

Variable Fonts

TUG 2021

Dave Crossland
Lead Program Manager
Google Fonts
August 6, 2021



Making the web more beautiful, fast, and open through great typography

We believe the best way to bring personality and performance to websites and products is through great design and technology. Our goal is to make that process simple, by offering an intuitive and robust collection of open source designer web fonts. By using our extensive catalog, you can share and integrate typography into any design project seamlessly—no matter where you are in the world.

Discover great typography

Our font catalog places typography front and center, inviting users to explore, sort, and test fonts for use in more than 135 languages. We showcase individual type designers and foundries, giving you valuable information about the people and their processes, as well as analytics on usage and demographics. Our series of thematic collections helps you discover new fonts that have been vetted and organized by our team of designers, engineers, and collaborators, and our default sort organizes fonts based on popularity, trends, and your geographic location. You can also create your own highly customized collections by filtering families, weights, and scripts, plus test color themes, and review sample copy. Collections can be shared, making it easy to collaborate on projects and ensure typography is optimized and streamlined throughout the design and engineering process.

Collaborate with open source

All the fonts in our catalog are free and open source, making beautiful type accessible to anyone for any project. This means you can share favorites and collaborate easily with friends and colleagues. Google Fonts takes care of all the licensing and hosting, ensuring that the latest and greatest version of any font is available to everyone.

Make the web faster

Using the code generated by Google Fonts, our servers will automatically send the smallest possible file to every user based on the technologies that their browser supports. For example, we use WOFF 2.0 compression when available. This makes the web faster for all users—particularly in areas where bandwidth and connectivity are an issue. Now everyone can enjoy the same quality and design integrity in their products and web pages, no matter where they are in the world.

Join our community

We are working with designers around the world to produce best-in-class typeface designs that are made for the web, and because we are open source, this means that we can release early access trials to our community for testing and feedback.

Interested in helping us evolve?

Pitch in and help us grow by signing up for user studies on fonts, emojis, icons, and more.

[I'm interested](#)

Support

Frequently asked questions

API documentation

GitHub

List of variable fonts

Analytics



Ravensbourne

College of Design and Communication

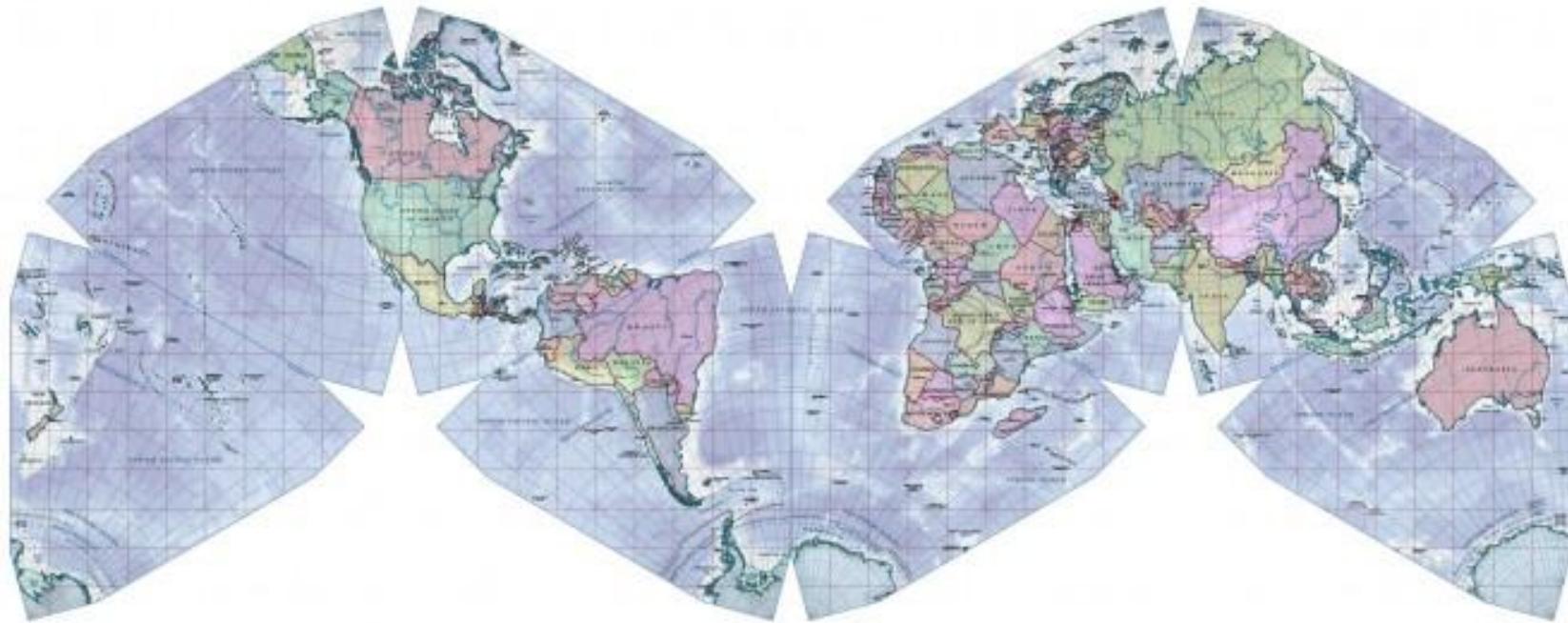




events Centre and Bridewell Theatre,
one of the most significant collections of typography
and historical printed reference in the world.







Visual culture

Language

Technology

Business

History

Visual culture

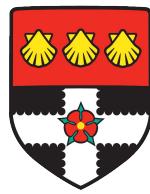
Language

Technology

Business

History

Ubiquity



University of Reading



THE FREE FONT MOVEMENT

DAVID CROSSLAND

Dissertation submitted in partial fulfilment of the requirements for the
MA Typeface Design, University of Reading, 2008

FREE FONT LICENCES

Fonts are typically redistributed in part when they are embedded into a digital document such as PDF. This is called ‘sub-setting,’ and means only the parts of the font needed for the characters in the document are included.

Strong copyleft licences like the GNU GPL make this situation complicated. When a GPL work is combined with another work, the whole must be licensed under the GPL or it cannot be distributed. This means that if GPL font is embedded in a PDF, it requires all other works in the PDF to also be licensed under the GPL—including the text of the document—or the document cannot be distributed.

Weak- and non-copylefts, such as CC-BY-SA or MIT X11 licences, do not cause this problem. The SIL Open Font licence (OFL, Appendix B.6) is a free software licence written specifically for fonts. Drafts were reviewed and refined at various free software and type design conferences (Spalinger and Gaultry, 2007).

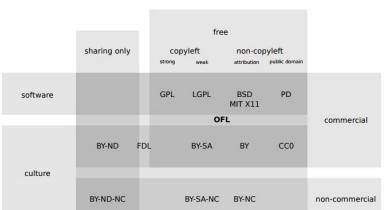


Figure 10: The SIL Open Font licence in the context of other free software and free culture licences.

The OFL accommodates type designers by being very simple, with the only major requirement being that derivatives must be renamed. For example, the ‘Gentium’ font published under the OFL by one of its authors, Victor Gaultry, can be freely modified and redistributed by anyone, but no one other than Gaultry may call their font ‘Gentium.’

10

FUTURE DEVELOPMENTS

GNU/Linux distributions include hundreds of fonts (Debian Font task force, 2008; Red Hat, 2008) whose developers have freely licenced the copy-rights inherent in the font software. The GPL version 3 is the strongest copyleft licence available for fonts, and it is essential to include the ‘font exception’ additional permission for document embedding. However, best practices for provisions to require renaming of GPL derivatives have not yet been established.

In addition to the copyright of a font being freely licenced, the typeface it implements much be in public domain or freely licensed too. To make a typeface design freely available in the USA, the designer has to simply not apply for a design patent. However in the EU unregistered design rights are automatically granted for a period of 3 years, and these rights must be disclaimed. There has been no precedent for this in the free font community, though.

Also, free fonts must avoid names that infringe trademarks. It is possible to use the same first two characters for a similar typeface design, so a revival of ‘Helvetica’ called ‘Helsen’ would risk trademark infringement while ‘Hernan’ would not. An exception to this is that people’s names and surnames can not be trademarks, so while ‘Gill’ ‘Stone’ ‘Bell’ ‘Cooper’ ‘Zapf’ and ‘Warnock’ are used as names for proprietary fonts, they are not valid trademarks (Stack, 2008).

A methodology or even technology for checking free fonts and type designs to avoid infringing design patents, design rights or trademarks ought to be established.

When people see type that they feel could be improved, if it is in the public domain they are free to do so. With the development of free software font editors, everyone has access to the necessary tools. Now the obstacle is that the knowledge of how to develop and refine type is not freely available.

There is also no central repository from which to easily feed a free font into the various free culture distribution channels, such as each of the popular GNU/Linux distributions. The closest projects to this so far are the ‘Open Font Library’ and the ‘Comprehensive TeX Archive Network’ websites (TUG, 2008; Philips and Prokoudine, 2008). But neither site provides visitors a means of browsing and download free fonts, akin to Bitstream’s MyFonts website (Bitstream, 2008). Such a website might also become a central place for free software fonts to be linked from using the upcoming CSS3 web font linking technology, already available in free software browsers like Midori and Apple’s Safari.

13

Cantarell

Fox Jumps Over
The Lazy Dog

G g



Variable Fonts

Skia Variations

Skia, Matthew Carter, 1994

Users Caught in Font War Cross Fire

*Apple, Microsoft
Join in Battle
Against Adobe*

BY LAURIE FLYNN
AND MARTIN MARSHALL

SAN FRANCISCO — In far-reaching font announcements last week, Microsoft, Apple, and Adobe staked out positions that promise a consistent imaging model across PC and Mac platforms but could leave users struggling to cope with multiple font standards.

Microsoft announced at the Seybold Computer Publishing Conference here that it will include Apple's font technology in OS/2 Presentation Manager. In the cross-licensing agreement which both companies said



ANNE HAMERSKY

Microsoft's Nathan Myhrvold and Bill Gates discuss Microsoft's decision to use Apple font technology with John Sculley.

Postscript-compatible interpreter in future Apple printers.

But the plan may have hit a

held Postscript language and font format in the hopes of fending off a swell of support for

As technology advancement is critical to the long-term success of the type industry, Monotype is thrilled to have played a role in development of OpenType Font Variations. This important technology will allow us to improve the value of type solutions we can offer to type designers, partners and customers.

Monotype

As a pioneer developer of Apple's GX variations in the 1990's, Font Bureau is delighted to be working with Type Network and its foundry partners to support the new OpenType Font Variations standards.

David Berlow, Font Bureau



ATypl, Warsaw, September 2016

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Google, Microsoft, Apple, Adobe

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David Berlow, Font Bureau



Ubiquity

Compress
Express
Finesse

**Compress
Express
Finesse**

 Search

Sentence ▾

Type something

40px ▾

[Categories ▾](#)[Language ▾](#)[Font properties ▾](#) Show only variable fonts ⓘ

1006 of 1006 families

Sort by: Trending ▾

**Roboto**

Christian Robertson

12 styles

Almost before
we knew it, we
had left the
ground.

