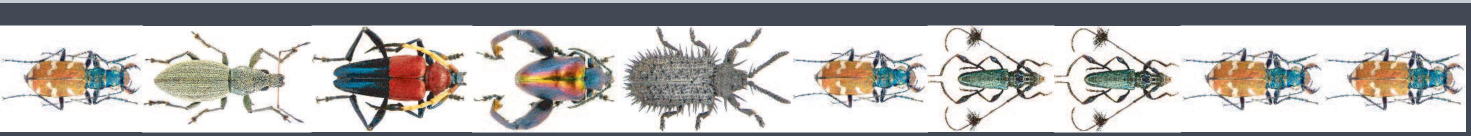

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Microsoft states on their page “Developing OpenType Fonts for Standard Scripts” that the standard order for applying OpenType features is as follows:

- ccmp – Character composition / decomposition substitution
- liga – Standard ligature substitution
- clig – Contextual ligature substitution
- dist – Distances
- kern – Pair kerning
- mark – Mark-to-base positioning
- mkmk – Mark-to-mark positioning

https://learn.microsoft.com/pl-pl/typography/script-development/standard

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The order Microsoft seems to recommend is likely only partially accurate. For instance, the ‘dlig’ (discretionary ligatures) feature may be applied either before or after the ‘liga’ feature, although one must admit that the position of ‘dlig’ is not explicitly defined – actually, ‘dlig’ is not mentioned in Microsoft’s note at all.

```
feature liga {
  sub a a by x;
} liga;
feature dlig {
  sub a a by z;
} dlig;
```

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feature dlig {
  sub a a by z;
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```

uaan ⇒ uxn

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feature dlig {
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} dlig;
feature liga {
  sub a a by x;
} liga;
```

uaan ⇒ uzn

FEATURES: A CONUNDRUM

Because the available documentation is unsatisfactory and unreliable, the only way to understand how OpenType feature processing actually works is through testing. Of course, for testing we use trivial yet fanciful (artificial) features – but even then, we ended up with a result that, to us, was an inexplicable conundrum.

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The following example was prepared to test (using FontForge) whether the output of one feature rule can be picked up by a subsequent rule.

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} liga;
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feature liga {
    sub a a by x;
    sub x by q;
} liga;
```

TO OTF

```
feature liga {
    sub q by x;
    sub a a by x;
} liga;
```

FROM OTF

uaan ⇒ uxn

uxn ⇒ uxn

uqn ⇒ uxn

The only plausible explanation for this riddle is a FontForge bug.

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uaav ⇒ uqv

uxv⇒ uqv

uqv ⇒ uqv

Fortunately, the newest FontForge (January 1, 2023) fixed it.

CONCLUSIONS

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What's worse, we lack tools that would allow for a thorough inspection of the fonts. By far the most reliable and handy tool we've come across is LuaTeX – but unfortunately, even that is sometimes not enough.

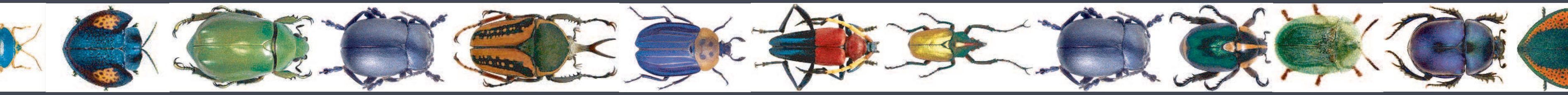
What we can certainly promise is that any reported issues with our fonts will be carefully analyzed, and we'll do our best to find an appropriate solution.

CONCLUSIONS – CONTINUED

The fonts we’ve mentioned will be available on the GUST website shortly after the meeting in Bachotek, and not long after that, they will also appear in the CTAN repository.

The published set will include:

- the Antykwa Półtawskiego family
- the Latin Modern family
- and the TeX Gyre collection.



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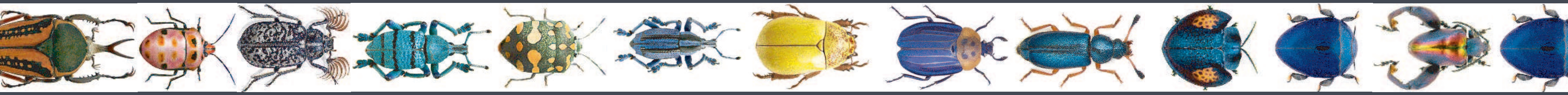
The published set will include:

- the Antykwa Półtawskiego family
- the Latin Modern family
- and the TeX Gyre collection.

This is a set generated for the GUST e-Foundry using the latest version of the Fontplant software. We have not introduced any significant modifications to the fonts themselves, as our main goal was to test whether the rapidly evolving Fontplant is functioning correctly.

We hope to release a stable version of Fontplant in the near future – and that will be the time for polishing and fine-tuning the fonts.



LET'S MEET AT BACHOTEX NEXT YEAR