@zachleat

zachleat.com

Anvil transition enthusiast

filament group

THE 5 WHYS OF WEB LOADING PERFOR

WHYS

WHYS

WHYS

WHYS

WHYS

WHYS
WHYS
WHYS
WHYS
WHYS

OF WEB FONT LOADING PERFORMANCE

WHY WHY WHY WHY

WHY WHY WHY WHY

WHY WHY WHY WHY

WHY WHY WHY WHY

WHY WHY WHY WHY

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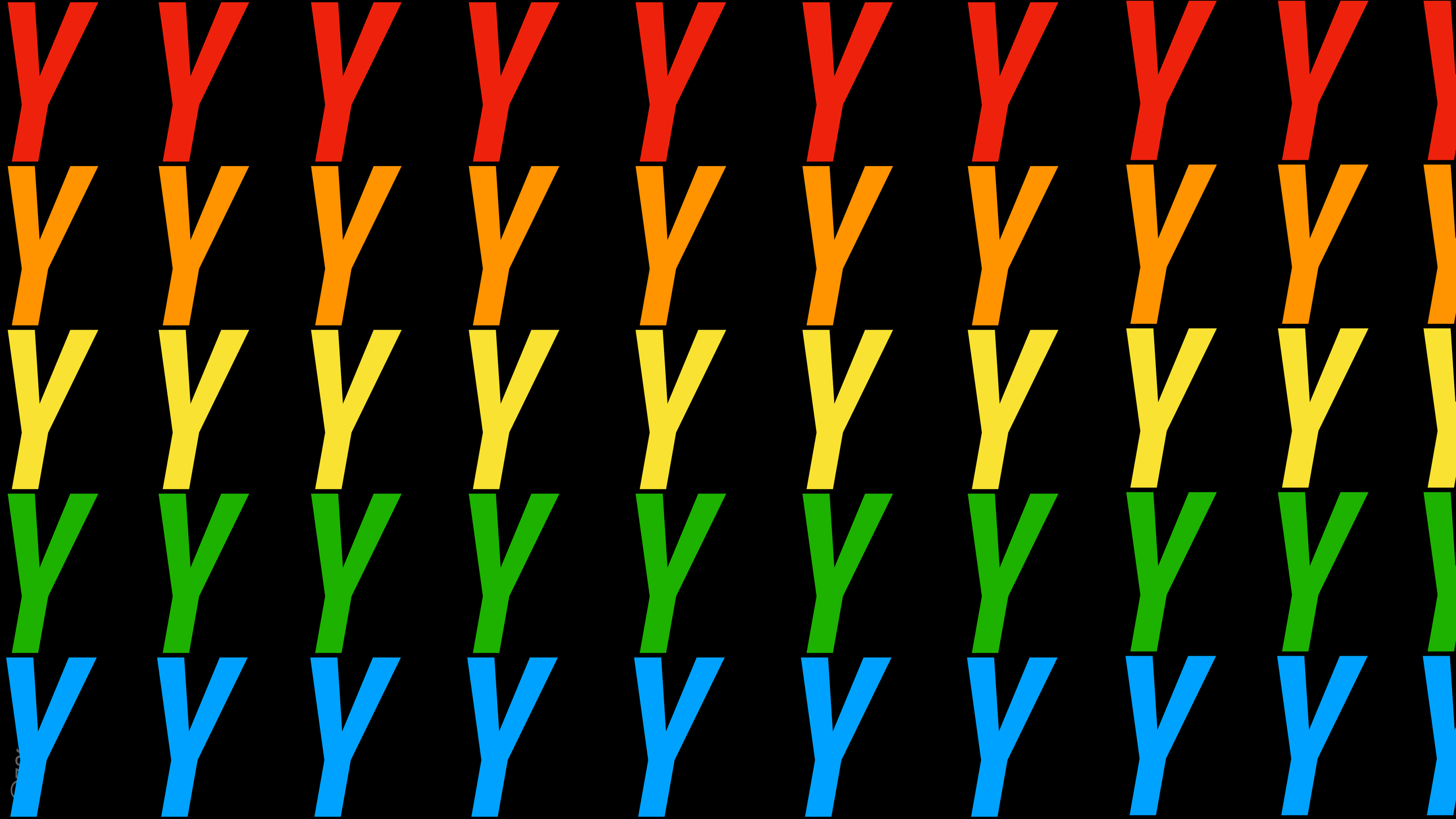
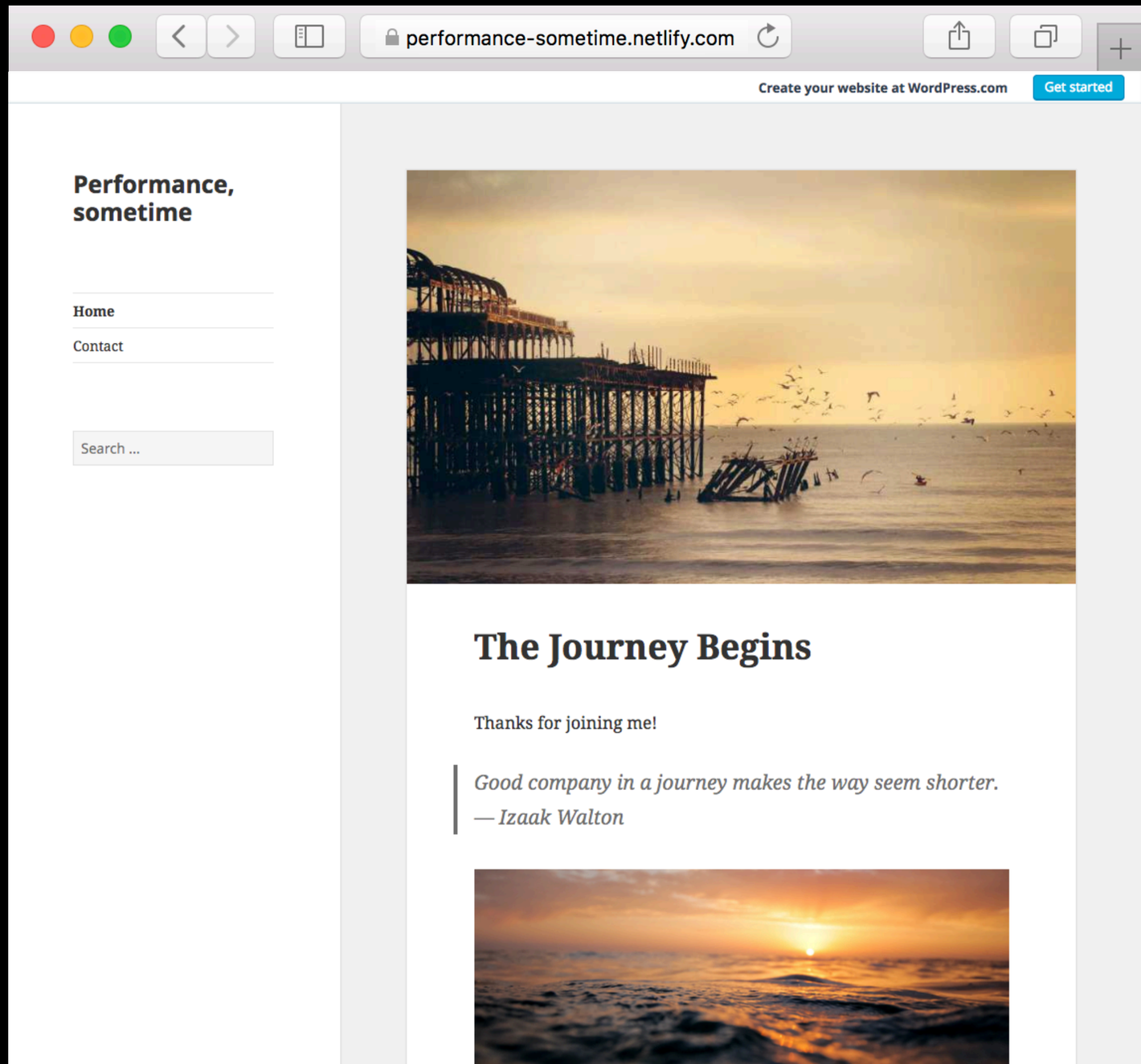

Y Y Y Y Y Y Y Y Y Y
Y Y Y Y Y Y Y Y Y Y
Y Y Y Y Y Y Y Y Y Y
Y Y Y Y Y Y Y Y Y Y
Y Y Y Y Y Y Y Y Y Y

THE 5Y OF WEB FONT LOADING PERFORMANCE

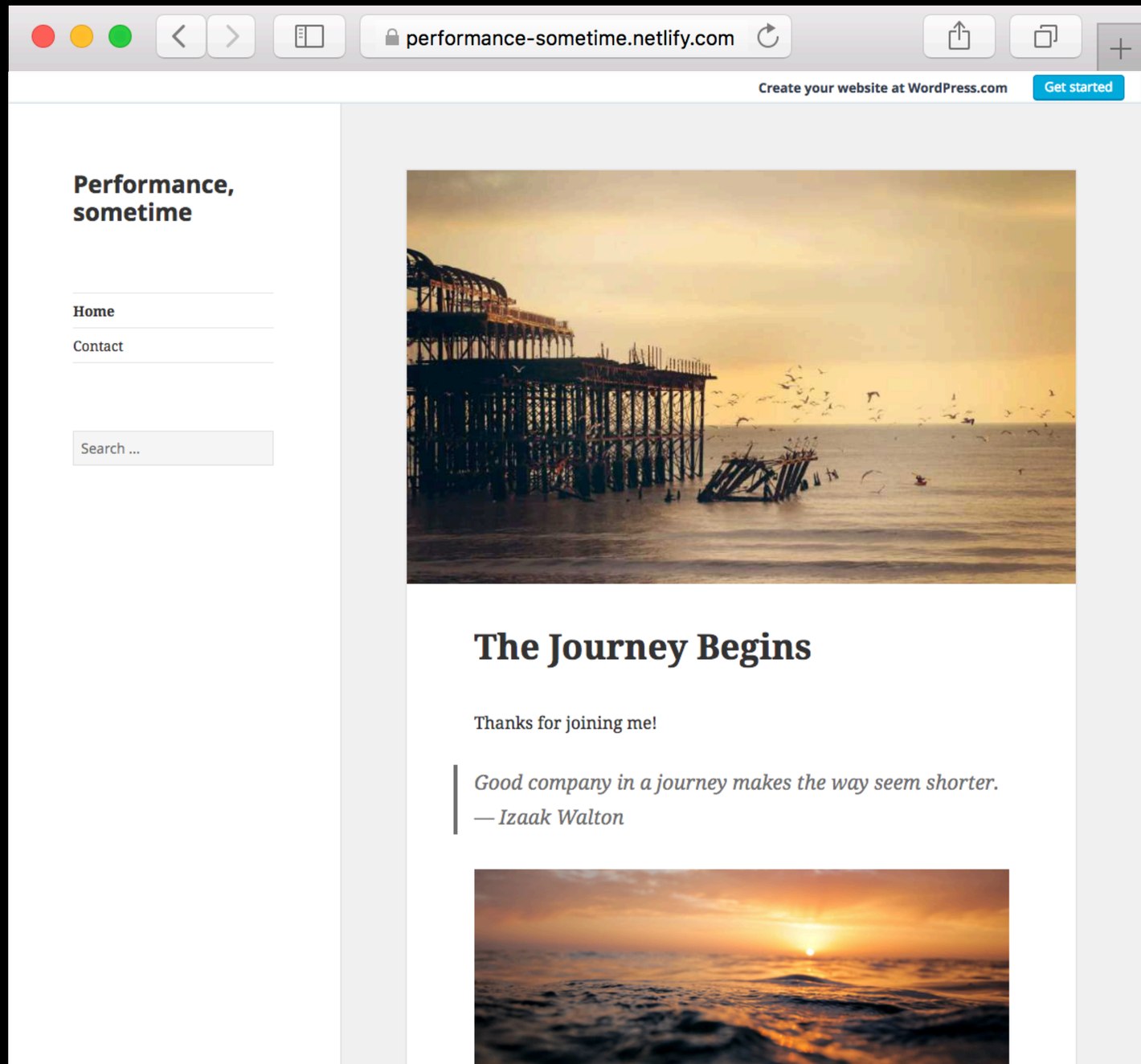
THE DEFAULT WORDPRESS SITE



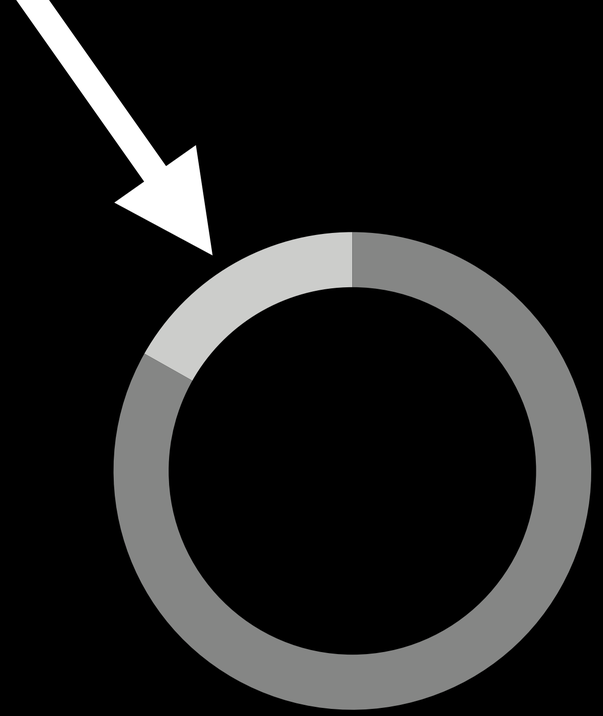
THE DEFAULT WORDPRESS SITE

595 KB

35 requests



17% WEB FONTS



100 KB IN **5** REQUESTS

YYYYY

48% Images, 8 requests
22% JavaScript, 12 requests
17% Fonts, 5 requests
12% CSS, 8 requests
1% HTML, 2 requests

Y

SANS SERIF 15.3 KB

YY

SANS SERIF BOLD 15.3 KB

YYY

SERIF 22.9 KB

YYYY

20.8 KB SERIF ITALIC

YYYYY

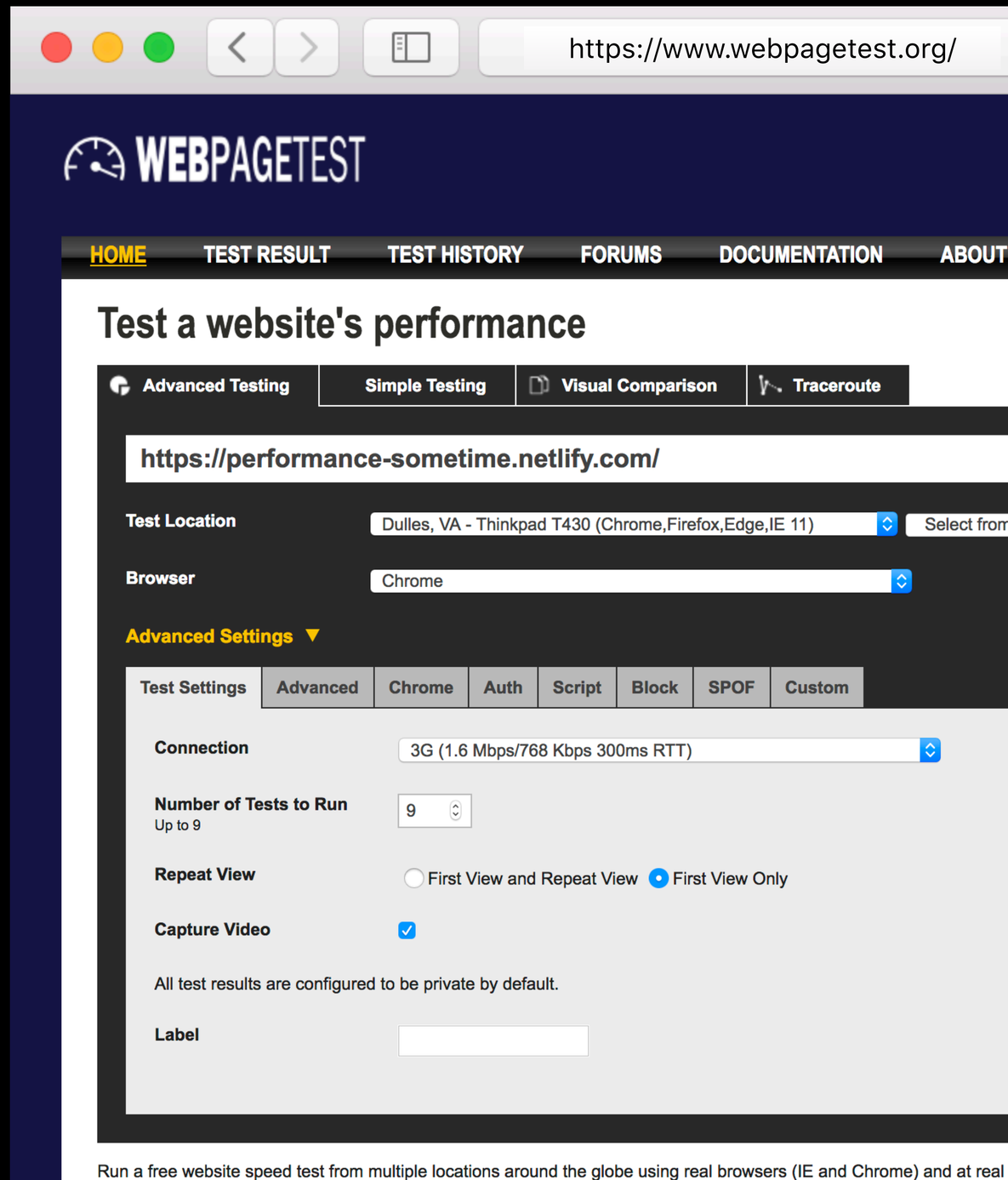
26.2 KB SERIF BOLD

ALL DEMOS ON GITHUB

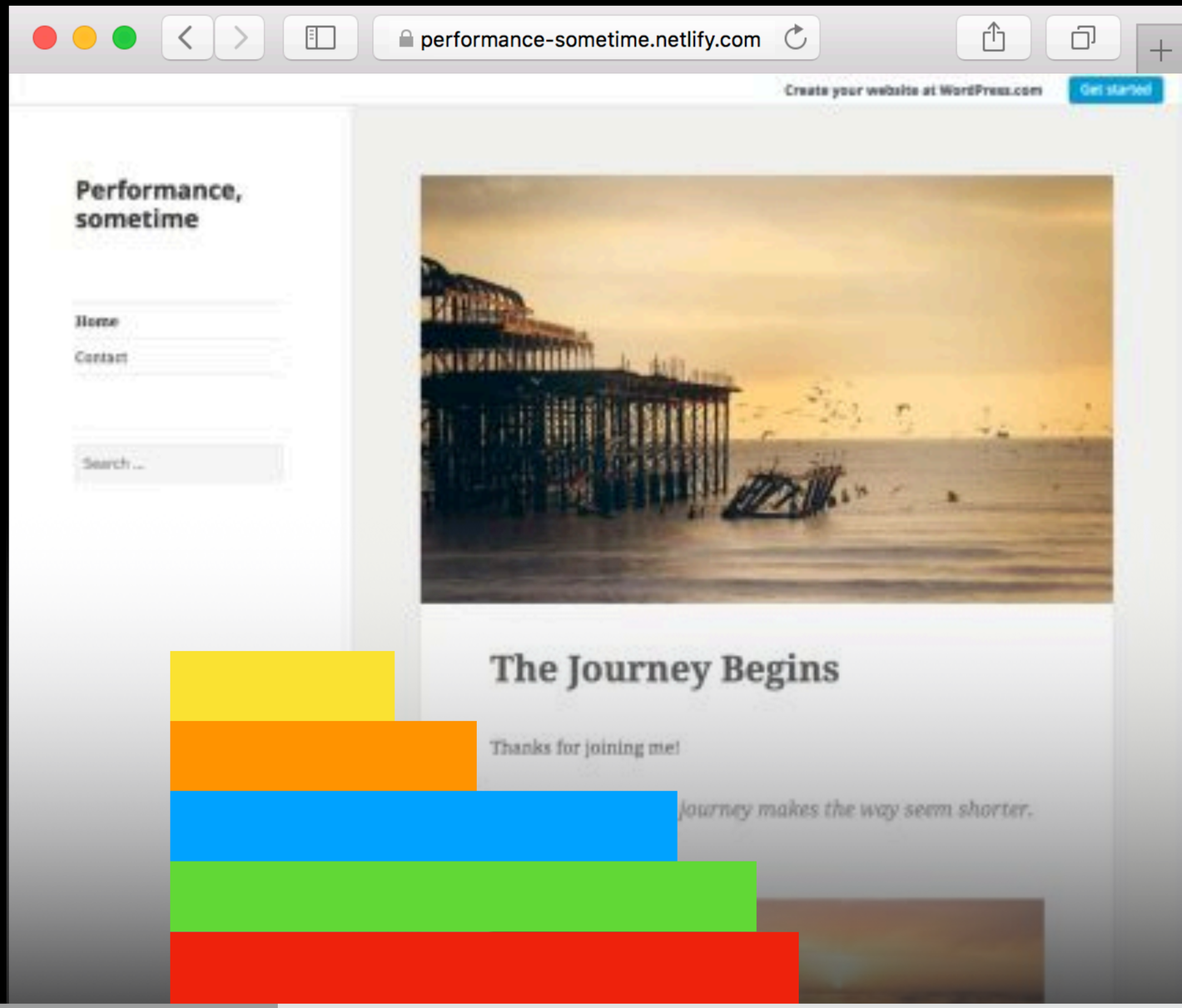
https://github.com/zachleat/performance-sometime

METHODOLOGY

3G NETWORK SPEED
HTTP/2 AND HTTPS
CHROME & WOFF2
ONLY FONT OPTIMIZATIONS



THE DEFAULT WORDPRESS SITE



SERIF
SANS-SERIF BOLD
SERIF BOLD
SERIF ITALIC
SANS-SERIF

first render 3.3s

visually complete 5.7s

OUR OPPONENTS:

OUR OPPONENTS:
INVISIBLE TEXT

FOIT

T-Mobile
12:06 PM
100%
slate.com
Mitt Romney Is Officially Running for President
By Betsy Woodruff
https://twitter.com/jmuspratt/status/561239961924403200

