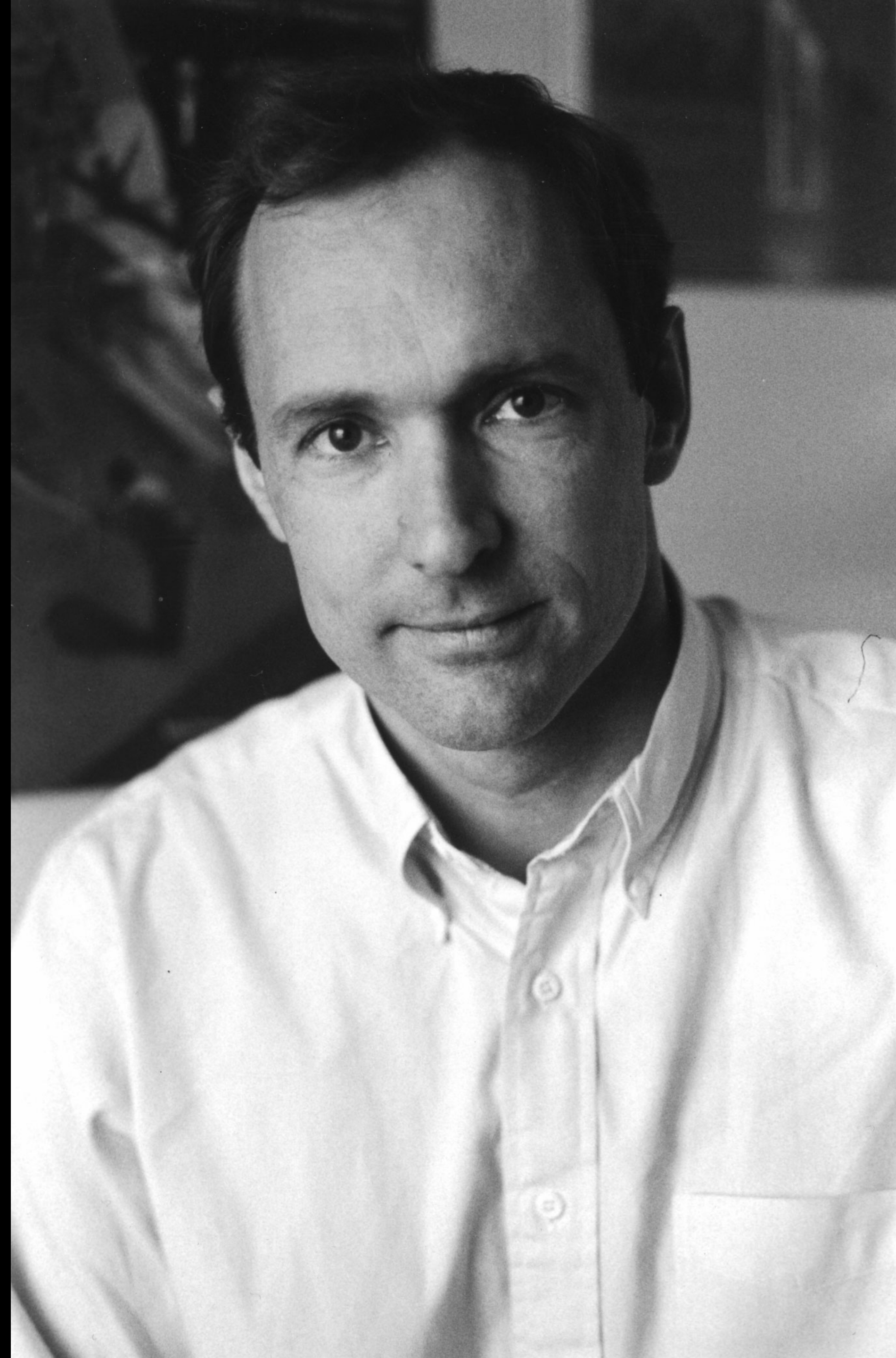


The Layers of The Web

**Tim
Berners-
Lee**



CERN DD/OC

Tim Berners-Lee, CERN/DD

Information Management: A Proposal

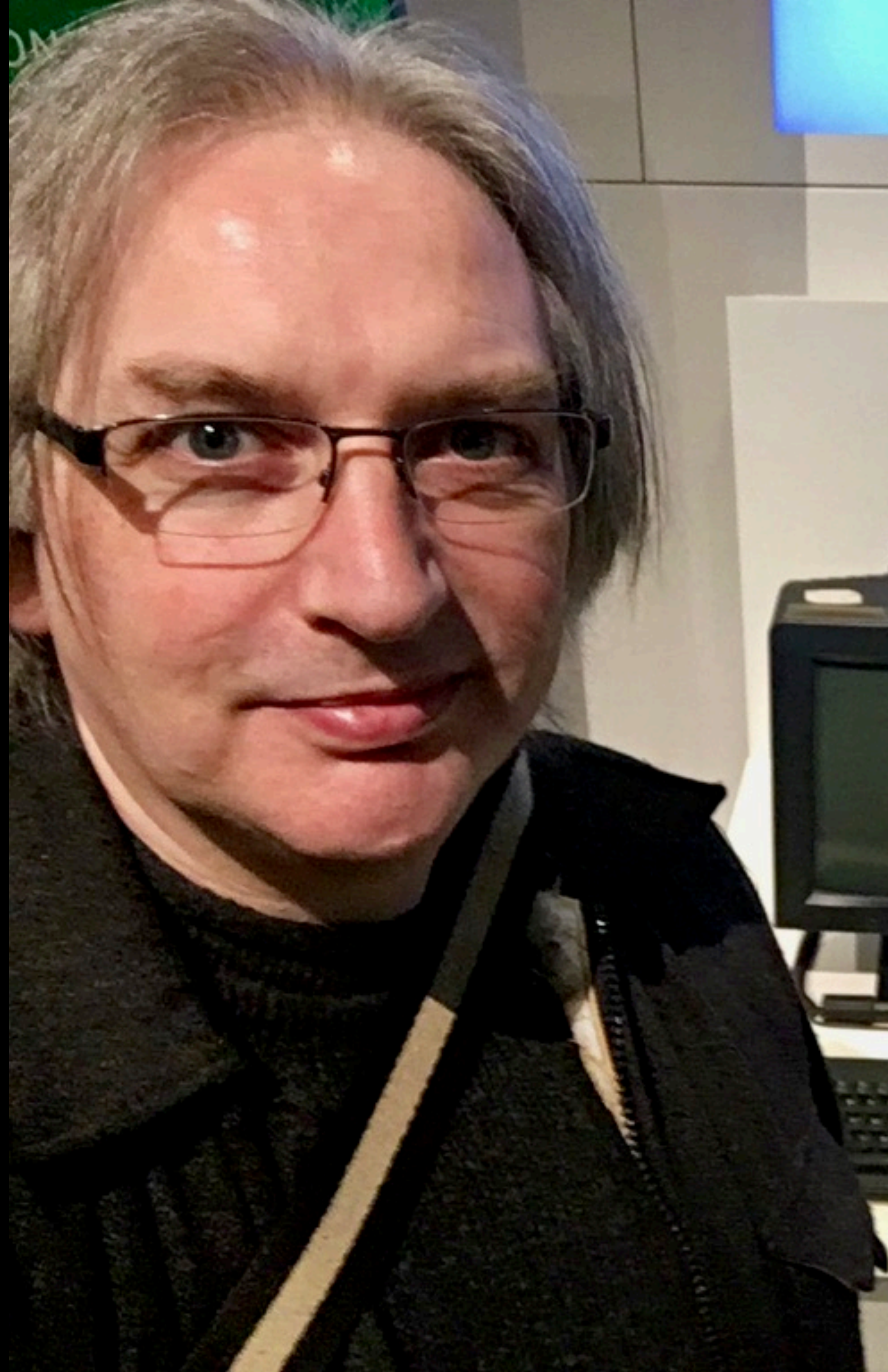
March 1989

Information Management: A Proposal

Abstract

This proposal concerns the management of general information about accelerators and experiments at CERN. It discusses the problems of loss of information about complex evolving systems and derives a solution based on a distributed hypertext system.

Keywords: Hypertext, Computer conferencing, Document retrieval, Information management, Project





WorldWideWeb	
Info	▷
Navigate	▷
Document	▷
Edit	▷
Links	▷
Style	▷
Print	p
Page Layout	
Windows	
Services	
Hide	h
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The World Wide Web project

World Wide Web

The WorldWideWeb (W3) is a wide-area hypermedia information retrieval initiative aiming to give universal access to a large universe of documents.

Everything there is online about W3 is linked directly or indirectly to this document, including an executive summary of the project, Mailing lists , Policy , November's W3 news , Frequently Asked Questions .

<u>What's out there?</u>	Pointers to the world's online information, <u>subjects</u> , <u>W3 servers</u> , etc.
<u>Help</u>	on the browser you are using
<u>Software Products</u>	A list of W3 project components and their current state. (e.g. <u>Line Mode</u> , <u>X11 Viola</u> , <u>NeXTStep</u> , <u>Servers</u> , <u>Tools</u> , <u>Mail robot</u> , <u>Library</u>)
<u>Technical</u>	Details of protocols, formats, program internals etc
<u>Bibliography</u>	Paper documentation on W3 and references.
<u>People</u>	A list of some people involved in the project.
<u>History</u>	A summary of the history of the project.
<u>How can I help ?</u>	If you would like to support the web..
<u>Getting code</u>	Getting the code by <u>anonymous FTP</u> , etc.

Information
Management:
A Proposal

Reference

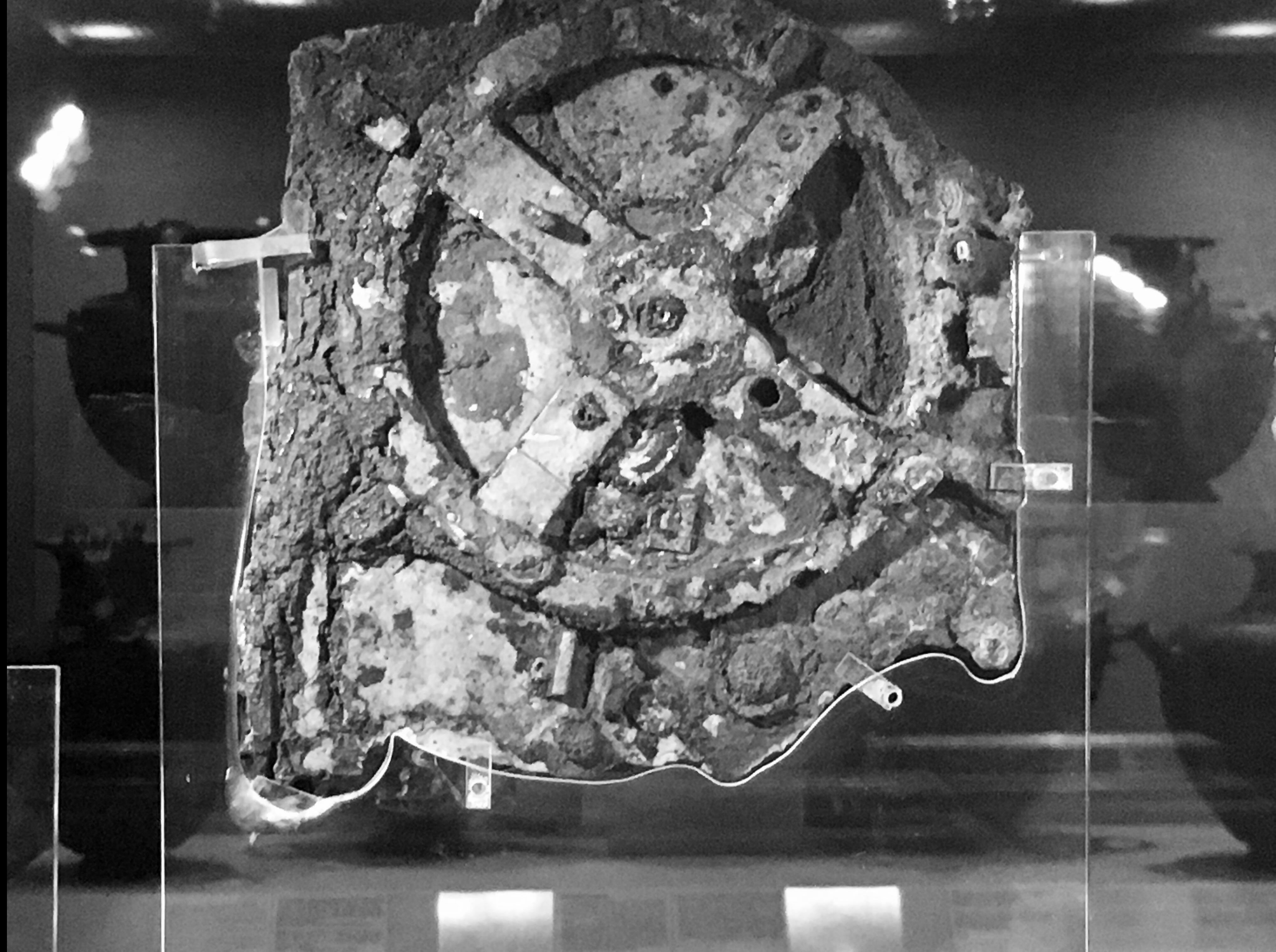
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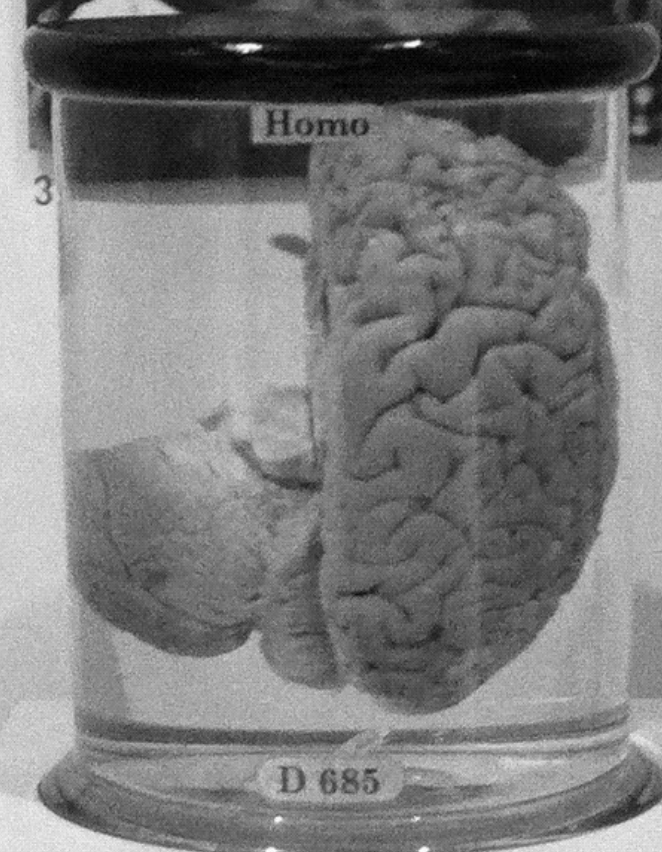
**Mary Lee
Woods**