Commissioner

Kostas Bartsokas

Variable

Almost before
we knew it, we
had left the
ground.

Open Sans

Steve Matteson

10 styles

Almost before
we knew it, we
had left the
ground.

Krona One

Yvonne Schüttler

1 style

**Almost
before we
knew it, we
had left the
ground.**

Noto Sans JP

Google

6 styles

Almost before
we knew it, we
had left the
ground.

Lato

Łukasz Dziedzic

10 styles

Almost before we
knew it, we had
left the ground.

MontserratJulieta Ulanovsky, Sol Matas, Juan Pablo del
Peral, Jacques Le Bailly

18 styles

Almost before
we knew it, we
had left the
ground.

Piazzolla

Juan Pablo del Peral, Huerta Tipográfica

Variable

Almost before we
knew it, we had
left the ground.

 SearchSentence

Type something

40px  Categories Language Font properties Show only variable fonts ①

66 of 1006 families

Sort by: Trending 

Commissioner

Variable

Kostas Bartsokas

Almost before we knew it, we had left the ground.

Piazzolla

Variable

Juan Pablo del Peral, Huerta Tipográfica

Almost before we knew it, we had left the ground.

Oswald

Variable

Vernon Adams, Kalapi Gajjar, Cyreal

Almost before we knew it, we had left the ground.

Raleway

Variable

Multiple Designers

Almost before we knew it, we had left the ground.

Roboto Mono

Variable

Christian Robertson

Almost before we knew it, we had left the ground.

Sansita Swashed

Variable

Omnibus-Type

Almost before we knew it, we had left the ground.

Roboto Slab

Variable

Christian Robertson

Almost before we knew it, we had left the ground.

Playfair Display

Variable

Claus Eggers Sørensen

Almost before we knew it, we had left the ground.

[Select styles](#)[Glyphs](#)[About](#)[License](#)[Pairings](#)

Thin 100

Almost before we knew it, we had left the ground.

[+ Select this style](#)

Extra-light 200

Almost before we knew it, we had left the ground.

[+ Select this style](#)

Light 300

Almost before we knew it, we had left the ground.

[+ Select this style](#)

Regular 400

Almost before we knew it, we had left the ground.

[+ Select this style](#)

Medium 500

Almost before we knew it, we had left the ground.

[+ Select this style](#)

Semi-bold 600

Almost before we knew it, we had left the ground.

[+ Select this style](#)

Bold 700

Almost before we knew it, we had left the ground.

[+ Select this style](#)

Extra-bold 800

Almost before we knew it, we had left the ground.

[+ Select this style](#)

Black 900

Almost before we knew it, we had left the ground.

[+ Select this style](#)

	Roboto Thin
Roboto Cond Light	Roboto Light
Roboto Cond Regular	Roboto Regular
Roboto Cond Bold	Roboto Medium
	Roboto Bold
	Roboto Black

Roboto VF

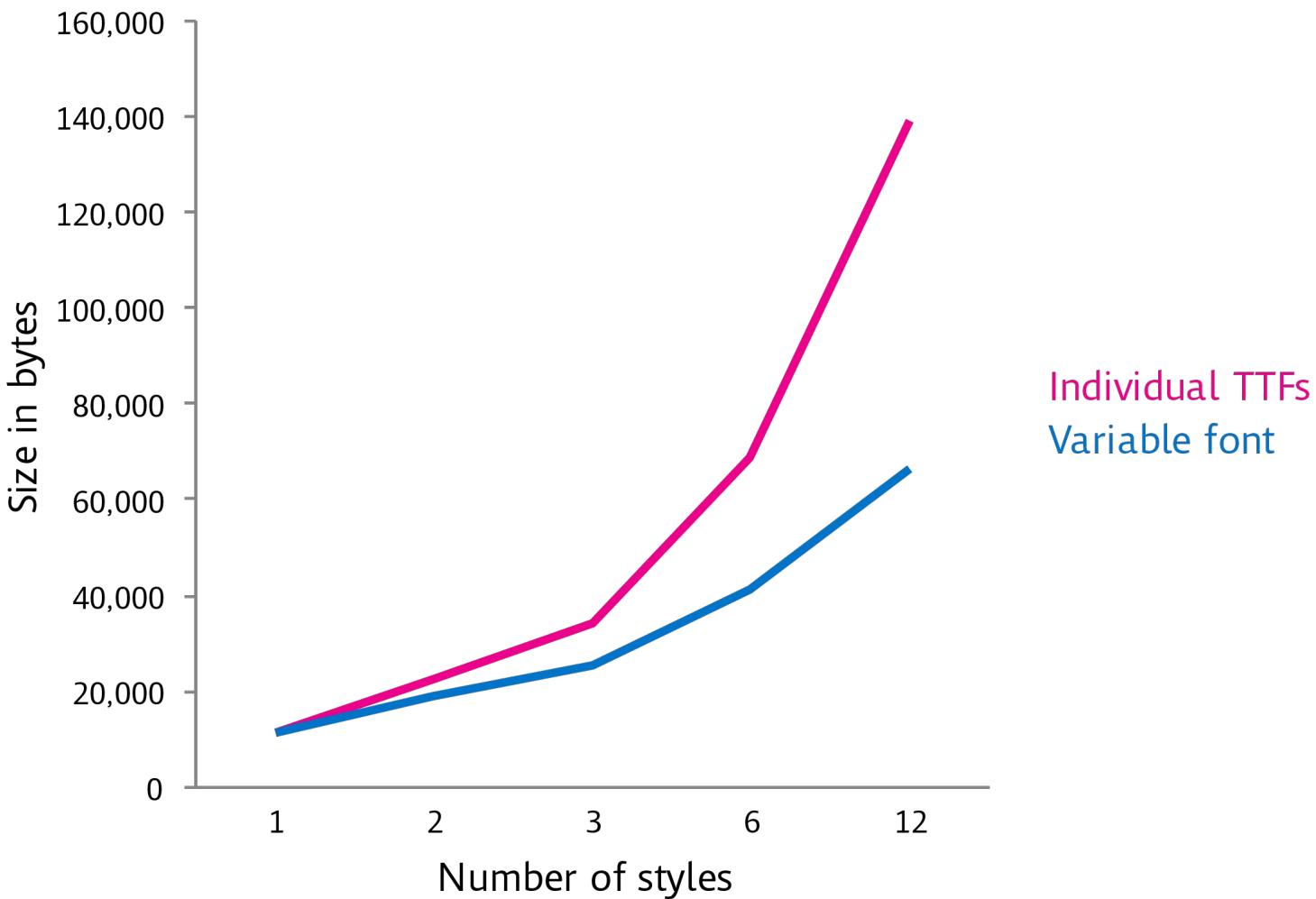
Roboto VF

Roboto VF

Roboto VF

Roboto VF Roboto VF Roboto VF

Roboto VF Roboto VF Roboto VF



Compress
Express
Finesse

[Select styles](#)[Glyphs](#)[About](#)[License](#)[Pairings](#)

Variable axes

[Learn more about variable fonts](#)

Weight



Almost before we
knew it, we had left
the ground.

Weight: 400

[+ Select this style](#)

Glyphs

A	B	C	Č	Ć	D	Đ	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	Š	T	U	V	W	X	Y	Z	Ž
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[Select styles](#)[Glyphs](#)[About](#)[License](#)[Pairings](#)

Variable axes

[Learn more about variable fonts](#) Weight 

1

900

**Almost before we
knew it, we had
left the ground.**

Weight: 900

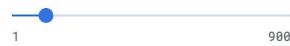
[+ Select this style](#)

Glyphs

A	B	C	Č	Ć	D	Đ	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	Š	T	U	V	W	X	Y	Z	Ž
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[Select styles](#)[Glyphs](#)[About](#)[License](#)[Pairings](#)

Variable axes

[Learn more about variable fonts](#)Weight [i](#)

Almost before we
knew it, we had left
the ground.

Weight: 100

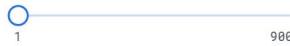
[+ Select this style](#)

Glyphs

A	B	C	Č	Ć	D	Đ	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	Š	T	U	V	W	X	Y	Z	Ž
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[Select styles](#)[Glyphs](#)[About](#)[License](#)[Pairings](#)

Variable axes

[Learn more about variable fonts](#)Weight ⓘ

Almost before we
knew it, we had left
the ground.

Weight: 1

[+ Select this style](#)

Glyphs

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DECOPAR

DECOPAR

DECOPAR

DECOPAR

DECOVAR

DECOVAR

DECOVAR

DECOPAR

fontbureau.typenetwork.com

Default

MY SPECIMENS

SPECIMENS

Amstelvar
Avenir Next
BitCount
Buffalo Gal
Decovar
Dunbar
Fit
Gingham
Grade
Jam
Kairos Sans
Lab-DJR
Libre Franklin
San Francisco
Selawik Variations
Skia
Tablet Gothic
Voto Serif
Zeitung Pro
Zycon

TEXTBOX

Textbox heading

Font Decovar Regular24

Font size

Line-height

Alignment

New textbox

CSS

FONT VARIATION ☰

Instance Regular (default)