OUR OPPONENTS:
INVISIBLE TEXT
TEXT IN MOTION

FOUT

PERFORMANCE METRICS

CRITICAL REQUEST CHAINS

DOMCONTENTLOADED

FIRST CONTENTFUL PAINT

FIRST PAINT

VISUALLY COMPLETE

SPEED INDEX

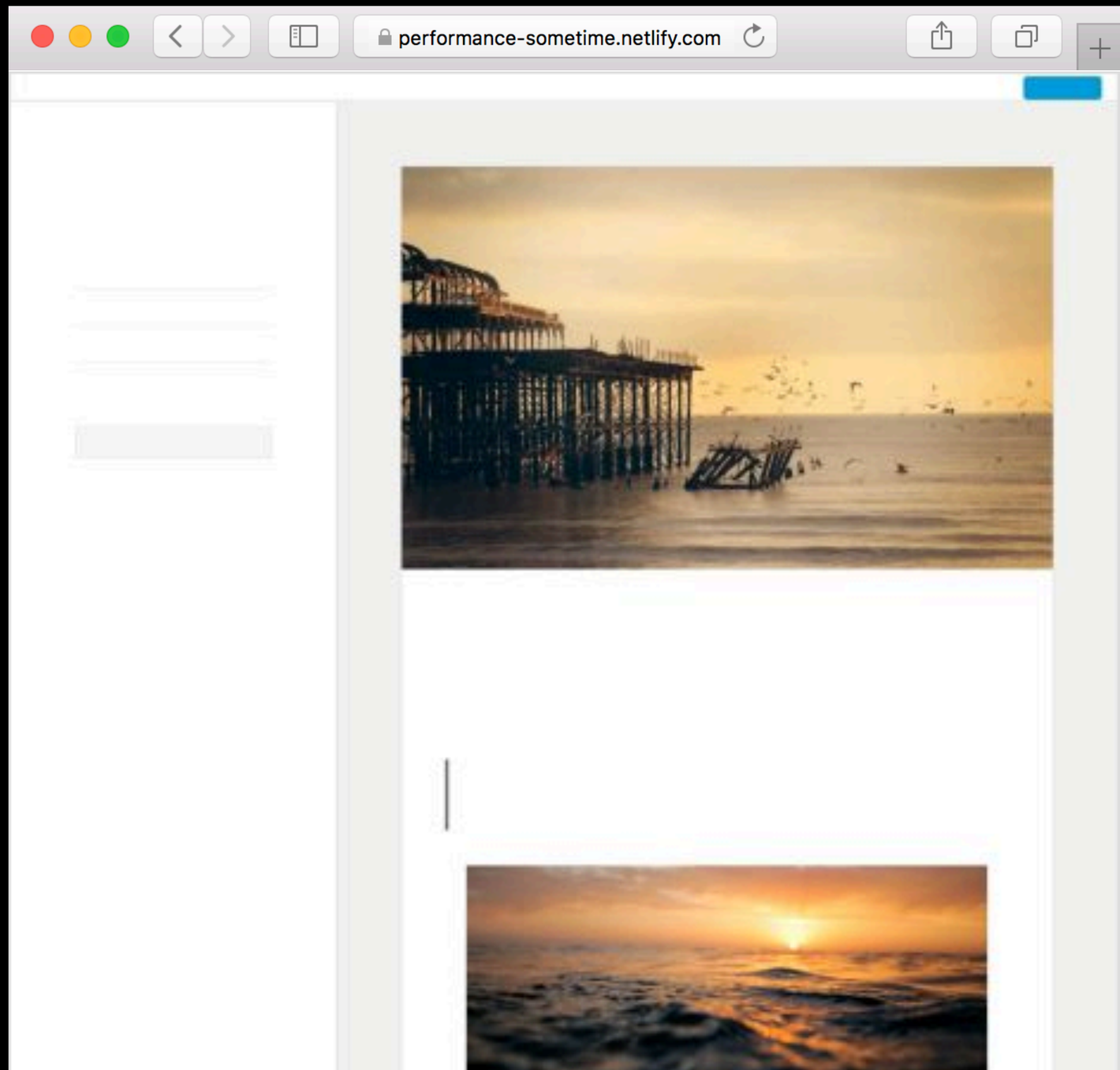
FIRST RENDER

ONLOAD

CPU IDLE

TIME TO INTERACTIVE

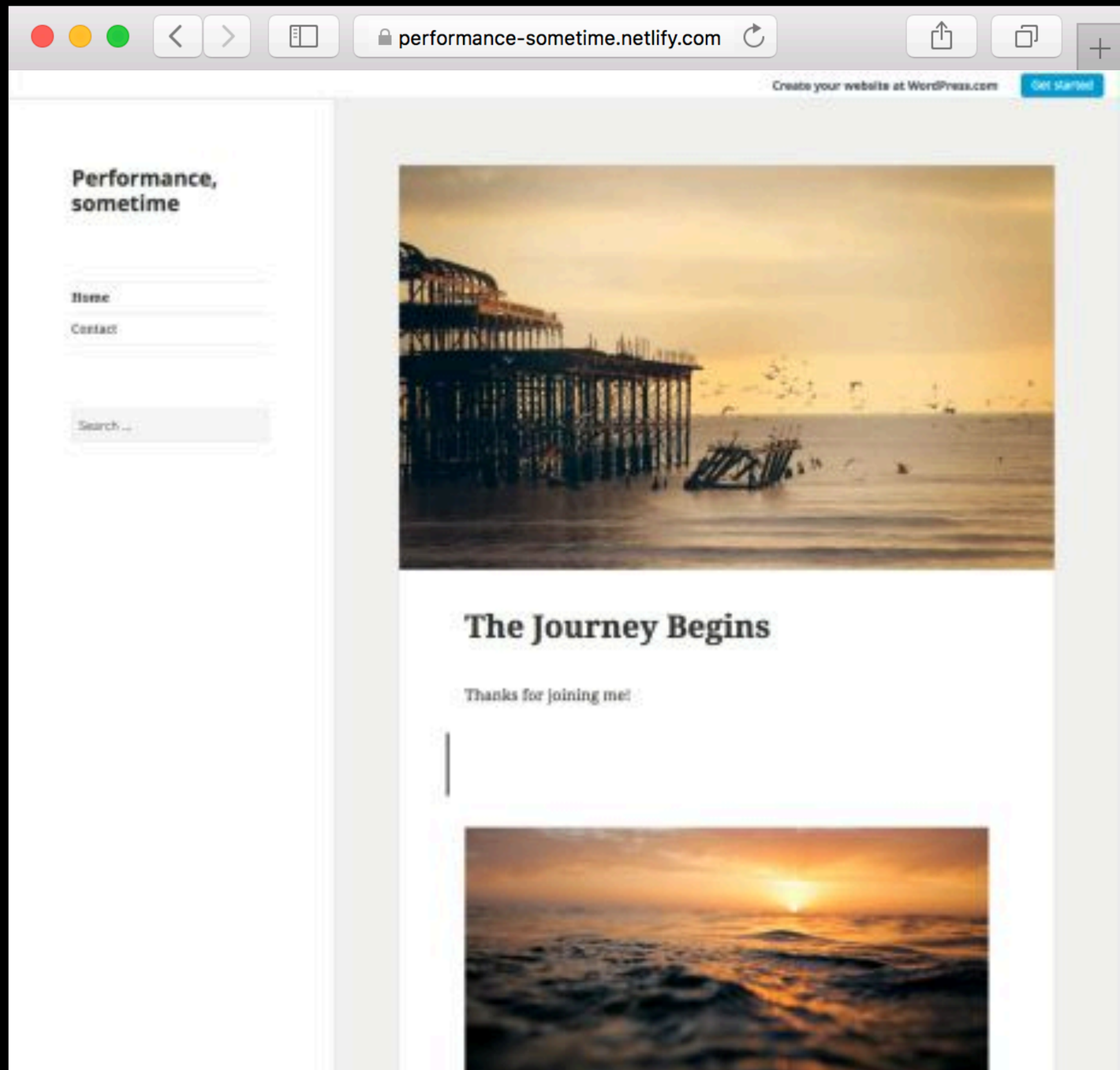
FIRST RENDER
FIRST CONTENTFUL PAINT



FIRST MEANINGFUL PAINT

FINALLY A METRIC THAT PROPERLY ACCOUNTS FOR WEB FONTS 🎉

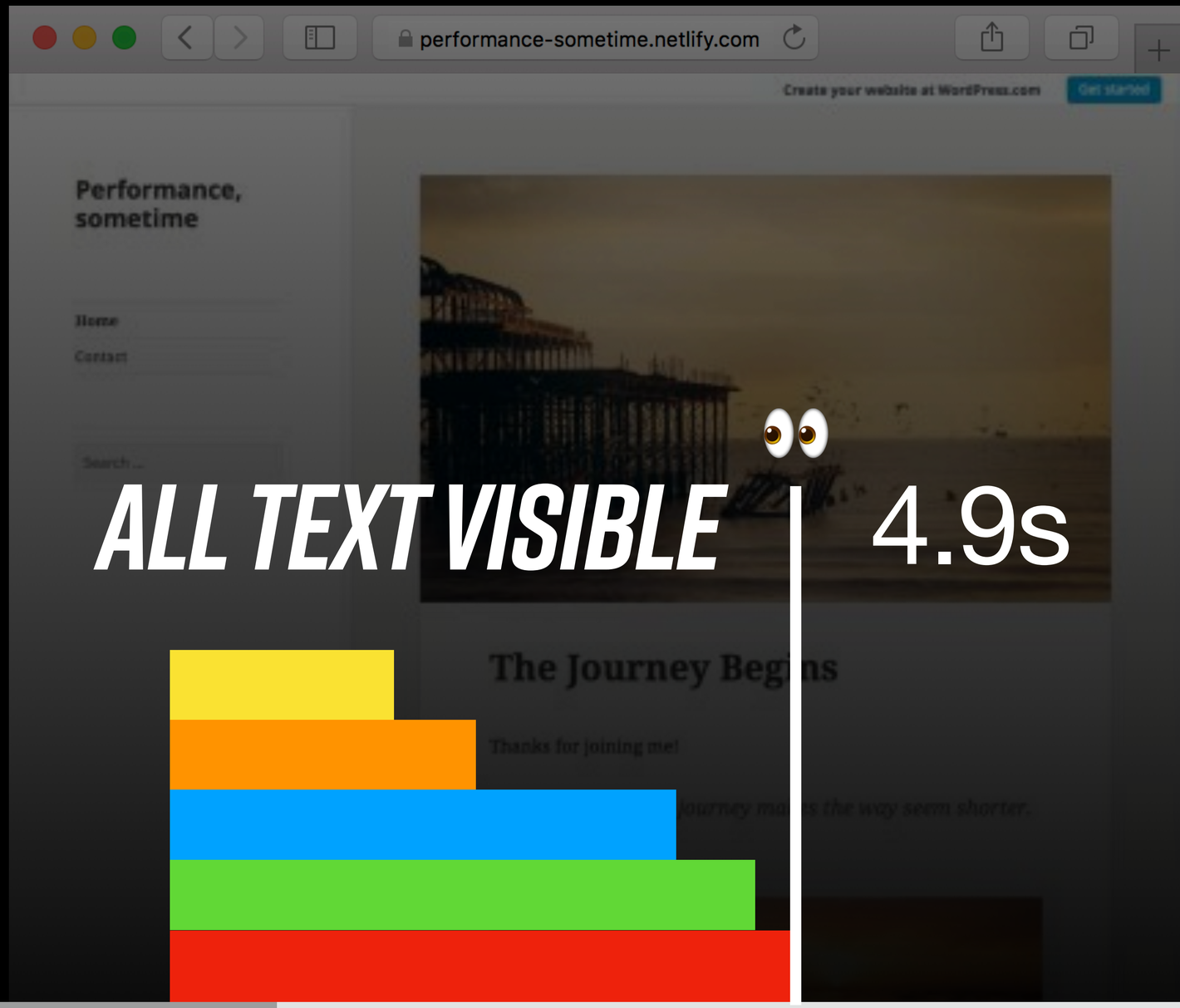
MEASURE USING LIGHTHOUSE



OPPONENTS:
INVISIBLE TEXT
TEXT IN MOTION

NEW METRIC:
ALL TEXT VISIBLE

THE DEFAULT WORDPRESS SITE



first render 3.3s

visually complete 5.7s

OPPONENTS:
INVISIBLE TEXT
TEXT IN MOTION

NEW METRIC:
WEB FONT REFLOW COUNT

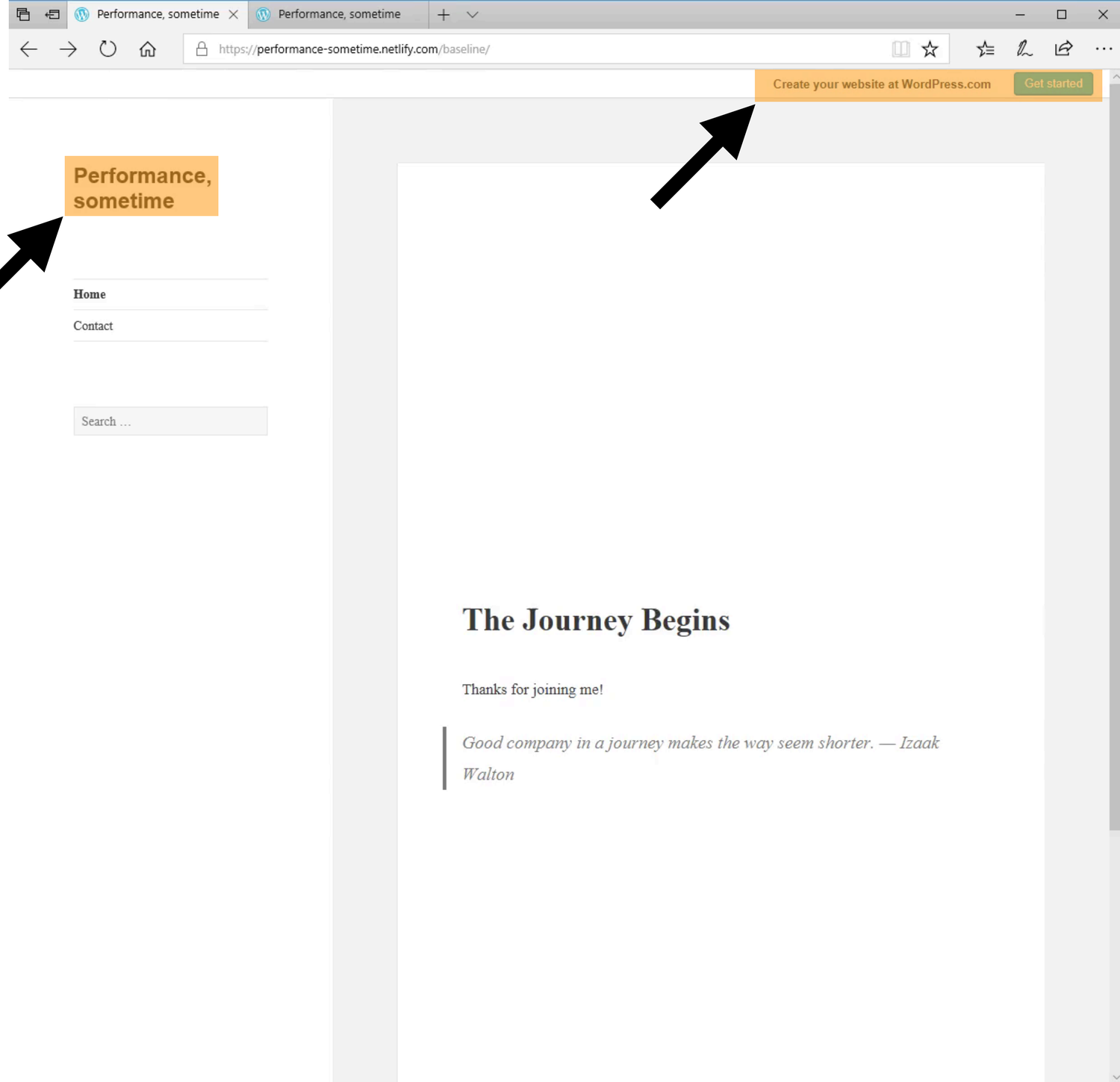
* AFTER FIRST RENDER

REFLOW
COUNTER

0

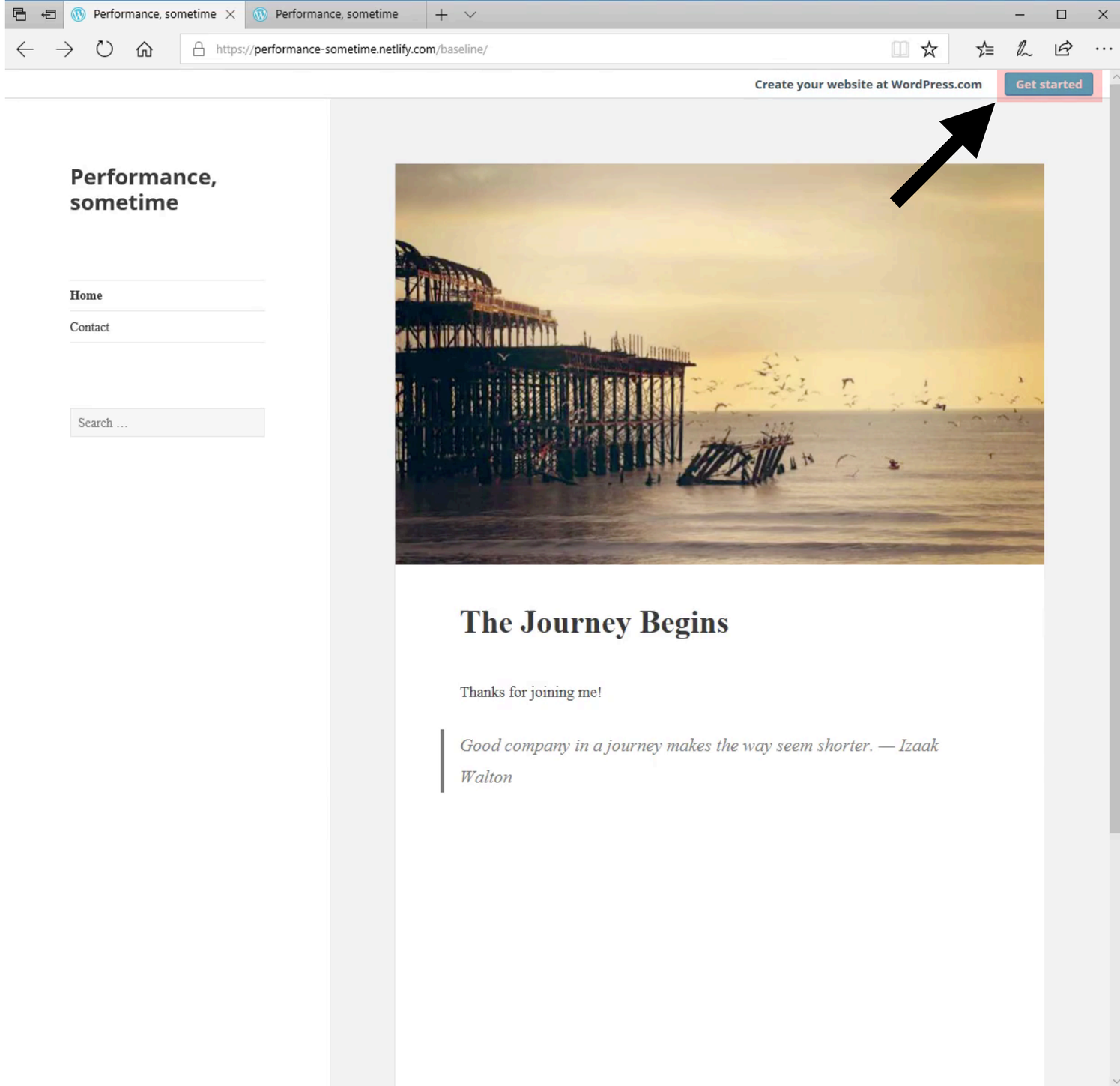
REFLOW COUNTER

1



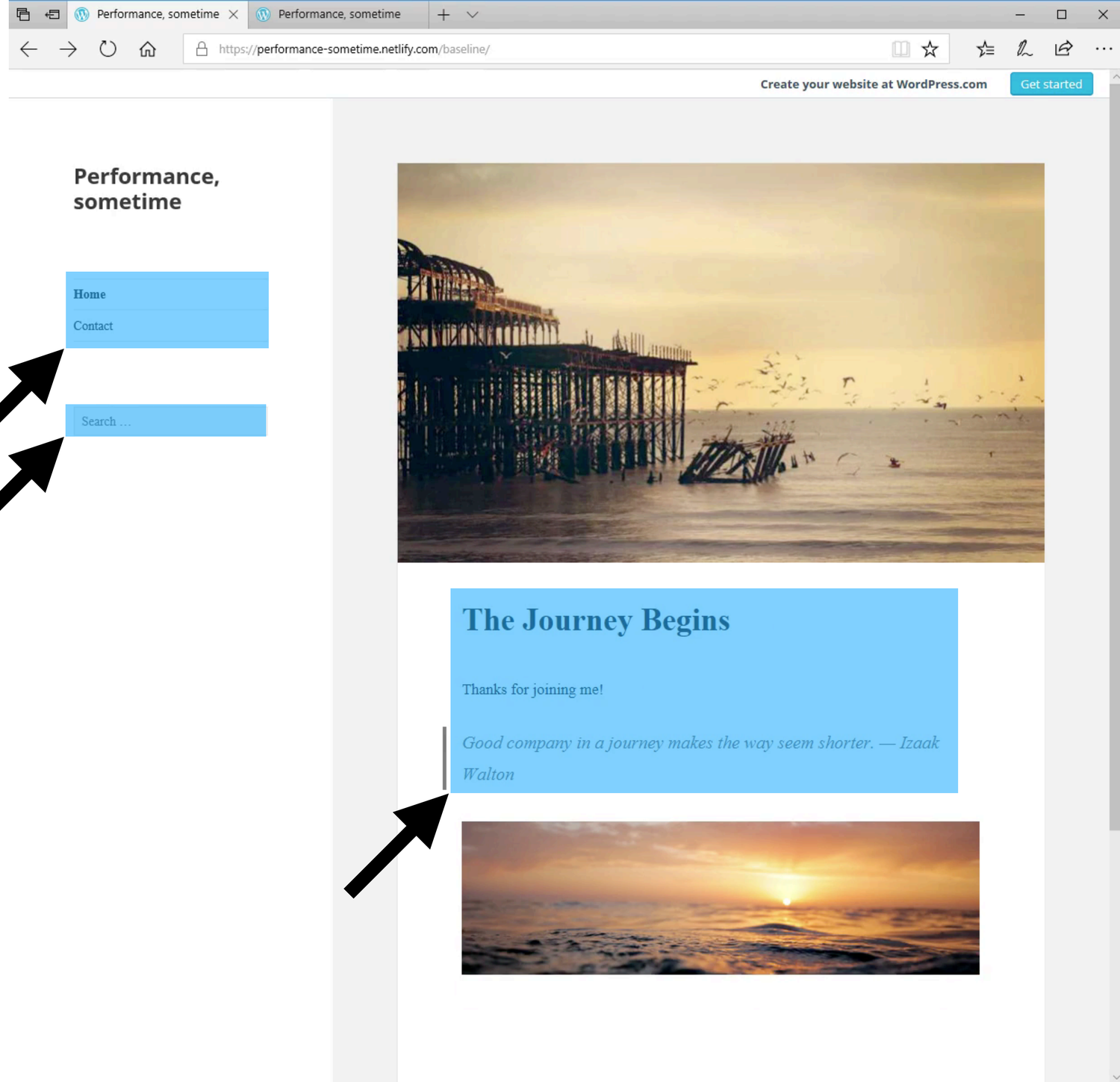
REFLOW COUNTER

2



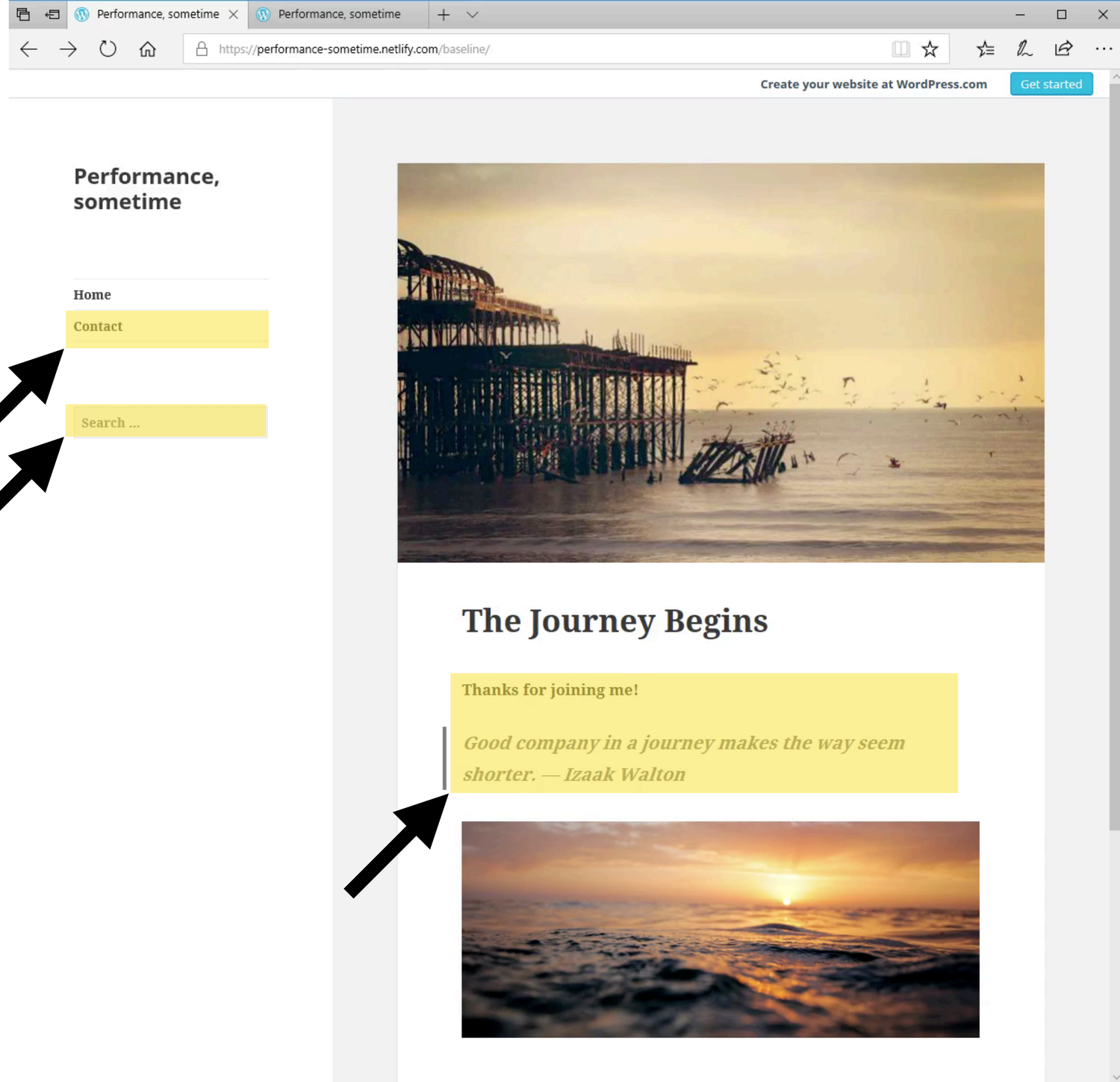
REFLOW COUNTER

3



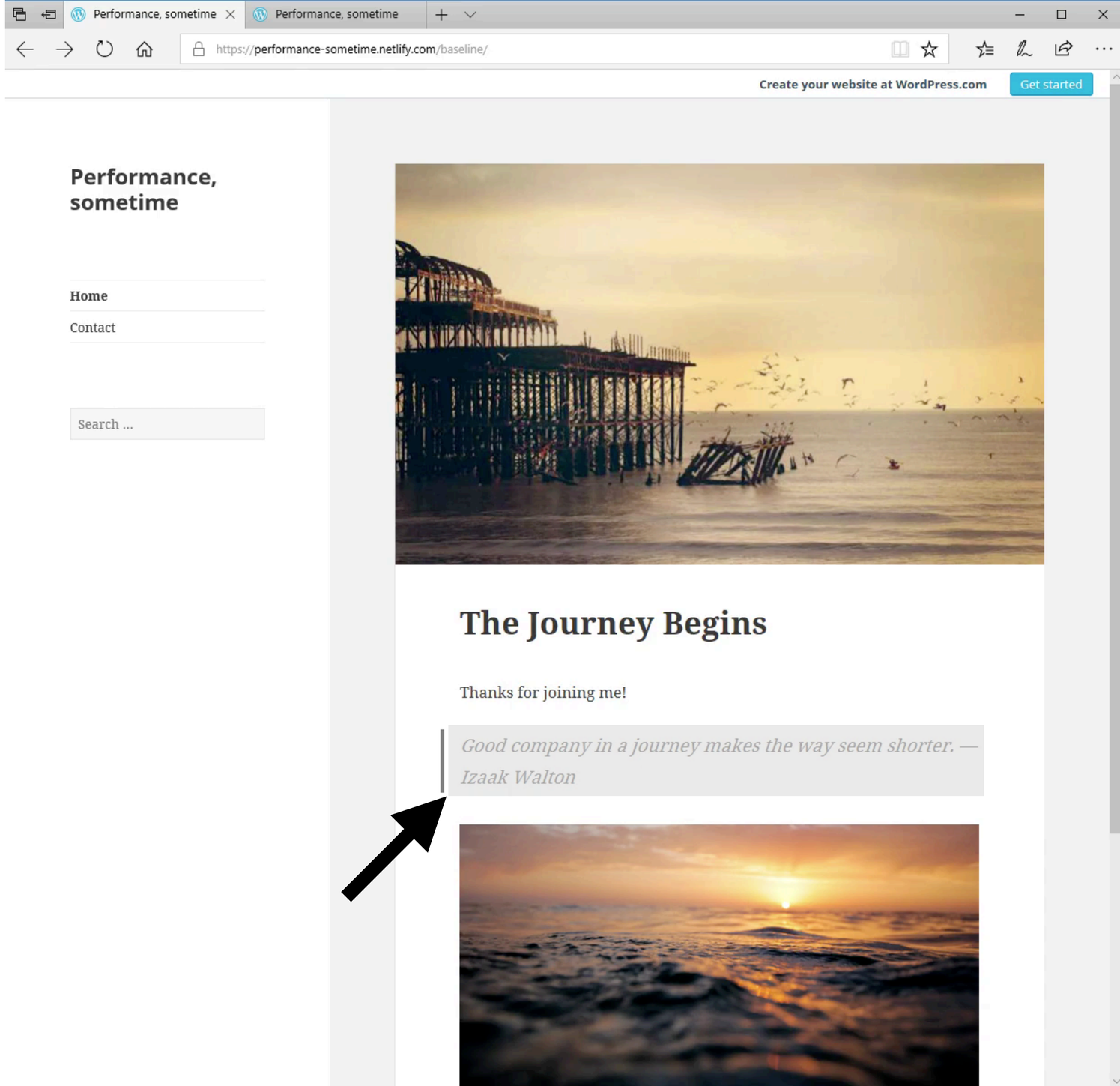
REFLOW COUNTER