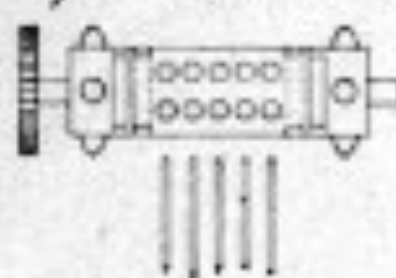


Charles Babbage

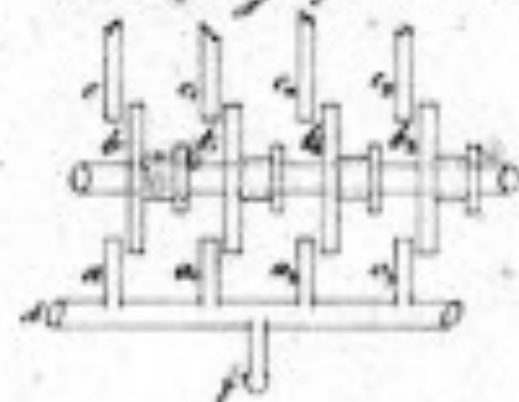
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Wed 6	to 7. 29. 1844	Wed 6	to 7. 29. 1844
Thu 7	to 8. 30. 1844	Thu 7	to 8. 30. 1844
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Sat 9	to 10. 2. 1845	Sat 9	to 10. 2. 1845
Sun 10	to 11. 3. 1845	Sun 10	to 11. 3. 1845
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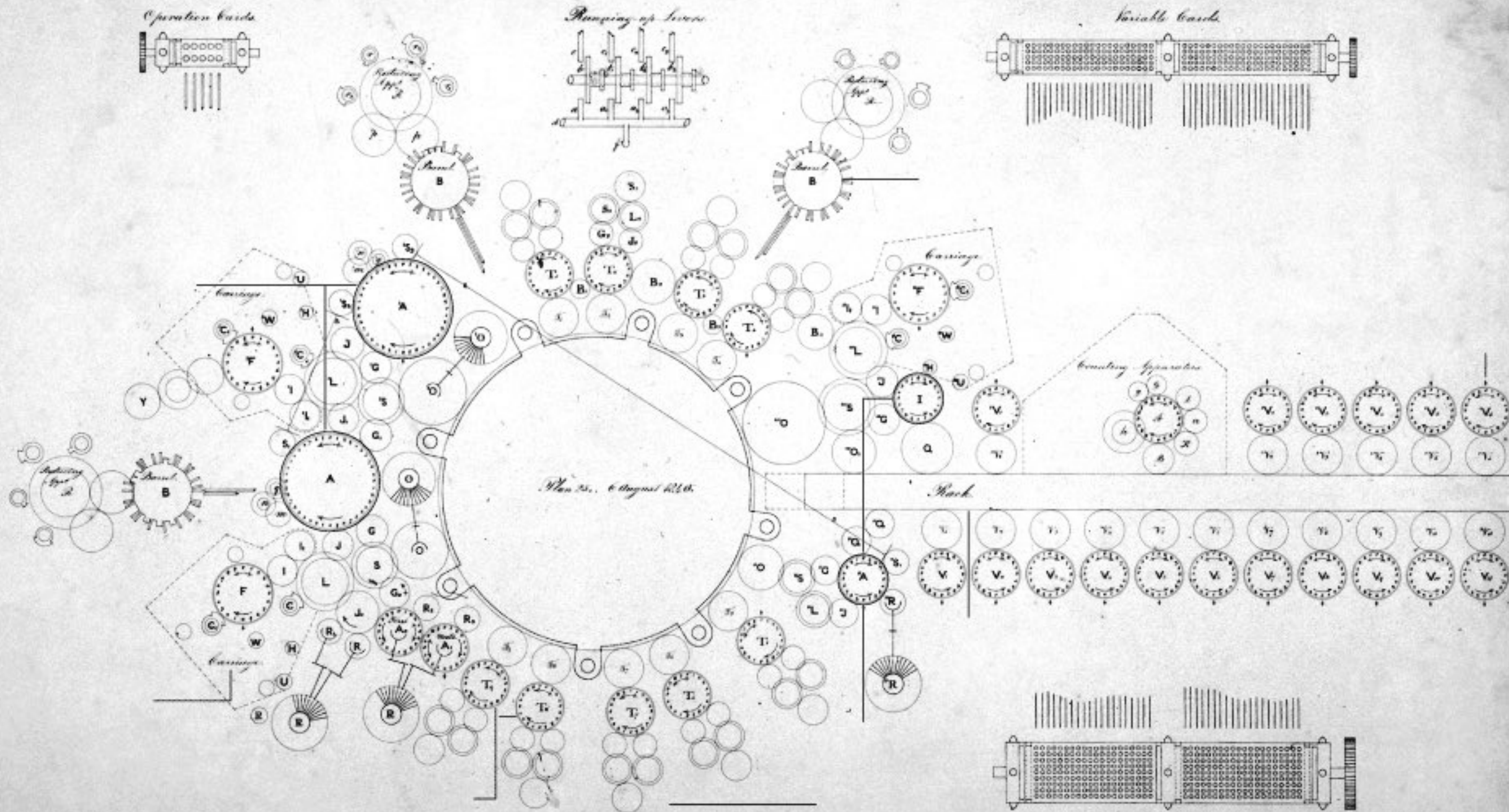
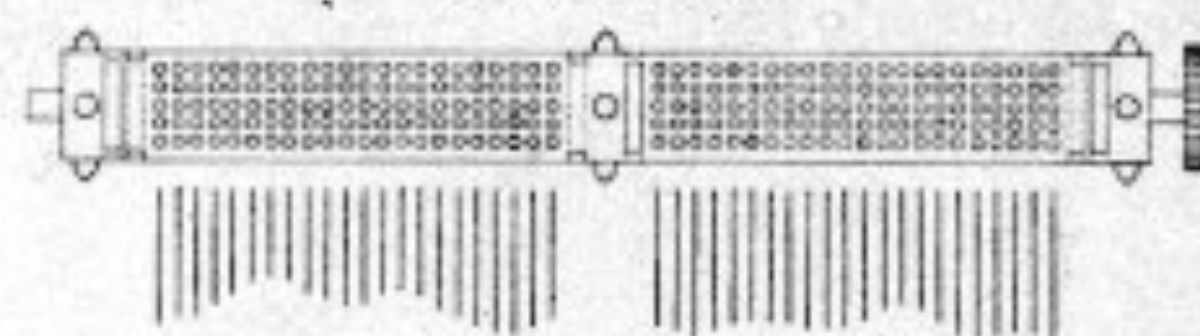
Operation Cards



Pumping up levers

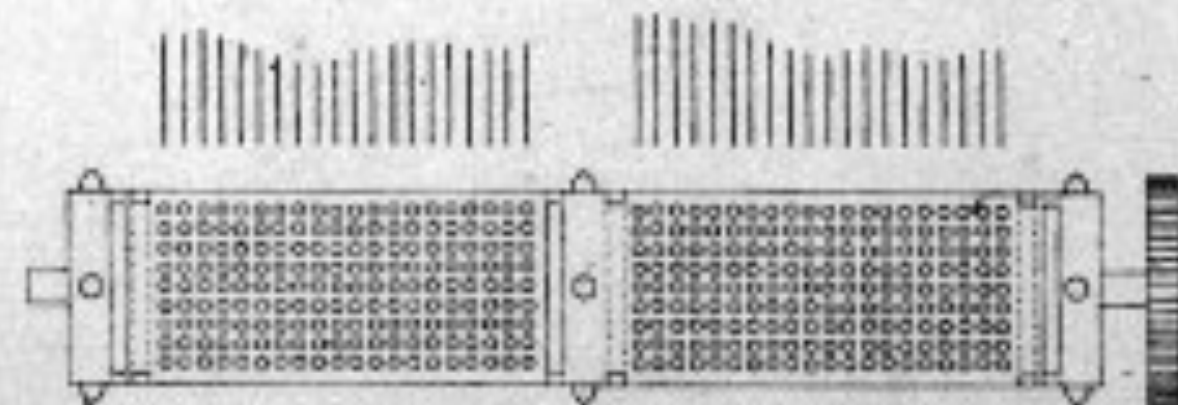


Variable Cards



Scale of 1 inch = 1 foot

Number Cards



Ada Lovelace

DIAGRAM BELONGING TO NOTE D

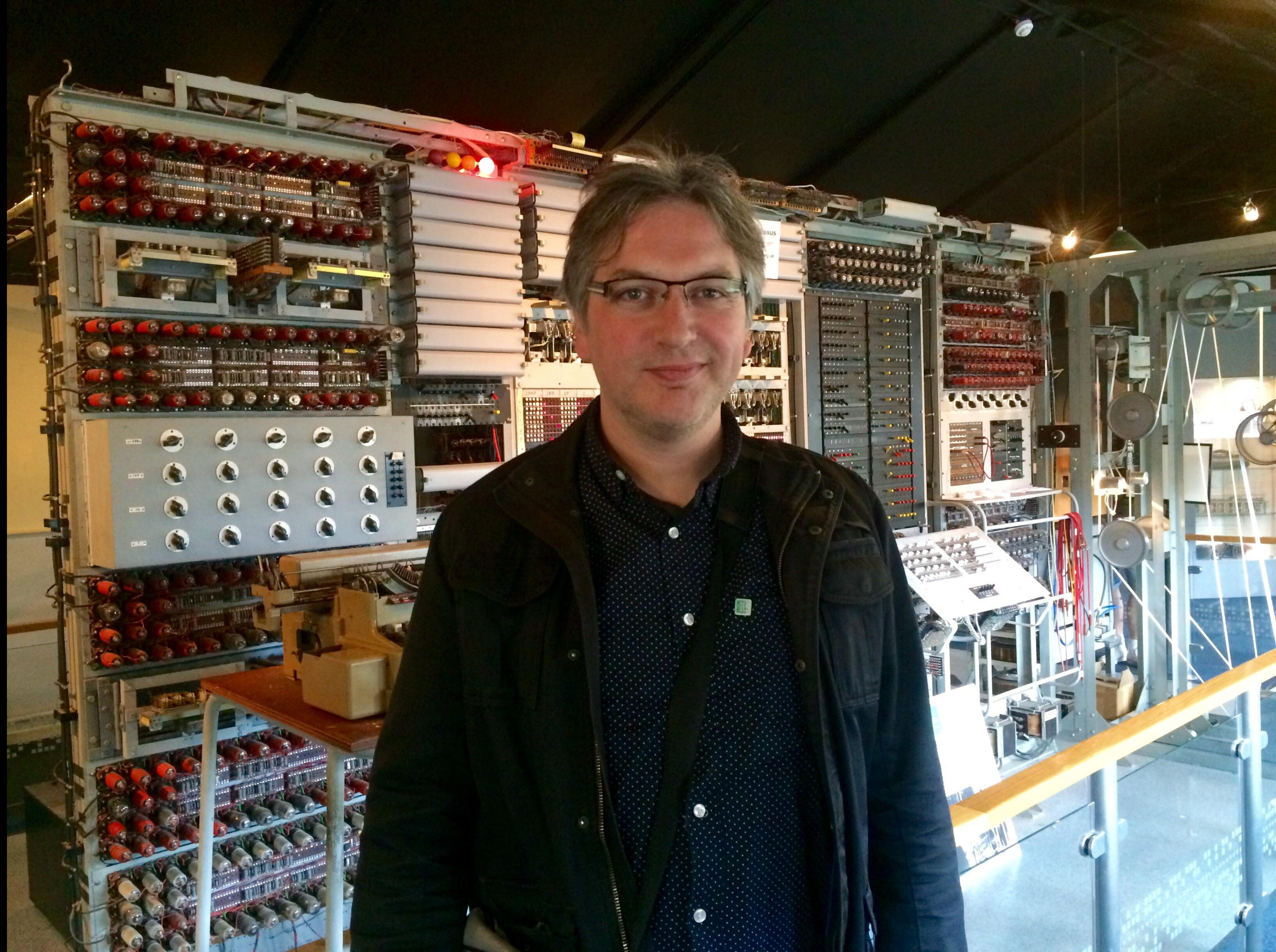
		Variables for Data						Working Variables							
Number of Operations	Kind of Operations	1V_0	1V_1	1V_2	1V_3	1V_4	1V_5	0V_6	0V_7	0V_8	0V_9	${}^0V_{10}$	${}^0V_{11}$	${}^0V_{12}$	${}^0V_{13}$
		+	+	+	+	+	+	+	+	+	+	+	+	+	+
		0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0
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1	×	m				n'		mn'							
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6	×														
7	+							0	0					$(mn' -$	
8	+									0	0				
9	+											0	0		
10	+													$mn' -$	
11	+														

$$\frac{d'm - dm'}{mn' - m'n} = y$$



Alan Turing

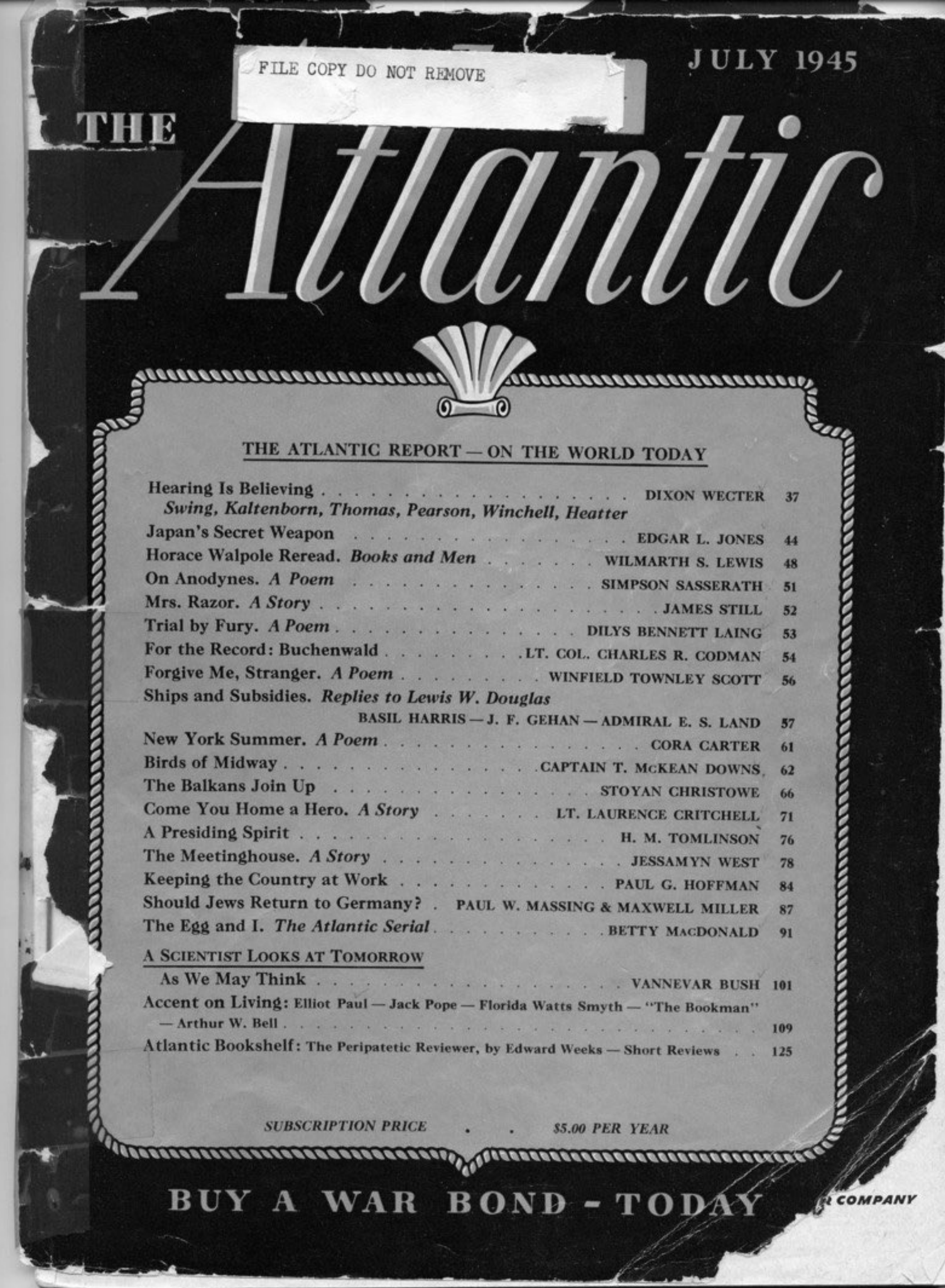




Vannevar Bush



As We
May Think





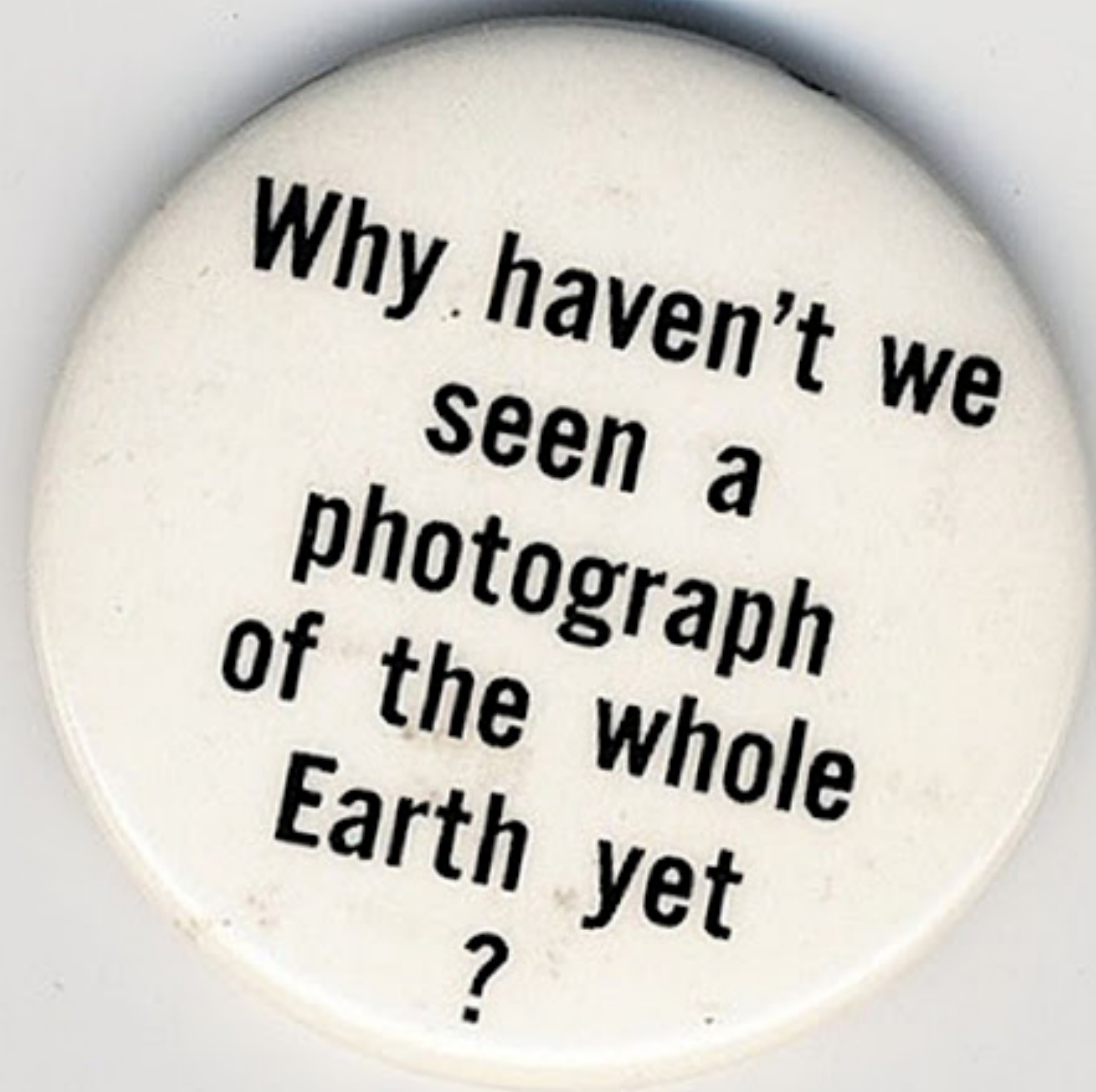
**Douglas
Engelbart**



DEMO

Stewart Brand





WHOLE EARTH CATALOG

access to tools



Fall 1968

\$5



SPACEWAR

Fanatic Life and Symbolic Death Among the Computer Bums by Stewart Brand

THE FIRST "INTERGALACTIC SPACEWAR OLYMPICS" WILL BE HELD HERE, WEDNESDAY 10 OCTOBER, 1972. FIRST PRIZE WILL BE A YEAR'S SUBSCRIPTION TO "ROLLING STONE". THE GALA EVENT WILL BE REPORTED BY STONE SPORTS REPORTER STEWART BRAND & PHOTOGRAPHED BY ANNIE LIEFERWITZ. (FULL PAGE)

RACE ON, SON, computers are coming to the people. That's good news, maybe the best since psychoanalysis. It's the track of the "Computers—Threat or Menace?" school of liberal criticism but surprisingly in line with the romantic fantasies of the forerunners of the science such as Norbert Wiener, Warren McCulloch, J.C.R. Licklider, John von Neumann and Vannevar Bush.

