

**Progress of the T_EX Gyre Math Font Project:
T_EX Gyre Schola Math or Coup de Grâce**

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A worrisome question...

Why there are so few teams in the world that produce math OTF typefaces?

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- Underware ■ Zang-O-Fonts ■ Webfont Foundry ■ WC Fonts ■ WhiteCrow Designs



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Possible answers:

- “Large form type foundries” are concocting something
- Math fonts are unsellable
- Math fonts are actually unusable
- Type foundries customers are mathematically illiterate
- Mathematicians are typographically illiterate
- We are the champions...



OTF Math font components

plain (upright, serifed)	Latin, Greek and digits
italic	Latin and Greek
bold	Latin, Greek and digits
bold italic	Latin and Greek
sans-serif	Latin and digits
sans-serif italic	Latin
sans-serif bold	Latin, Greek and digits
sans-serif bold italic	Latin and Greek
script (calligraphic)	Latin
bold script (calligraphic)	Latin
Fraktur	Latin
bold Fraktur	Latin
double-struck	Latin and digits
monospace	Latin and digits

A B C D a b c d 0 1 π γ Π Γ Σ \sum \mathcal{D} d e i j
 α β γ α β γ ∇ ∂ ∇ ∂



Assembling OTF math font: basic alphabets

Excerpting glyphs from the relevant (basic) text font family is a relatively easy task, as the sources were prepared by us and, thus, we roughly know what can be expected, provided a particularly nasty bug does not show up; here, the basic set was obviously excerpted from the T_EX Gyre Schola text font

A A_q B C Ć a a_q b c ć *ABCabc* **ABCabc** *ABCabc*

A A_q B C Ć a a_q b c ć *ABCabc* **ABCabc** **ABCabc**

A A_q B C Ć a a_q b c ć *ABCabc* **ABCabc** *ABCabc*

A A_q B C Ć a a_q b c ć *ABCabc* **ABCabc** *ABCabc*

A A_q B C Ć a a_q b c ć *ABCabc* **ABCabc** *ABCabc*



Assembling OTF math font: borrowed alphabets

Borrowing alphabets from other text fonts or relevant font variants is also fairly simple, although surprises lurk here and there, e.g., “unorthodox” glyph names; needless to say, the problem of copyrights is not negligible – usually we have to ask the authors for granting a permission

In T_EX Gyre Schola, the sansserif alphabet was borrowed from Łukasz Dziejczak’s beautiful Lato font, with the kind permission from the Author;

ABCabcABCabcABCabcABCabc $\alpha\beta\gamma\delta\nabla$ $\alpha\beta\gamma\delta\nabla$
ABCabcABCabcABCabcABCabc $\alpha\beta\gamma\delta\nabla$ $\alpha\beta\gamma\delta\nabla$
ABCabcABCabc **ABCabcABCabc** $\alpha\beta\gamma\delta\nabla$ $\alpha\beta\gamma\delta\nabla$
ABCabcABCabcABCabcABCabc $\alpha\beta\gamma\delta\nabla$ $\alpha\beta\gamma\delta\nabla$
ABCabcABCabcABCabcABCabc $\alpha\beta\gamma\delta\nabla$ $\alpha\beta\gamma\delta\nabla$

The only problem was the missing *pi1* glyph: **⌘⌘** (needed only in bold and bold oblique sans serif – don’t know if anybody will ever use it)

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$\alpha\beta\gamma\delta\Delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}$
 $\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}$
 $\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}$
 $\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}$
 $\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}\alpha\beta\gamma\delta\mathbf{A}\mathbf{B}\mathbf{\Gamma}\mathbf{\Delta}$