4



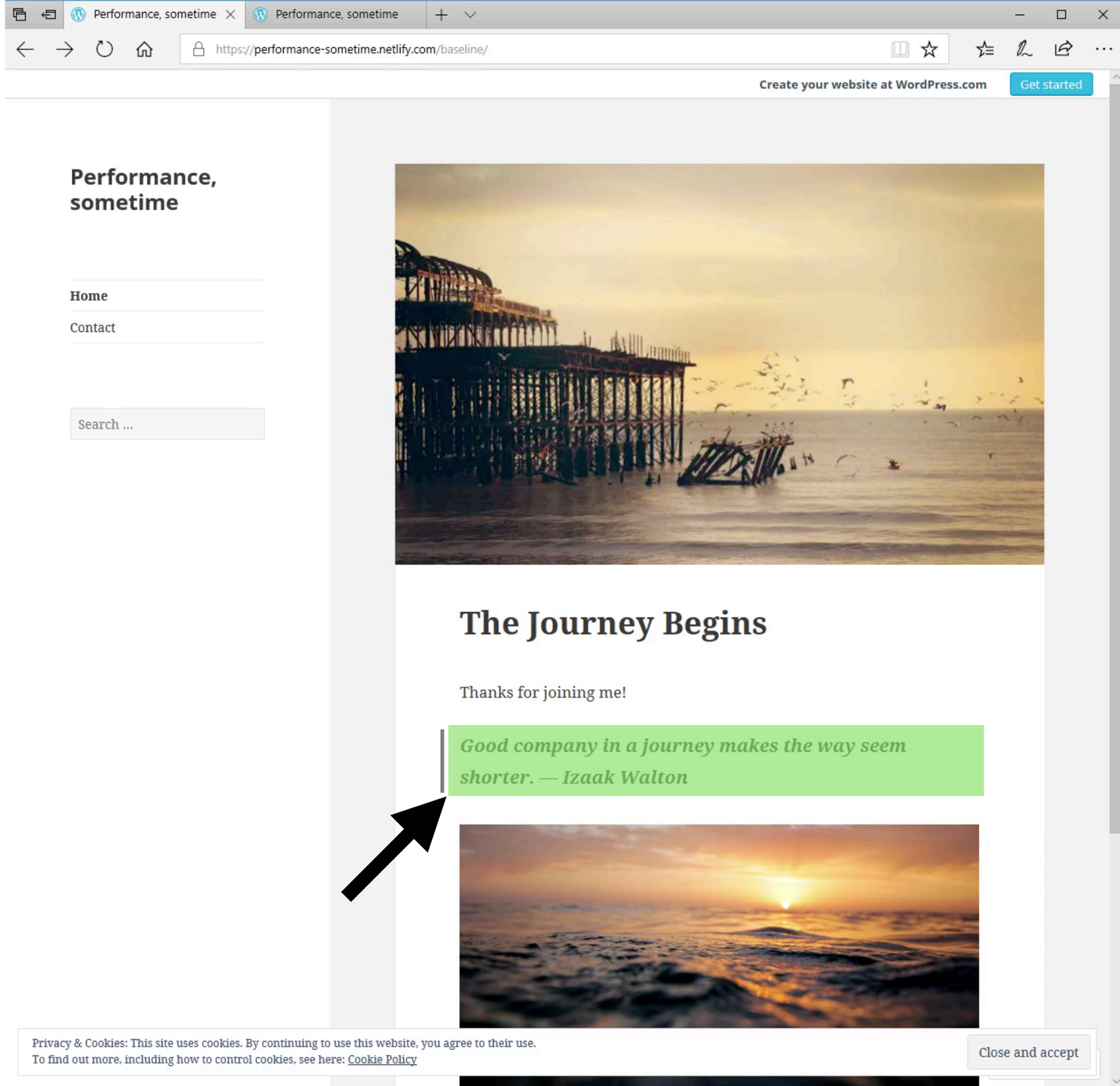
REFLOW COUNTER

5

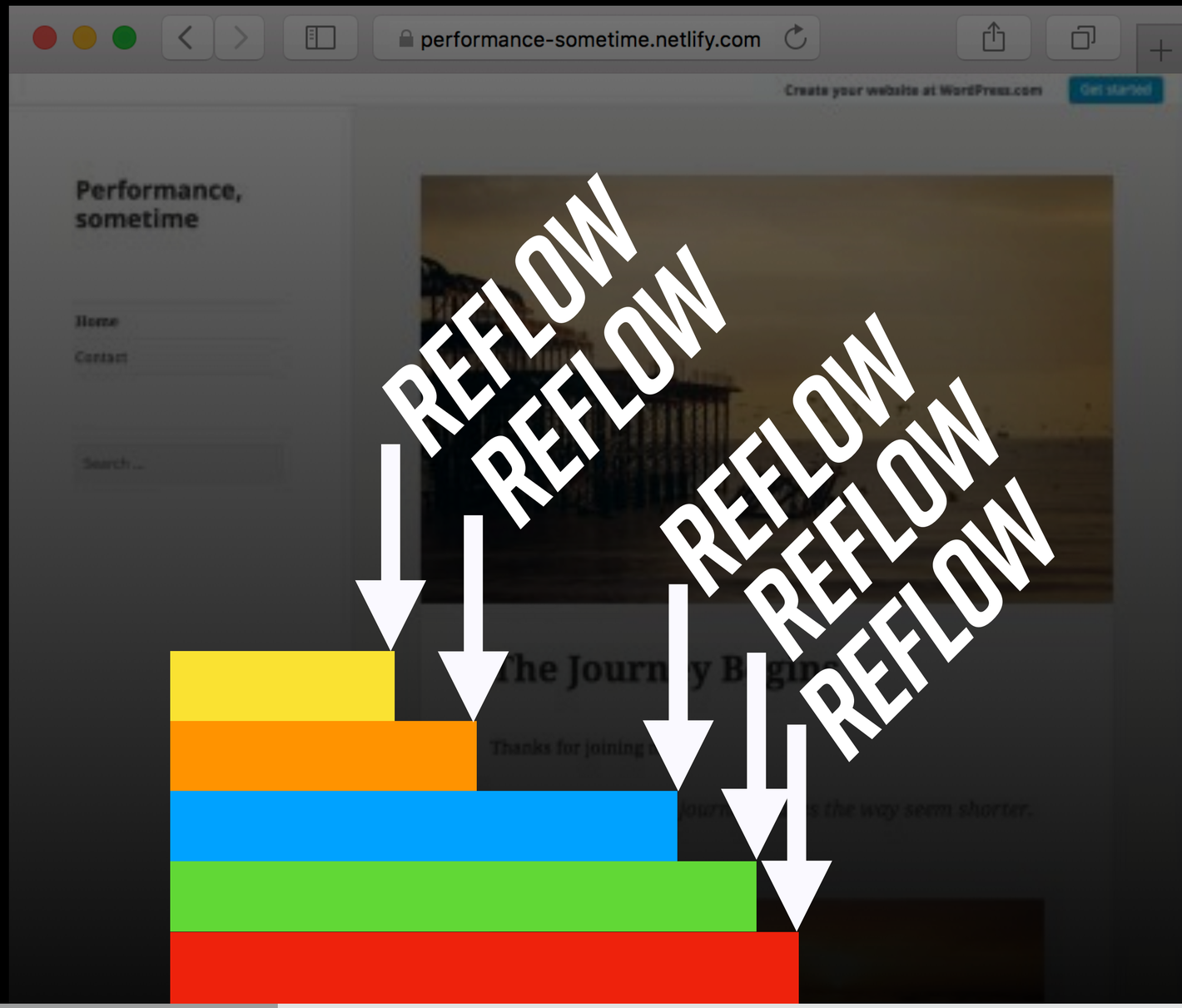


REFLOW COUNTER

6



THE DEFAULT WORDPRESS SITE



first render 3.3s

visually complete 5.7s

OUR METRICS:

ALL TEXT VISIBLE

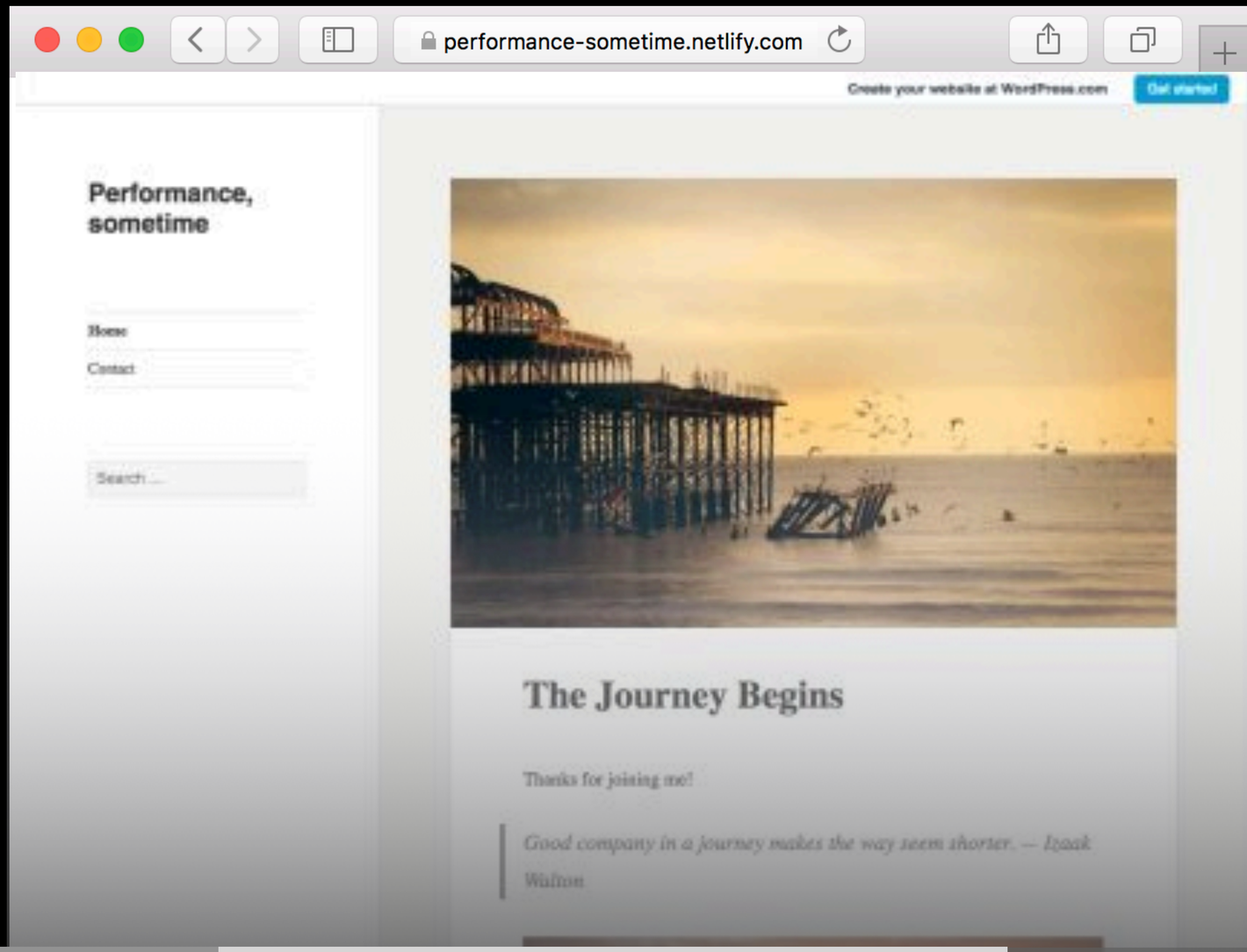
WEB FONT REFLOW COUNT

YYYYY

YYYYY

“WEB-SAFE”/SYSTEM/INSTALLED FONTS

SYSTEM FONTS



System Fonts:	▼ -6% 3.1s	▼ -10% 5.1s
Baseline:	first render 3.3s	visually complete 5.7s

YYYYY

SYSTEM FONTS

NO NETWORK REQUESTS
INSTANT RENDERING

THANK YOU

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Crayola
Preferred by Teachers!
Made With Solar Power!
CRAYONS
24
Nontoxic

Crayola
TM
MC
120
CRAYON
COLORS
120 DIFFERENT Colors
Bonus
Sharpener
Inside!
Nontoxic

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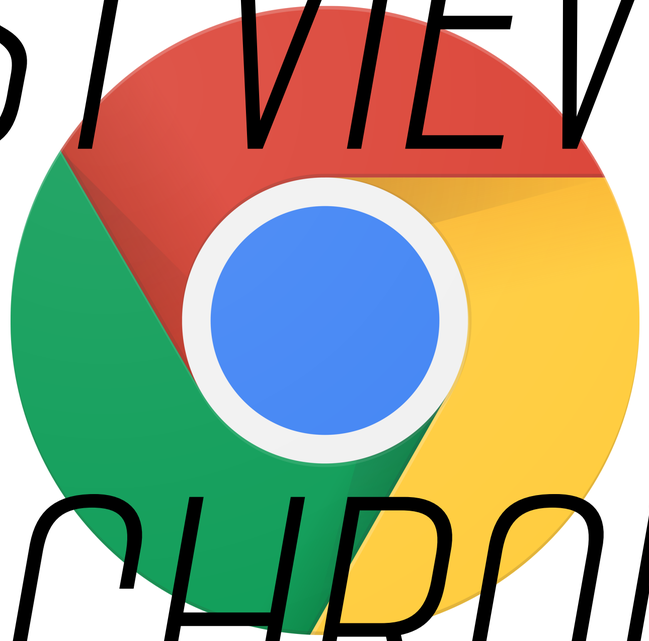
BEST VIEWED IN CHROME



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https://github.com/alrra/browser-logos

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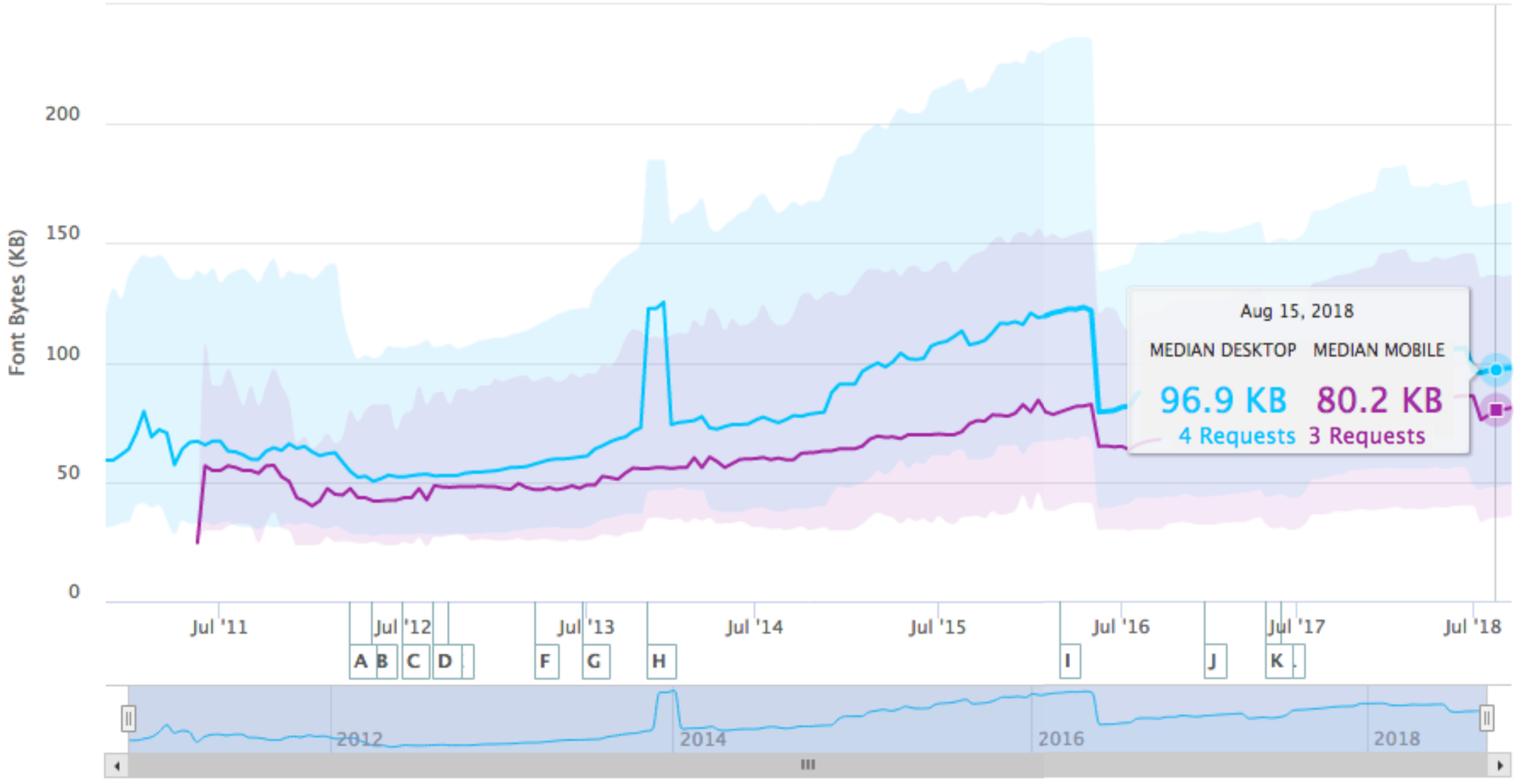
http archive