The trend owes its health to an odd array of influences. The youthful fervor and firm dis-establishmentarianism of the freaks who design computer science; an astonishingly enlightened research program from the very top of the Defense Department; an unexpected market-fanking movement by the manufacturers of small calculating machines; and an irrepressible midnight phenomenon known as Spacwar.

Reliably, at any nighttime session (i.e. non-business hours) in North America hundreds of computer technicians are effectively out of their bodies, locked in life-or-death space combat computer-projects onto cathode ray tube display screens, for hours at a time, running their eyes, rubbing their fingers in frenetic mashing of control buttons, joyously slaying their friends and wasting their employers' valuable computer time. Something basic is going on.

rudimentary Spacwar consists of two humans, two sets of control buttons or joysticks, one TV-like display and one computer. Two spaceships are displayed in motion on the screen, controllable for thrust, yaw, pitch and the firing of torpedoes. Whenever a spaceship and torpedo meet, they disappear in an attractive explosion. That's the original version, invented in 1962 at MIT by Steve Russell. (More on him in a moment.)

October, 1972, 8 PM, at Stanford's Artificial Intelligence (AI) Laboratory, moonlit and remote is the foothills above Palo Alto, California. Two dozen of us are jammed in a semi-dark console room just off the main hall containing AI's PDP-10 computer. AI's Head System Programmer and most avid Spacwar nut, Ralph Goring, from a display screen which says only:

THIS CONSOLE AVAILABLE
He logs in on the keyboard with his initials Click clickclickclick click.

LI, RAO
CSD FALL PUNCH, SATURDAY 11
AM IN FLOOR PARK

He interrupts further announcements, including one about the "First Intergalactic Spacwar Olympics" at 8 PM, with: Click ("Yup"), clickclickclick ("Space War Ralph") click ("Go it").

R SWR.
WELCOME TO SPACWAR.

How many ships? MAXIMUM IS 5
— Stewart Brand, 33, is a graduate of Stanford (biology) from 1968 to 1971 he edited the Whole Earth Catalog.

Click 3 (Five players. This is for the first familiarization battles in the Spacwar Olympics, initiated by me and sponsored [here & there] by RELIABLE X-FILES. Friends, I won't be able to explain every computer-technical term that comes by. Fortunately you don't need them to get the gist of what's happening.)

KEYBOARD BUTTONS? (EARN RIGHT-LIKE) TYPE Y OR N.

Yin? Click Y.

THE STANDARD GAME IS: 1 CONSOLE, 2 TORPEDO TUBES, (NORMAL) KICKING, NO PARTIAL DAMAGING, NO REVERSE, KILLER SUN. SHIPS START IN STANDARD PORTIONING, TYPE Y TO GET A STANDARD GAME. Ralph wears other features. "No," Click N.

HOW MANY SPACE MEN DO YOU WANT? CHOOSE FROM ZERO TO 4.

Click 4.

PARTIAL DAMAGE?

Click N.

DISPLAY SCREEN?

Click Y.

TWO TORPEDO TUBES?

Click Y.

HYPERSPACE?

Click N.

RANDOM STARTING PORTIONING?

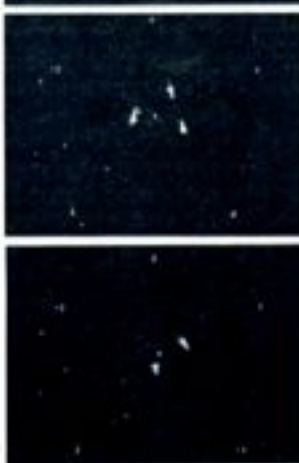
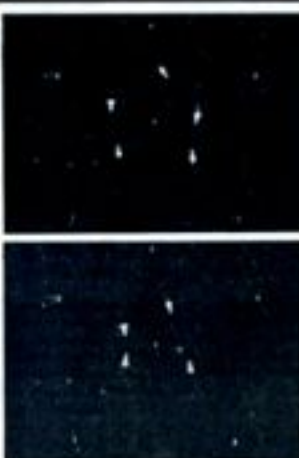
Click Y.

Immediately the screen goes dark

and then displays: Five different spaceships, each with a dot indicating torpedoes (also are loaded, five scores, each at zero, a convincing starfield, and four space mines orbiting around a central sun, toward which the spaceships are starting to fall at a correctly accelerating rate.

Players seize the five sets of control buttons, find their spaceship persona on the screen, and simultaneously turn and fire toward any nearby still-beleaguered spaceships, hit the thrust button to initiate orbit before being disrupted by the killer sun, and evade or shoot down any incoming enemy torpedoes or attacking mines. After two torpedoes are fired, each ship has a three-second "reloading" time. First torpedoes last nine seconds and then disappear.

At kills are made the scores start to change: -1 for a successful kill, +1 for being killed, +1 for being lone survivor of a battle. Personalities begin to establish themselves in the maneuvering spacegame. The pilot of the ship called Poney Fine is a dead shot but panics easily in cross fire. Roundback tries to avoid early dueling and routinely fires two torpedoes "around the universe" off the screen, so they reappear suddenly unexpected from the opposite side. Bride drives for the sun and a fast orbit, has excellent agility in weaving and firing toward hazards. Poney Fine shoots a lot, singling out individual opponents. Flatback is slow and maintains an uneasy field-sense of the



Falling into orbit around the central point, Bride, at lower left, deftly Poney Fine in single combat, then attempts flank attack on Poney Fine (upper right), who has caught Roundback's surprise & outflanks Flatback's head to head. As kills are made the displayed numbers keep score.

while battleship, impervious to surprise attack.

A game is over when only one or no survivors are displayed. The scores then black out, counts down 5-4-3-2-1, erases in ten different directions, the most hot-hot-hot scene I've been around since Merry Prankster Acid Tests... and really it's just a second night at the AI Project, at any suitably hairy computer research project. Something basic.

These are heads, most of them. Half or more of computer science is heads. But that's not it. The rest of the consciousness is laid low and back these days, showing none of this kind of mad. What, then?

The Hackers

I'm guessing that Alan Kay at Xerox Research Center (more on them shortly) has a line on it, defining the standard Computer Bum.

"About as straight as you'd expect bootstrappers to look. It's that kind of fanaticism. A true hacker is not a group person. He's a person who loves to stay up all night, he and the machine in a low-hat relationship... They're kids who tended to be brilliant but not very interested in conventional goals. And computing is just a fabulous place for that, because it's a place where you don't have to be a Ph.D. or anything else. It's a place where you can still be an artisan. People are willing to pay you if you're any good at all, and you have plenty of time for screwing around."

The hackers are the technicians of this science. "It's a term of devotion and also the ultimate compliment." They are the ones who translate human demands into code that the machines can understand and act on. They are legion. Fanatics with a potent new toy. A mobile new-found elite, with its own apparel, language and character, its own legends and humor. Those magnificent men with their flying machines, wearing a leading edge of technology which has an odd softness to it, outlaw country, where rules are not decreed or routine so much as the stark or demands of what's possible.

A young science travels where the young take it. The water computer research directors have learned that not trading their young programmers with major responsibility can lead immediately to no research. AI is one of perhaps several dozen computer research centers that are flourishing with their young, some of them with no more formal education than they got at the local Free School. I'm talking to Les Earnest, the guest who went for beer. He's tall, swarthy, has a black and white striped beard, looks like a Salt Athlete. He's telling me about what the people build here besides refinements of Spacwar. There's a speech recognition project. There's the hand-eye project, in which the computer is learning to see and visually correct its robot functions. There's work on symbolic computation and grammatical inference. Work with artistic children, "trying to get them to relate to computers first, and then later to people."

Seems to be successful in part because many of these children think of themselves as machines. You can encourage them to interact in a game with the machine.

Another window on the interests of



AI and of the hackers is a posted print-out of the file of AI's system programs, some 250 elaborate routines available. Scanning Hand Eye Monitor... Go Game... DPT Back Brown Balancing... Companion Portion of Soup...

Resumes Selected AP News Stories... Display Hack... Mad Doctor...

New TV Editor... Fortune Cookie Program... Another Display Hack...

Kalah Game... Oh Where, Oh Where Has My Little Job Gone... Personal Model...

Pruning Program... The Wonderful News Program... Old Spacwar... New Spacwar...

Send Everyone a Message... Old Version of Daemon... Tell Everyone the System Is Going Down... Music Compiler Sort Of... New Music Compiler...

A distinction exists between low-level and high-level computer research, between preoccupations of support group (hackers) and of research group. The distinction blurs often, Les Earnest. "Sometimes it's hard to tell the difference between recreation and work, happily. We try to judge people not on how much time they waste but on what they accomplish over fairly long periods of time, like a half year to a year."

He adds that Spacwar players "are more from the support groups than the research groups. The research group tend to get their kicks out of research."

Spacwar is low-cost.

His account of the invention of

Bruce Baumgart, winner of the Free-Man Free-For-All at the First Intergalactic Spacwar Olympics, brandishing control buttons in triumph.

Spacwar is not only intriguing history, it's the most sophisticated analysis of good game design I've ever run across—elegant work. But that's in retrospect; back then it was just kids enjoying all night.

"We had this brand new PDP-1," Steve Russell recalls. "It was the first mini-computer, ridiculously inexpensive for its time. And it was just sitting there. It had a console typewriter that worked right, which was rare, and a paper tape reader and a cathode ray tube display. [There had been CRT displays before, but primarily in the Air Defense System.] Somebody had built some little pattern-generating programs which made interesting patterns like a kaleidoscope. Not a very good demonstration. Here was this display that could do all sorts of good things! So we started talking about it, figuring what would be interesting displays. We decided that probably you could make a two-dimensional maneuvering sort of thing, and decided that naturally the obvious thing to do was space-ships."

Naturally? "I had just finished reading 'Doc' Smith's Letterman series. He was some sort of scientist but he wrote this really dashing brand of science fiction. The details were very good and it had an excellent pace. His heroes had a strong tendency to get pursued by the villain across the galaxy and have to invent their way out of their problem while they were being pursued. That sort of action was the thing that intrigued Spacwar. He had some very glowing descriptions of spaceship encounters and space fleet maneuvers."

"Doc" Smith.

The basic impulse upon the Newton, every weapon of war. But, as Costigan had expected, Norad's visual was completely ready for any emergency. And, unlike her sister-ship, she was manned by scientists well-versed in the fundamental theory of the weapons with which they fought. Beams, rods and lanes of energy flamed and flared, planes and pencils out, slashed and stabbed, defensive screens glowed tully or flared suddenly into instantly brilliant, curvilinear incandescence. Critson openly struggled valiantly against violent curtains of annihilating material properties and torpedoes were launched under full-beam control, only to be exploded harmlessly in mid-space, to be blasted into torpedoes or to disappear inconspicuously against impenetrable polycyclic screens.

—Populansky (1948)
Steve Russell: "By picking a world which people weren't familiar with, we could alter a number of parameters of the world in the interests of making a good game and of making it possible to get it onto a computer. We made a great deal of compromises from some of our original grand plans in order to make it work well."

One of the important things in Spacwar is the pace. It's relatively fast-paced, and that makes it an interesting game. It seems to be a reasonable compromise between action—pushing buttons—and thought. Thought does help you, and there are some tactical considerations, but just plain fast reflexes also help.

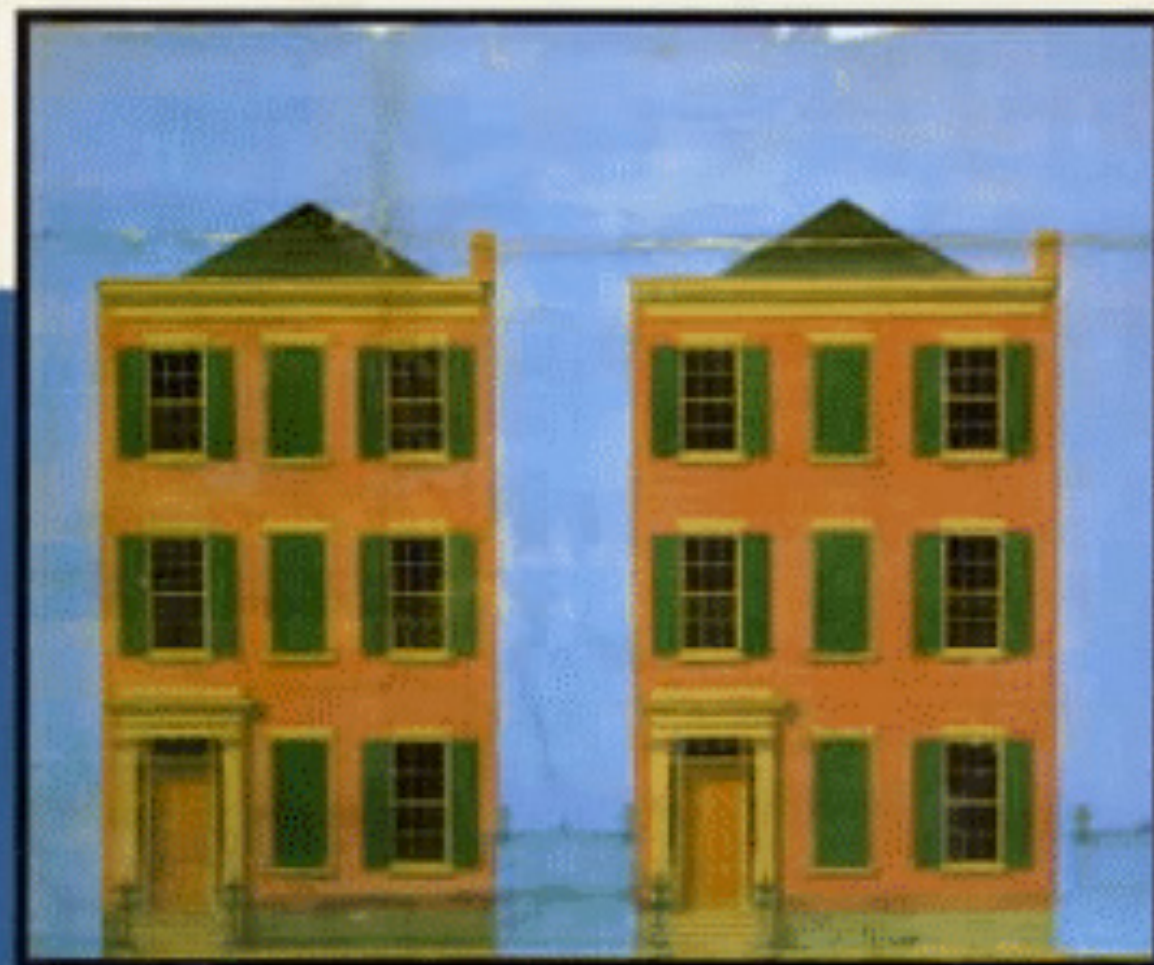
"It was quite interesting to fiddle with the parameters, which of course I