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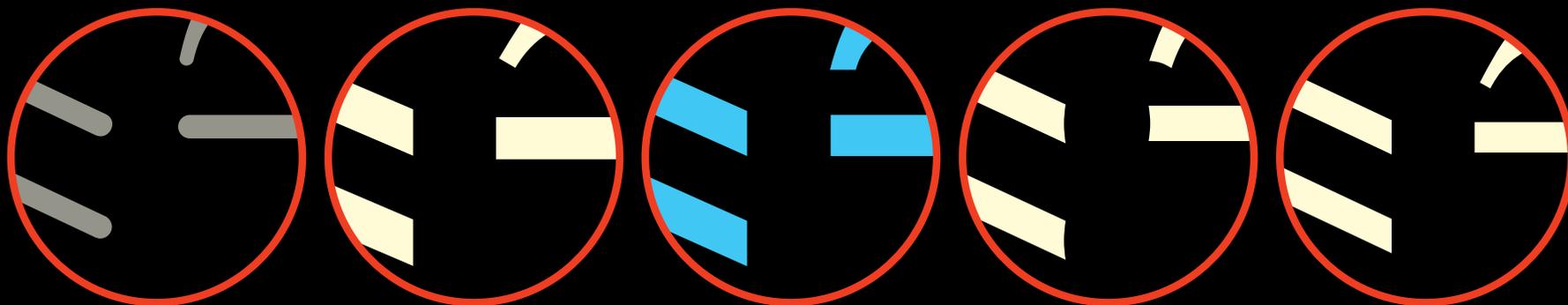
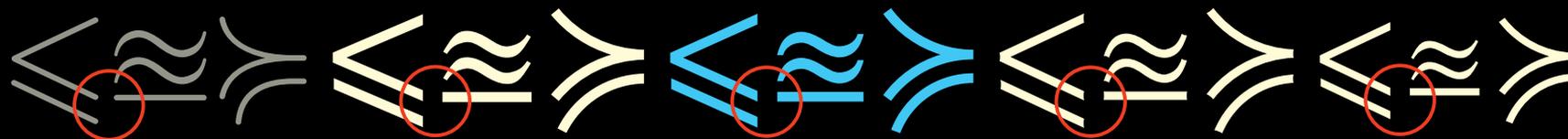
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ABCXYZabcdefghijklmnopqrstuvwxyz123 **ABCXYZabcdefghijklmnopqrstuvwxyz123**
ABCXYZabcdefghijklmnopqrstuvwxyz123 **ABCXYZabcdefghijklmnopqrstuvwxyz123**



Assembling OTF math font: programmed symbols

The programming of symbols is the most pleasant part of the job:
the lion share of the work is done once for ever and making tiny
adjustments and variations is no problem





Assembling OTF math font: programmed symbols

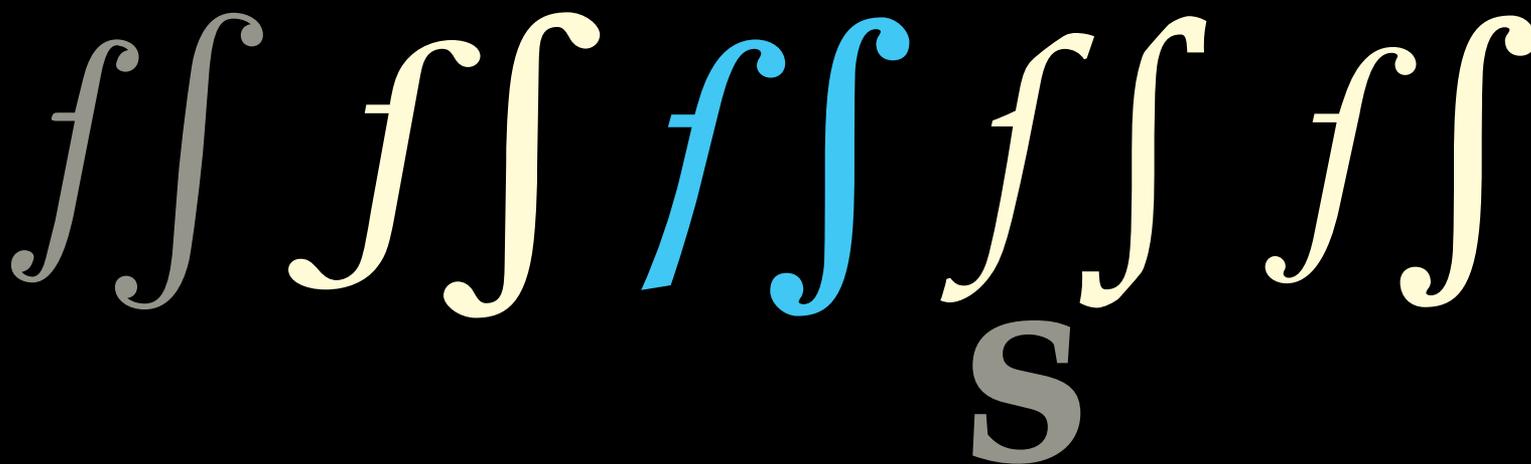
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the lion share of the work is done once for ever and making tiny
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Assembling OTF math font: “hybrid” symbols