Timeseries of Font Bytes

Source: httparchive.org

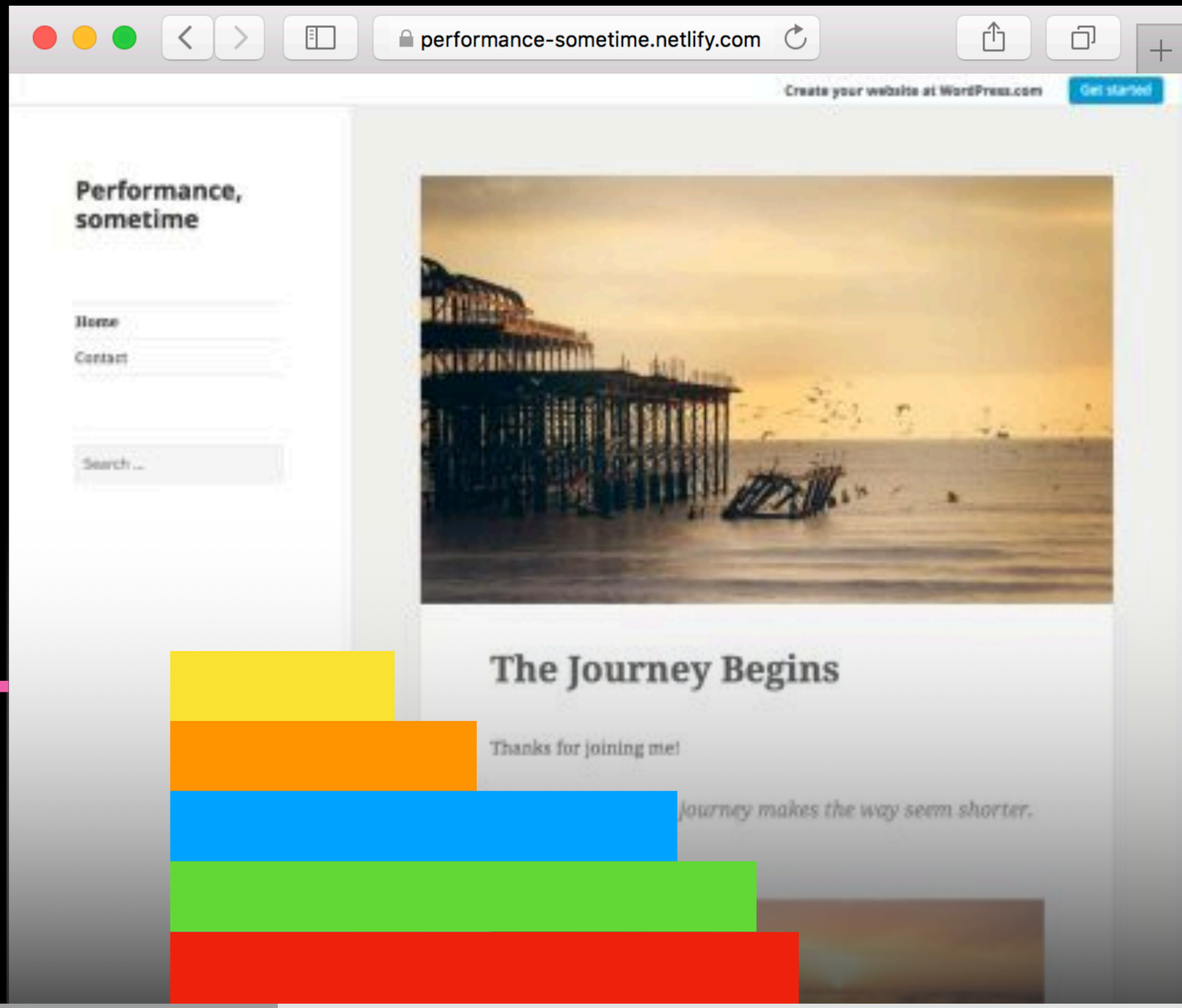
Zoom 1m 3m 6m YTD 1y All

From Nov 15, 2010 To Sep 15, 2018



@za

THE DEFAULT WORDPRESS SITE



first render 3.3s

visually complete 5.7s

Google Fonts

OUR TOOLS:

~~WOFF2~~
PRECONNECT
SELF HOSTING
SHARDING 😱

FONT-DISPLAY
PRELOAD
CSS FONT LOADING API
~~SUBSETTING~~
VARIABLE FONTS

WYNY

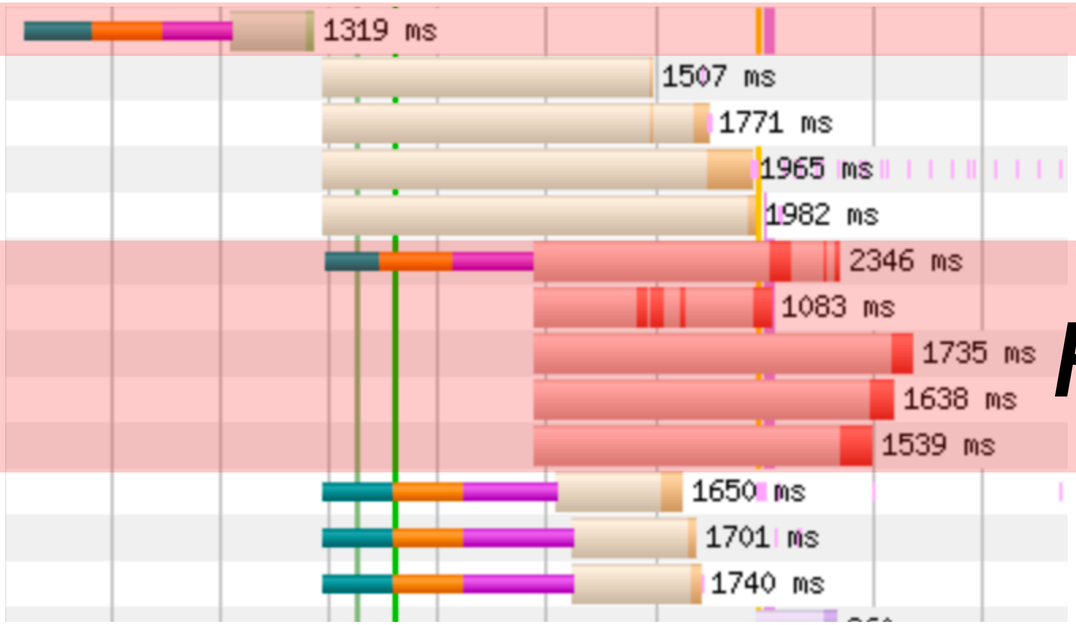
PRECONNECT

```
<link rel='preconnect'
      href='https://fonts.gstatic.com'
      crossorigin>
```

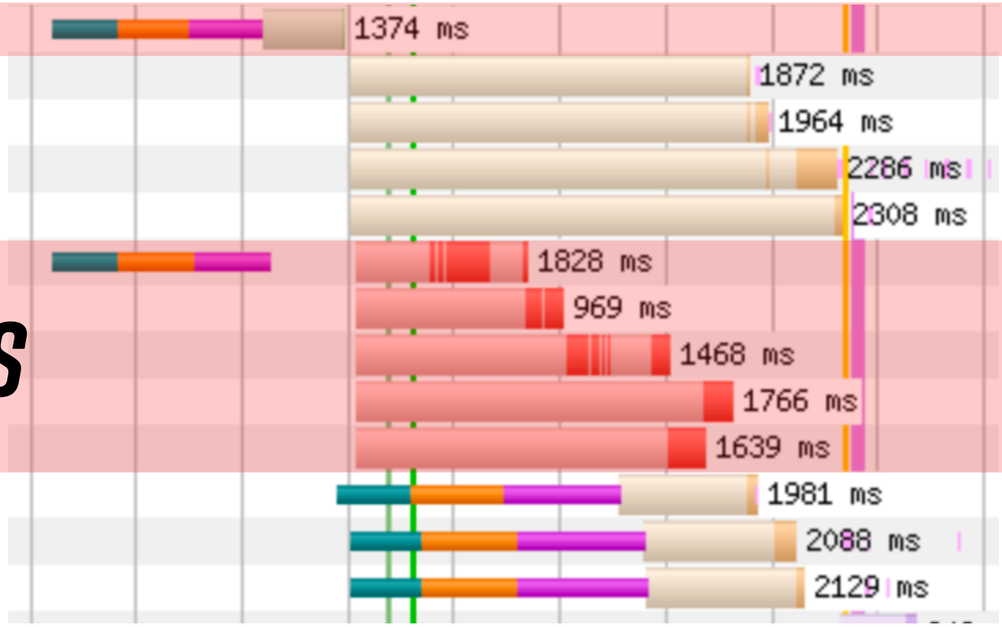
```
<!-- CSS -->
<link rel='dns-prefetch' href='//fonts.googleapis.com'>

<!-- Fonts -->
<link rel='preconnect' href='https://fonts.gstatic.com' crossorigin>

<link rel='alternate' …>
<link rel='alternate' …>
<script>…</script>
<script>…</script>
<style>…</style>
<link rel='stylesheet' …>

<link rel='stylesheet' href='
  https://fonts.googleapis.com/css?family=
  Noto Sans:400italic,700italic,400,700|
  Noto Serif:400italic,700italic,400,700|
  Inconsolata:400,700&subset=latin,latin-ext'>
```

PRECONNECT 🎉

WITHOUT



WITH



CSS

FONTS

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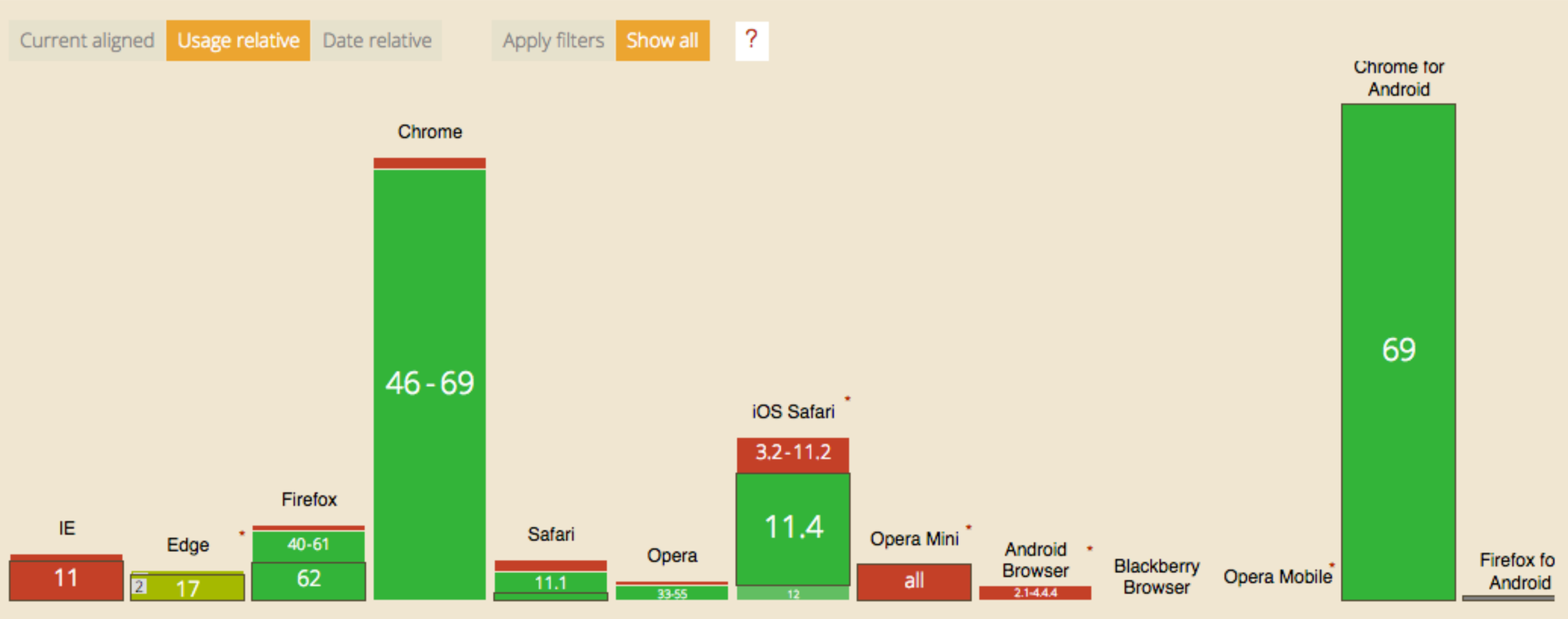
PRECONNECT BROWSER SUPPORT



Can I use _____ ?

https://caniuse.com/#feat=link-rel-preconnect

PRECONNECT:

GREAT FOR CROSS-ORIGIN FONT REQUESTS

OUR TOOLS:

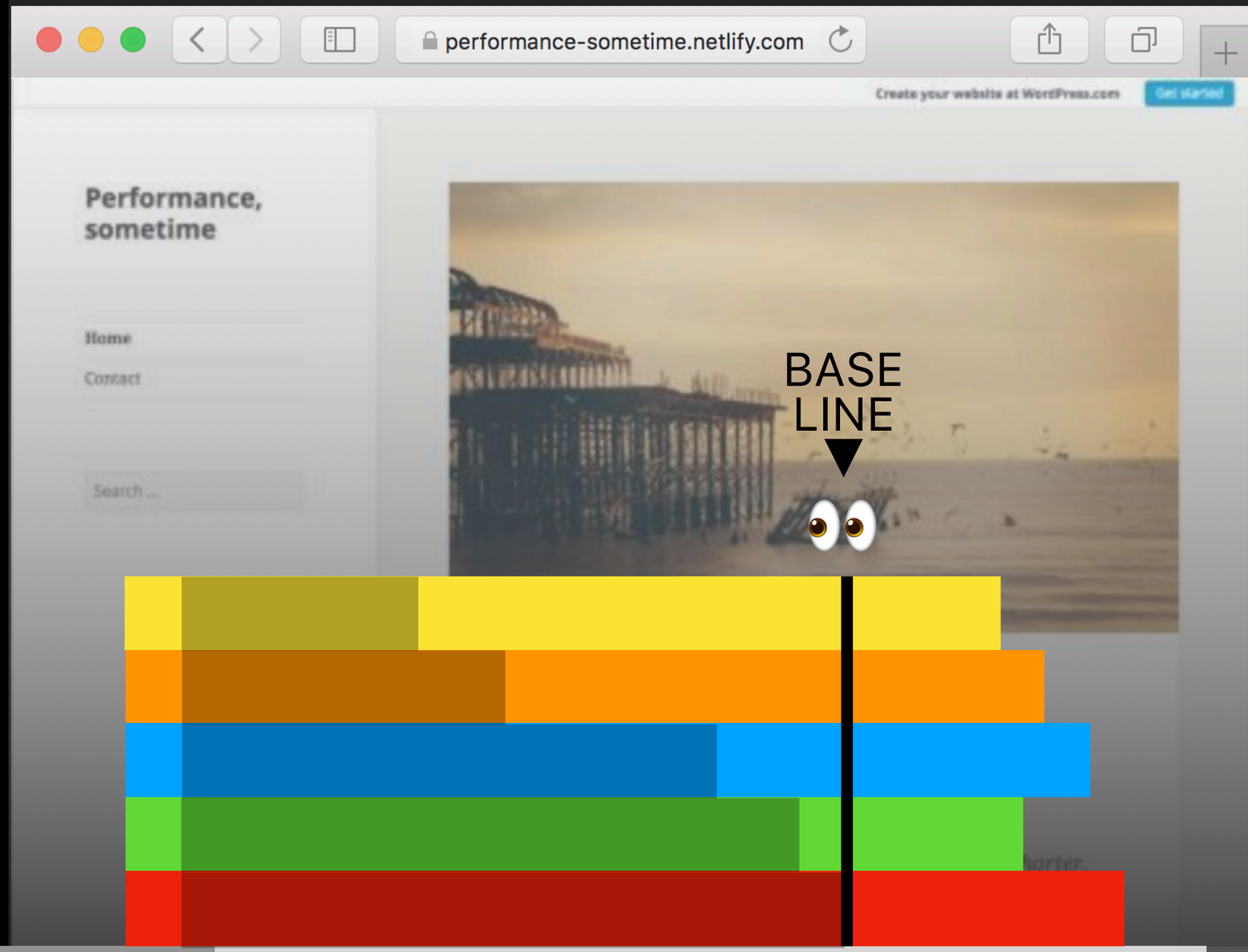
~~WOFF2~~
~~PRECONNECT~~
SELF HOSTING
SHARDING 😱

FONT-DISPLAY
PRELOAD
CSS FONT LOADING API
~~SUBSETTING~~
VARIABLE FONTS

YYYYY

THIRD PARTY ▸ SELF HOSTING

SELF HOSTING



Self Hosting:	▼ -6% 3.1s	▼ -1% 5.6s
Baseline:	first render 3.3s	visually complete 5.7s

WHAT HAPPENED?

SUPER LONG TTFB'S
NETWORK CONGESTION
BAD HTTP/2 PRIORITIZATION

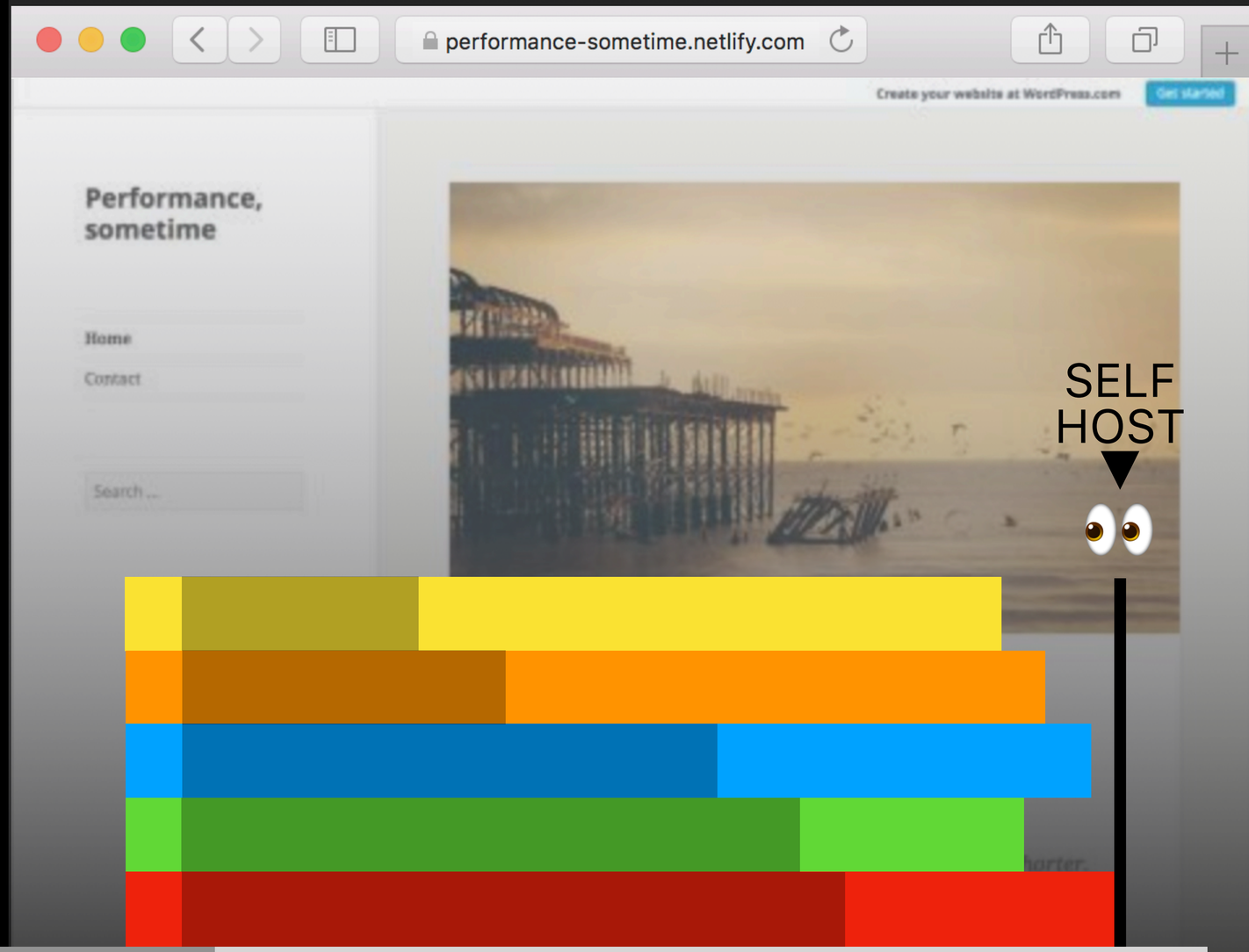
Patrick Meenan
@patmeenan

Read more:
https://blog.cloudflare.com/http-2-prioritization-with-nginx/

```
@font-face {
  src: url(notosans.woff2) format('woff2');
}
```

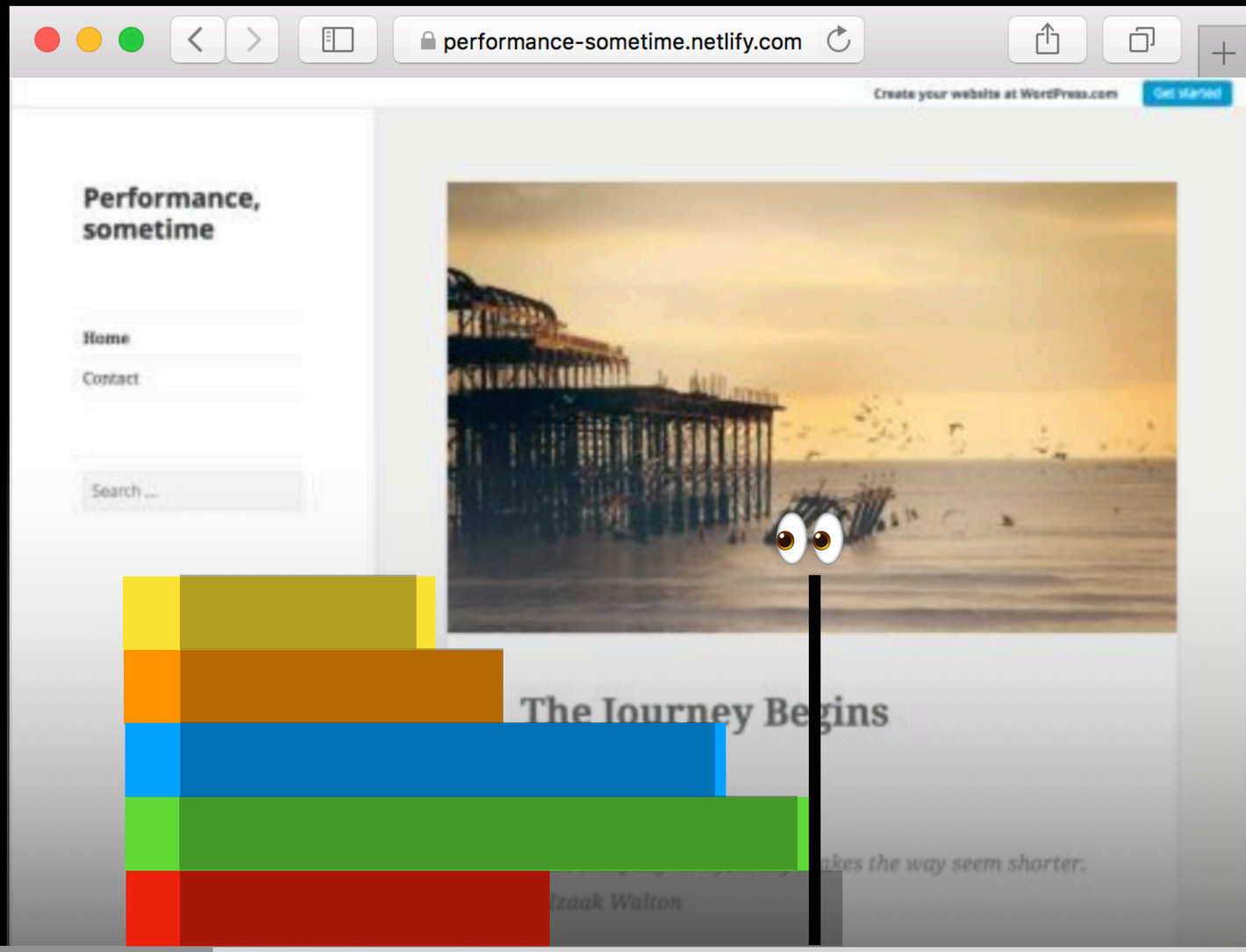
```
@font-face {
  src: url(https://performance-sometime-
assets.netlify.com/notosans.woff2) format('woff2');
}
```

SELF HOSTING



Self Hosting:	▼ -6% 3.1s	▼ -1% 5.6s
Baseline:	first render 3.3s	visually complete 5.7s

SELF HOSTING
WITH A BIT OF **SHARDING**
USING **PRECONNECT**



Self Host & Shard:	▼ -6% 3.1s		5.7s
Baseline:	first render 3.3s		visually complete 5.7s

***DON’T DO THIS, PROBABLY

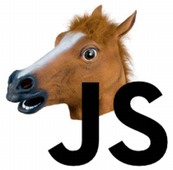
SHARDING IS AN ANTI-PATTERN ON HTTP/2

“ONE PERSON’S ANTI-PATTERN IS ANOTHER PERSON’S TREASURE -PATTERN”

WHY SELF HOST?