—Continued on Next Page



HOW BUILDINGS LEARN

What happens after they're built



New Orleans, 1857



The same two buildings, 1993

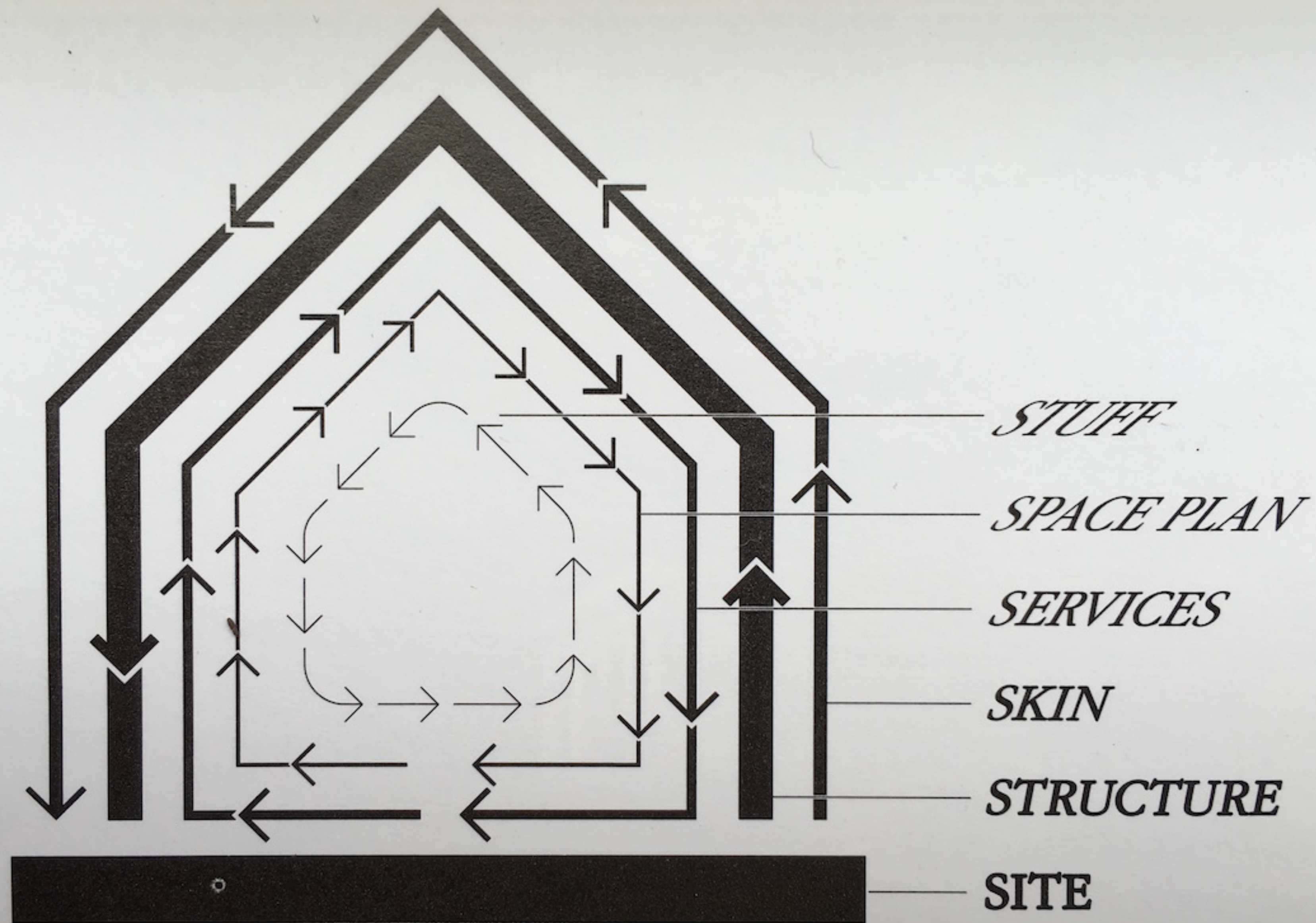
STEWART BRAND

Creator of *THE WHOLE EARTH CATALOG*

Creator of *THE WHOLE EARTH CATALOG*

STEWART BRAND

shearing layers



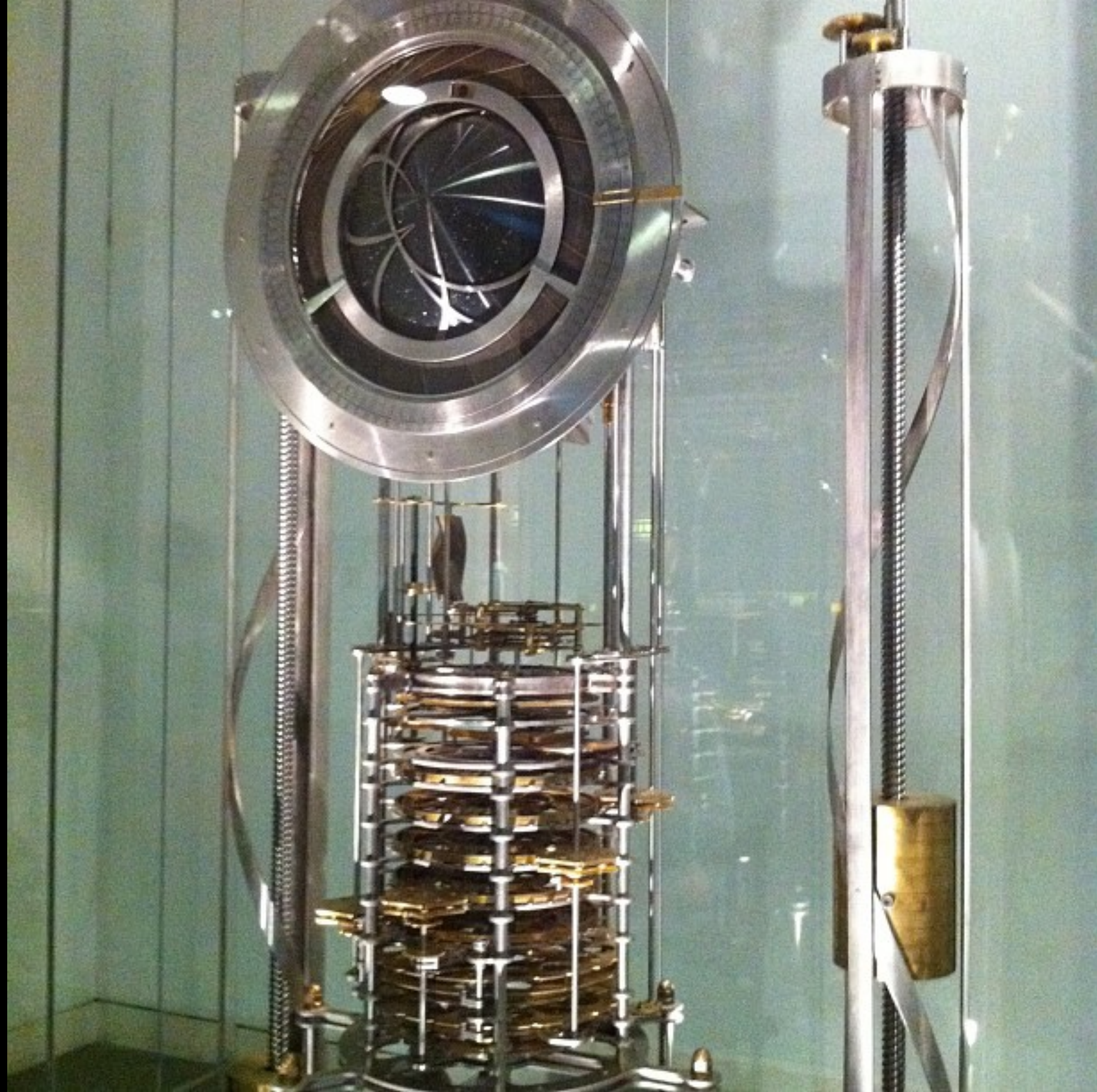
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LONG NOW

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member





THE CLOCK OF THE LONG NOW

TIME AND RESPONSIBILITY

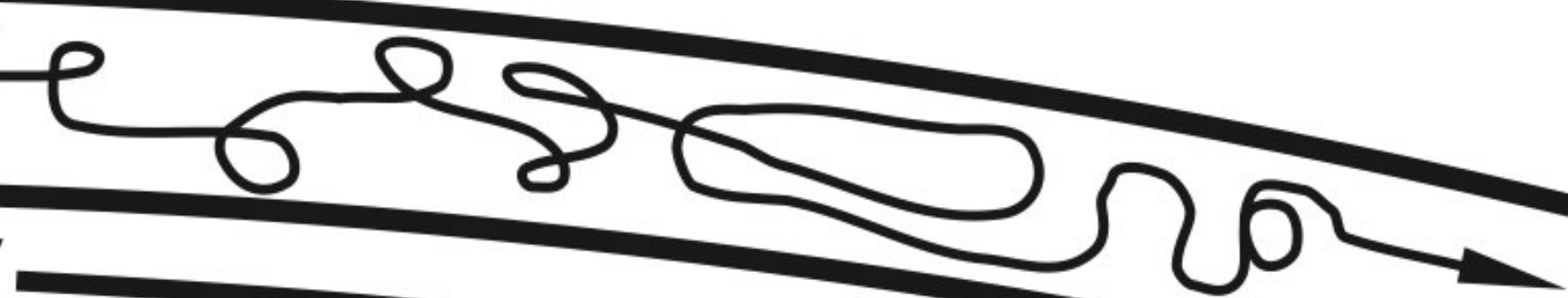
THE IDEAS BEHIND THE WORLD'S SLOWEST COMPUTER



STEWART BRAND
AUTHOR OF *THE MEDIA LAB*

THINKER OF THE WEEKEND
STEWART BRAND

pace layers

FASHION 

COMMERCE 

INFRASTRUCTURE 

GOVERNANCE 

CULTURE 

NATURE 

Copyrighted Material



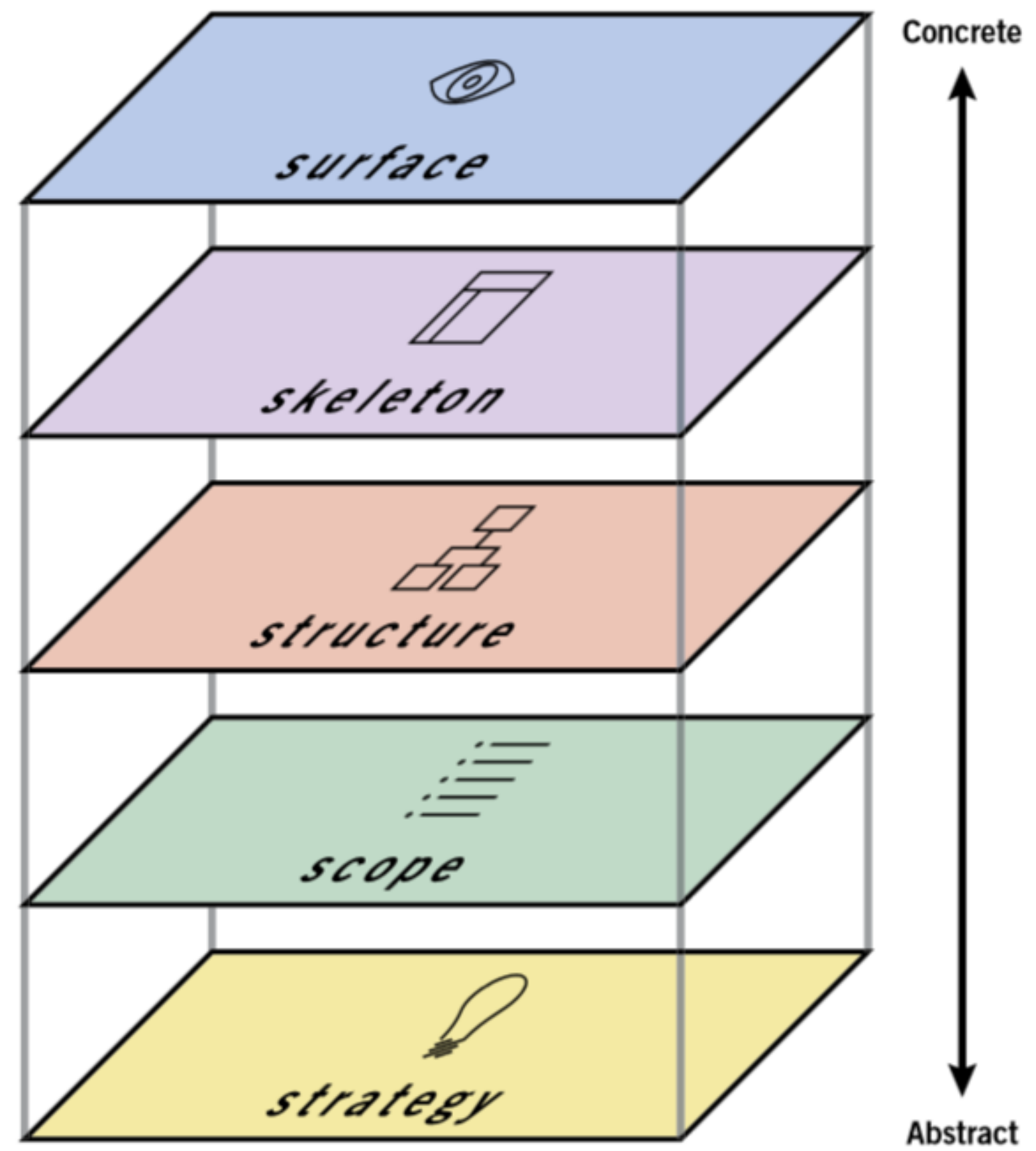
THE ELEMENTS OF USER EXPERIENCE

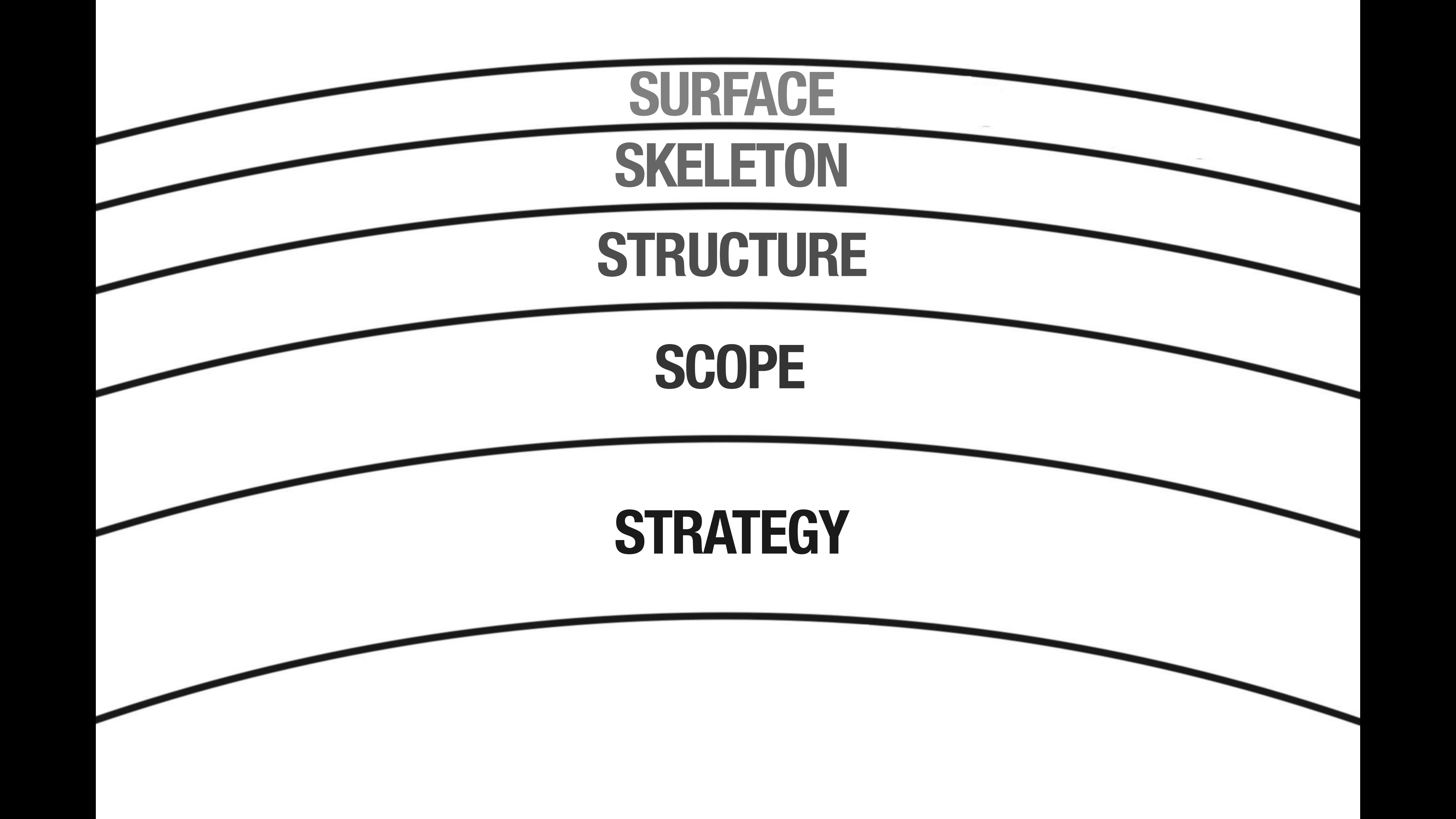


USER-CENTERED DESIGN FOR THE WEB

Jesse James Garrett







**SURFACE
SKELETON
STRUCTURE**

SCOPE

STRATEGY

JS+

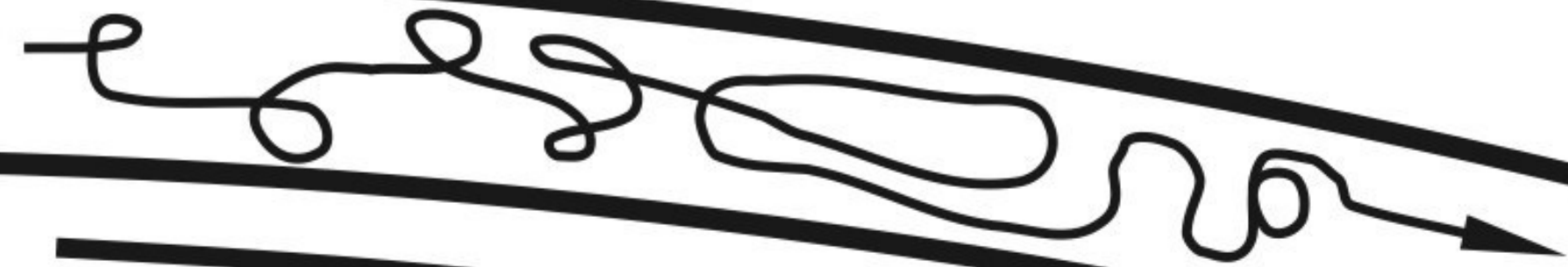
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HTML