As a good example of a hybrid symbol may serve the integral symbol: its top, at least in the T_EX Gyre fonts, should resemble (somehow) the head of the italic form of the letter *long s* which, in turn, resembles the top of the letter *italic f*; therefore, the most appropriate tool for this purpose seems to be an interactive (visual) shape editor

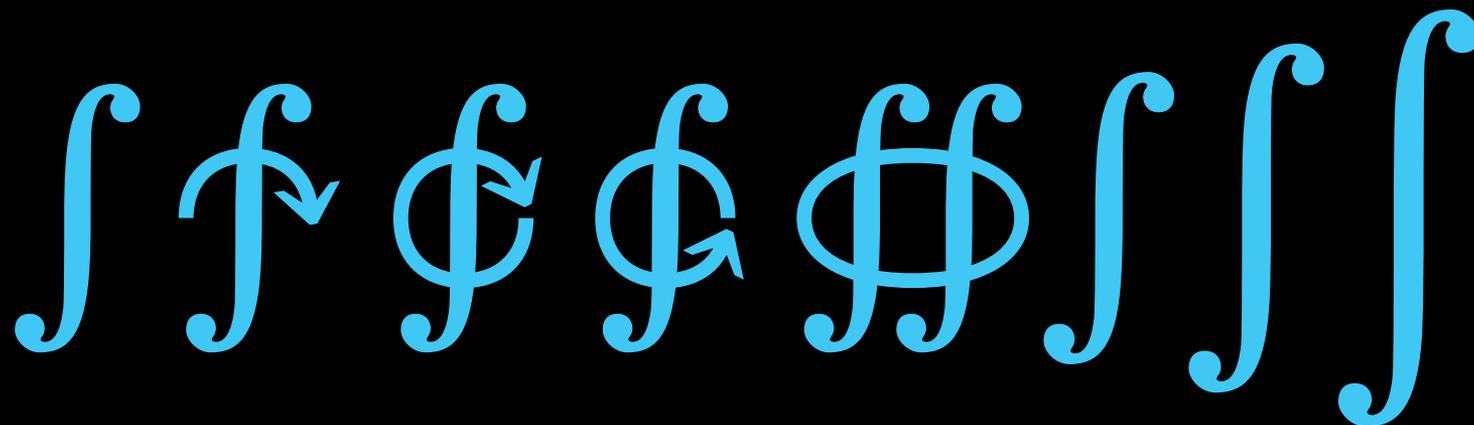


How was it possible that such similar letterforms like *f* and *long s*, having completely different meaning, evolved in the same scripts at the same time?



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the head of the italic form of the letter *long s* which, in turn, resembles
the top of the letter *italic f*; therefore, the most appropriate tool for this
purpose seems to be an interactive (visual) shape editor;
the middle part, in turn, should be programmed in order to generate
a variety of derivative forms





Assembling OTF math font: manually prepared glyphs

This is undoubtedly the most tiresome part of the work, given the unpredictable number of various corrections in other components of a font, e.g., in font parameters, having not infrequently an effect also on these glyphs (not speaking about the insufficient typographic skills of the authors of the T_EX Gyre Math fonts)

A A B B C C a a b b c c Γ Γ γ γ 5 5

A A B B C C a a b b c c Γ Γ γ γ 5 5

A A B B C C a a b b c c Γ Γ γ γ 5 5

A A B B C C a a b b c c Γ Γ γ γ 5 5

A A B B C C a a b b c c Γ Γ γ γ 5 5



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Assembling OTF math font: setting font parameters

An OTF math font must contain a table of 57 numeric parameters (in T_EX, according to the T_EXbook, there are 24 math parameters) controlling the positioning in predefined situations in math formulas; moreover, there are tables containing italic corrections values, glyph axis values, the information about dotless ‘i’ and ‘j’ glyphs, about glyphs assembled from pieces, about subscripts, etc.