WHY SELF HOST?

HOLD YOUR HORSES



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OUR TOOLS:

~~WOFF2~~
~~PRECONNECT~~
~~SELF HOSTING~~
~~SHARDING~~ 😱

FONT-DISPLAY
PRELOAD
CSS FONT LOADING API
~~SUBSETTING~~
VARIABLE FONTS

YYYYY

FONT-DISPLAY

```
@font-face {
  font-display: swap;
}
```

SHOWS FALLBACK FONT IMMEDIATELY, RENDER WEB FONT WHENEVER

Monica Dinculescu
notwaldorf

Font-display

This is a small explainer that I built for a talk on web fonts and performance.

Before we talk about what `font-display` is, let's talk about the lifetime of a web font. For a super detailed explanation of where web fonts fit in the browser rendering process, Ilya Grigorik has an amazing blog post on web font optimization. But, if we're just trying to understand the basics, there are basically three parts to it:

Learn more:
https://font-display.glitch.me/

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```
@font-face {
  font-display: optional;
}
```

RENDER WEB FONT ONLY IF CACHED

Monica Dinculescu
notwaldorf

Font-display

This is a small explainer that I built for a talk on web fonts and performance.

Before we talk about what `font-display` is, let's talk about the lifetime of a web font. For a super detailed explanation of where web fonts fit in the browser rendering process, Ilya Grigorik has an amazing blog post on web font optimization. But, if we're just trying to understand the basics, there are basically three parts to it:

Learn more:
https://font-display.glitch.me/

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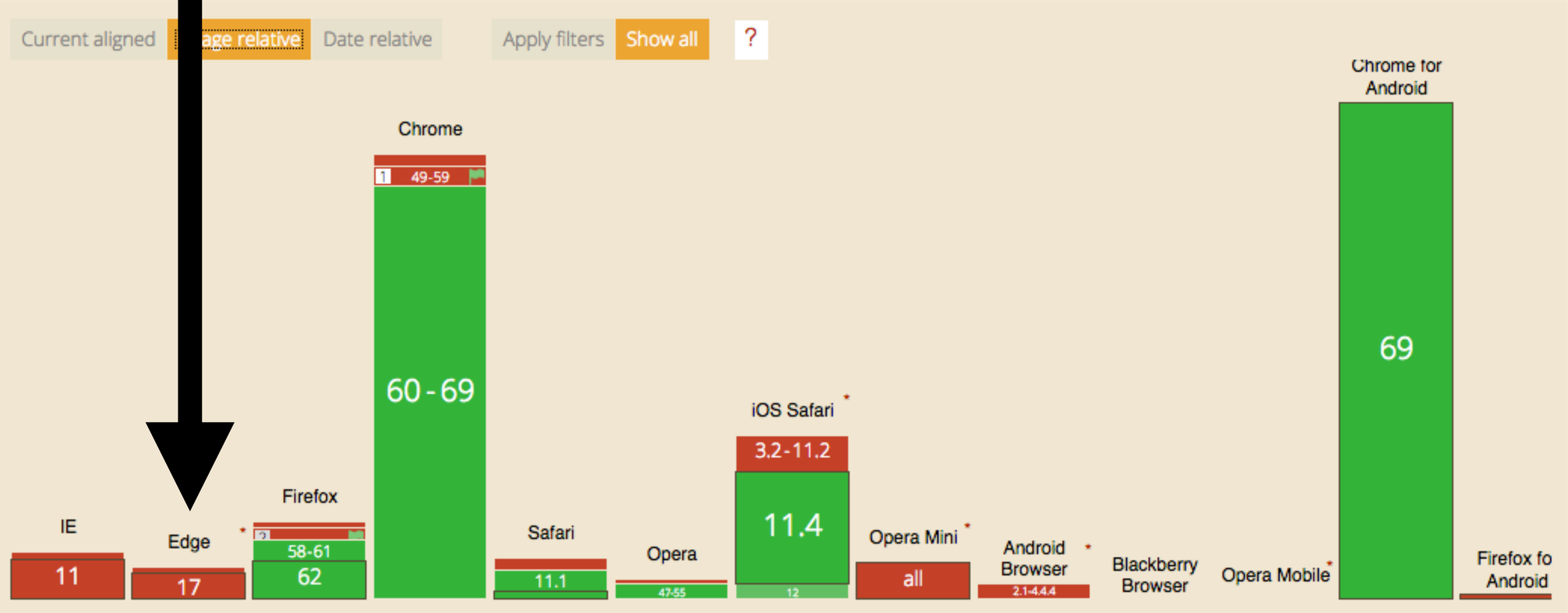
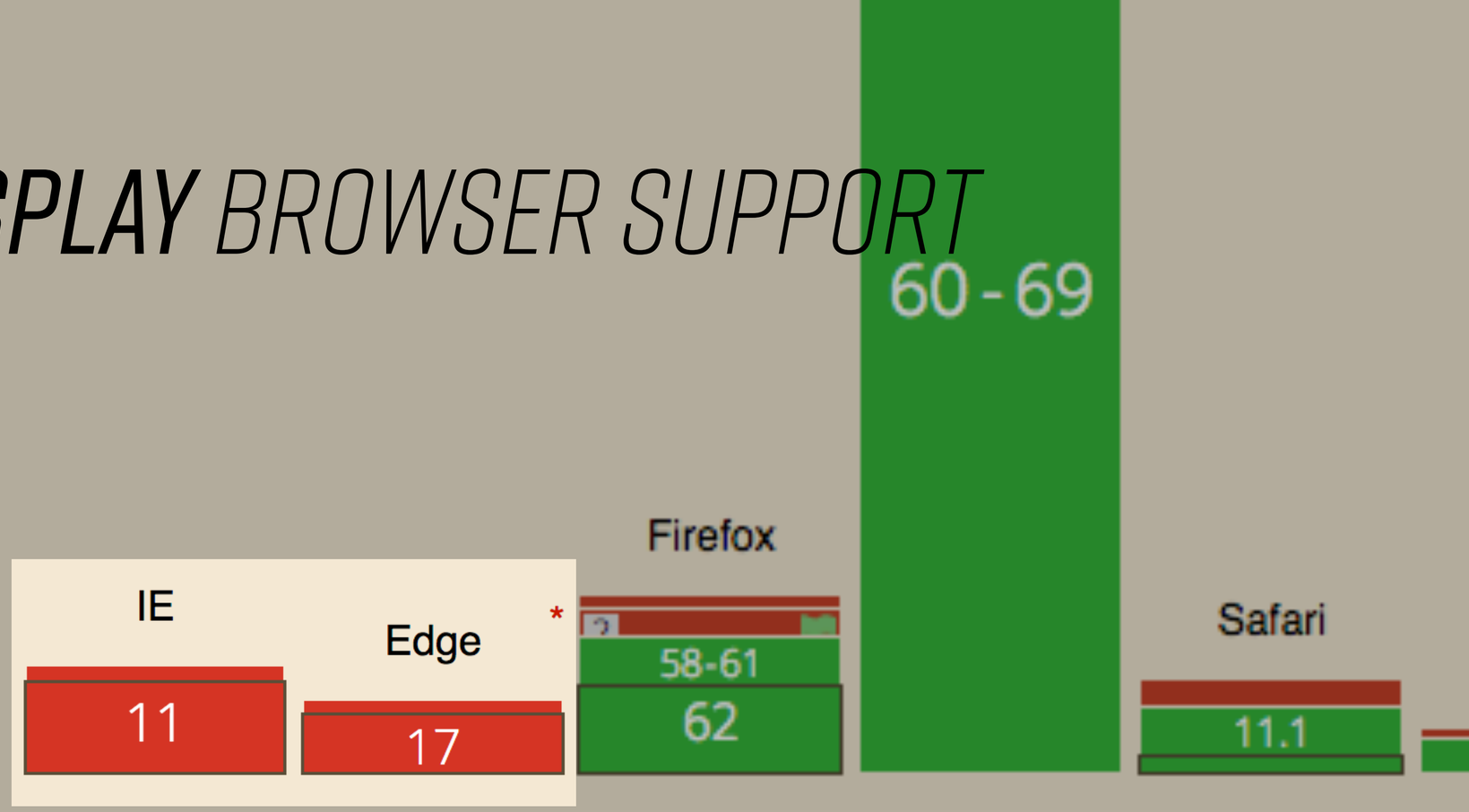
FONT-DISPLAY BROWSER SUPPORT



Can I use _____ ?

https://caniuse.com/#feat=css-font-rendering-controls

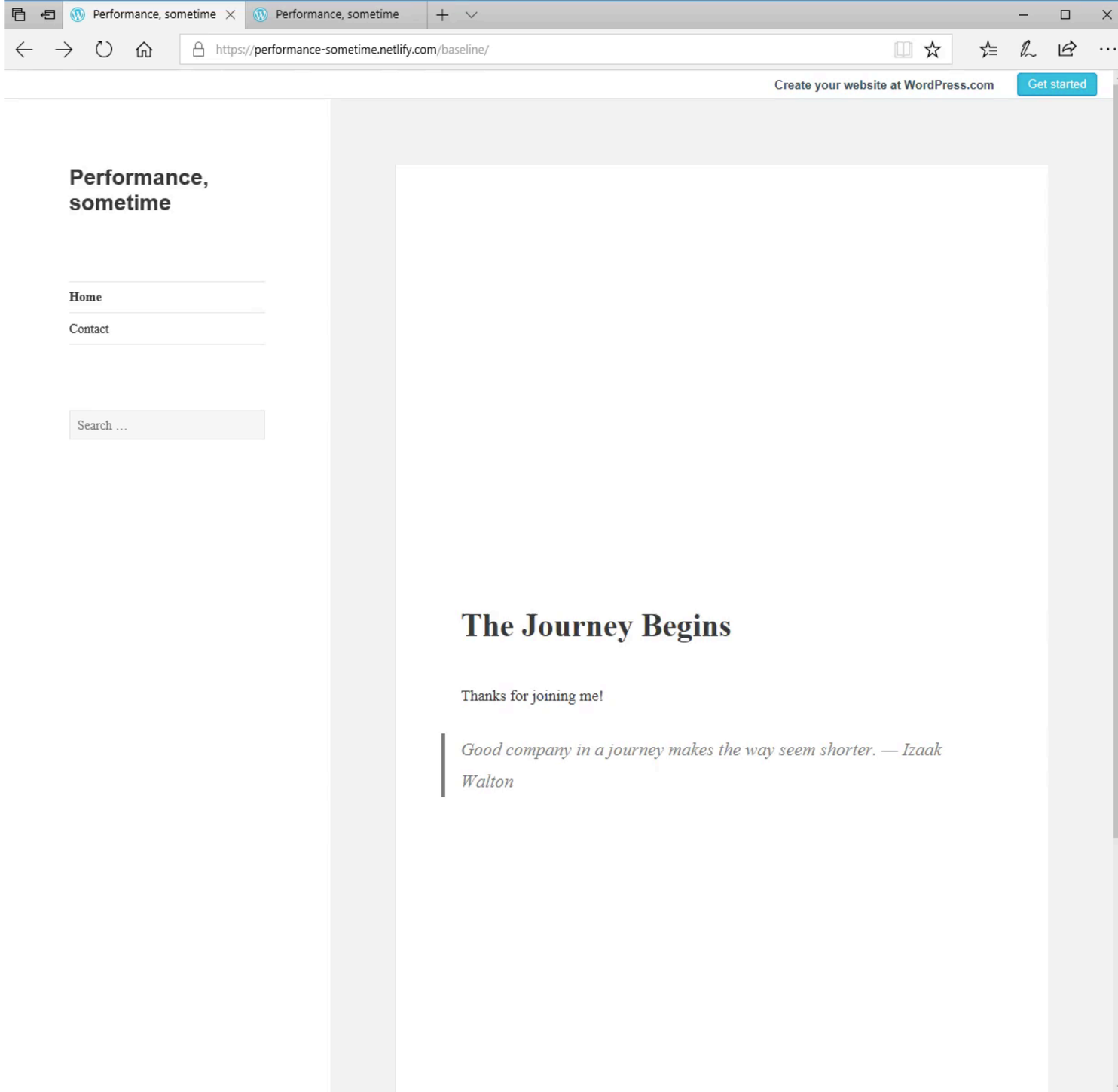
FONT-DISPLAY BROWSER SUPPORT



Can I use _____ ?

https://caniuse.com/#feat=css-font-rendering-controls

FONT-DISPLAY: SWAP
-ISH

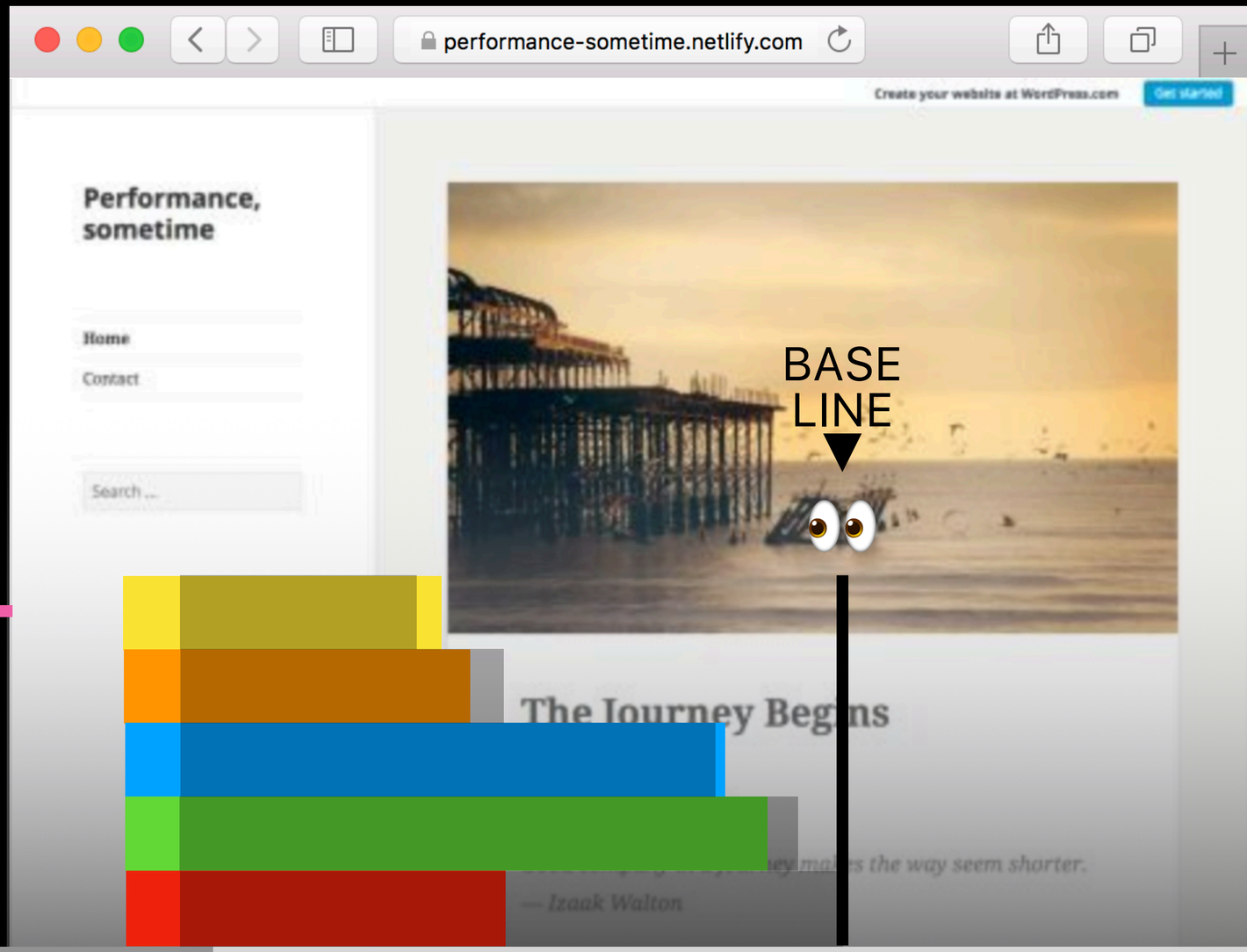


WE NO LONGER NEED ***JAVASCRIPT*** TO LOAD A WEB FONT

**WITH VISIBLE FALLBACK TEXT*

@zachleat

SELF HOSTING
WITH A BIT OF **SHARDING**
USING **PRECONNECT**
AND **FONT-DISPLAY**



New:	▼ -3% 3.2s	5.7s
Baseline:	first render 3.3s	visually complete 5.7s

OUR OPPONENTS:

~~INVISIBLE TEXT~~

TEXT IN MOTION

OUR TOOLS:

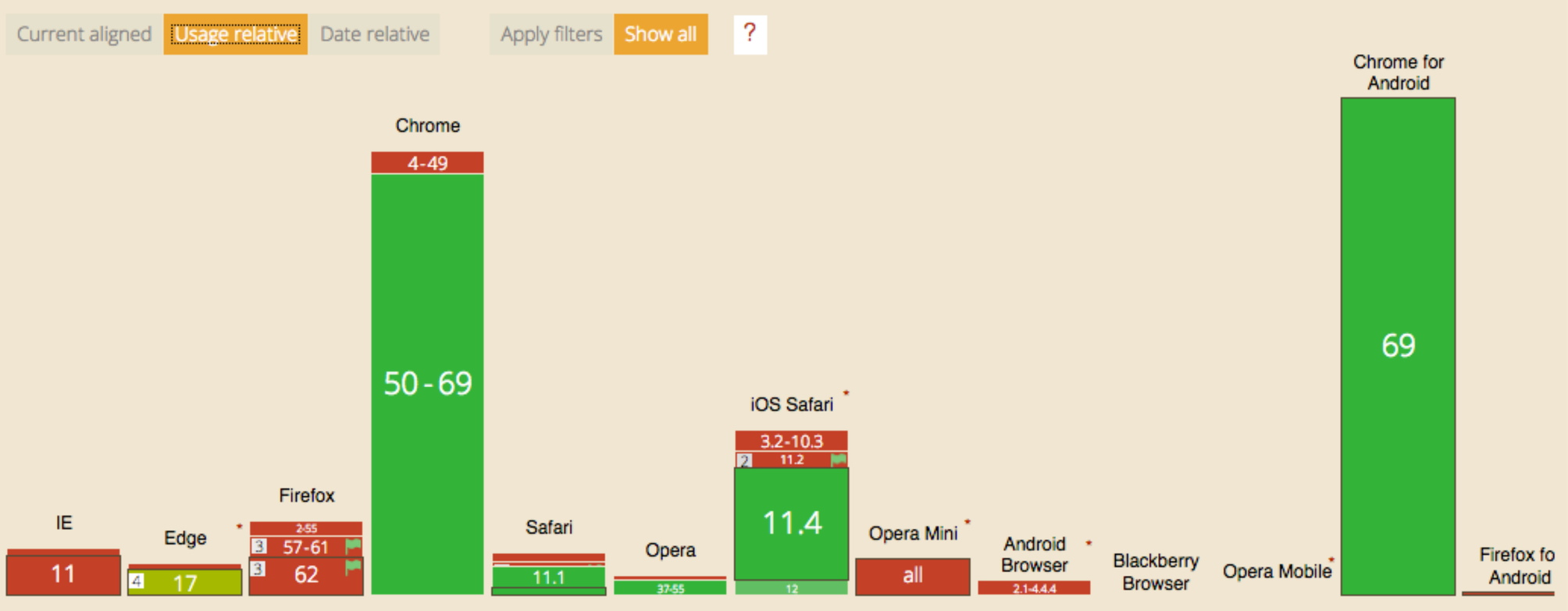
~~WOFF2~~
~~PRECONNECT~~
~~SELF HOSTING~~
~~SHARDING~~ 😱

~~FONT-DISPLAY~~
PRELOAD
CSS FONT LOADING API
~~SUBSETTING~~
VARIABLE FONTS

PRELOAD