Blend A

Blend B

Skeleton A

Skeleton B

Skeleton D

Terminal A

Terminal B

Terminal C

Terminal D

Terminal E

Terminal F

Terminal G

Terminal K

Terminal L

Weight Max 2

COLOUR



e

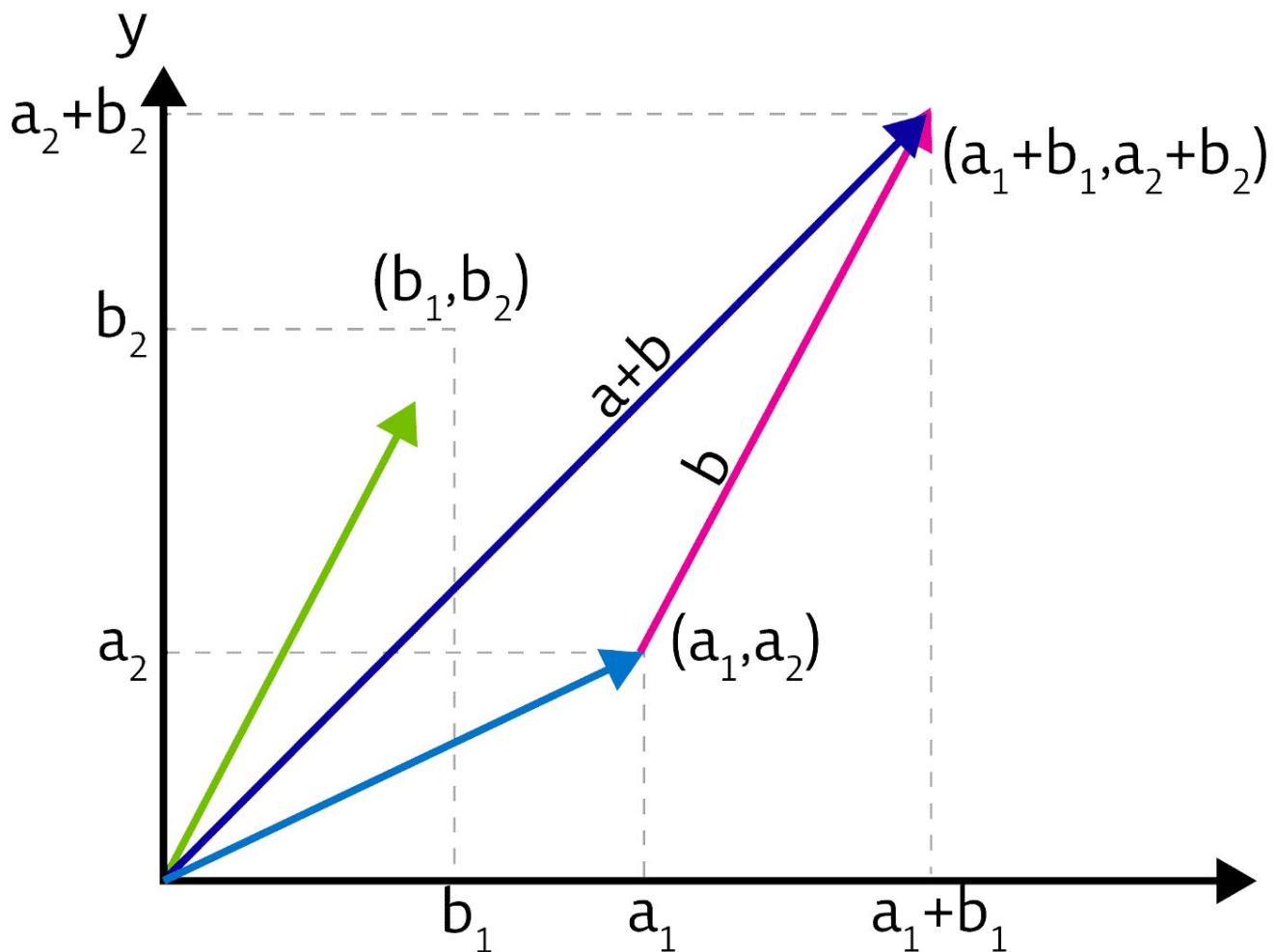
Adobe “Multiple Master” Model

monotype.com/resources/articles/part-1-from-truetype-gx-to-variable-fonts

e

Apple “GX” Model

monotype.com/resources/articles/part-1-from-truetype-gx-to-variable-fonts



Compress
Express
Finesse

Variable axes

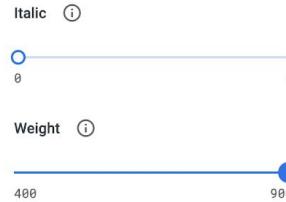
[Learn more about variable fonts](#)



Glyphs

Variable axes

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Italic: 0 | Weight: 900

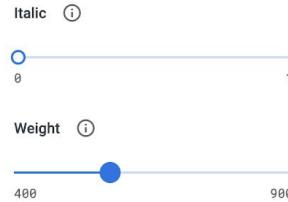
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Glyphs

A	B	C	Č	Ć	D	Đ	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	Š	T	U	Ų	W	X	Y	Z	Ž
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Variable axes

[Learn more about variable fonts](#)



Italic: 0 | Weight: 570

+ Select this style



Glyphs

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Variable axes

Learn more about variable fonts



Glyphs

Optical Size

Amstelvar

Amstelvar

Amstelvar

Amstelvar

Amstelvar

Amstelvar

opsz 12 size 60

abcdefghijklmnopqrstuvwxyz

opsz 24

abcdefghijklmnopqrstuvwxyz

opsz 36

abcdefghijklmnopqrstuvwxyz

opsz 48

abcdefghijklmnopqrstuvwxyz

opsz 60

abcdefghijklmnopqrstuvwxyz



Size

Size

“Where can I obtain
optical size designs?”

Variable fonts

[Font families](#) [Axis definitions](#)

Font families

 Axis ▾

Font Family ↑	Axes	Default	Min	Max	Step
Arimo	ital	0	0	1	1
	wght	400	400	700	1
Assistant	wght	400	200	800	1
Bitter	ital	0	0	1	1
	wght	400	100	900	1
Bodoni Moda	ital	0	0	1	1
	opsz	14	6	96	0.1
	wght	400	400	900	1
Cabin	ital	0	0	1	1
	wdth	100	75	100	0.1
	wght	400	400	700	1

Variable fonts

[Font families](#) [Axis definitions](#)

Font families

Font Family ↑		Axes	Axis ▲			
		All	Default	Min	Max	Step
		ital				
		opsz				
Arimo		ital	0	0	1	1
		slnt				
		wdth	400	400	700	1
		wght				
Assistant		wght	CASL	400	200	800
			CRSV	0	0	1
Bitter		ital	MONO			
		wdth	SOFT	400	100	900
		wght	WONK	0	0	1
Bodoni Moda		ital				
		opsz		14	6	96
		wght		400	400	900
				0	0	1
Cabin		ital				
		wdth		100	75	100
		wght		400	400	700

Font families

 opsz ▾

Font Family ↑	Axes	Default	Min	Max	Step
Bodoni Moda	opsz	14	6	96	0.1
Fraunces	opsz	14	9	144	0.1
Imbue	opsz	14	10	100	0.1
Literata	opsz	14	7	72	0.1
Piazzolla	opsz	14	8	30	0.1
Texturina	opsz	14	12	72	0.1

Axis definitions

opsz
Optical size

Default: 14 Min: 6 Max: 144 Step: 0.1

Adapt the style to specific text sizes, specified in Points. At smaller sizes, letters typically become optimized for more legibility, with loose spacing/kerning and thicker strokes with less detail. At larger sizes, letters are typically optimized for headlines with thinner strokes and more detailed forms, and more extreme weights and widths. When used in CSS, this axis is activated by default, but not all products/platforms use it automatically.



Literata

opsz

14

7

72

0.1

fonts.google.com/variablefonts

дом

Мариам Петросян

Н Каасондоа

В

Фабрика
свободы

Книги на данный
момент

& THE
WALL

АЛИССА СЧИТАЕТ

Γιατί δεν τα λέτε
(χρονογραφήματα)

BOOKS
THEATRE
FILMS
COMICS
ART

13 must-read Russian female writers

Russian literature has for centuries been male dominated, but here we present a rare selection of women writers

1 LUDMILA ULITSKAYA –

Людмила Евгеньевна Улицкая



iPad 3:14 PM

WEEK 23 2020 THE CONTEMPORARY

BOOKS THEATRE FILMS COMICS ART

13 must-read Russian female writers

Russian literature has for centuries been male dominated, but here we present a rare selection of women writers

HEADLINE
wght: 900
opsz: 110
letter-spacing: 0/1000

DECK
wght: 395
opsz: 20
letter-spacing: 0/1000

COPY
wght: 350
opsz: 16
letter-spacing: 0/1000

TT SPECIAL Monday 18 December 2020

Give us some credit

Crediting nourishes the community and helps to establish type-making worthy of people's appreciation

VERONIKA BURIAN

Larger teams and more complex work are moving type design toward more thorough crediting systems. But it's only partially about the system and more about honouring the often unknown ones investing their considerable skills into producing the fonts we use and love. To begin with, type design is a problematic field when it comes to crediting for several reasons. It can be done by a single person working from a home office, or by large teams of professionals, each of them dealing with very specific parts of the development and release cycle. Many of the necessary tasks may require in-depth research, hiring external consultants, or outsourcing processes. These external collaborators may not push nodes around, but they do contribute toward the final product's quality or lack thereof. Another important fact that is obvious but should be mentioned is that type design has changed together with technology — from a craft to an industrial trade to a technical design field. As part of an article about intellectual property and copyrights, Charles Bigelow compares type design to a monumental sculpture or to the design of a programming language. Bigelow helps us understand some of the first things we need to consider when discussing credits. In short, type design has a strong artistic component, parts of the process imply creativity, and it has become a technically challenging trade, other processes require specific technical knowledge.

At the same time, the artistic qualities of a typeface are not solely related to the drawing of

HEADLINE
wght: 925
opsz: 20
letter-spacing: 10/1000

DECK
wght: 340
opsz: 16
letter-spacing: 10/1000

COPY
wght: 365
opsz: 14
letter-spacing: 15/1000

TT SPECIAL Monday 18 December 2020

Give us some credit

Crediting nourishes the community and helps to establish type-making worthy of people's appreciation

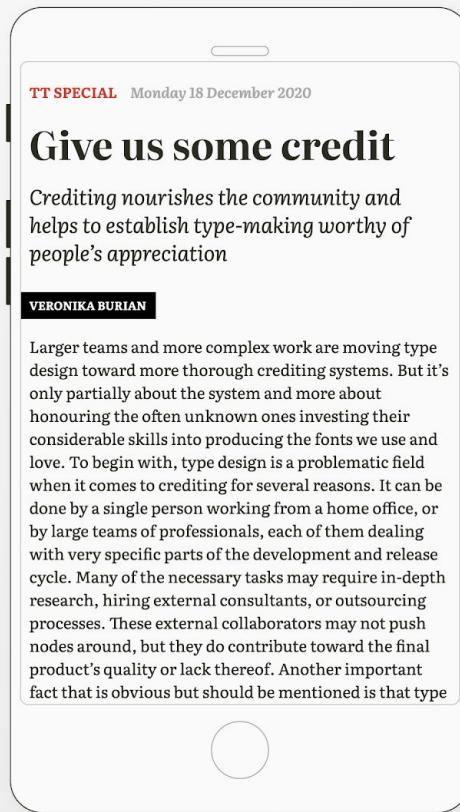
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HEADLINE
wght: 675
opsz: 72
letter-spacing: 0/1000

DECK
wght: 375
opsz: 20
letter-spacing: 0/1000

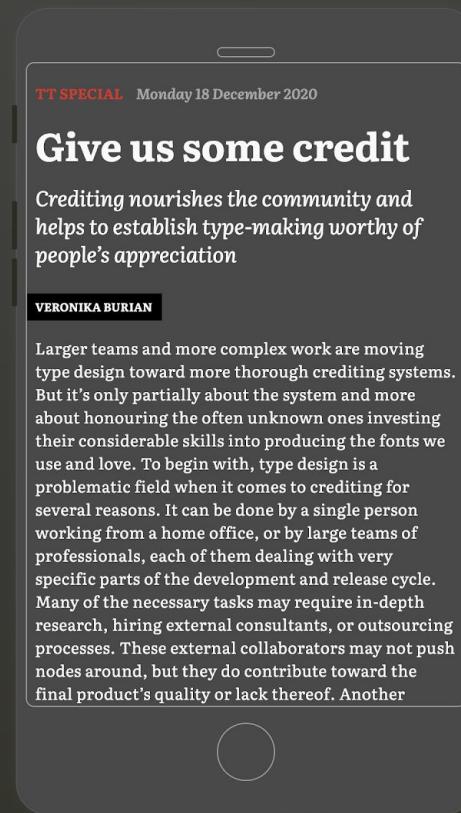
COPY
wght: 400
opsz: 16
letter-spacing: 0/1000



HEADLINE
wght: 695
opsz: 20
letter-spacing: 0/1000

DECK
wght: 495
opsz: 16
letter-spacing: 0/1000

COPY
wght: 430
opsz: 14
letter-spacing: 25/1000



Hañdglovês,

TITLING THIN •



• TITLING EXTRABOLD

TEXT THIN •



• TEXT EXTRABOLD

CAPTION REGULAR



• CAPTION EXTRABOLD

Now in its third version, Literata is one of the most distinct free font families for digital books. Literata was originally created as the default font family for all Google Play Books, balancing a brandable look for Google with the strict needs of a comfortable reading experience on a wide range of devices with varying screen resolutions and rendering technologies — not an easy task.