Unabating thanks to Urlik Vieth for the elucidation of most tough cases!



Assembling OTF math font: setting font parameters

An OTF math font must contain a table of 57 numeric parameters plus a lot of additional data; as was mentioned, no optimal set of parameters exists, moreover, different engines have different opinions on how to interpret them

$$\frac{1}{\frac{g}{b} \cdot \frac{d}{j}} = \frac{b}{g} \cdot \frac{y}{d}$$

LuaL_AT_EX

$$\frac{1}{\frac{g}{b} \cdot \frac{d}{j}} = \frac{b}{g} \cdot \frac{y}{d}$$

MS Word

$$\frac{1}{\frac{g}{b} \cdot \frac{d}{j}} = \frac{b}{g} \cdot \frac{y}{d}$$

X₃L_AT_EX



GUST e-foundry Math Fonts Collection

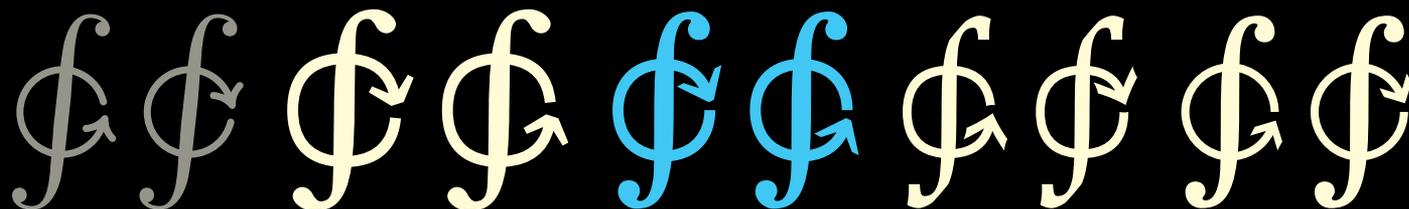
The closing of the project does not mean ceasing its maintenance – there is a lot of amendments and improvements to be done



GUST e-foundry Math Fonts Collection

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- obvious bugs, like swapped slots (Latin Modern, Pagella, Termes) of contour directed integrals have to be fixed:

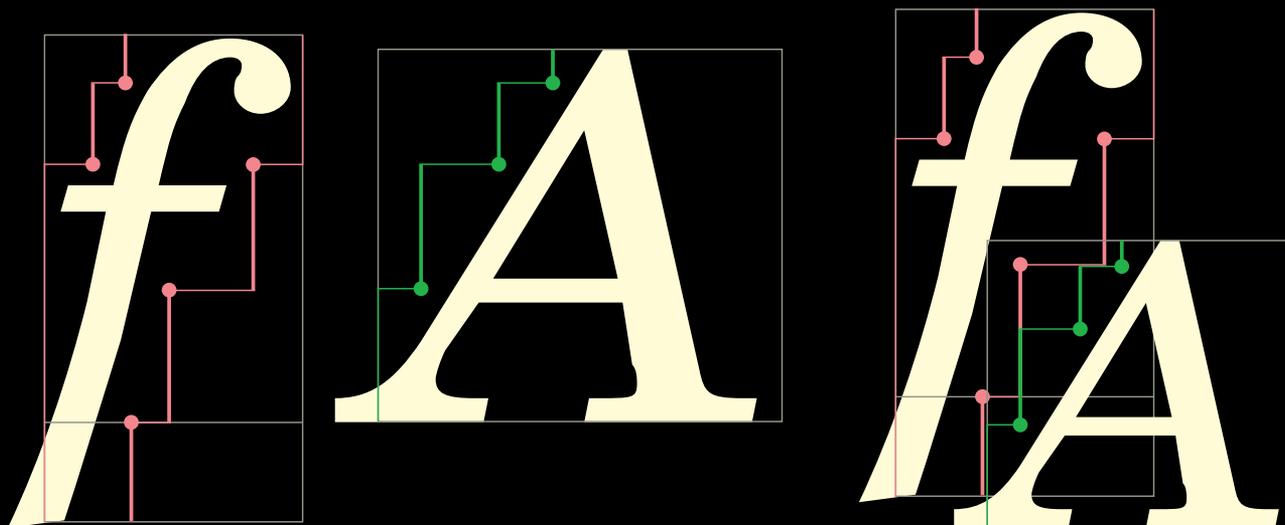




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The closing of the project does not mean ceasing its maintenance – there is a lot of amendments and improvements to be done