```
<link rel="preload"
      href="notosans.woff2"
      as="font"
      type="font/woff2"
      crossorigin>
```

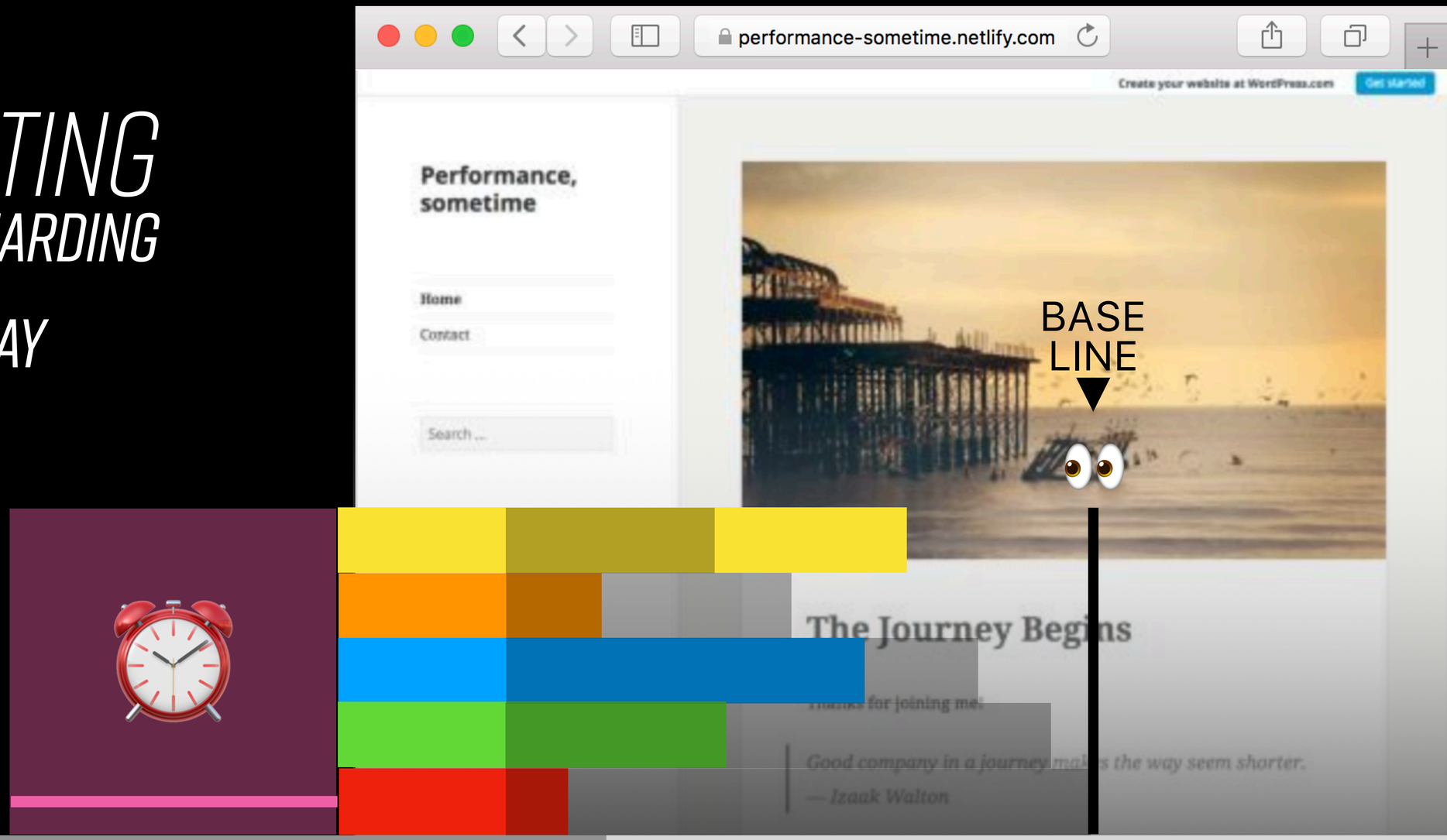
PRELOAD BROWSER SUPPORT



Can I use _____ ?

https://caniuse.com/#feat=link-rel-preload

SELF HOSTING
WITH A BIT OF **SHARDING**
USING **PRECONNECT**
AND **FONT-DISPLAY**
AND **PRELOAD**



New:	3.3s	▲ 3%	5.9s
Baseline:	first render 3.3s		visually complete 5.7s

PRELOADING FONTS FROM A DIFFERENT ORIGIN INCURS CONNECTION COSTS AT A BAD TIME ⚠️

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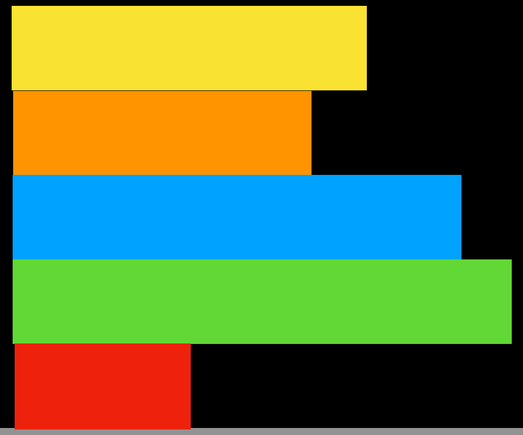
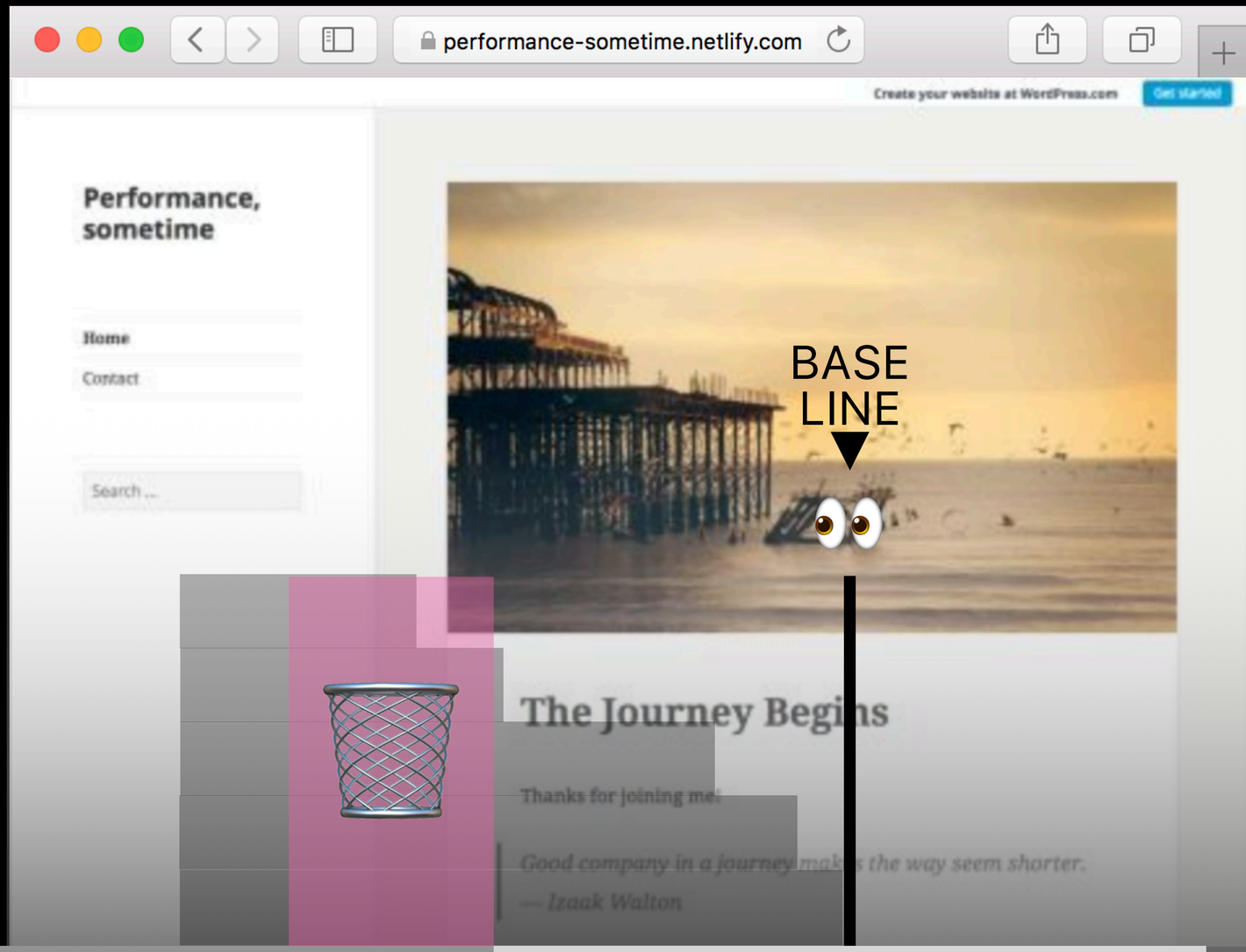
SELF HOSTING

~~WITH A BIT OF **SHARDING**~~

AND **FONT-DISPLAY**

AND **PRELOAD**

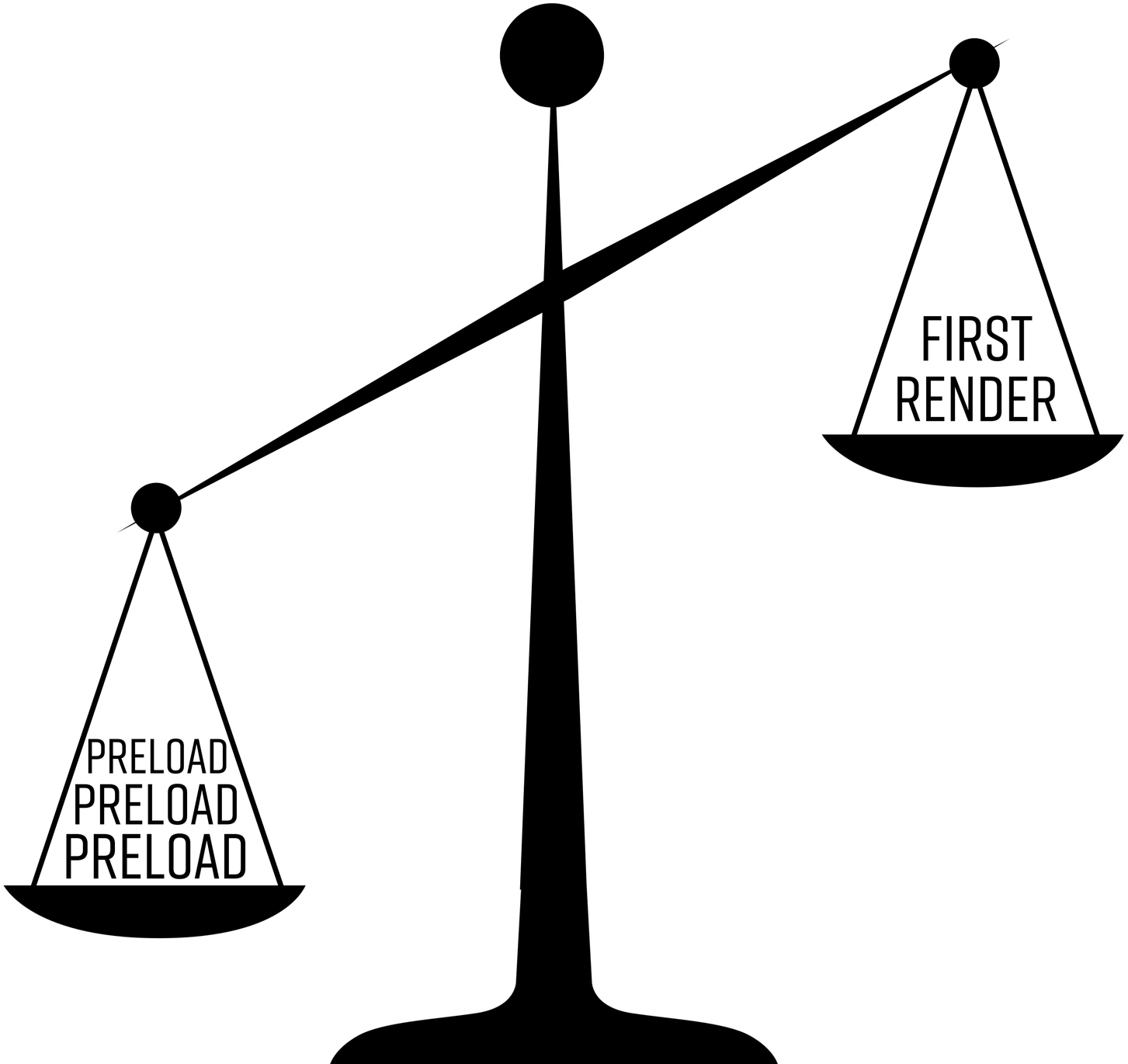




New:	▲ 15% 3.8s	▼ -1% 5.6s
Baseline:	first render 3.3s	visually complete 5.7s

OVERUSE OF PRELOAD WILL COST YOU IN FIRST RENDER TIME ⚠️

@zachleat



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PRELOAD SOME, NOT ALL.

HOW TO CHOOSE?

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LET'S GET...

SUBJECTIVE

PRIORIZATION STRATEGY:

USER DISRUPTION METRICS

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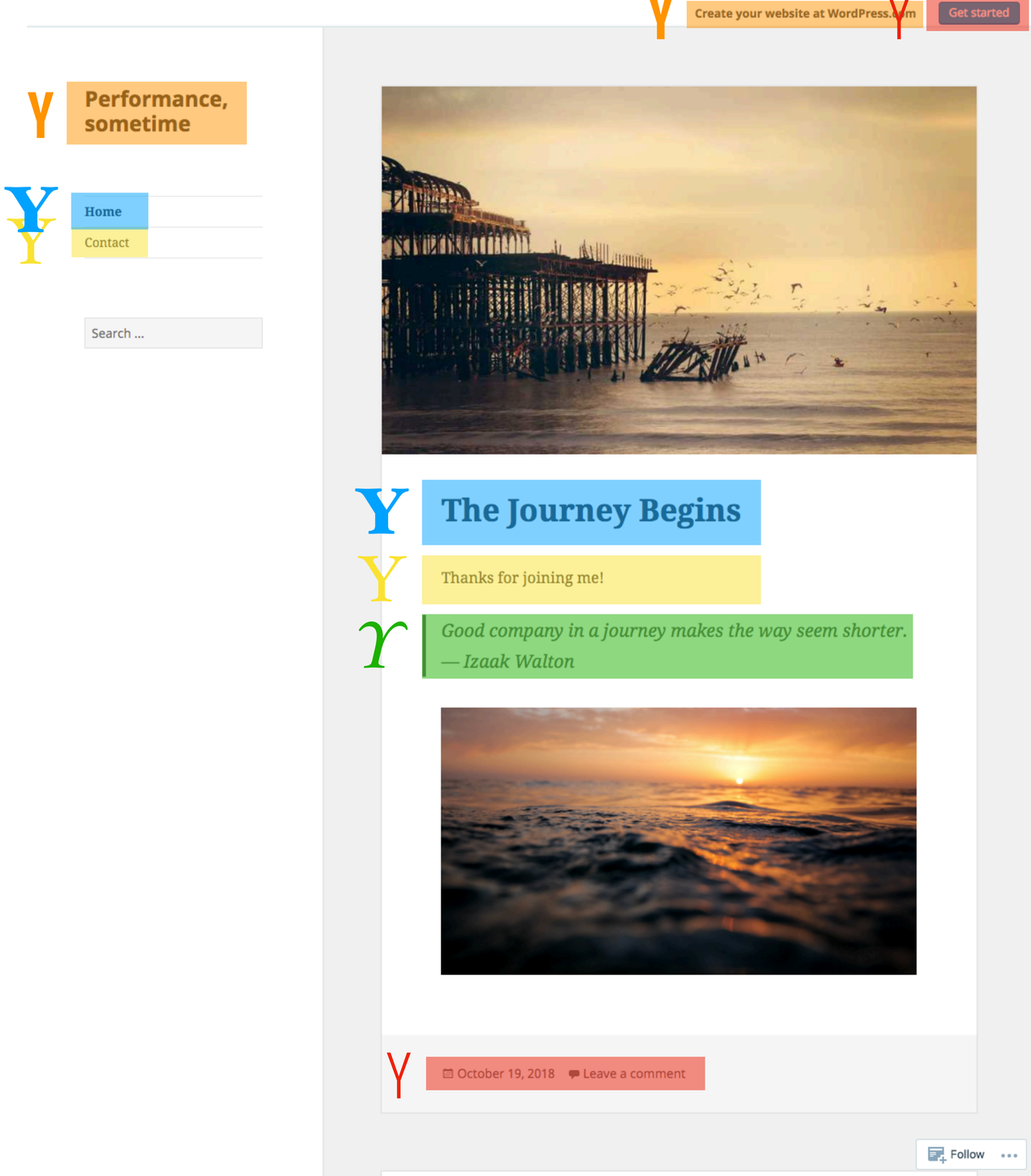
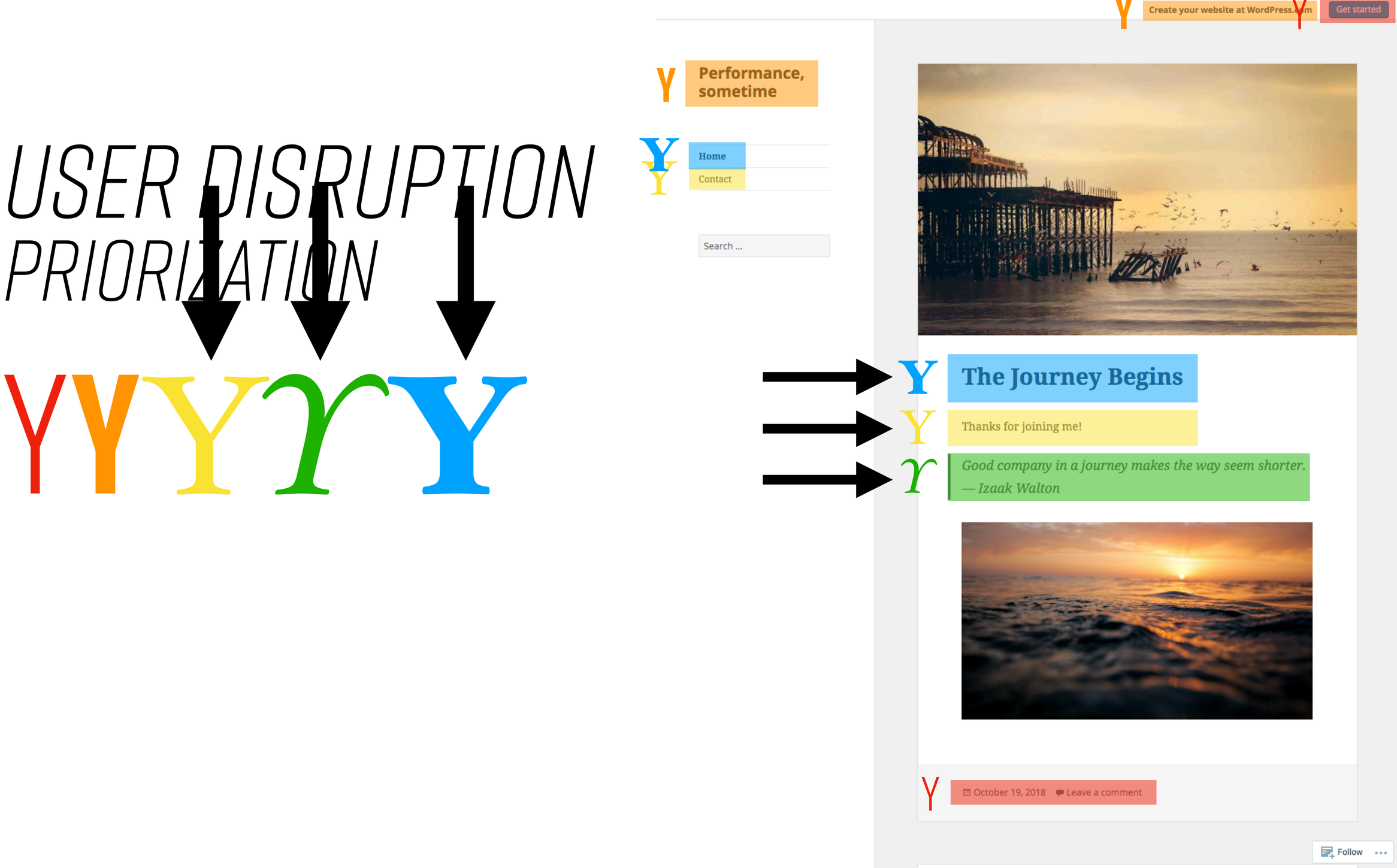
USER DISRUPTION
PRIORIZATION

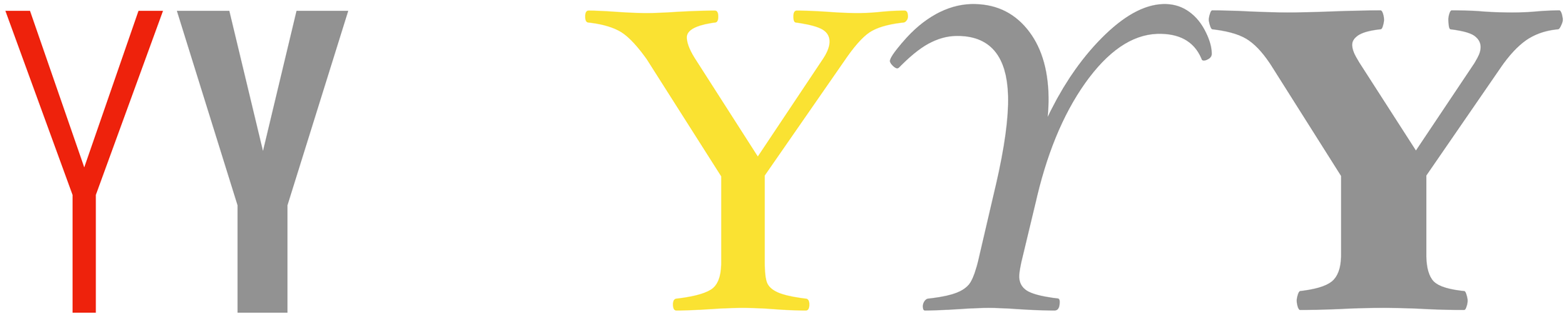


WHAT REFLOWS ARE MOST LIKELY TO BE THE MOST DISRUPTIVE?

USER DISRUPTION PRIORITIZATION



METRICS
PRIORIZATION: **PRELOAD ONE OF EACH FAMILY**



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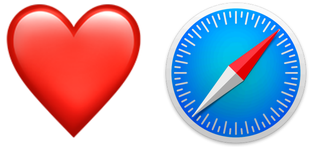
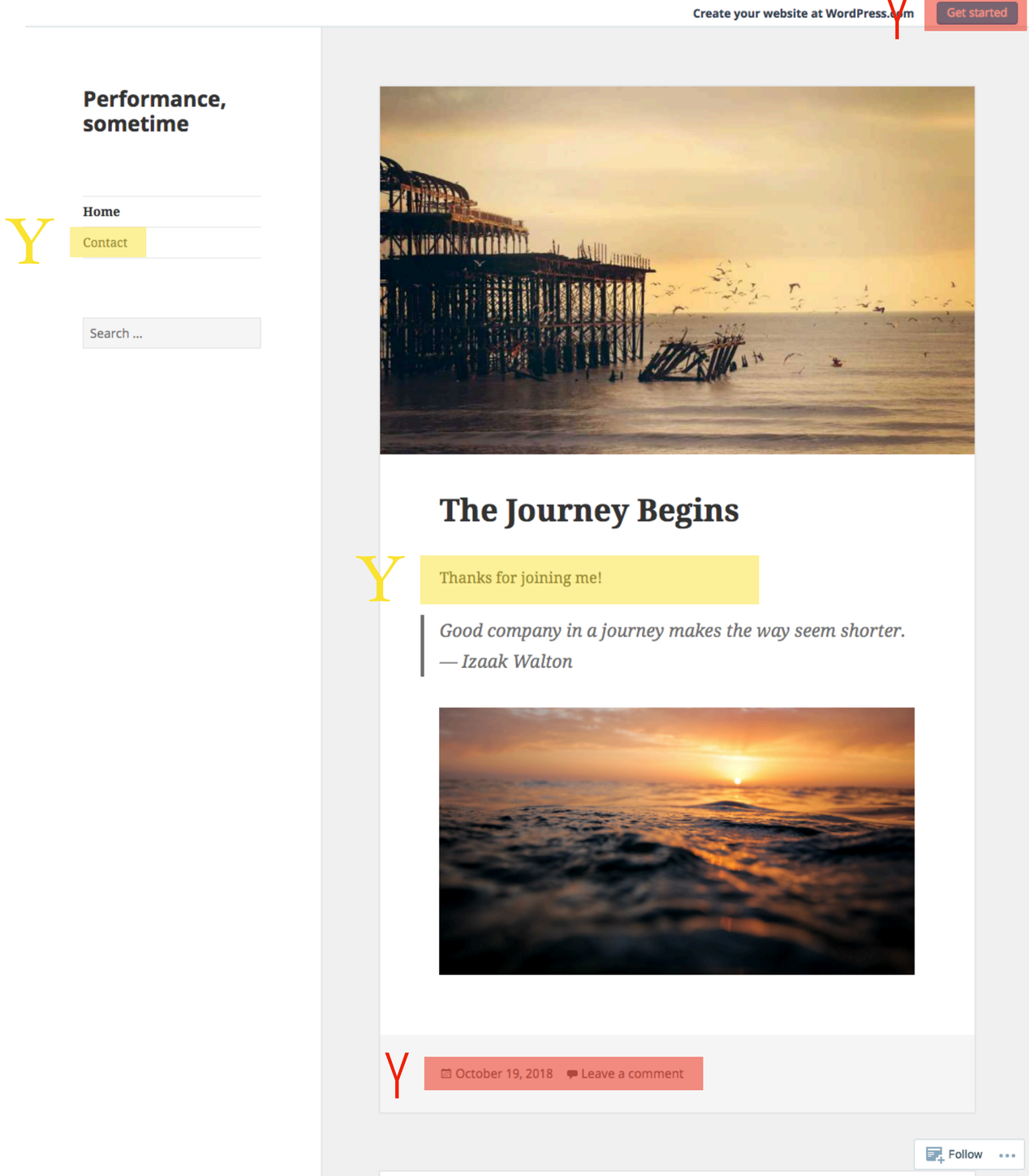
METRICS PRIORIZATION: PRELOAD ONE OF EACH FAMILY

YY YYY





The Journey Begins

ROMAN

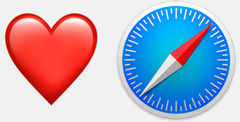
The Journey Begins

FALLBACK

The Journey Begins

FAUX-BOLD

FONT-SYNTHESIS



The Journey Begins

BOLD 🏁

Thanks for joining me!

> *Good company in a journey makes the way seem shorter.*
> *— Izaak Walton*

@zachleat

The Journey Begins

Y

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October 19, 2018 Leave a comment

The Journey Begins

Y

Thanks for joining me!

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DEAR NON-WEBKIT WEB BROWSERS, IT'S ME, MARGARET
CAN YOU COPY WEBKIT PLEASE?

FONT-SYNTHESIS

OUR TOOLS:

~~WOFF2~~
~~PRECONNECT~~
~~SELF HOSTING~~
~~SHARDING~~ 😱

~~FONT-DISPLAY~~
~~PRELOAD~~ ~~& FONT-SYNTHESIS~~
CSS FONT LOADING API
~~SUBSETTING~~
VARIABLE FONTS

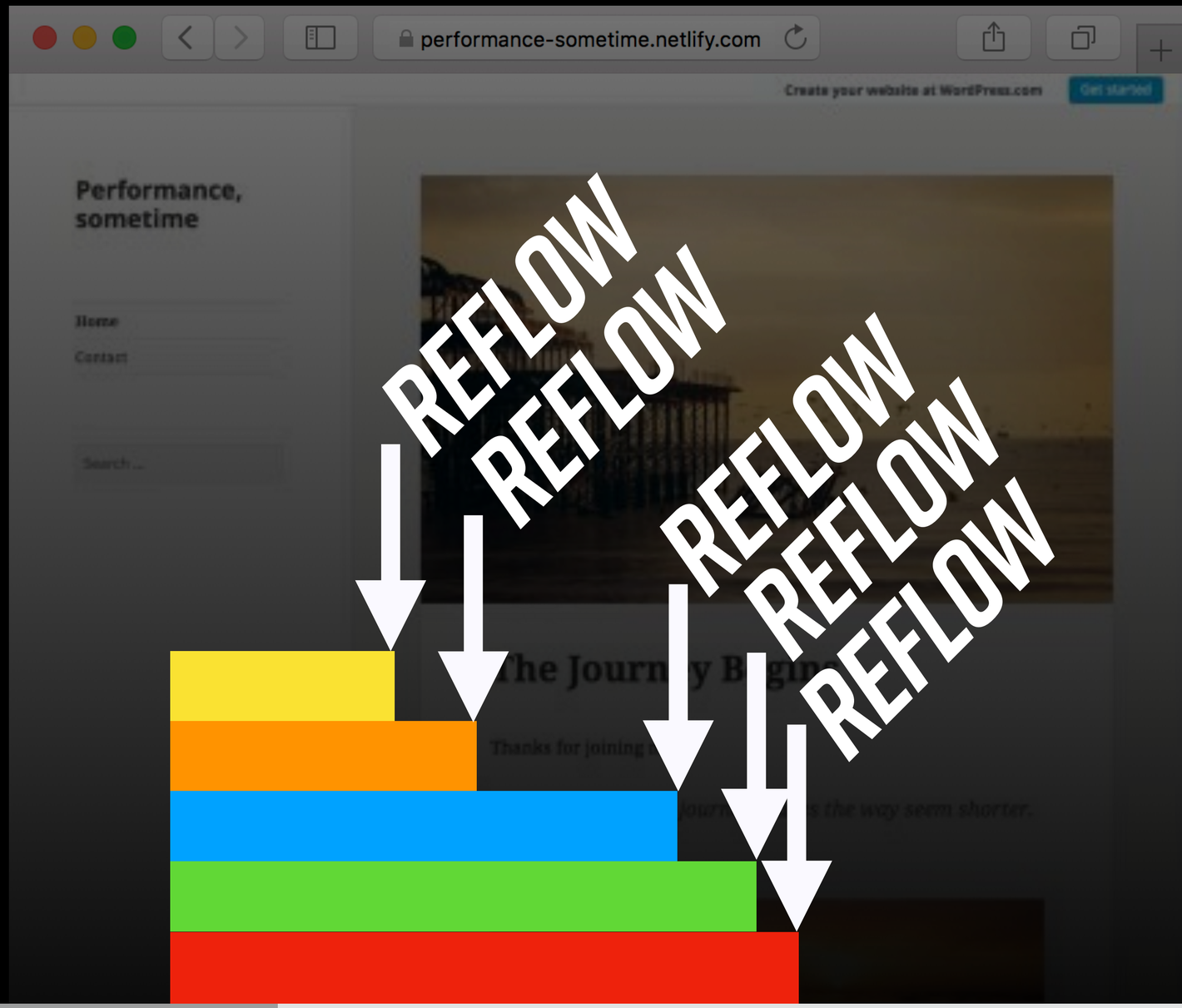
MINI-REVIEW

OUR OPPONENTS:

~~INVISIBLE TEXT~~

TEXT IN MOTION

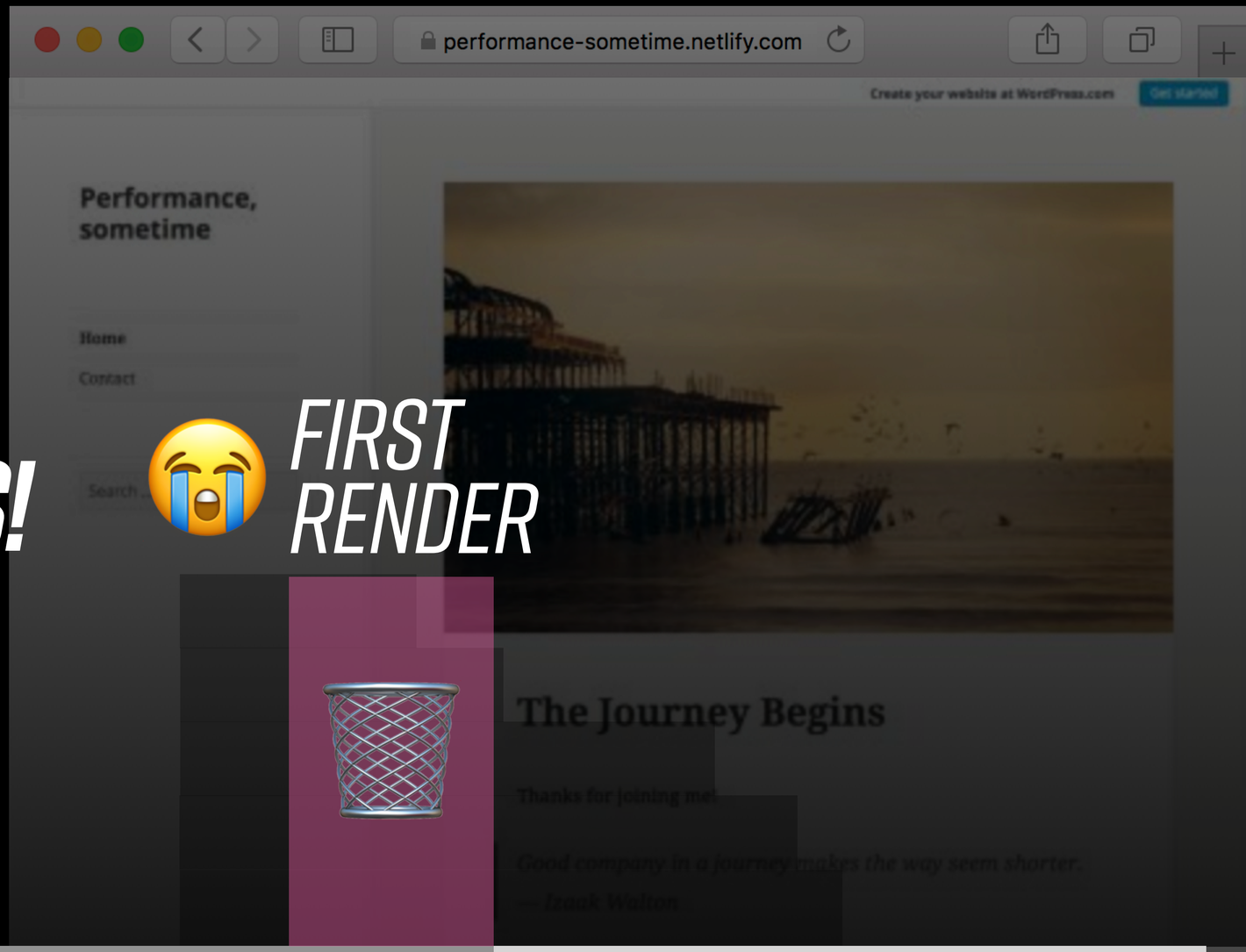
THE DEFAULT WORDPRESS SITE



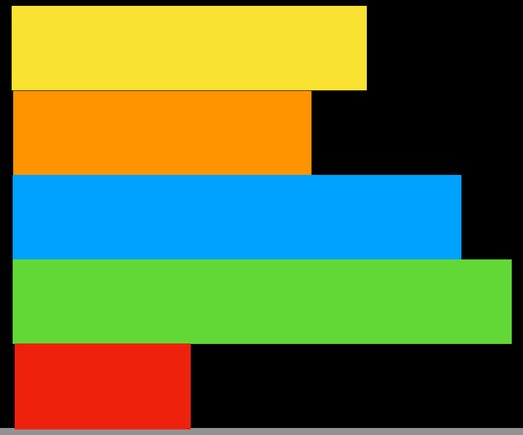
first render 3.3s

visually complete 5.7s

PRELOAD EVERYTHING



NO REFLOWS!



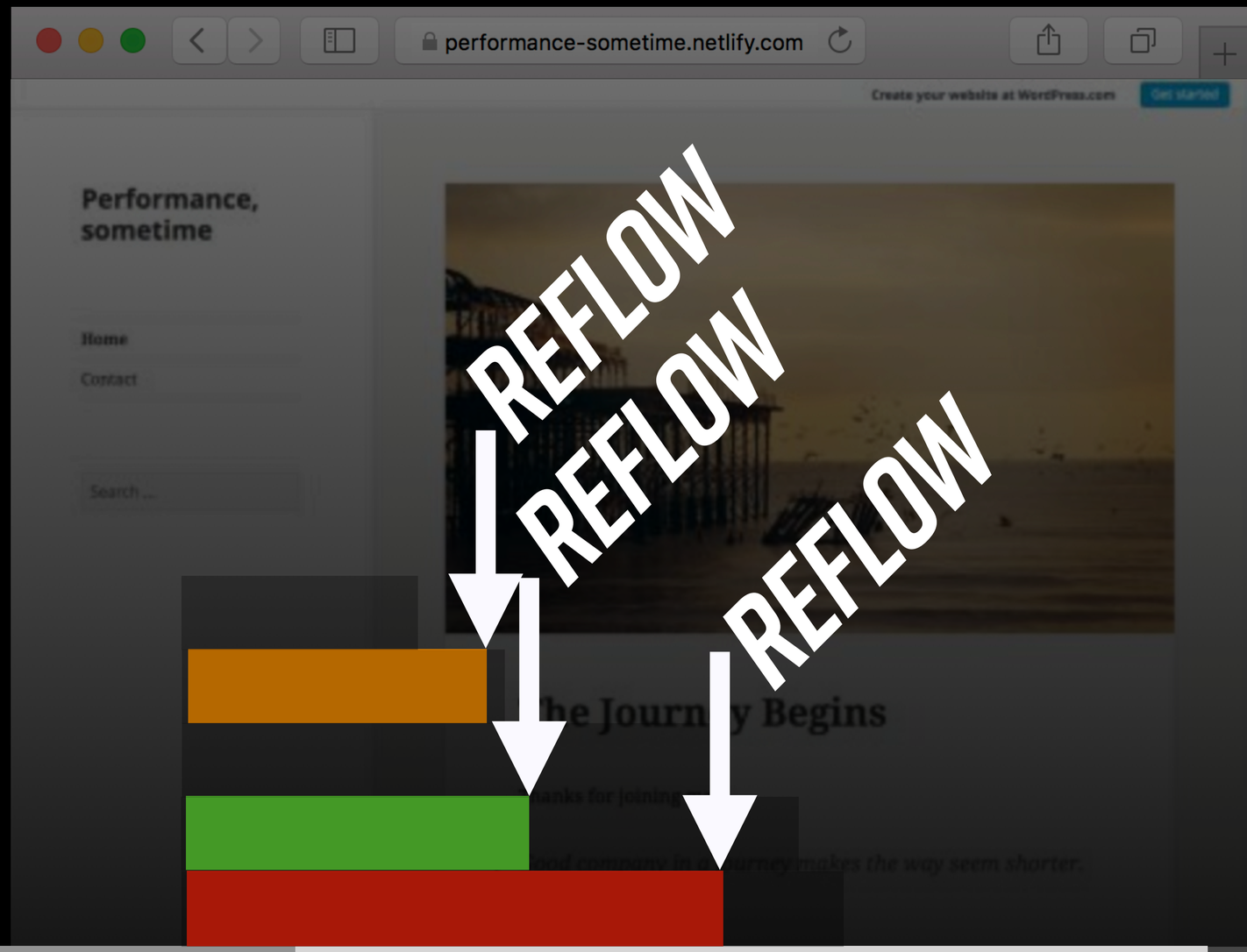
😭 FIRST RENDER

New:	▲ 15% 3.8s	▼ -1% 5.6s
Baseline:	first render 3.3s	visually complete 5.7s

PRELOAD TWO FONTS

❤️

FONT-SYNTHESIS



New:	3.3s	▼ -1%	5.6s
Baseline:	first render 3.3s		visually complete 5.7s

YYYYY

CSS FONT LOADING API

LOAD A WEB FONT USING JS