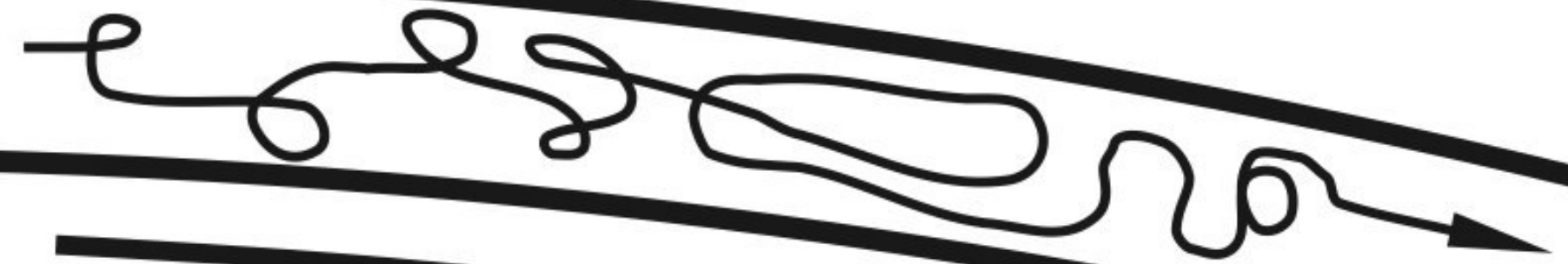
URLs

HTTP

TCP/IP



JS+



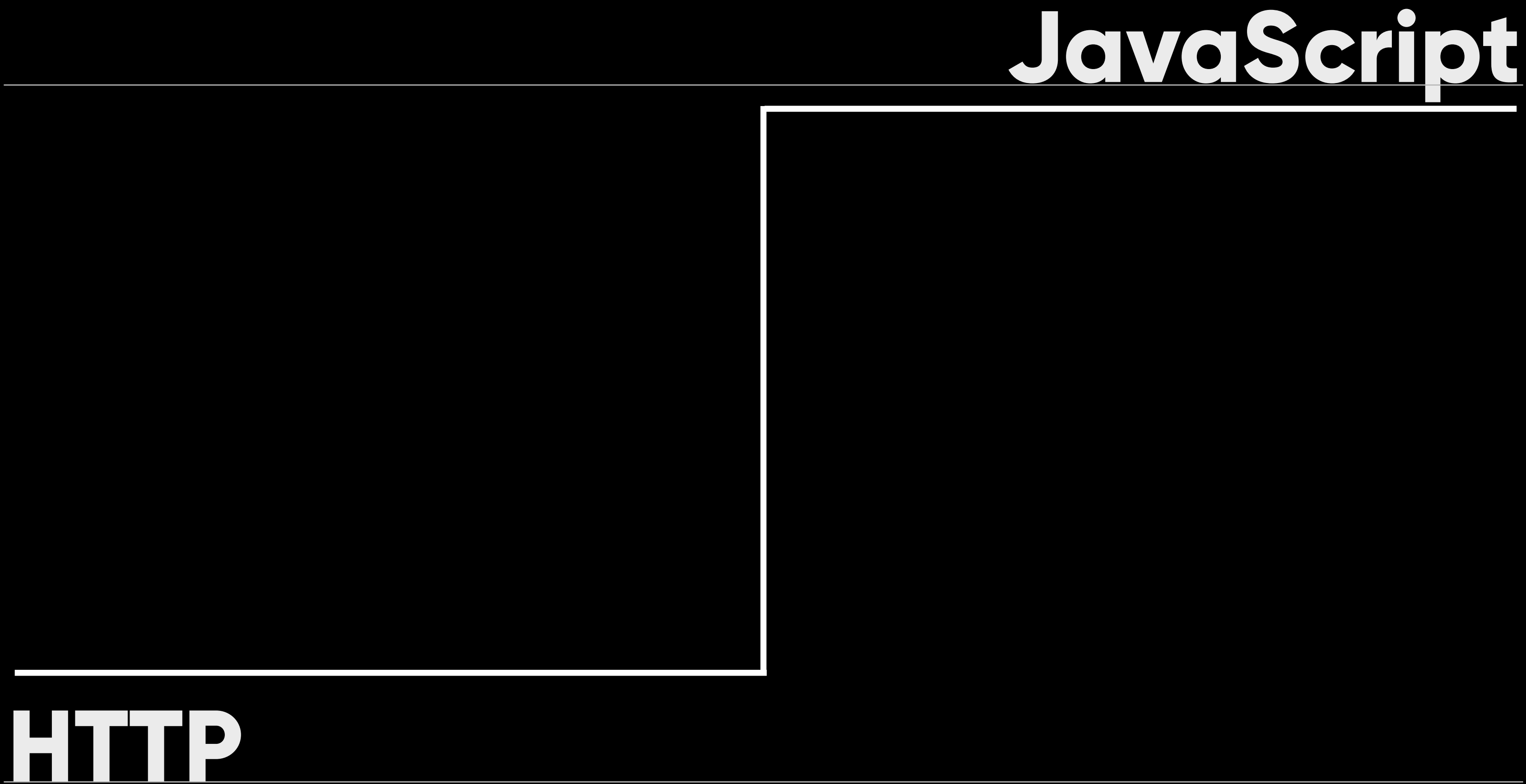
HTTP



TCP/IP

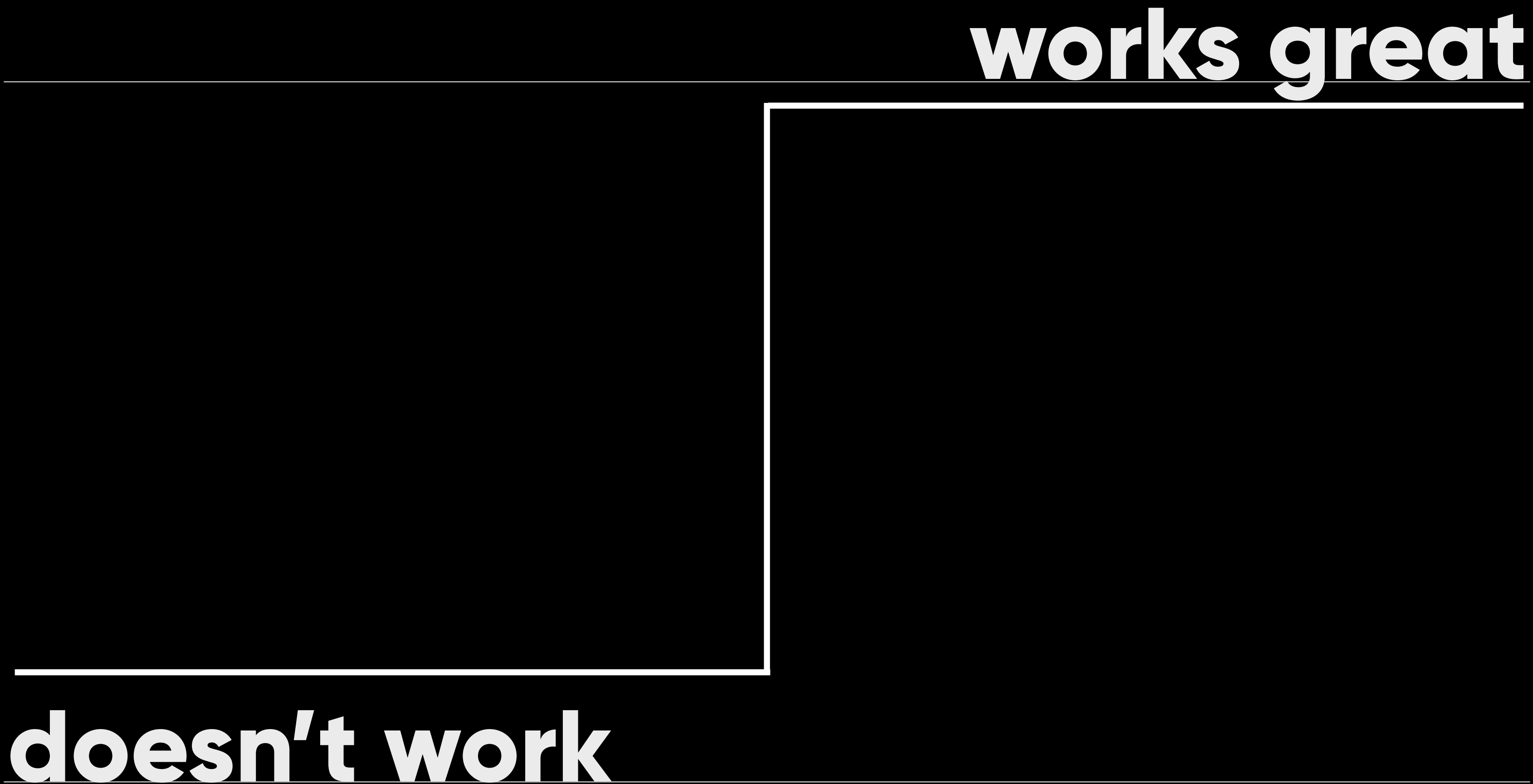


JavaScript

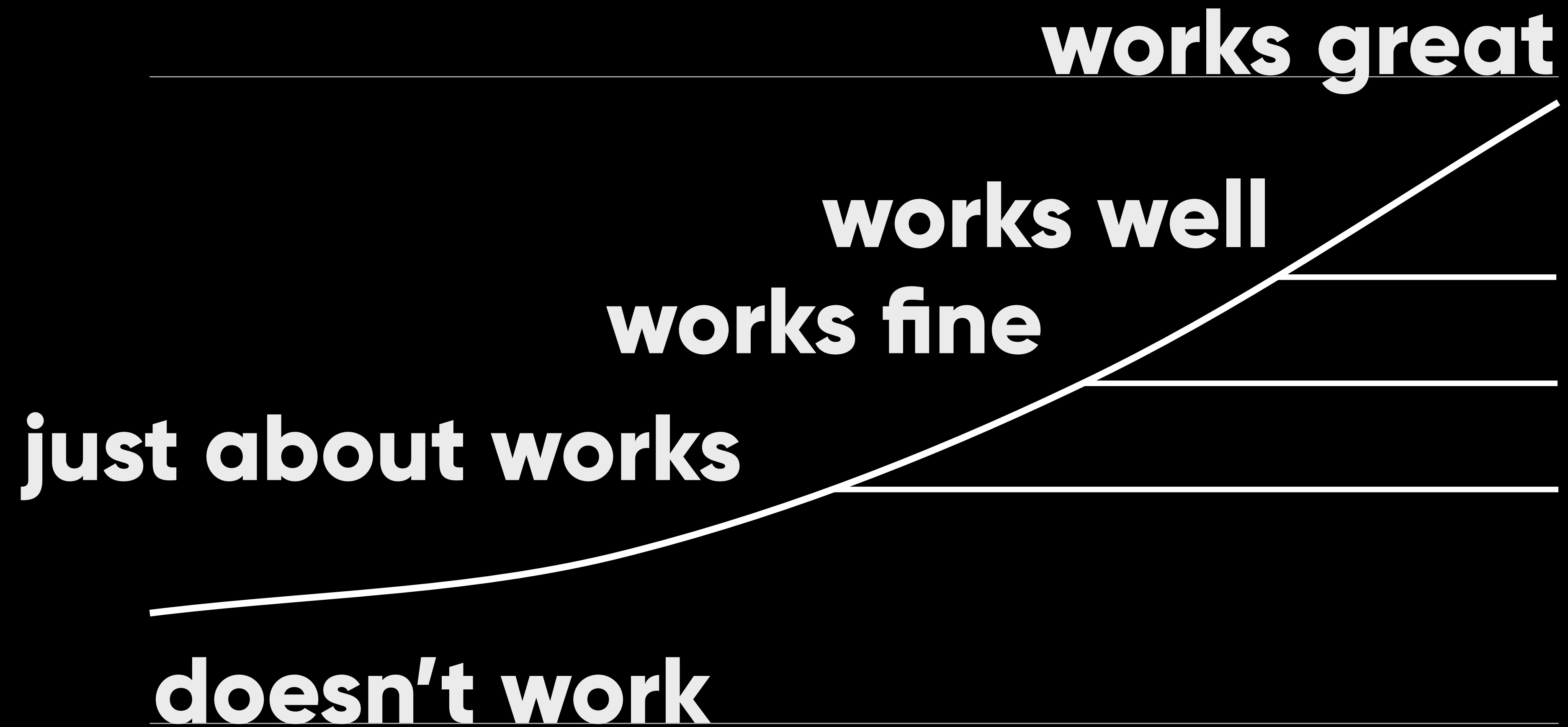


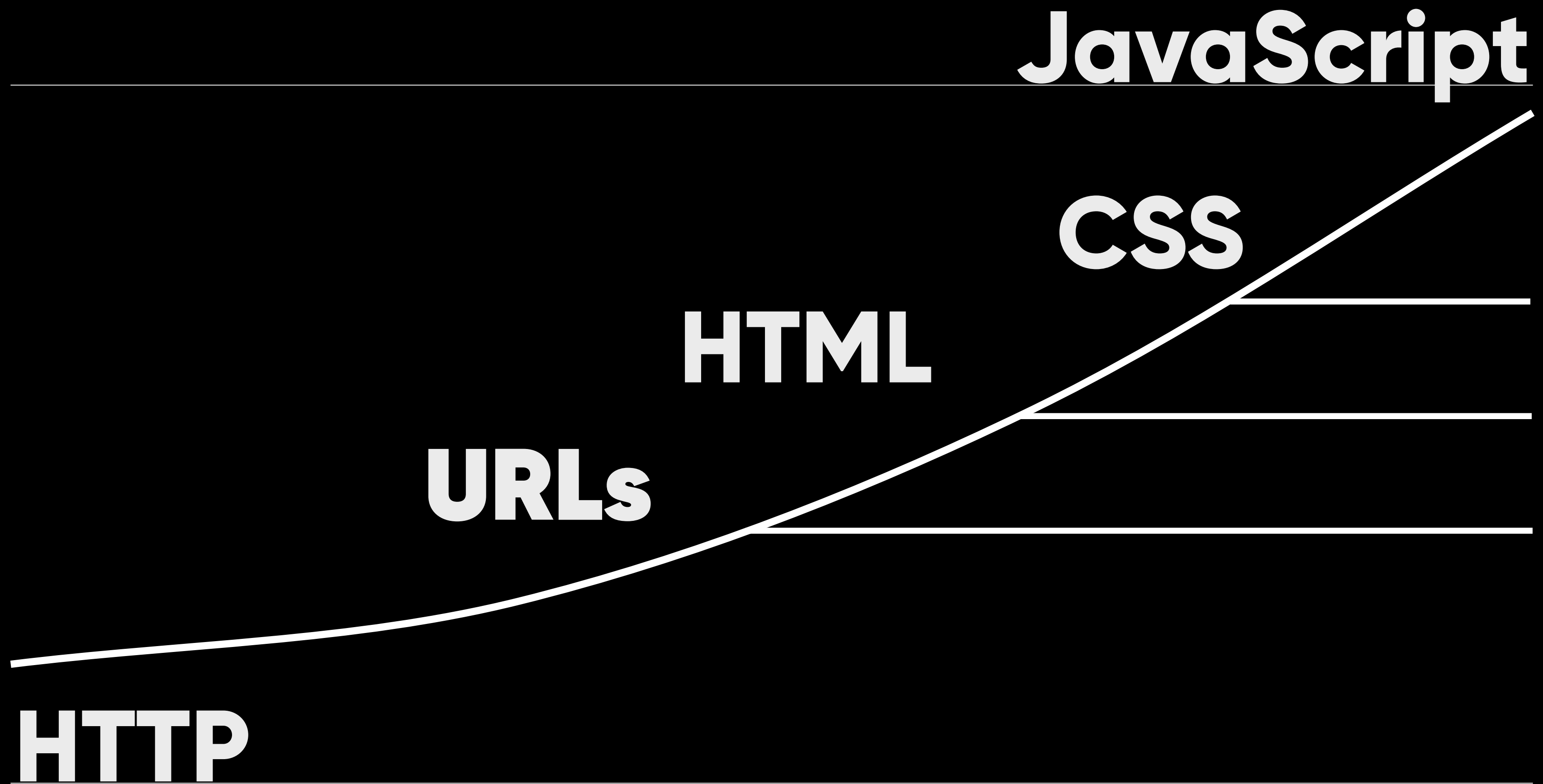
HTTP

works great

A diagram consisting of a vertical white line. At the top, a horizontal line extends to the left, and at the bottom, a horizontal line extends to the right. The text 'works great' is positioned above the top horizontal line, and 'doesn't work' is positioned below the bottom horizontal line.

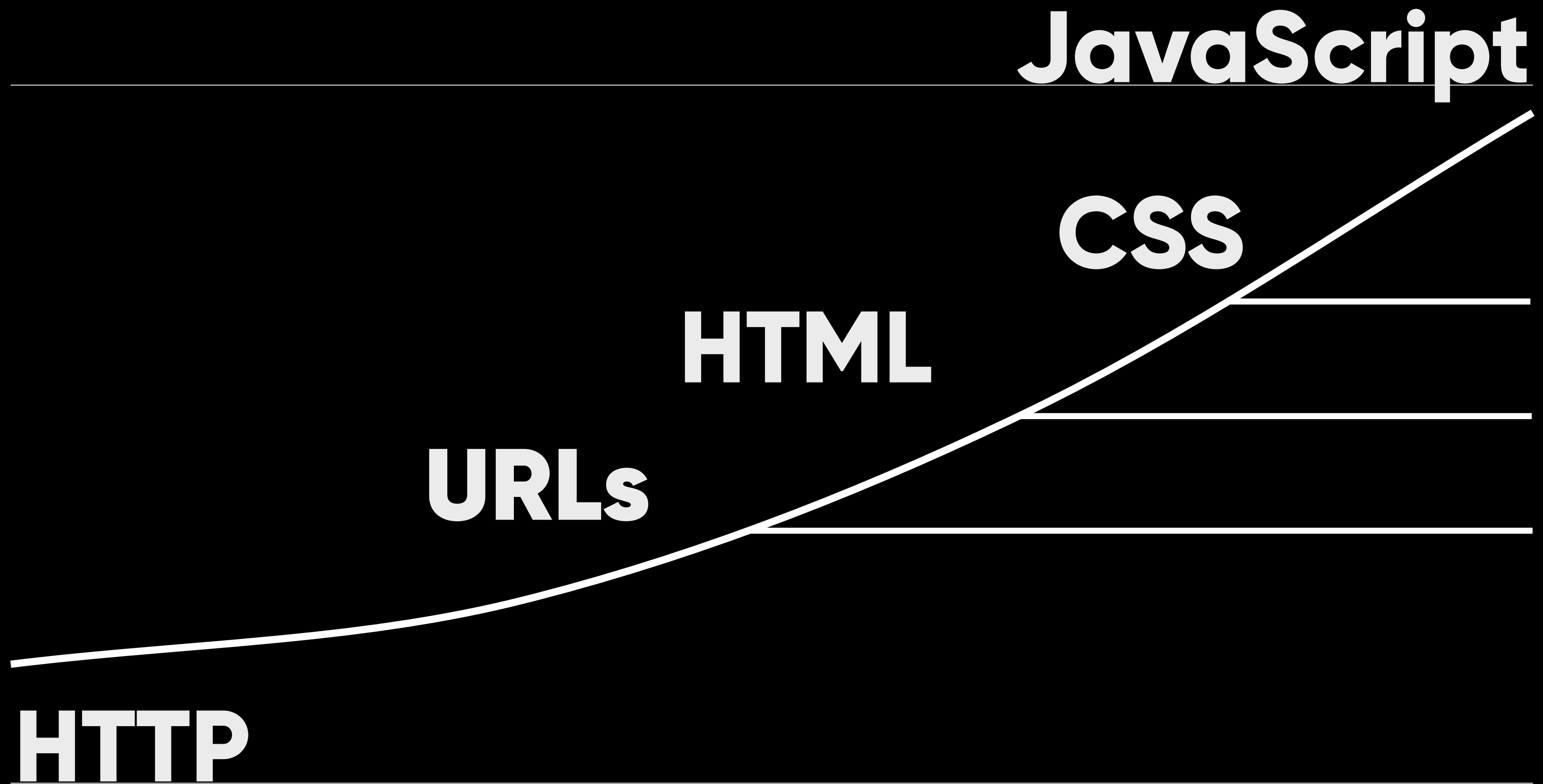
doesn't work





How well does it work?