TypeTogether solved these problems by designing a familiar roman style (varied texture, slanted stress, and less mechanic structure) paired with an uncommon upright italic that accounts for the inherent limitations of the square pixel grid. Get the entire type family for free!

“Where can I play with
optical size designs?”

LAYOUT: Ramp ▾

FAMILY: Amstelvar Roman ▾
+ Add your own ?

STYLE: No named instances ▾

Column width 41.44

Size: 64 Leading: 60

Alignment FG BG


VIEW ALL AXES

wght (wght) 400

wdth (wdth) 100

H1 Heading One

H2 Heading Two

H3 Heading Three

T1 Intro text leads reader into the article by the nose, with grace and dignity and a little pithy charm. Typeface has changed to the appropriate optical size by the miracle of modern typography.

T2 Johannes Gutenberg's work on the printing press began in approximately 1436 when he partnered with Andreas Heilmann, owner of a paper mill.

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LAYOUT: Ramp ▾

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Column width 41.44

Size: 64 Leading: 60

Alignment FG BG

VIEW ALL AXES

wght (wght) 400

wdth (wdth) 100

opsz (opsz) 64

Mirror size changes

H1 Heading One

H2 Heading Two

H3 Heading Three

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T2 Johannes Gutenberg's work on the printing press began in approximately 1436 when he partnered with Andreas Heilmann, owner of a paper mill. Having previously worked as a goldsmith, Gutenberg made skillful use of the knowledge of metals he had learned as a craftsman. He was the first to make type from an alloy of lead, tin, and antimony , which was critical for

Auto approximation

font-optical-sizing: auto

[NTG-context] Auto selecting optical sizes for a font

Hans Hagen [pragma at wxs.nl](#)

Tue Jun 25 10:32:30 CEST 2013

- Previous message: [\[NTG-context\] Auto selecting optical sizes for a font](#)
- Next message: [\[NTG-context\] Auto selecting optical sizes for a font](#)
- Messages sorted by: [\[date \]](#) [\[thread \]](#) [\[subject \]](#) [\[author \]](#)

On 6/25/2013 6:16 AM, Andres Conrado Montoya wrote:

> Thank you so much, Hans. :) It works great!.

>

> I must agree, however, with Georg's considerations. I am very grateful
> for the current solution, but an automatic selection of optical sizes
> could be insanely good, from a book designer point of view (I'm a book
> designer). Just for the curious, these are some links that go deeper
> in the theme of Optical Sizes for Typography:

Optical sizes have always been part of tex (macro packages) and are also one of the reasons why tex font subsystems are complex:

- fonts often provide only some styles / variants in sizes, so fallbacks need to be supported
- names are highly inconsistent, so there is no systematic robust solution that automates it
- only a few fonts provide optical sizes and the whole font machinery must not suffer (in performance) from this
- fonts can be combined in any way with other designs (and we also need to take math into account)

Why are these changes made?

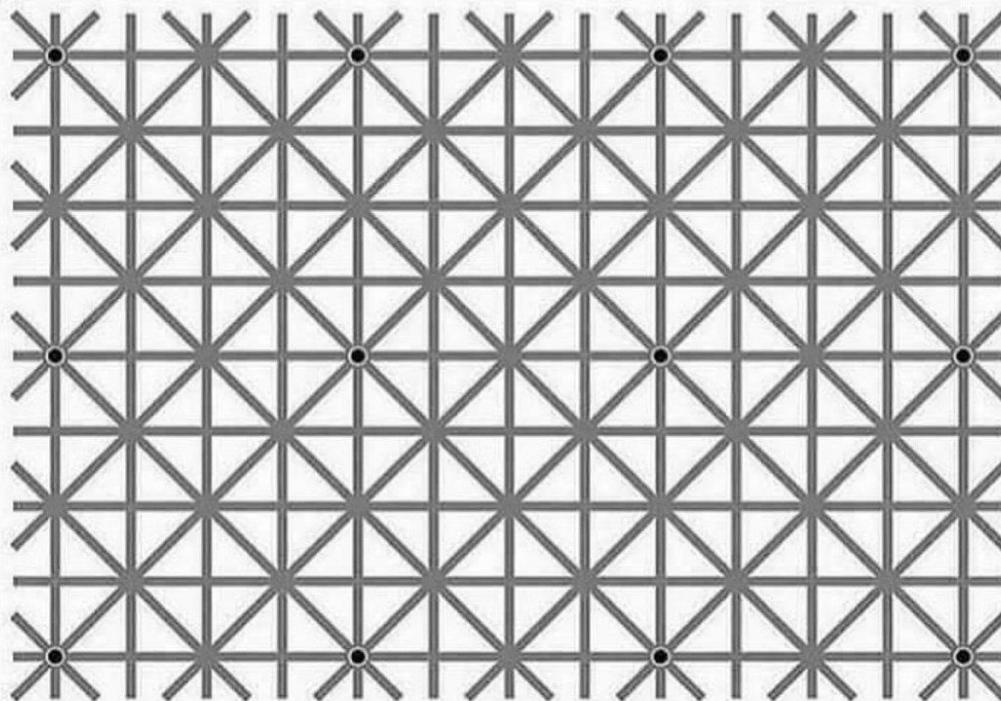
2 confounding ideas

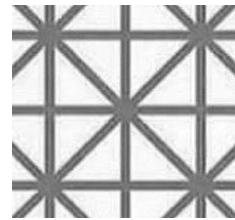
1. Human Perception

Physiology + Neurology

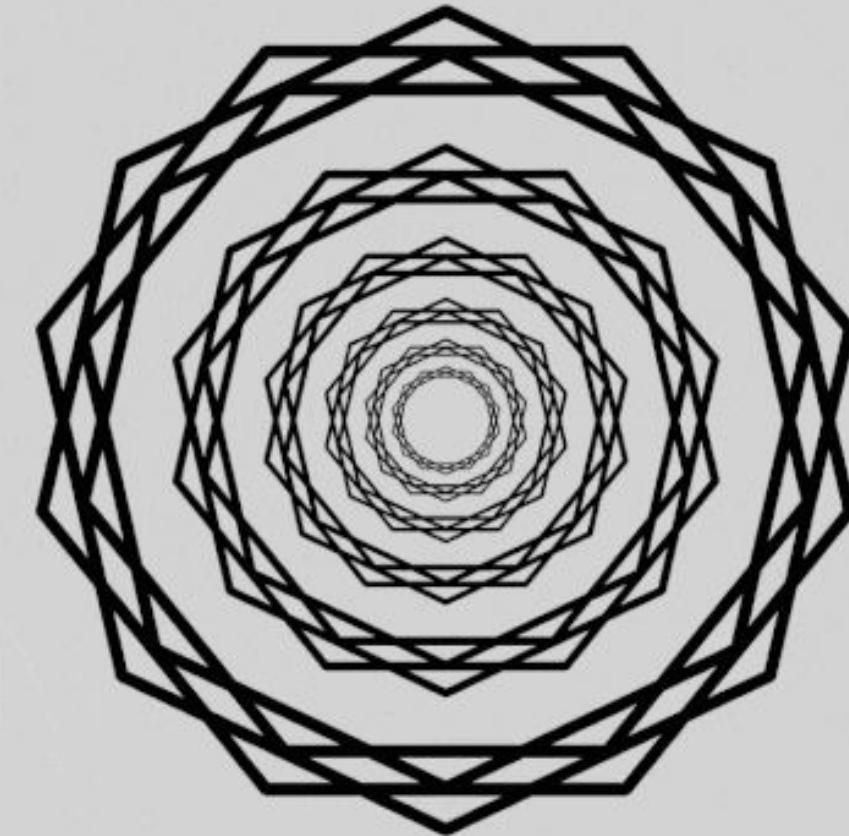
The Doors of Perception

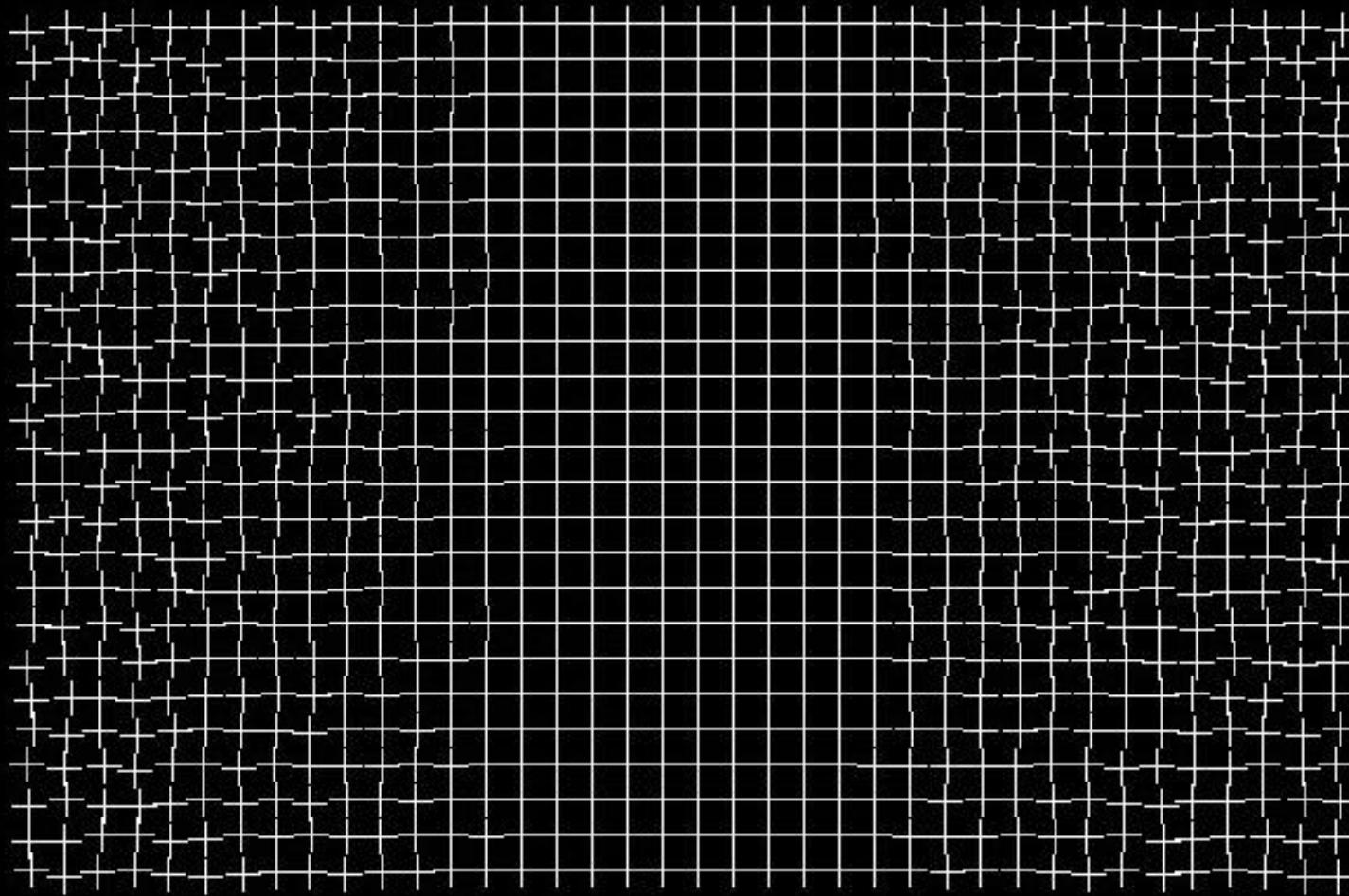
There are twelve black dots at the intersections in this image. Your brain won't let you see them all at once.