```
// Remove existing @font-face blocks
// Make it
let font = new FontFace(
  "Noto Serif",
  "url(notoserif.woff2) format('woff2')"
);

// Load it
let loadedFont = await font.load();

// Render it
document.fonts.add(loadedFont);
```

Full Code at https://github.com/zachleat/performance-sometime/blob/master/css-font-loading.js

LOAD TWO WEB FONTS USING JS

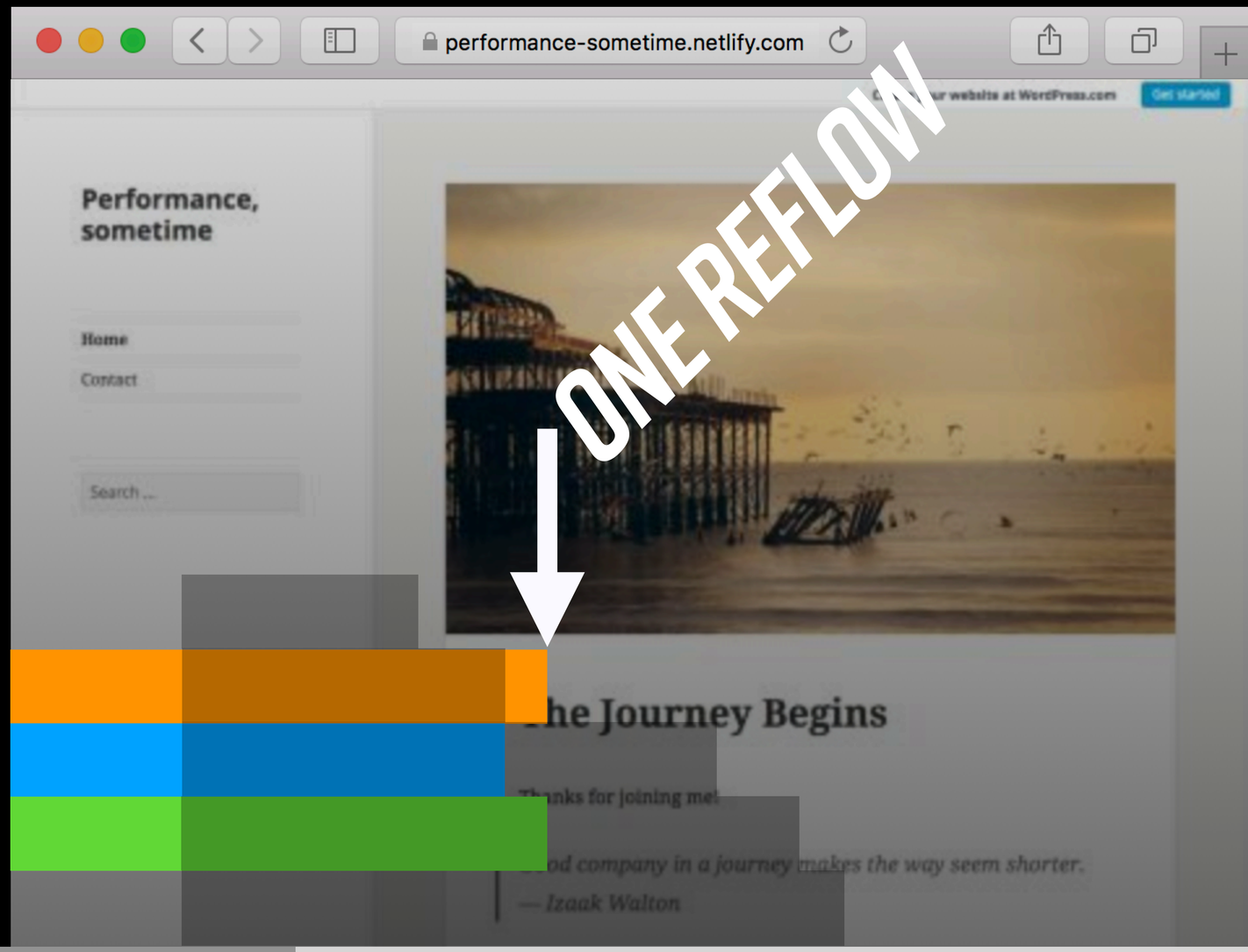
```
// Remove existing @font-face blocks
// Make two
let font = new FontFace("Noto Serif", /* … */);
let fontBold = new FontFace("Noto Serif", /* … */);

// Load two
let fonts = await Promise.all([
  font.load(),
  fontBold.load()
]);