How well does it fail?

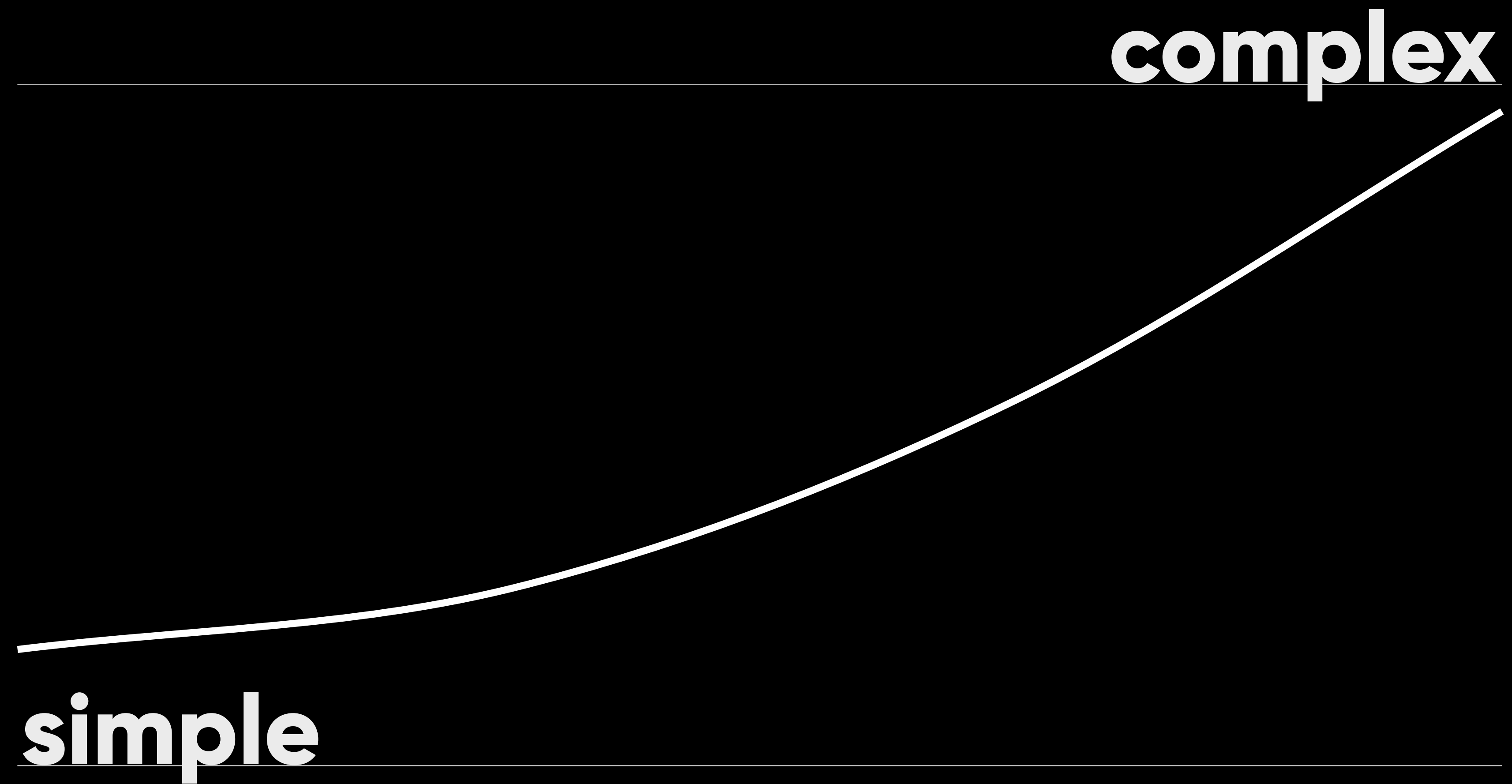


**"Choose the least powerful
language suitable for a given
purpose."**

—Principle of Least Power

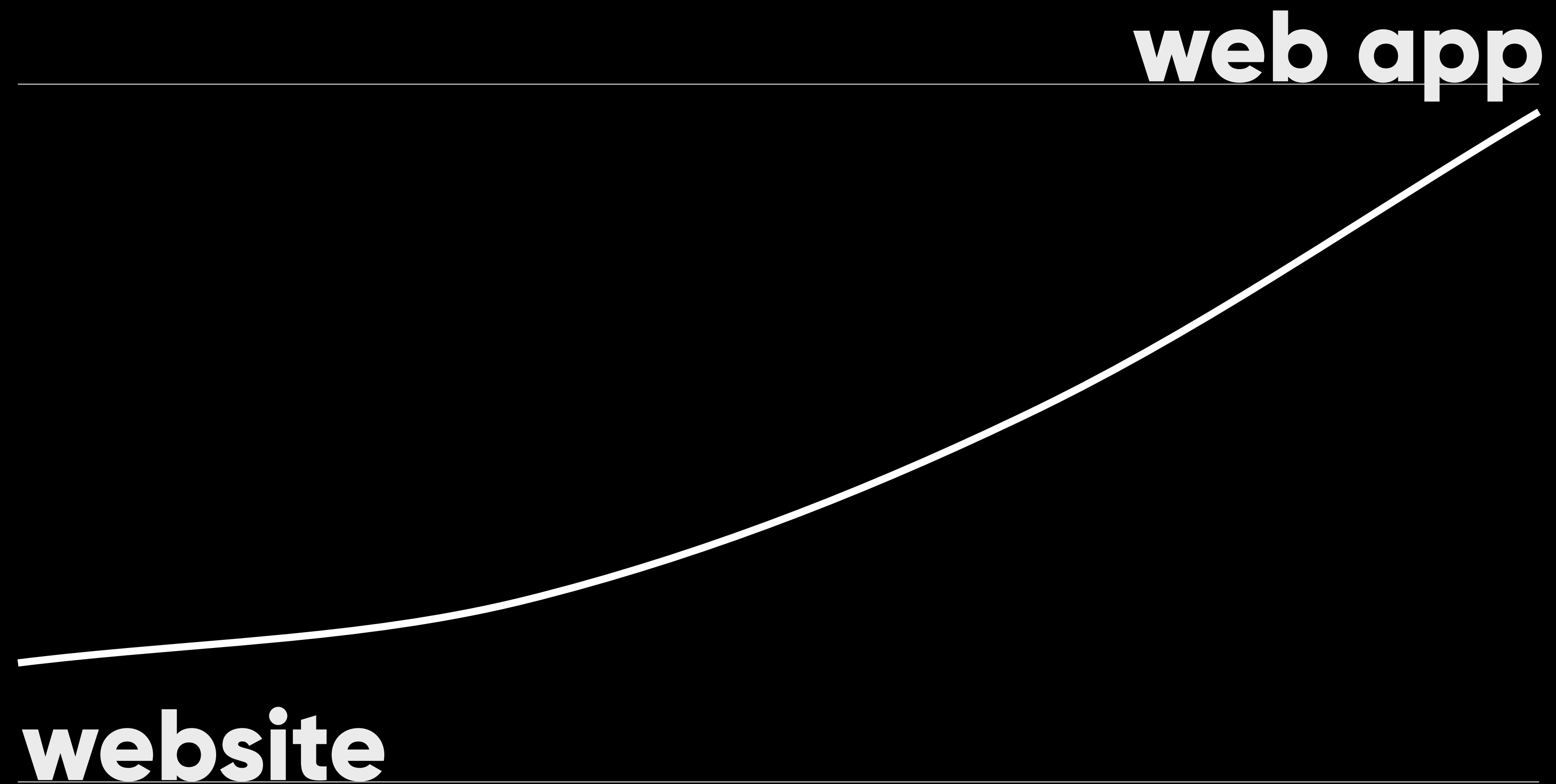
complex

simple



web app

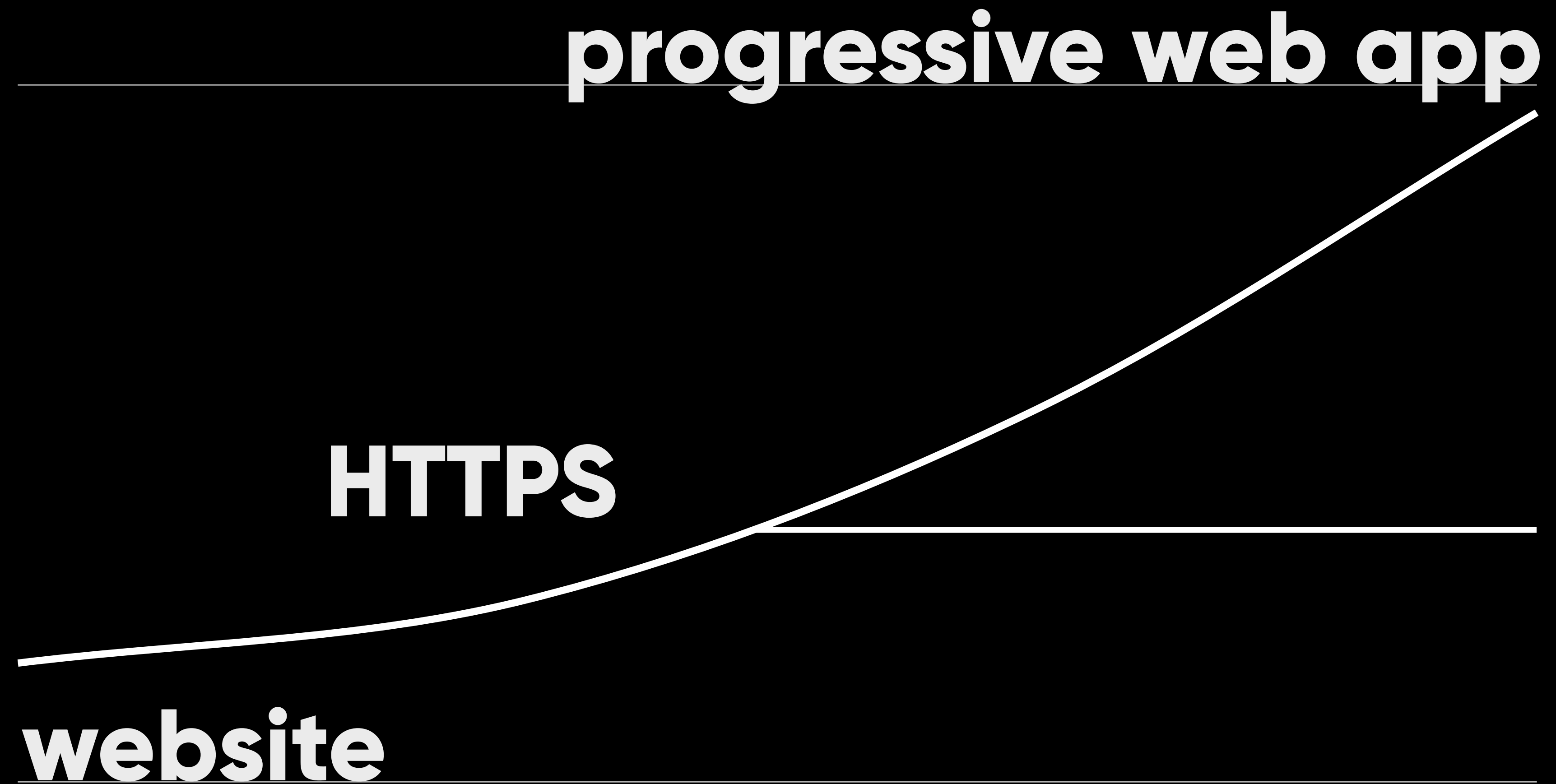
website



progressive web app

website





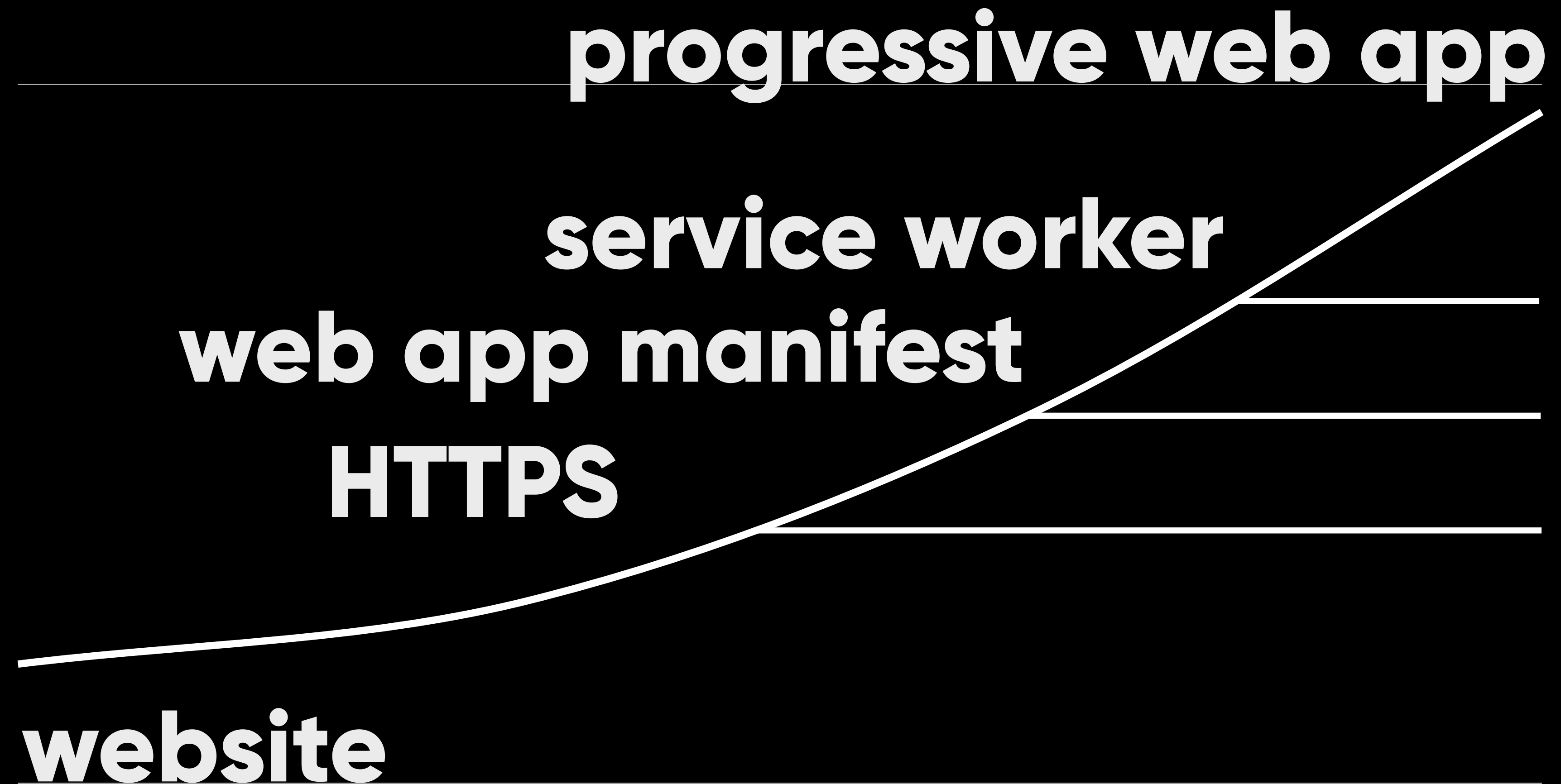
progressive web app

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graph TD; website[website] --> HTTPS[HTTPS]; HTTPS --> manifest[web app manifest]; manifest --> pwa[progressive web app];
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web app manifest

HTTPS

website



 A BOOK APART

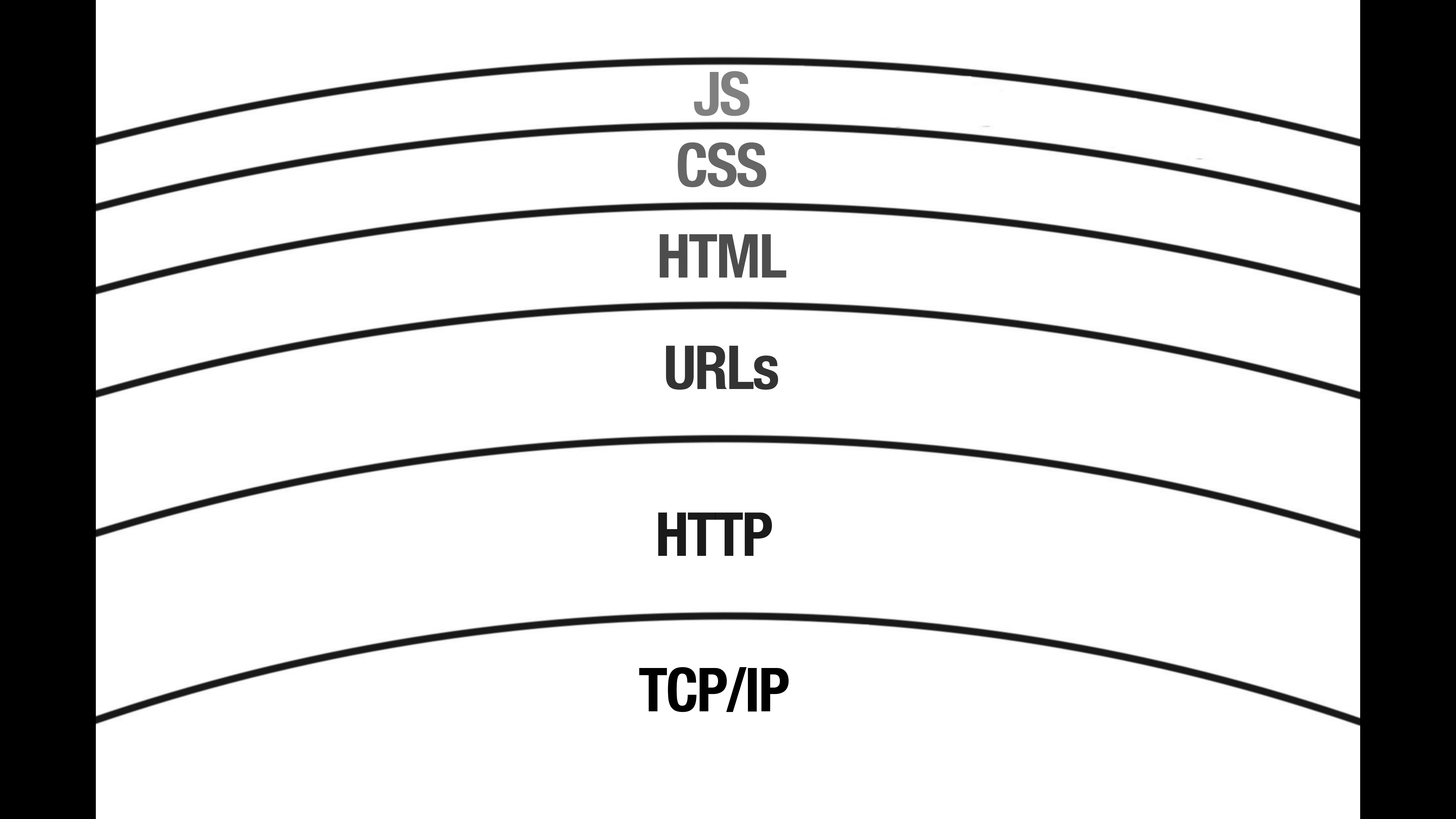
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Jeremy Keith