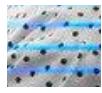
twitter.com/TeslaPhx/status/1373436726727745537







"2011-07-12-Railway People" by Chuwa (Francis) is licensed under CC BY-SA 2.0, color illusion remix by <http://pippin.gimp.org/>



twitter.com/SteveStuWill/status/1380203791191007233/photo/1





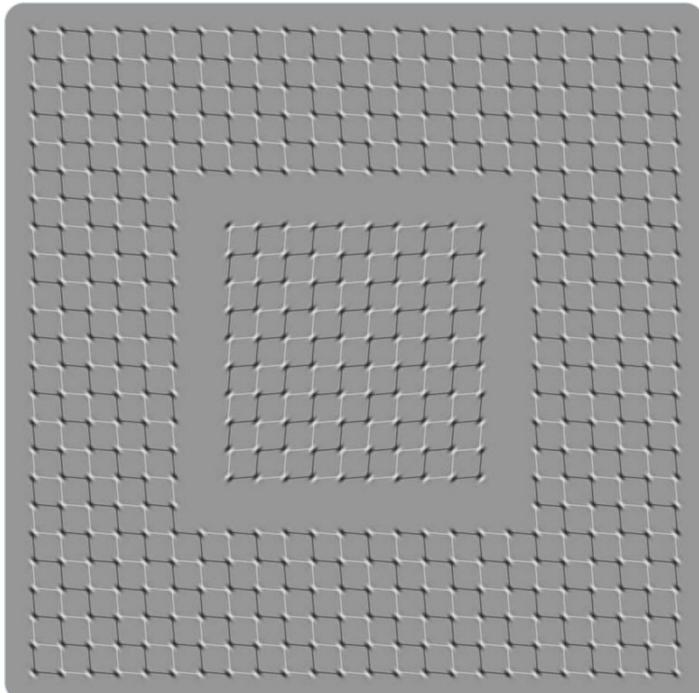


Jim Al-Khalili

@jimalkhalili

...

Stop messing with my head.



3:33 PM · May 6, 2017 · Twitter for iPhone

twitter.com/jimalkhalili/status/860940648492478472



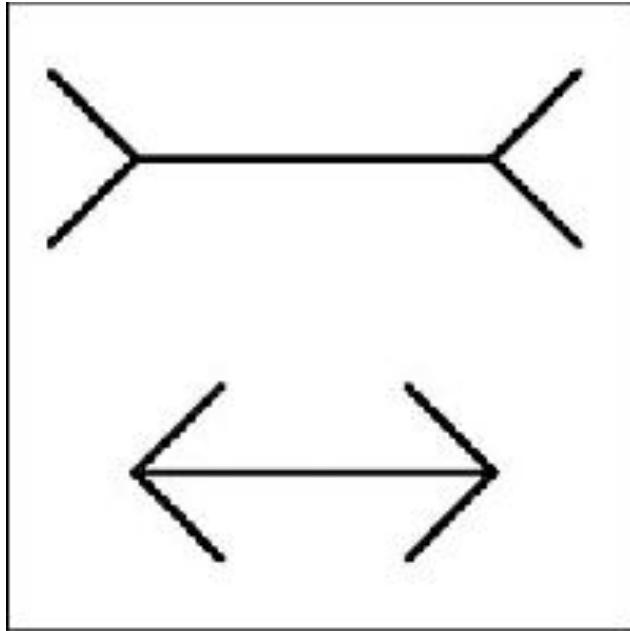
Type@Cooper
@CooperType

ooo

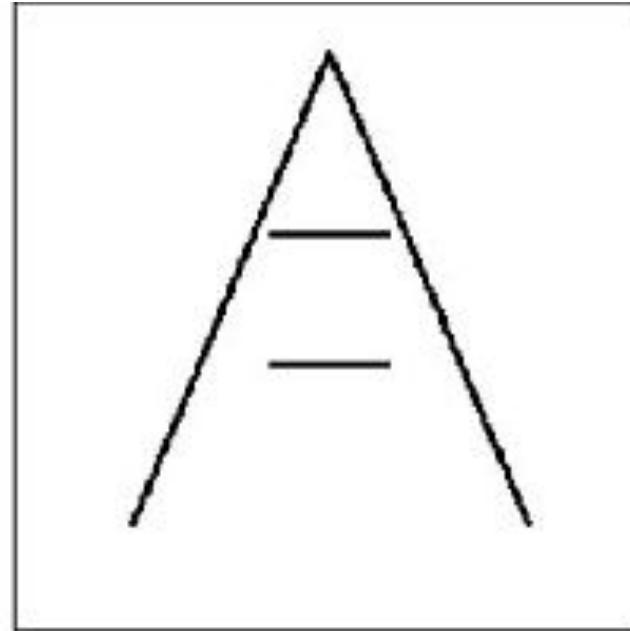
Legendary poster artist Victor Moscoso joins
[@jamestedmondson](#) to teach psychedelic lettering
[@Lett_Arc](#) 7/22 & 7/23 buff.ly/2rQvqOG



12:15 PM · Jun 12, 2017 · Buffer



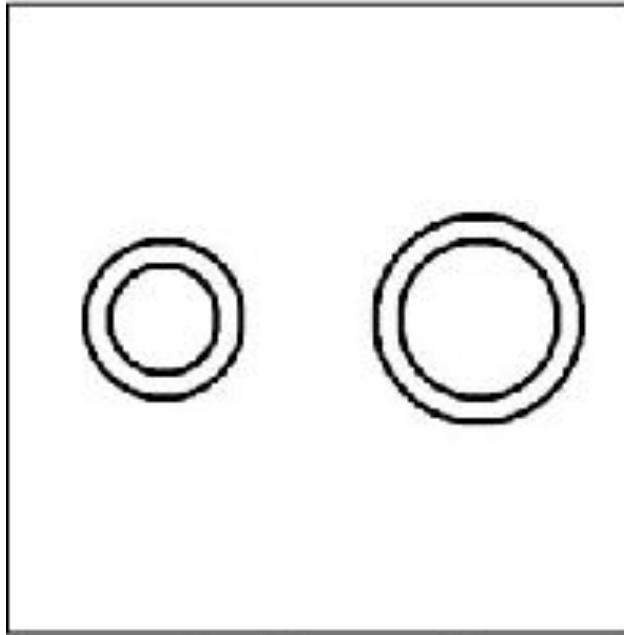
Muller-Lyer



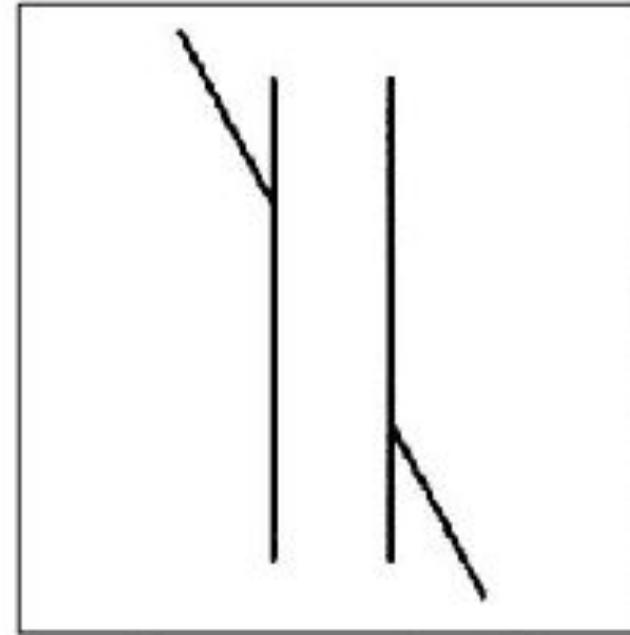
Ponzo

Same lines look different lengths.

researchgate.net/publication/42834022_Application_of_Riesz_transforms_to_the_isotropic_AM-PM_decomposition_of_geometrical-optical_illusion_images



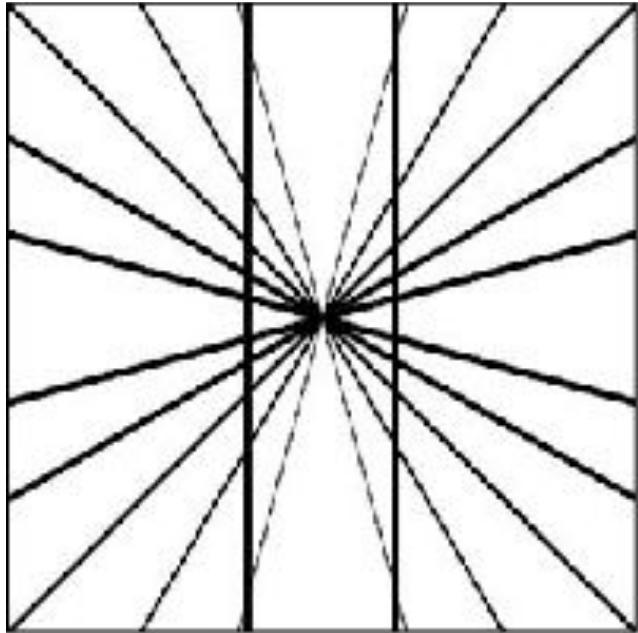
Delboeuf



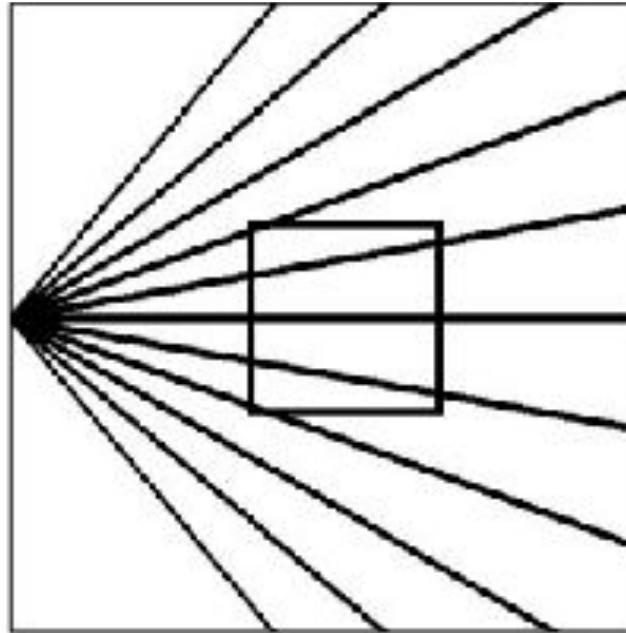
Poggendorff

Same size shapes look different sizes. Straight lines look crooked.