// Render them at the same time!!!
fonts.forEach(font => document.fonts.add(font));
```

Full Code at https://github.com/zachleat/performance-sometime/blob/master/css-font-loading.js

NO CSS MAINTENANCE REQUIRED 🎉

SELF HOSTING

AND **FONT-DISPLAY**
AND **PRELOAD**: 2 OF 5
AND **SHARDING**: 3 OF 5
WITH **PRECONNECT**
AND **CSS FONT LOADING**: 3 OF 5



New:	3.3s	5.7s
Baseline:	first render 3.3s	visually complete 5.7s

The Journey Begins

ROMAN

The Journey Begins

FALLBACK

The Journey Begins

FAUX-BOLD

FONT-SYNTHESIS

The Journey Begins

BOLD 🏁

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@zachleat

The Journey Begins

ROMAN

The Journey Begins

FAUX-BOLD

FONT-SYNTHESIS

The Journey Begins

BOLD 🏁

Thanks for joining me!

❤️ 🚩

JAVASCRIPT FONTS CAN BE FANCY:

NETWORK INFORMATION API

Opt out of fonts on slow connections

https://developer.mozilla.org/en-US/docs/Web/API/Network_Information_API

SAVE-DATA

Opt-out of fonts when the user has enabled Data Saver mode.

https://developers.google.com/web/fundamentals/performance/optimizing-content-efficiency/save-data/

PREFERS-REDUCED-MOTION

Opt-out of font reflows when the user has enabled Reduce Motion in accessibility preferences.

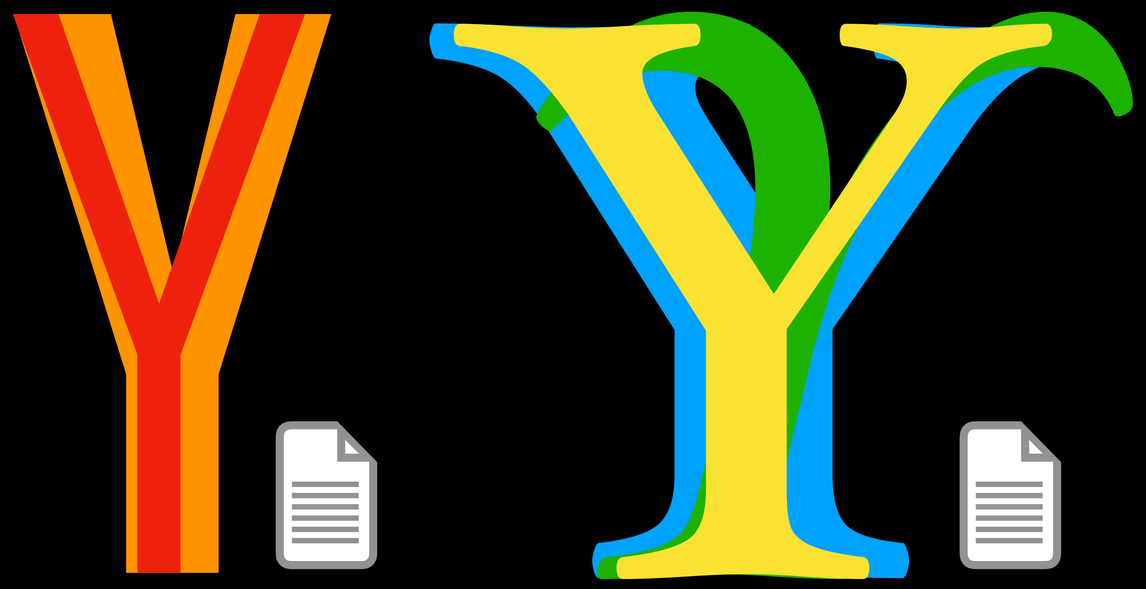
https://webkit.org/blog/7551/responsive-design-for-motion/#using-reduce-motion-on-the-web

OUR TOOLS:

~~WOFF2~~
~~PRECONNECT~~
~~SELF HOSTING~~
~~SHARDING~~ 😱

~~FONT-DISPLAY~~
~~PRELOAD~~
~~CSS FONT LOADING API~~
~~SUBSETTING~~
VARIABLE FONTS

VARIABLE FONTS

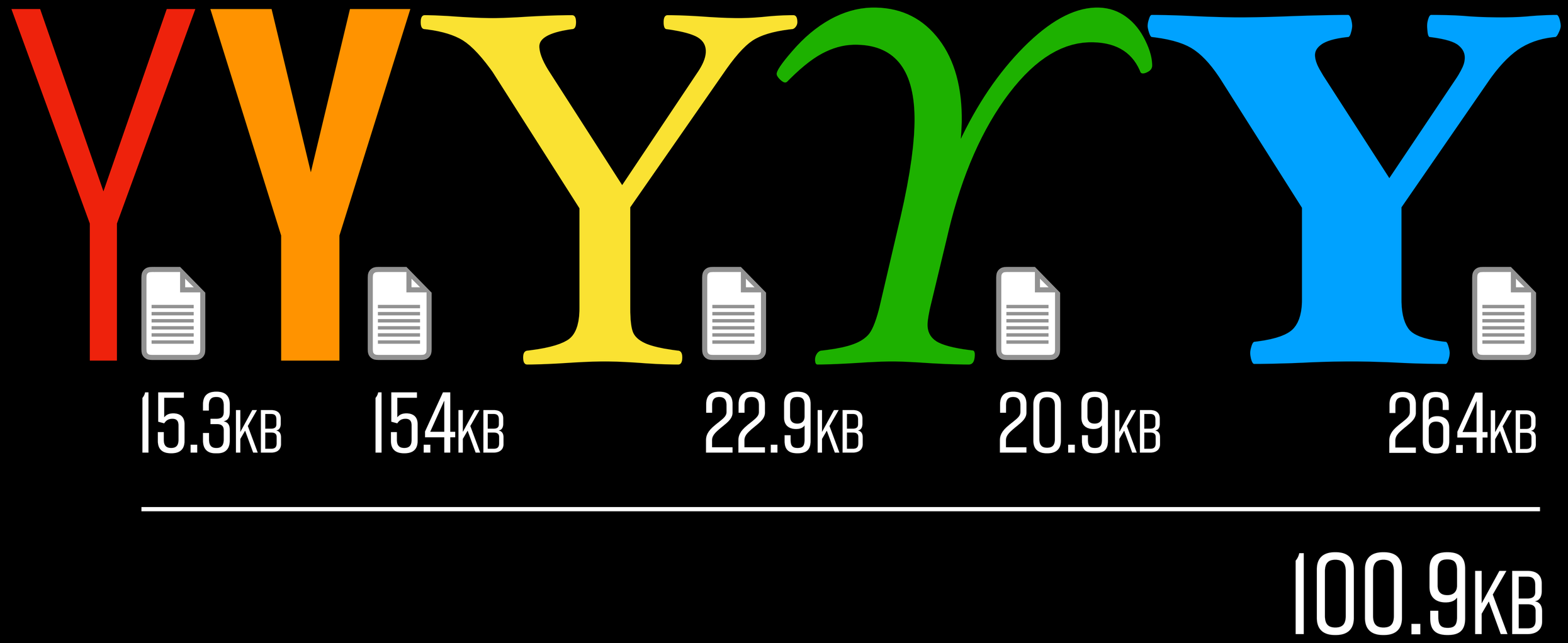


VARIABLE FONTS

COMPRESSA

AXISPRAXIS https://www.axis-praxis.org/

PREUSS TYPE https://www.preusstype.com


Y.Y.Y.Y.Y.
15.3KB
15.4KB
22.9KB
20.9KB
26.4KB
100.9KB

COMPRESSA

AXISPRAXIS

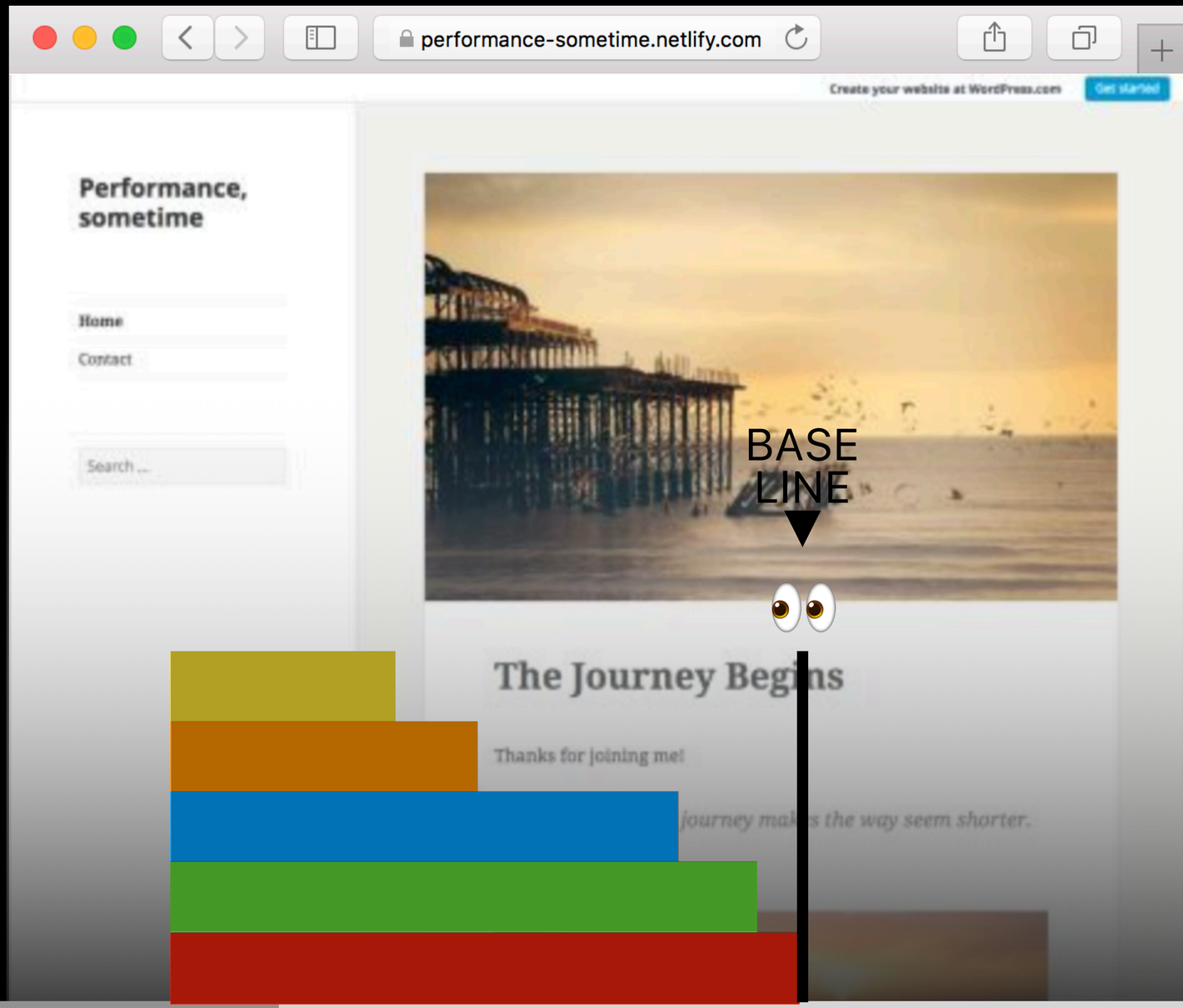
PREUSS TYPE

100.0KB

CompressaPRO-GX.woff2

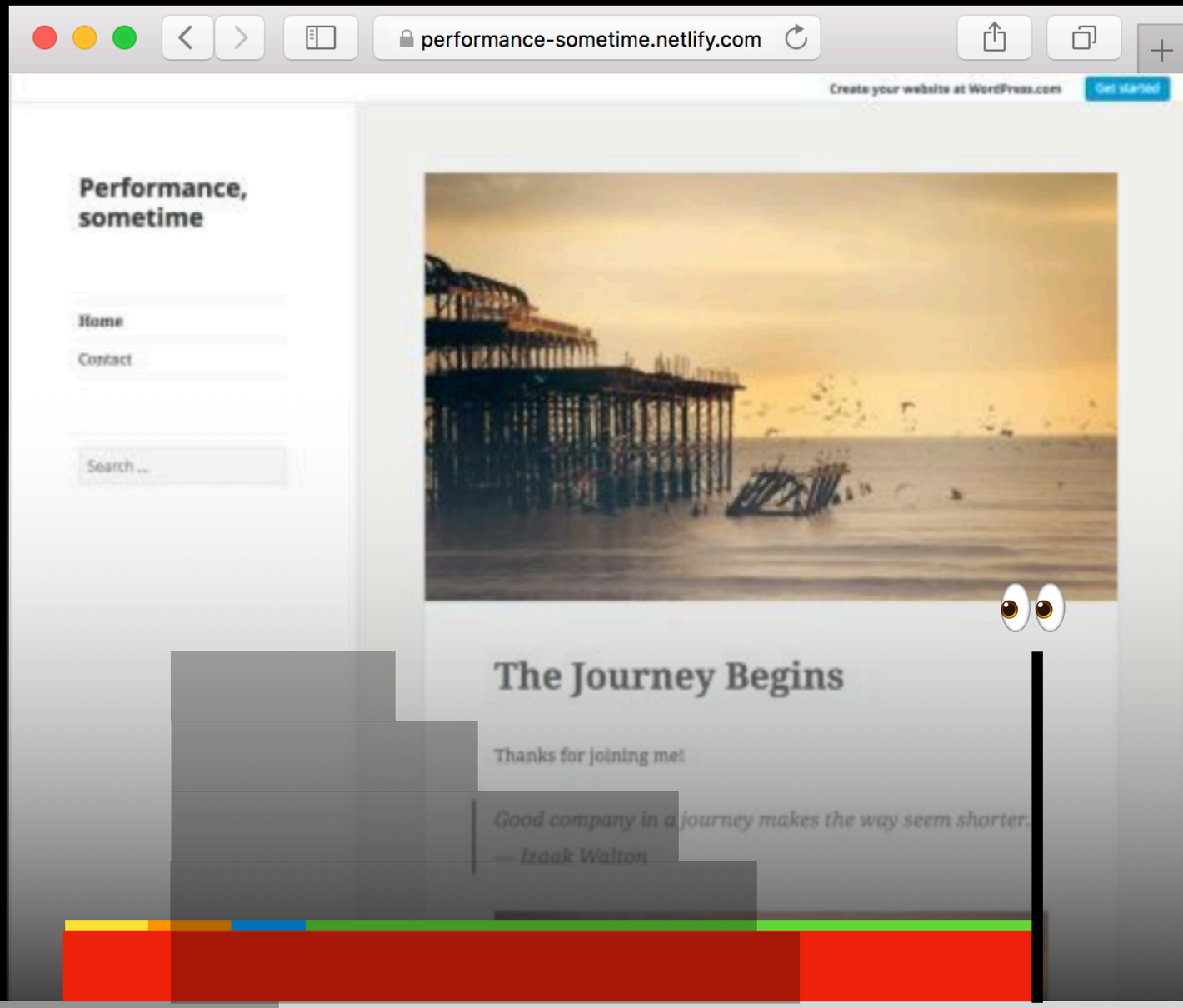
Read more about Variable Font size comparisons:
http://stuff.djr.com/gimlet-vf-size-test/

SELF HOSTING
WITH A SINGLE
115KB VARIABLE FONT



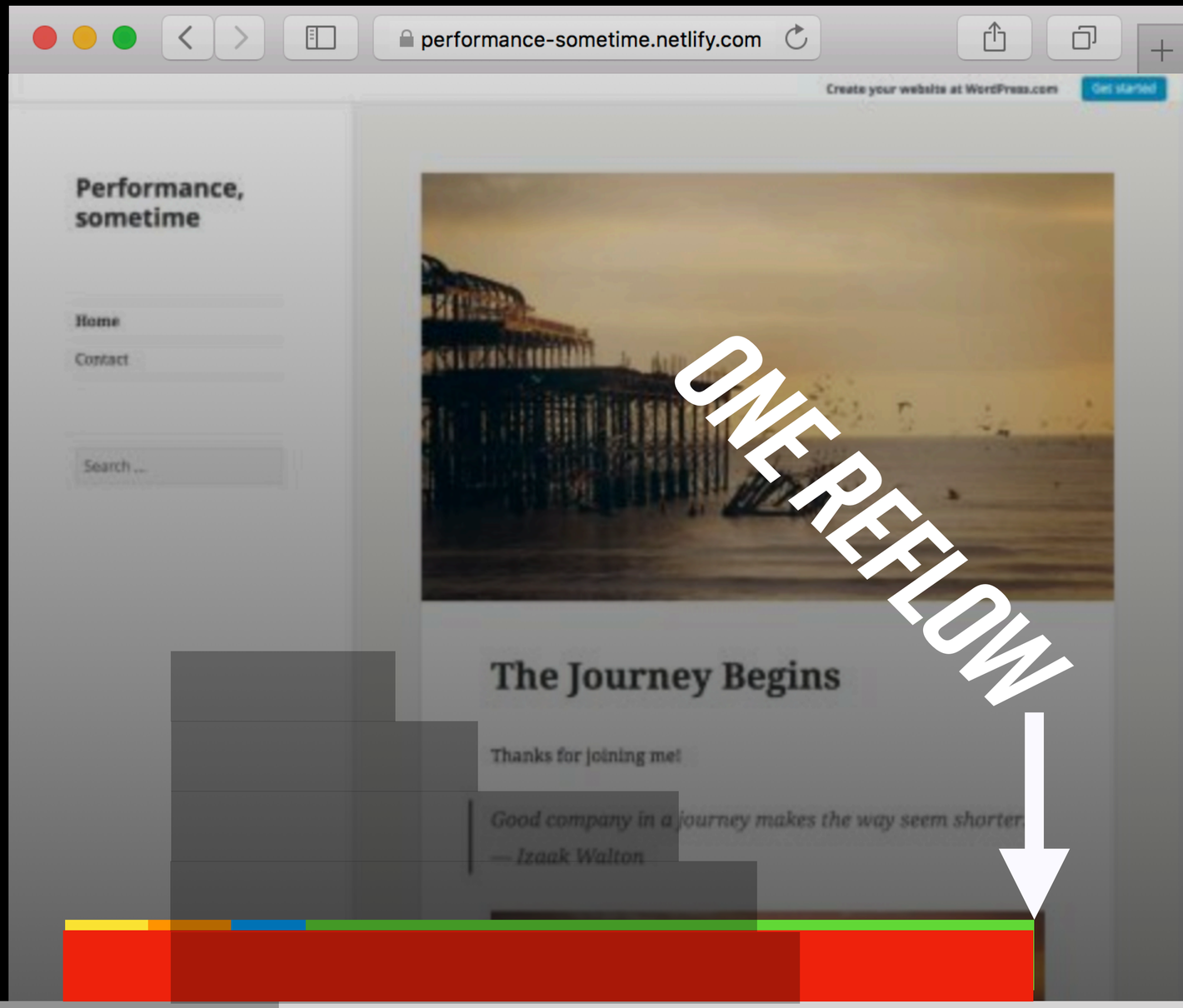
Baseline: first render 3.3s visually complete 5.7s

SELF HOSTING
WITH A SINGLE
115KB VARIABLE FONT



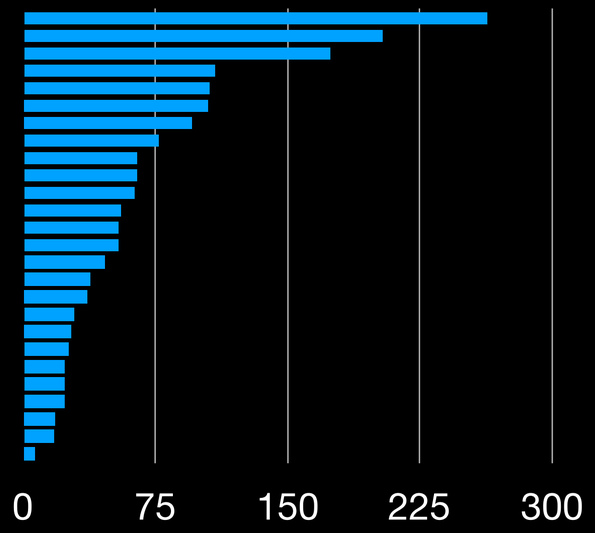
Baseline: first render 3.3s visually complete 5.7s

SELF HOSTING
WITH A SINGLE
115KB VARIABLE FONT



Baseline: first render 3.3s visually complete 5.7s

V-FONTS.COM



69.3 KB MEAN

54.1 KB MEDIAN

Variable Fonts (beta)

A simple resource for finding and trying variable fonts

Pappardelle Party

Color Spinner: 0 — 4

A horizontal-stress, stencil, variable font that's unusual because it's a color font, but also because its variation doesn't alter the glyph shapes like most variable fonts. Instead, color font technology, variable font technology, and OpenType contextual alternates are combined to cycle through multiple color combos. Users can generate versions with custom color palettes using DJR's Color Font Customizer. (If the sample here is black and/or doesn't change with the sliders, your browser doesn't fully support variable color fonts yet.)

Design:	David Jonathan Ross
Publisher:	DJR
Characters:	Latin
Licensing:	Paid/commercial
Info/fonts:	djr.com

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopq rstuvwxyz 0123456789

Chicken Shop Gothic

Super Size: 0 — 100

A sans inspired by squooshed letterforms from vinyl fast food signage and 1960s phototype effects. The 'Super Size' axis stretches letters vertically while maintaining consistent glyph widths. Includes a set of food-related dingbats.

Design:	Lewis McGuffie
Publisher:	Lewis McGuffie
Characters:	Latin, Cyrillic, Dingbats/emoji
Licensing:	Paid/commercial
Info/fonts:	typeverything.com

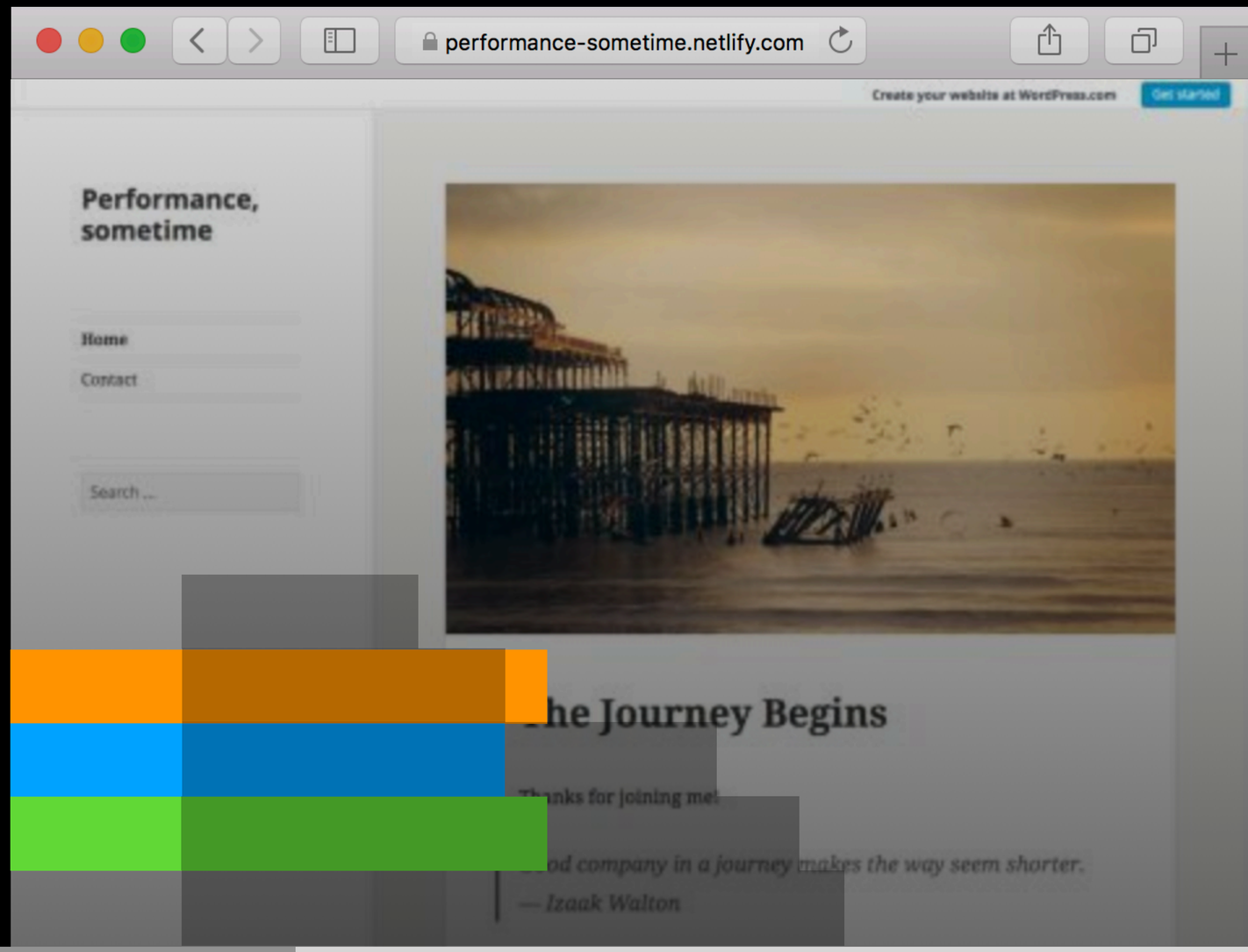
ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789 АБВГДЕ ЖЗИЙКЛМНОПРСТУФХЦЧШЩЪЫЬЭЮЯ абвгдежзийклмнопрстуфхцчшщъыьэюя

OUR TOOLS:

- ~~WOFF2~~
- ~~PRECONNECT~~
- ~~SELF HOSTING~~
- ~~SHARDING~~ 😱
- ~~FONT-DISPLAY~~
- ~~PRELOAD~~
- ~~CSS FONT LOADING API~~
- ~~SUBSETTING~~
- ~~VARIABLE FONTS~~

SELF HOSTING

AND **FONT-DISPLAY**
AND **PRELOAD**: 2 OF 5
AND **SHARDING**: 3 OF 5
WITH **PRECONNECT**
AND **CSS FONT LOADING**: 3 OF 5



New:	3.3s	5.7s
Baseline:	first render 3.3s	visually complete 5.7s

OUR TOOLS:

WOFF2
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SHARDING 😱

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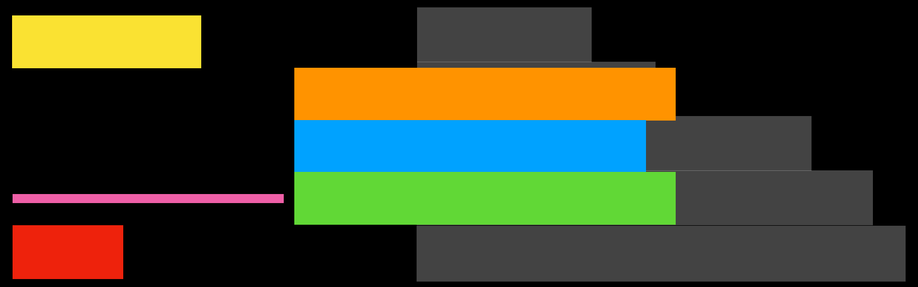
OUR TOOLS:



WOFF2
PRECONNECT
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FONT-DISPLAY
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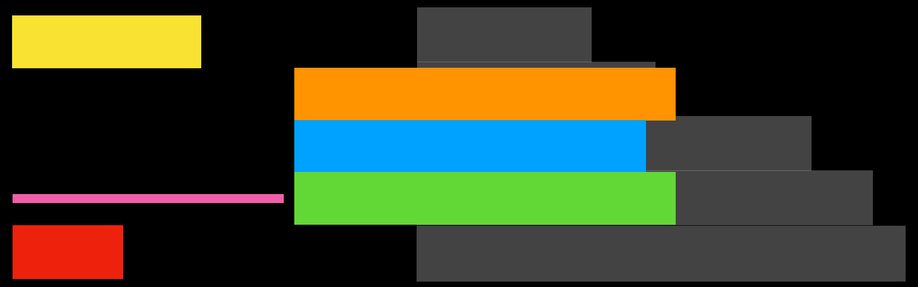
OUR TOOLS:



WOFF2
PRECONNECT
SELF HOSTING
SHARDING 😱

FONT-DISPLAY
PRELOAD
CSS FONT LOADING API
SUBSETTING
VARIABLE FONTS

OUR OPPONENTS:

~~INVISIBLE TEXT~~

~~TEXT IN MOTION~~ -ISH

ALL DEMOS ON GITHUB

https://github.com/zachleat/performance-sometime

A COMPREHENSIVE GUIDE TO FONT LOADING STRATEGIES

zachleat.com/web/comprehensive-webfonts/

45 (and counting) font loading blog posts at zachleat.com/web/fonts/

Web Font Loading Recipes
https://github.com/zachleat/web-font-loading-recipes

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THANK YOU

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