GOING OFFLINE

FOREWORD BY Aaron Gustafson

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JS

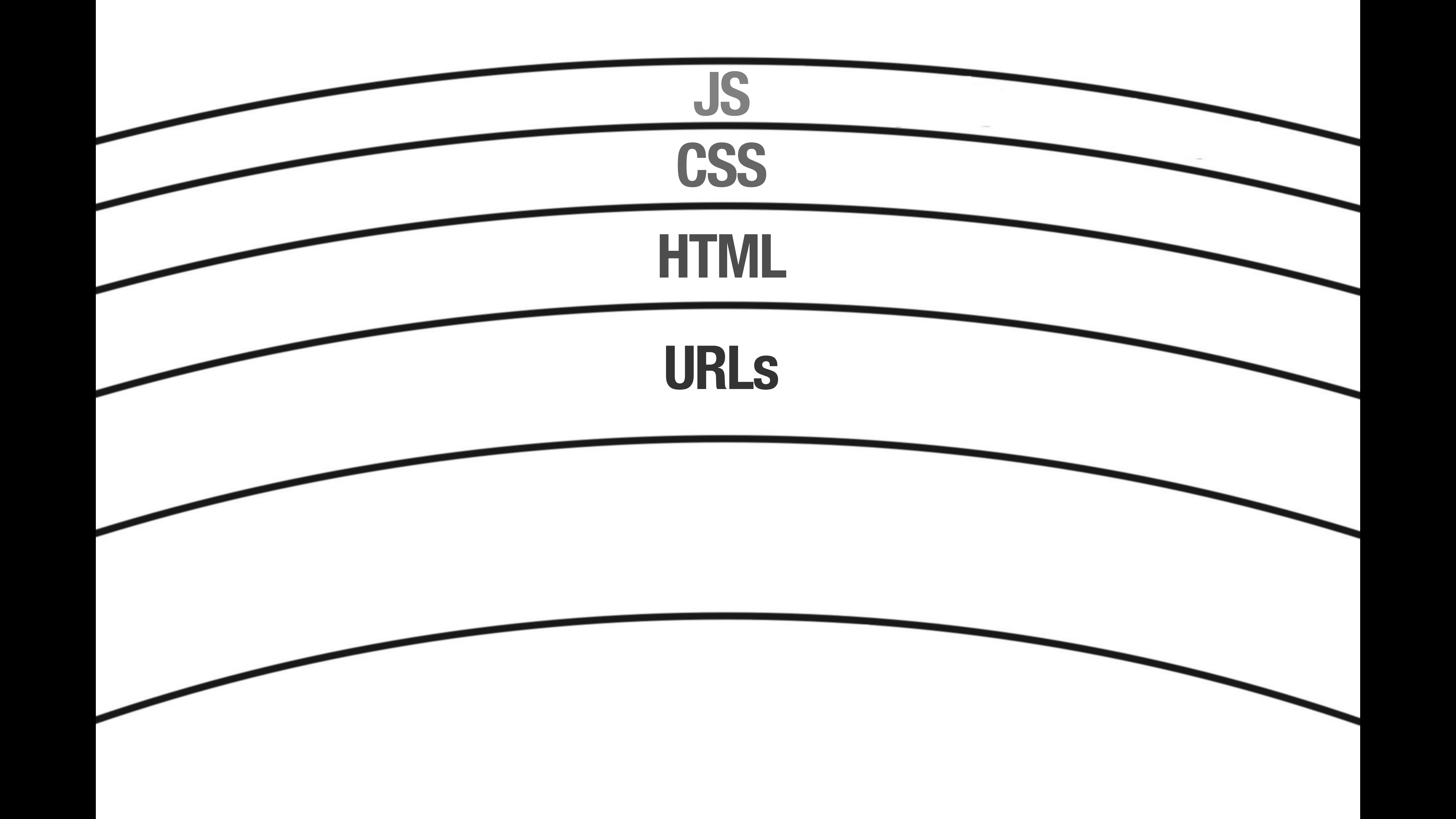
CSS

HTML

URLs

HTTP

TCP/IP



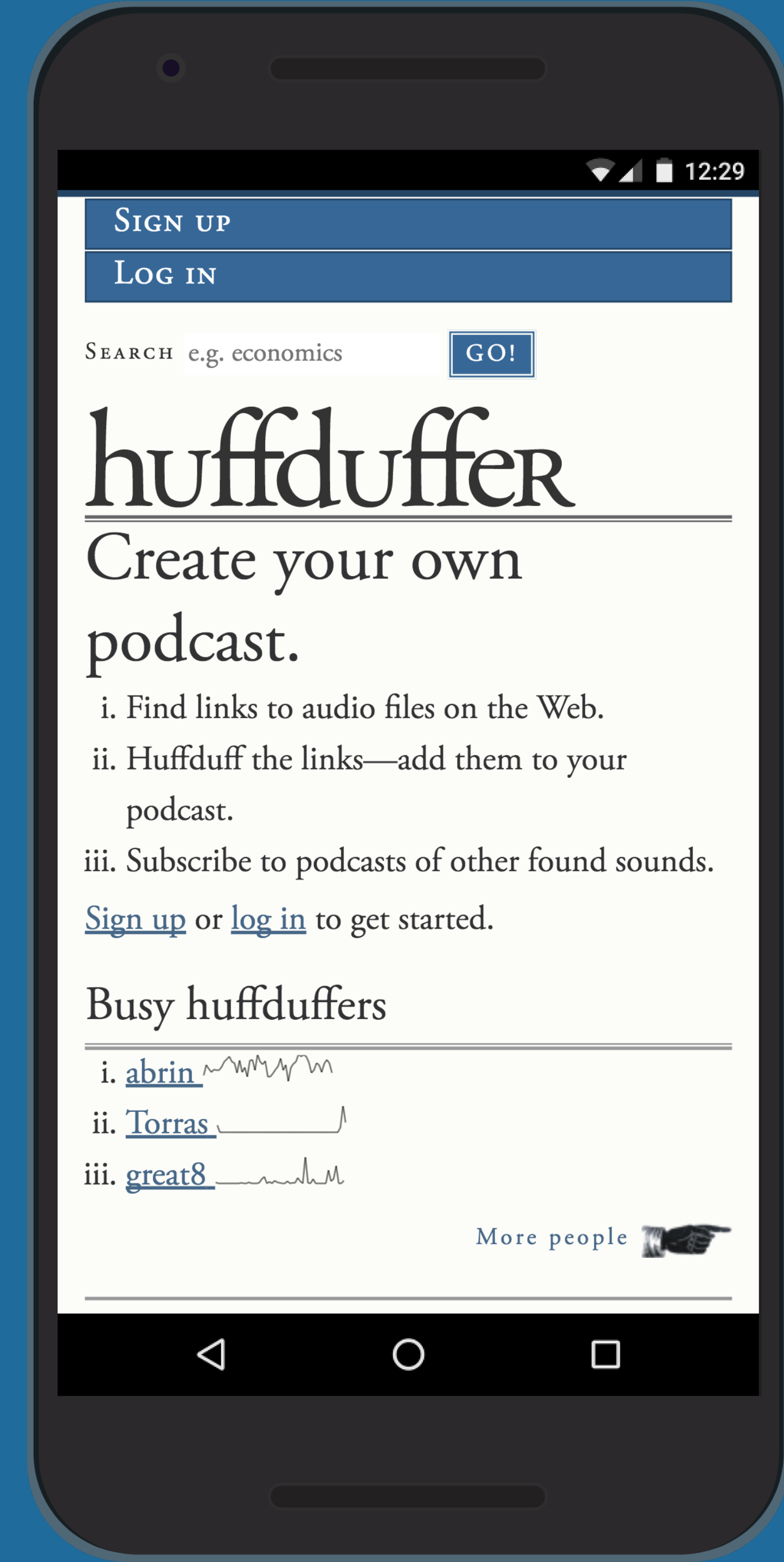
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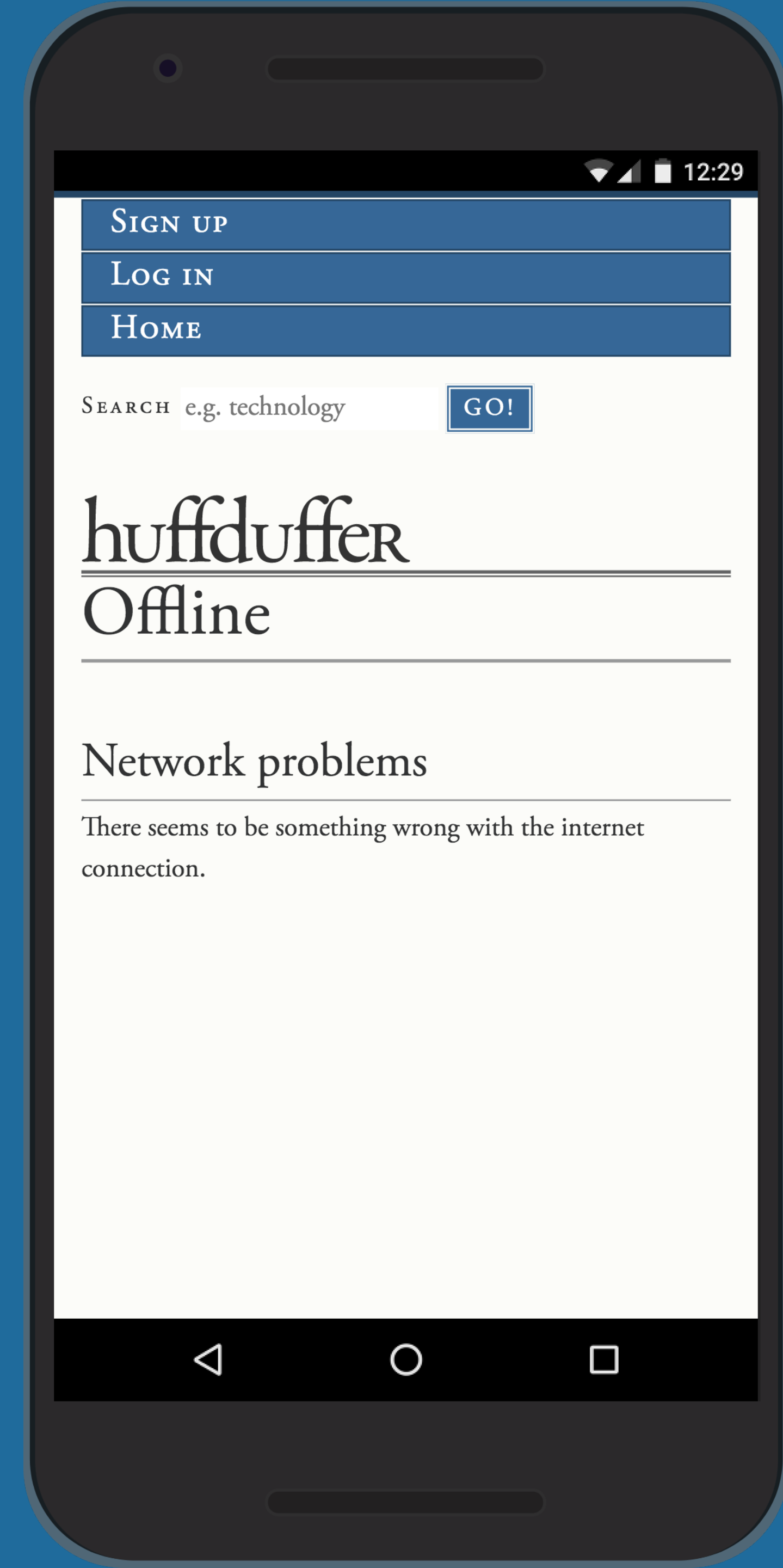
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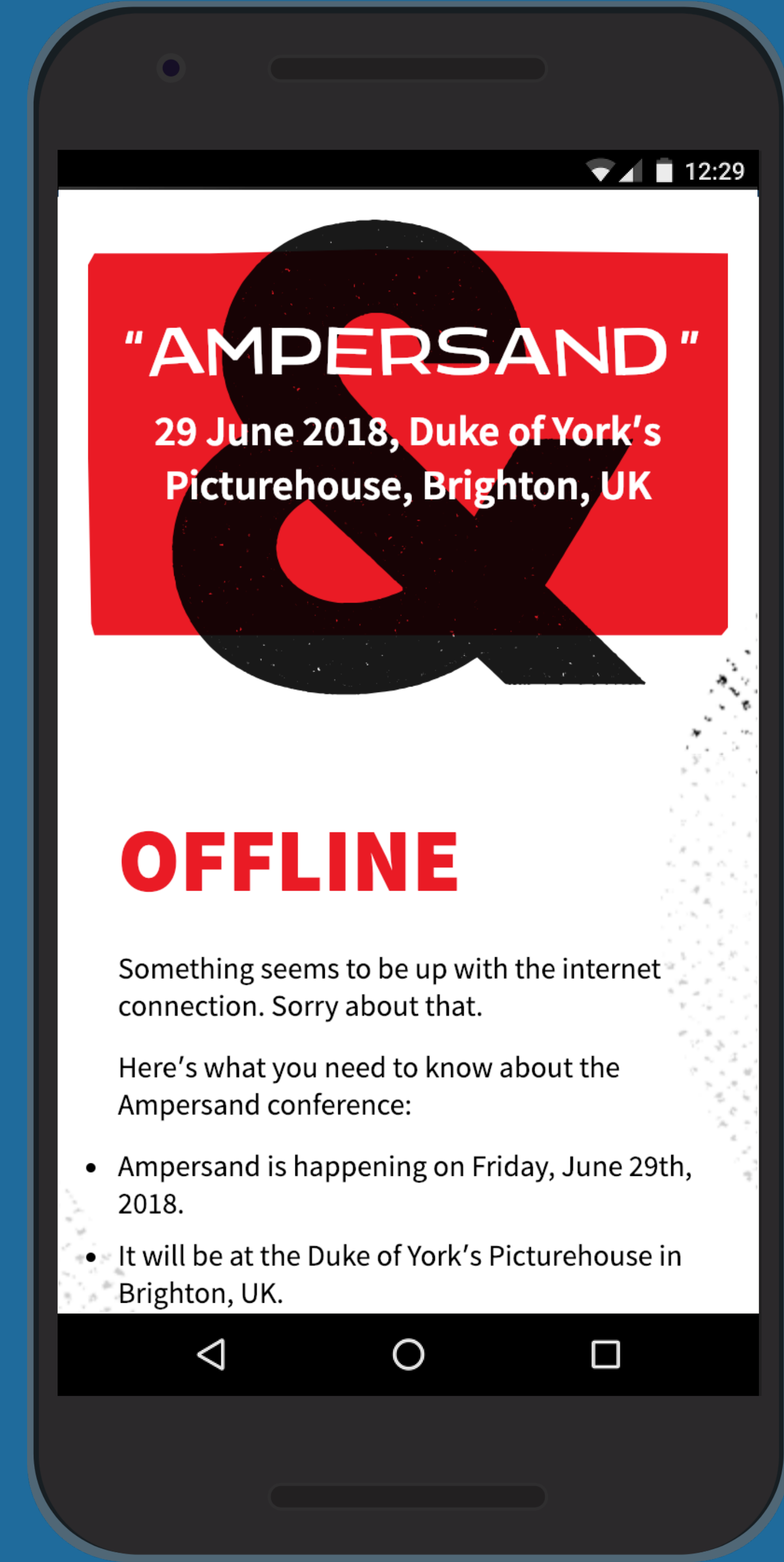
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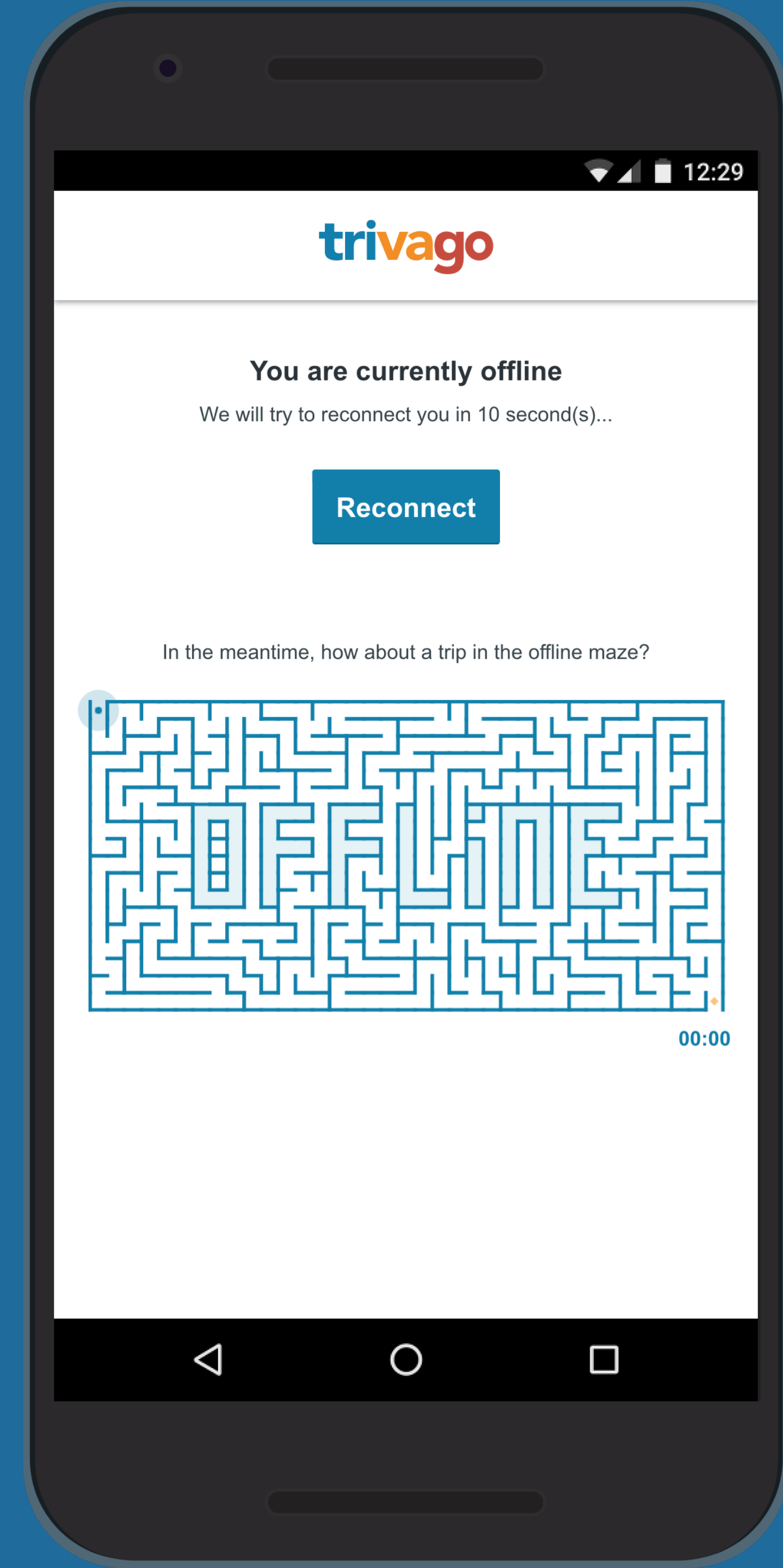