[researchgate.net/publication/42834022_Application_of_Riesz_transforms_to_the_isotropic_AM-PM_decomposition_of_geometrical-optical_illusion_images](https://www.researchgate.net/publication/42834022_Application_of_Riesz_transforms_to_the_isotropic_AM-PM_decomposition_of_geometrical-optical_illusion_images)



Hering



Ehrenstein

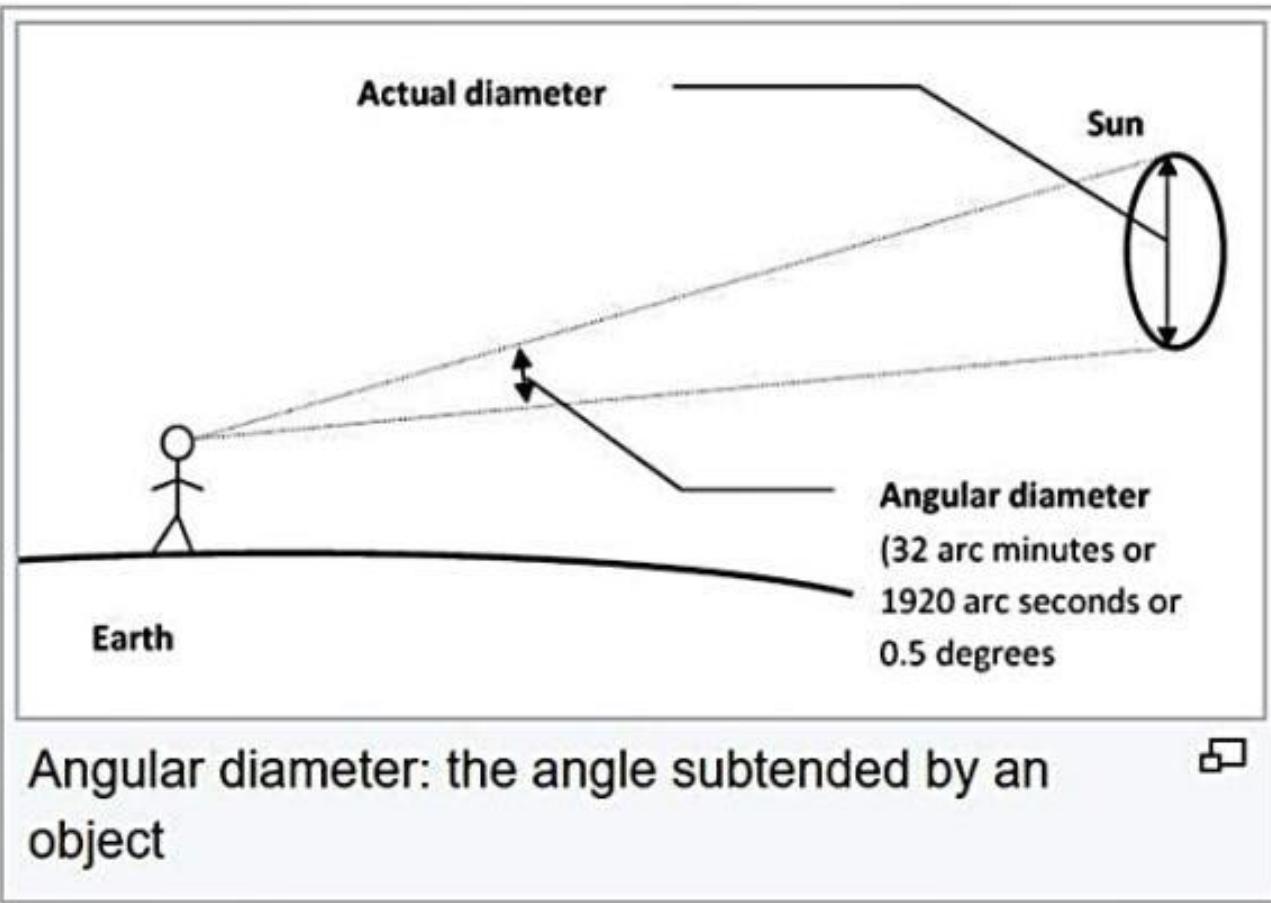
Straight lines don't even look straight.

researchgate.net/publication/42834022_Application_of_Riesz_transforms_to_the_isotropic_AM-PM_decomposition_of_geometrical-optical_illusion_images

2. What is ‘size’?

Points and arc minutes





72 pt

48

24

18

14

12

10

8

6

5

4

aaaaaaaaaaaaaaaaaaaa

aaaaaaaaaaaaaaaaaaaaaaa

8px

16px

24px

32px

40px

48px

56px

64px

72px

80px

88px

96px

104px

112px

120px

128px

136px

144px

The state of the art, 1900 & 2020

w3.org/TR/css-fonts-4/#font-optical-sizing-def

1.8 The large size-specific designs are optimized for elegance (The Berlow-Hudson Hypothesis)

Historically, typefaces were designed differently for large sizes than for small sizes. This is sometimes called optical scaling or size-specific design. A typeface designed for small size will have a taller x-height, wider letters, less difference between thick and thin strokes, and wider spacing

[researchgate.net/publication/309754147_Sitka_A_collaboration_between_type_design_and_science](https://www.researchgate.net/publication/309754147_Sitka_A_collaboration_between_type_design_and_science)

than a typeface designed for larger sizes. In metal type each size had to be made separately. In digital type the same letter can be displayed at any size. The advantage to digital type production is the ease and speed of designing a single version of each letter, but what is lost is the size-specific tuning. Sitka is one of several dozen digital typefaces that have different outlines optimized for different output sizes [Ahrens and Mugikura, 2013].

For the legibility testing aspects of this project we focused our attention on the Sitka Small size because we saw its optimization as having the greatest effect on legibility. In agreement with Harry Carter [1937/1984], we felt that the larger sizes were optimized for elegance and visual interest: ‘Shortened descending and ascending strokes are unforgivable on bodies over 18-point. It is quite legitimate to shorten the tails of the small founts to increase legibility and to lengthen them in the display sizes of the same face for the sake of elegance.’ An alternative hypothesis that was disputably proposed by David Berlow (personal conversation), and later taken up by John Hudson (personal conversation), claimed that the size-specific adjustments for larger sizes are in fact legibility optimizations for larger text.

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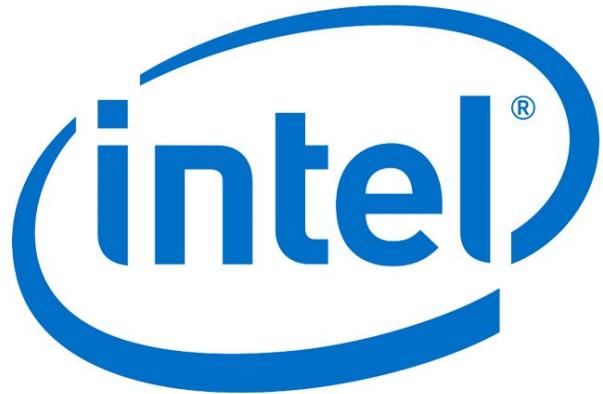
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Brand Design: Logo anti-homogenization

Optical size for ‘downsizing’

Google Google

Google Google



Tech

- Revolut** ➤ **Revolut**
- facebook.** ➤ **FACEBOOK**
- Google ➤ Google
- Microsoft** ➤ Microsoft
- airbnb** ➤ airbnb
- Spotify** ➤ Spotify®
- Pinterest** ➤ Pinterest
- ebay** ➤ ebay

Fashion

- BALENCIAGA ➤ **BALENCIAGA**
-  BURBERRY® LONDON ➤ **BURBERRY**
LONDON ENGLAND
-  YVESSAINTLAURENT ➤ **SAINT LAURENT**
- Berluti ➤ **BERLUTI**
-  BALMAIN PARIS ➤ **BALMAIN**
PARIS
-  RIMOWA ➤ **RIMOWA**
-  DIANE von FURSTENBERG ➤ **DIANE VON FURSTENBERG**

velvetshark.com

The fictitious Elemenno Pea company is having difficulty spreading their brand across the full range of media for modern use. Being used in print to just scaling their artwork and having the printer over-ink the smaller uses, the thin hairlines that bring elegance to their pea products, is having a hard time in rendering in screen environments, where such elegant details often fail to appear.

ELEMENO PEA Inc.

ELEMENO PEA Inc.

ELEMENO PEA Inc.

The first instinct of their fictitious ad agency, probably based on the experience of doing the same thing over and over again and again from brand to brand, is to switch Elemeno to a simple, low contrast san serif with little or no flavor.

ELEMENO PEA Inc.

ELEMENO PEA Inc.

ELEMENO PEA Inc.

Elemeno instead, can now make a custom version of their logo as a scaleable font with an optical size axis that maintains the look, feel, and elegance of their products, without the concern for ink in print, and with control over their logo's appearance with any rendering.

ELEMENO PEA Inc.

ELEMENO PEA Inc.

ELEMENO PEA Inc.

ELEMENO PEA Inc.

ELEMENO PEA Inc.

ELEMENO PEA Inc.

ELEMENO PEA Inc.

ELEMENO PEA Inc.

ELEMENO PEA Inc.