- obvious bugs have to be fixed
- mathematical kerning should be implemented at least for basic alphabets; roughly, we have an idea how to calculate such kerns, but devising and implementing the algorithm turned out too difficult to be accomplished in the “in-between” mode

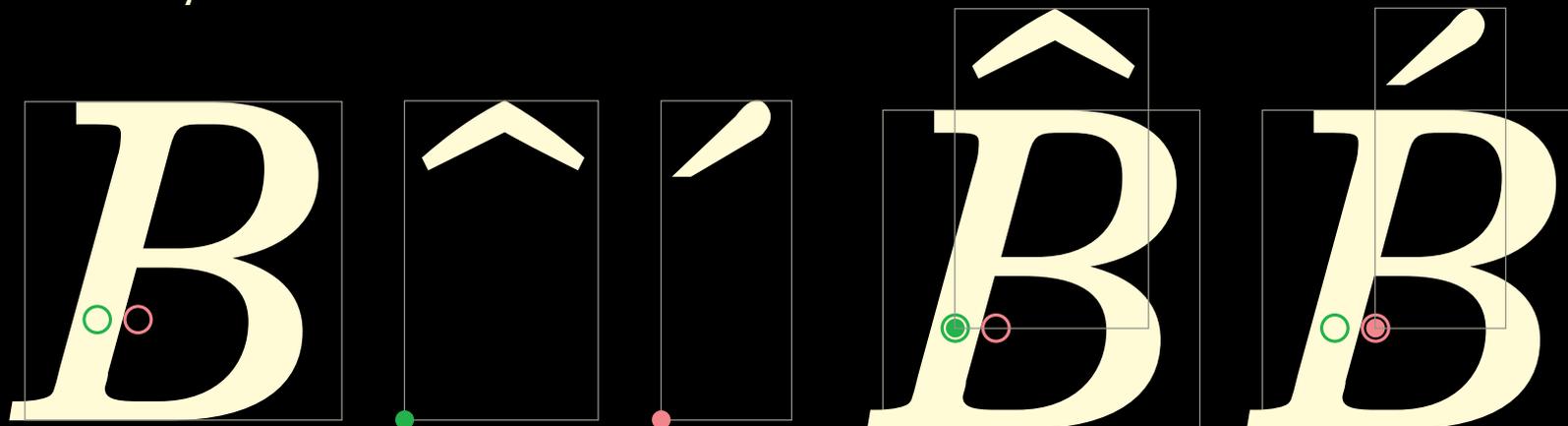




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The closing of the project does not mean ceasing its maintenance – there is a lot of amendments and improvements to be done

- obvious bugs have to be fixed
- mathematical kerning is to be implemented
- anchors are another functionality, we'd like to implement in both math and text fonts; in this case, an algorithm of this kind we have already implemented in METATYPE1 (actually, we use it for positioning accents within METATYPE1), only a “translation” to the OTF code is needed





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The closing of the project does not mean ceasing its maintenance – there is a lot of amendments and improvements to be done

- obvious bugs have to be fixed
- mathematical kerning is to be implemented
- anchors are to be implemented in both math and text fonts
- pending is the enhancement of the TG text fonts by math symbols
- et cætera, et cætera...

Acknowledgements

The creating of the T_EX Gyre Math fonts (plus Latin Modern Math) was not as perplexing as it might have been. It is the result of shared experience and efforts by Barbara Beeton, Hans Hagen, Taco Hoekwater, Khaled Hosny, Jonathan Kew, Johannes Küster, Karel Píška, Adam Twardoch, Ulrik Vieth, George Williams and many others, which made our struggle against the insubordinate font matter significantly less painful

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Thank you for your attention
&
let's meet in Bachotek again