Reading fluency

Optical size for better comprehension,
retention, and speed

Stem rhythm

Stem rhythm
minimum

Stem rhythm
minimum

Saccades

DANS, KÖN OCH JAGPROJEKT

På jakt efter ungdomars kroppsspråk och den "synkretiska dansen", en sammansmältning av olika kulturerς dans, har jag i mitt färtarbetet under hösten rört mig på olika arenor inom skolans värld. Nordiska, afrikanska, syd- och östeuropeiska ungdomar gör sina röster hörda genom sång, musik, skrik, skratt och gestalter känslor och uttryck med hjälp av kroppsspråk och dans.

Den individuella estetiken framträder i kläder, frisyer och symboliska tecken som förstärker ungdomarnas "jagprojekt" där också den egna stilen i kroppsrörelserna spelar en betydande roll i identitetsprövningen. Upphållsrummet fungerar som offentlig arena där ungdomarna spelar upp sina performanceliknande kroppss

6



If You Can Raed Tihs, You Msut Be Raelly Smrat

Published March 31, 2009 • Fox News



Chances are you've seen this in your inbox:

"Aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are, the olny iprmoatnt tihng is taht the frist and lsat ltteers be at the rghit pclae. The rset can be a toatl mses and you can sitll raed it wouthit porbelm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe."



A mirror is an object that reflects light in such a way that, for incident light in some range of wavelengths, the reflected light preserves many or most of the detailed physical characteristics of the original light. This is different from other light-reflecting objects that do not preserve much of the original wave signal other than color and diffuse reflected light.

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The Valuable Virtues of Variable Font Technology

As the study demonstrates, while the Lexend series were beneficial to a large sample of students, no one setting worked best for all students. Diverse readers call for diverse axis settings just like every individual person requires their own individual eyeglass prescription.

Eyeglass prescriptions are not six strict settings. There are more granular settings possible.

Variable font technology allows for continuous selection of the Lexend Series to find the specific setting for an individual student.

LEXEND

VARIABLE WIDTH + BOUNDING BOX



VARIABLE FONT SETTINGS FOR CSS

```
h1, p { font-variation-settings: 'LXND' 0; }
```

Avg WPM (100)
Text #0 Lexend START

My name is Commander Smith and the spaceship that I command has been exploring the planet known as Earth for almost a year. We have discovered that Earth is very different from our planet. Our next job was to explore the states of Texas, New Mexico, Arizona, and Nevada. These states make up the Southwest region.

First, we had to backtrack a little and fly east to Texas. This is a huge state— the map showed that it was more than seven hundred miles wide. Later we found out that Texas is the second largest state in size, after Alaska. It is also the second largest state in population, after California. We certainly saw a lot of really big things in Texas— big cities, big oil fields, and big ranches. In fact, we found out that there is a ranch in Texas that is bigger than the whole state of Rhode Island! Texas raises more cattle than any other state. The cowboy, a person who takes care of the cattle, is a symbol of Texas. In the late 1800s, Texas cowboys drove the cattle hundreds of miles to market in the northern states.

It was hard, dangerous, adventurous work, so many people thought of cowboys as heroes. Over time, the cattle ranches changed so that there was less need for cowboys. Today, there are not as many cowboys in

Texas. There are, however, many Texans who still dress like cowboys. They wear cowboy boots and a kind of tall cowboy hat they call a ten-gallon- hat because it looks as if it could hold that much water. Another symbol of Texas is the oil well. Texas produces more oil than any other state. Oil was first discovered near the city of Houston in the early 1900s.

Today, Houston is the largest city in Texas. The American space program has one of its largest workplaces there. One man told us that Houston was the first word spoken on the moon. He explained that when an American became the first human to land on the moon on July 20, 1969. The first thing he did was radio back to Houston. The United States was the first manned mission to land on the Moon. There have been six manned U. S. landings and numerous unmanned landings. To date, the United States is the only country to have successfully conducted manned missions to the Moon, with the last one in December 1972.

TIME TO READ	WORDS READ	ERRORS	WORDS CORRECT PER MINUTE
0ms	0	0	0 WCPM

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VARIABLE WIDTH + BOUNDING BOX



VARIABLE FONT SETTINGS FOR CSS

```
h1, p { font-variation-settings: 'LXND' 88; }
```

Avg WPM (100) Text #0 Lexend START

My name is Commander Smith and the spaceship that I command has been exploring the planet known as Earth for almost a year. We have discovered that Earth is very different from our planet. Our next job was to explore the states of Texas, New Mexico, Arizona, and Nevada. These states make up the Southwest region.

First, we had to backtrack a little and fly east to Texas. This is a huge state—the map showed that it was more than seven hundred miles wide. Later we found out that Texas is the second largest state in size, after Alaska. It is also the second largest state in population, after California. We certainly saw a lot of really big things in Texas—big cities, big oil fields, and big ranches. In fact, we found out that there is a ranch in Texas that is bigger than the whole state of Rhode Island! Texas raises more cattle than any other state. The cowboy, a person who takes care of the cattle, is a symbol of Texas. In the late 1800s, Texas cowboys drove the cattle hundreds of miles to market in the northern states.

It was hard, dangerous, adventurous work, so many people thought of cowboys as heroes. Over time, the cattle ranches changed so that there was less need for cowboys. Today, there are not as many cowboys in

Texas. There are, however, many Texans who still dress like cowboys. They wear cowboy boots and a kind of tall cowboy hat they call a ten-gallon-hat because it looks as if it could hold that much water. Another symbol of Texas is the oil well. Texas produces more oil than any other state. Oil was first discovered near the city of Houston in the early 1900s.

Today, Houston is the largest city in Texas. The American space program has one of its largest workplaces there. One man told us that Houston was the first word spoken on the moon. He explained that when an American became the first human to land on the moon on July 20,

TIME TO READ	WORDS READ	ERRORS	WORDS CORRECT PER MINUTE
0ms	0	0	0 WCPM

lexend.com

Product & Page Design: A better type ramp

The spine of a design system,
and ‘upsizing’ with Roboto Flex

ROBOTO

96 pt Light

60 pt Light

48 pt Regular

34 pt Regular

24 pt Regular

20 pt Medium

16 pt Regular

16 pt Regular

14 pt Medium

14 pt Regular

14 pt Medium

12 pt Regular

10 pt Regular

Headline 1

Headline 2

Headline 3

Headline 4

Headline 5

Headline 6

Subtitle 1

Body 1

Subtitle 2

Body 2

BUTTON

Caption

OVERLINE

ROBOTO
FLEX

96 pt Regular

60 pt Regular

48 pt Regular

34 pt Regular

24 pt Regular

20 pt Regular

16 pt Regular

16 pt Regular

14 pt Regular

14 pt Regular

14 pt Regular

12 pt Regular

10 pt Regular

Headline 1

Headline 2

Headline 3

Headline 4

Headline 5

Headline 6

Subtitle 1

Body 1

Subtitle 2

Body 2

BUTTON

Caption

OVERLINE

Headline 1

Headline 2

Headline 3

Headline 4

Headline 5

Headline 6

Subtitle 1

Body 1

Subtitle 2

Body 2

BUTTON

Caption

OVERLINE

Headline 1

Headline 2

Headline 3

Headline 4

Headline 5

Headline 6

Subtitle 1

Body 1

Subtitle 2

Body 2

BUTTON

Caption

OVERLINE

Heading One

Heading Two

Heading Three

Intro text leads reader into the article by the nose, with grace and dignity and a little pithy charm. Typeface has changed to the appropriate optical size by the miracle of modern typography.

Johannes Gutenberg's work on the printing press began in approximately 1436 when he partnered with Andreas Heilmann, owner of a paper mill. Having previously worked as a goldsmith, Gutenberg made skillful use of the knowledge of metals he had learned as a craftsman. He was the first to make type from an alloy of lead, tin, and antimony, which was critical for producing durable type that produced high-quality printed books and proved to be much better suited for printing than all other known materials.

Feeling comfortable? No?
Here the 32pt design is mis-applied to the text sizes.

Heading One

Heading Two

Heading Three

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Here the 14 pt design is mis-applied to the display sizes. The H1 is now much longer, and even seems to be bolder.

Heading One

Heading Two

Heading Three

Intro text leads reader into the article by the nose, with grace and dignity and a little pithy charm. Typeface has changed to the appropriate optical size by the miracle of modern typography.

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To approximately finesse the headline, the Material Typography guidelines use Light (300) weight at H1.

Heading One

Heading Two

Heading Three

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Here the intended designs are applied. This should feel more comfortable to read, with nothing out of place.

Roboto Regular

Our quick brown fc

Sweep over the lazy sleeping

Pack my bag with six dozen jugs of

Blabbering boulevard strangers quizzed puzzled v

Parking attendants worried when the zebras quite juggling the sleeping

Masterful planning before the trip enabled the client, a Quaker family to all the peac

Everyone knew that the particle accelerator would not function in zero gravity but planned the experiment

Practical application of the necessary variables created a greatly simplified hierarchy over the broad range of nutritiona

The typical North American composition of text does not normally involve extensive testing for legibility

Magnification of issues into unmanageable specifications, quietly but certainly, raised the price of everything they did,

FILE EDIT PRINT VIEW ARRANGE WINDOW PAGE MORE LESS STANDINGS STATISTICS SIGN IN

This year's winning photograph from the south of England was taken on January 2 in Queen Anne's Park, South Chouldchester, betwe

ECUADOR EGYPT EL SALVADOR EQUATORIAL GUINEA ETHIOPIA FIJI FINLAND FRANCE GABON GAMBIA GEORGIA GERMANY AND M,

Roboto Flex Regular

Our quick brown fox
Sweep over the lazy sleeping dog
Pack my bag with six dozen jugs of wine
Blabbering boulevard strangers quizzed puzzled visit

Parking attendants worried when the zebras quite juggling the sleeping soldiers
Masterful planning before the trip enabled the client, a Quaker family to all the peace and quiet they wanted

Everyone knew that the particle accelerator would not function in zero gravity but planned the experiment no matter what

Practical application of the necessary variables created a greatly simplified hierarchy over the broad range of nutritional recommendations

The typical North American composition of text does not normally involve extensive testing for legibility at each stage of the process

Magnification of issues into unmanageable specifications, quietly but certainly, raised the price of everything they did, geometry and logic

FILE EDIT PRINT VIEW ARRANGE WINDOW PAGE MORE LESS STANDINGS STATISTICS SIGN IN LOG OUT YOU

This year's winning photograph from the south of England was taken on January 2 in Queen Anne's Park, South Chouldchester, between ECUADOR EGYPT EL SALVADOR EQUATORIAL GUINEA ETHIOPIA FIJI FINLAND FRANCE GABON GAMBIA GEORGIA GERMANY AND MASSACHUSETTS

“But that's just regular!”

The ‘Upside Down Pyramid,’
and ‘upsizing’

Roboto Cond Light

Roboto Cond Regular

Roboto Cond Bold

Roboto Thin

Roboto Light

Roboto Regular

Roboto Medium

Roboto Bold

Roboto Black

Typical font family

ROBOTO
24 pt

NORMAL ITALIC CONDENSED

Black *Black* **Black**

Bold *Bold* **Bold**

Medium *Medium* **Medium**

Regular *Regular* Regular

LIGHT *LIGHT* LIGHT

Small text use among typical font family

ROBOTO
10 pt

NORMAL ITALIC CONDENSED

Black

Black

Black

Bold

Bold

Bold

Medium

Medium

Medium

Regular

Regular

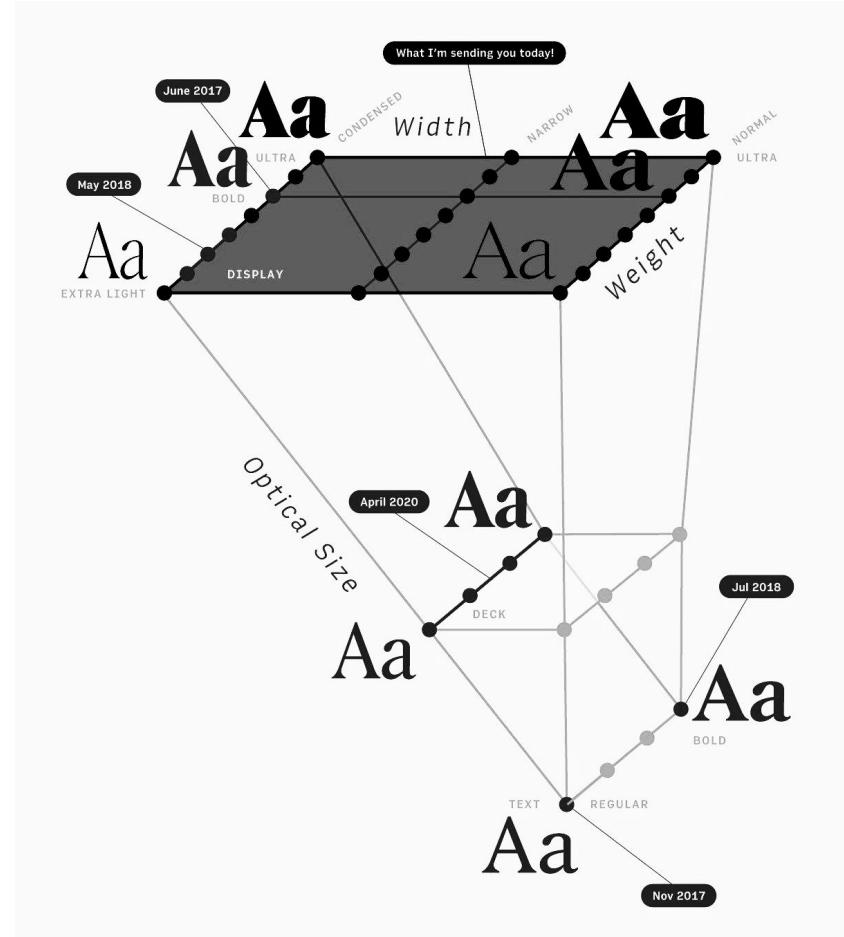
Regular

LIGHT

LIGHT

LIGHT

BROGUERY
RECKONER
MASONITE
GEOTONIC
IRONCLAD
KENMARK
ANOTHER
PURISTIC



Roboto

Neutral
LOUD
Delicate
TOUGH

Simple
ADVENTUROUS
Scientific

Roboto Flex: Words in styles that reinforce themselves.
github.com/typenetwork/roboto-flex

One Roboto, many moods

Variable font axes enable a variety of looks

Neutral LOUD
Delicate
TOUGH
Simple
ADVENTUROUS
Scientific

72/72 180 wt 135 wdh

Delicate

60/60 180 wt 135 wdh

Delicate

48/48 180 wt 135 wdh

Delicate

20/20 180 wt 135 wdh

Delicate

16/16 180 wt 135 wdh

Delicate

8/8 180 wt 135 wdh

Delicate

72/72 600 wt 25 wdh

ADVENTU

60/60 600 wt 25 wdh

ADVENTUR

48/48 600 wt 25 wdh

ADVENTURO

20/20 600 wt 25 wdh

ADVENTUROUS

16/16 600 wt 25 wdh

ADVENTUROUS

8/8 600 wt 25 wdh

ADVENTUROUS

“How can I make
optical size designs?”

A ‘Parametric Axes System’ approach

a

XTRA

a

YTRA

Transparency

Transparent

space inside and around the glyph in the
x and y direction.

TypeNetwork

a

XOPQ

a

YOPQ

Opacity Opacity

Changes the stroke weight in the
x and y direction.

TypeNetwork

a

XTRA

a

XOPQ

a

YOPQ

a = d g DOG dog

YTRA

Ascender

Descender

Uppercase

Lowercase

Parametric axes change
Spaces independently in the
x (horizontal) and y (vertical) directions

Weight $a + a + a + a = a$

Width $a + a + a + a = a$

Grade $a + a = a$

TypeNetwork

Blends are created by combining parametric axes

a

XTRA

a

XOPQ

a

YOPQ

Optical

d

g

dog

Ascender

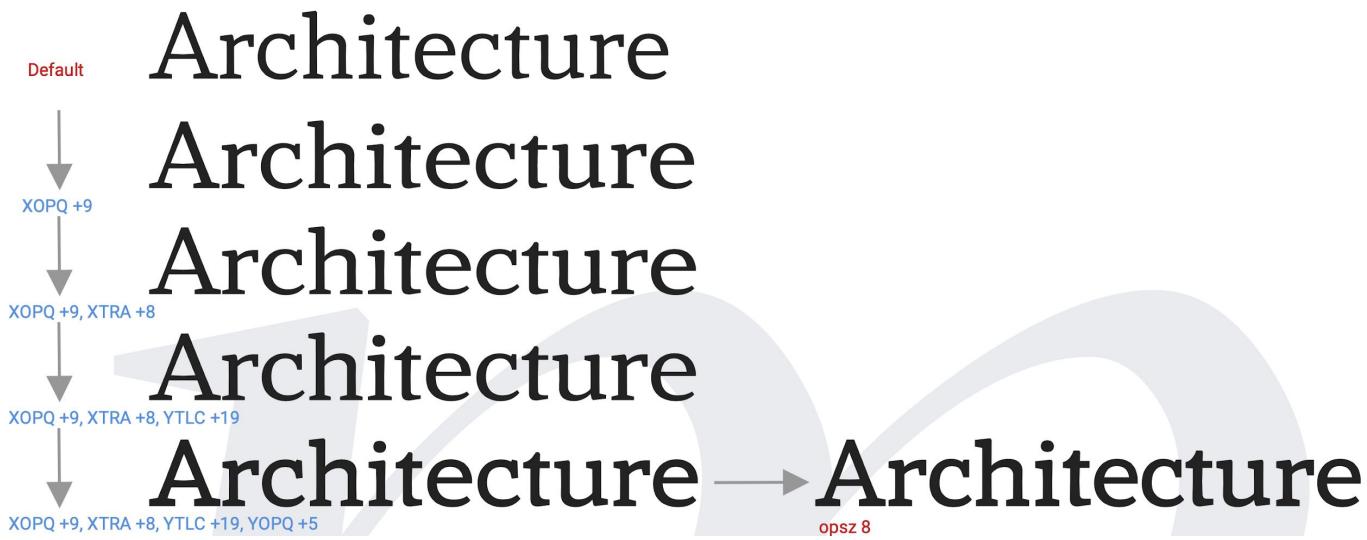
Descender

Lowercase

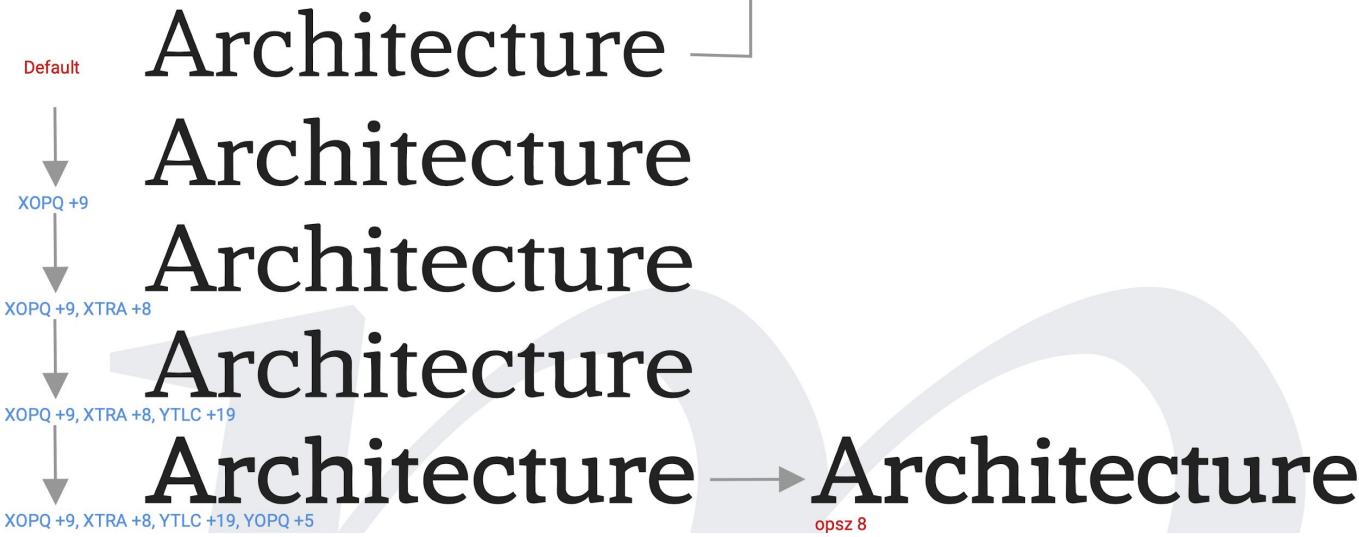
Start with the default

Architecture

Negative optical size (downsizing)



Positive optical size (upsizing)



Amstelvar

Parametric axis: YTRA overall

Hhp

Parametric axis: YTLC lowercase

Hh

Parametric axis: YTUC uppercase



The image displays three large, bold, black letters against a white background. From left to right, the letters are 'H', 'I', and 'h'. The 'H' is a standard capital letter with a vertical stem and a horizontal crossbar. The 'I' is a simple vertical stem. The 'h' is a lowercase letter with a vertical stem and a curved top loop. All three letters have a thick, uniform stroke.

Roboto บັງເລີກູ

Roboto บັງເລີກູ

bit.do/calibrate-type

“Where can I learn more?”

TypeNetwork

CONTENTS

OVERVIEW

Thirty to three billion users in three years

An old and stable font format

Enhancing typographic experience

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Scripts primer

OVERVIEW

Thirty to three b

The fastest ad...
raises lots of q

The web has changed to typefaces, font sizes, li

Thank you

@davelab6

fonts.google.com/variablefonts

design.google/library/variable-fonts-are-here-to-stay

type-together.com/demos/literata

variablefonts.typenetwork.com

typetools.typenetwork.com

axis-praxis.org