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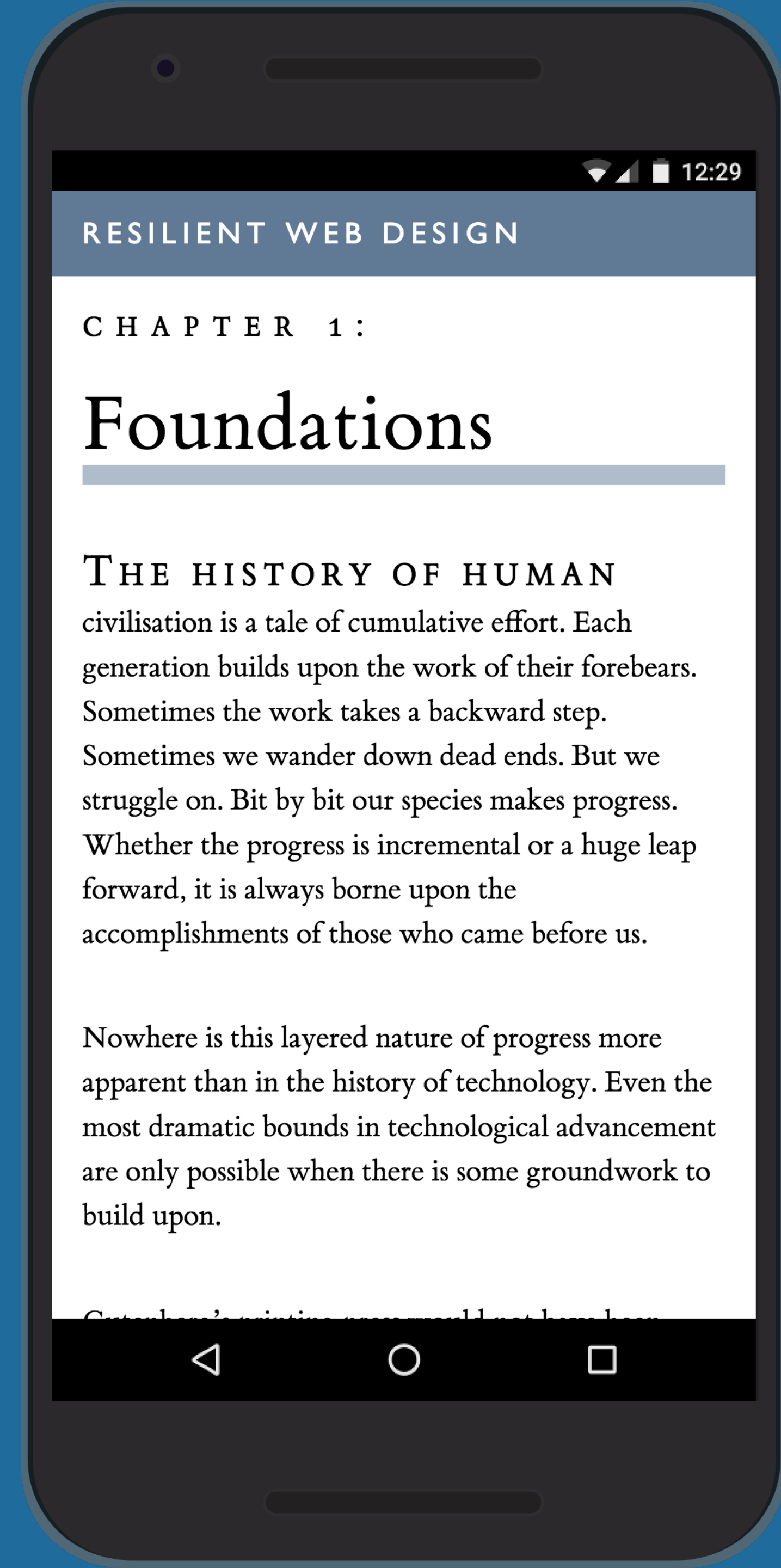
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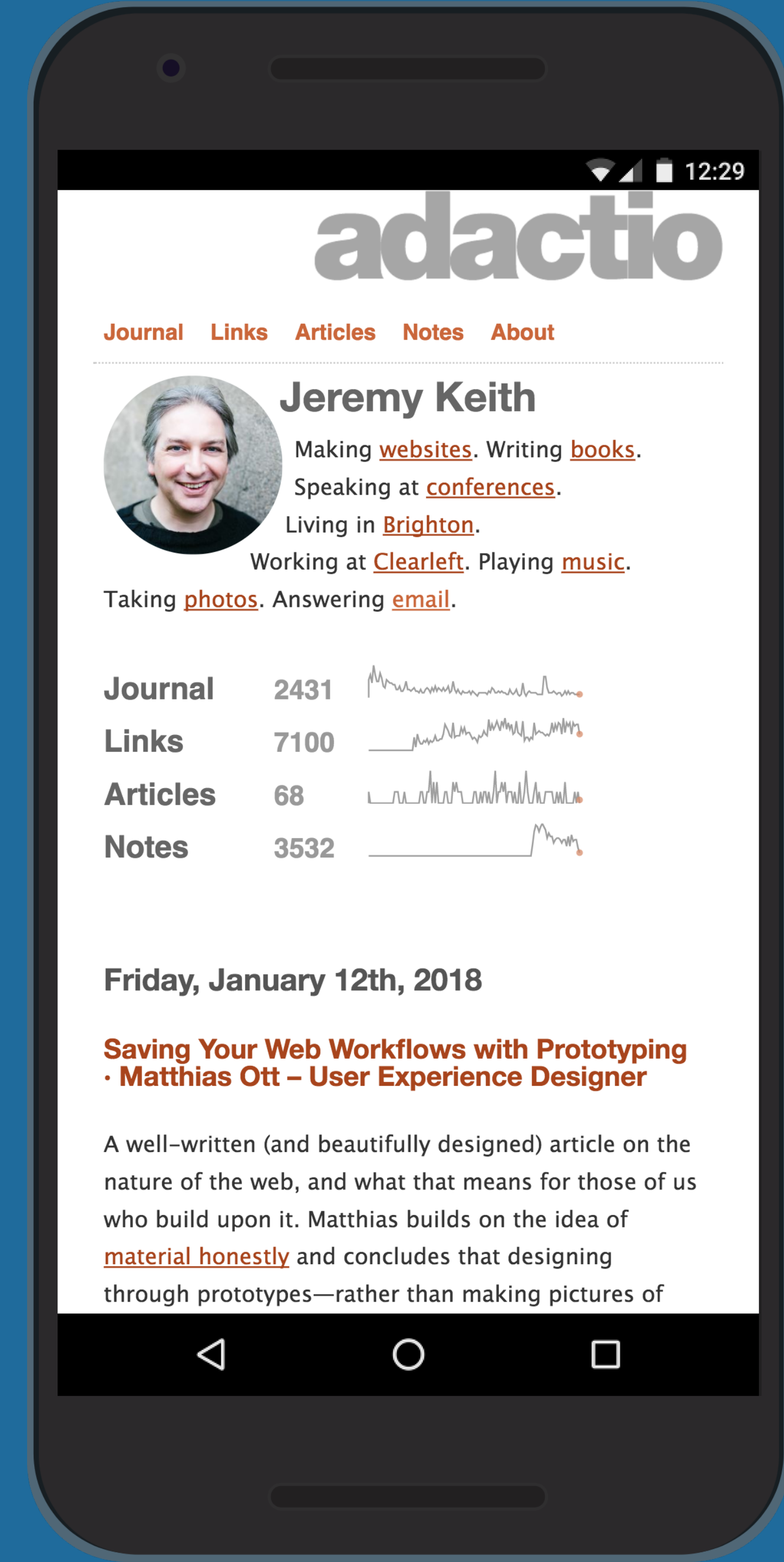
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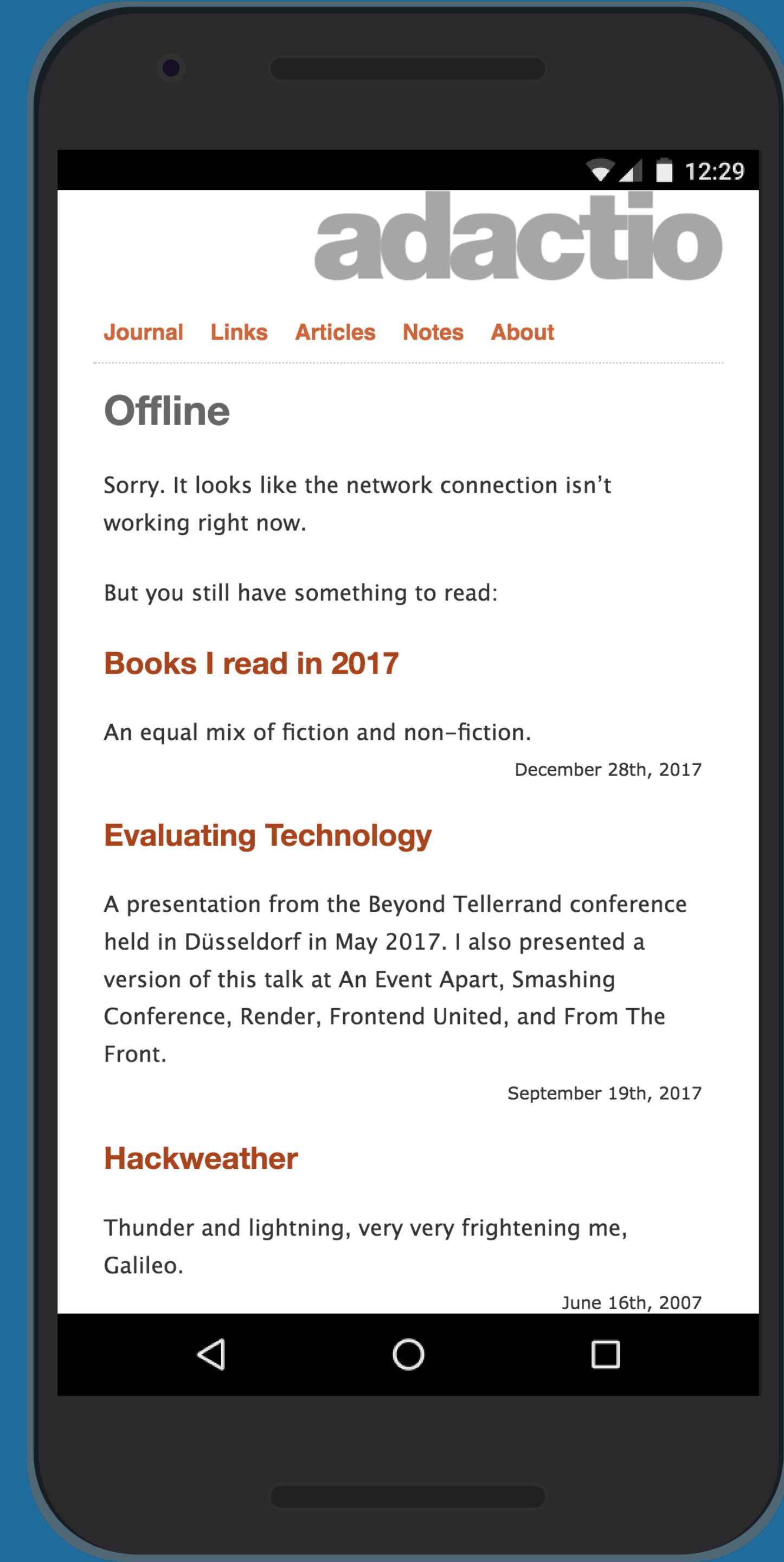
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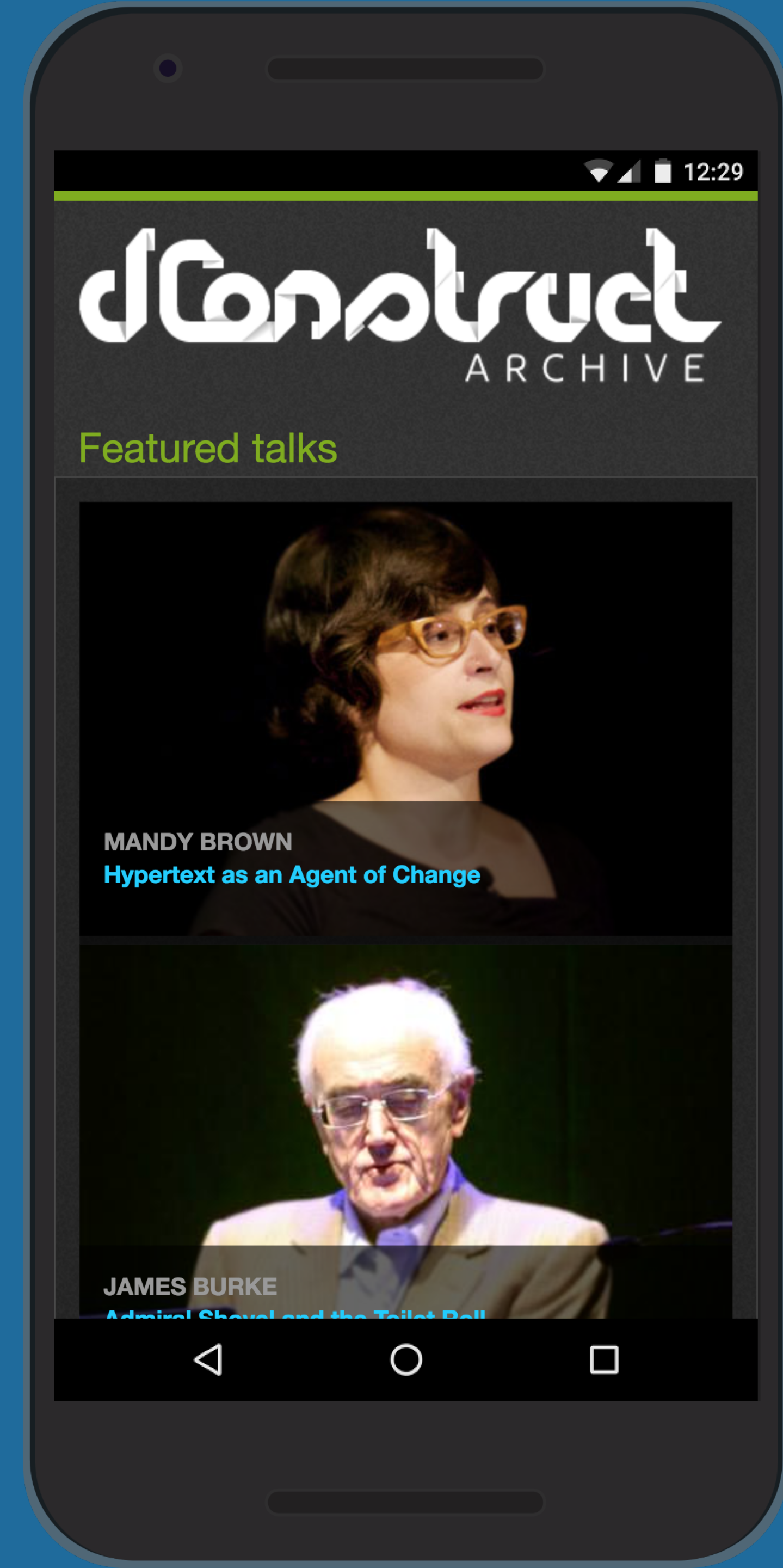
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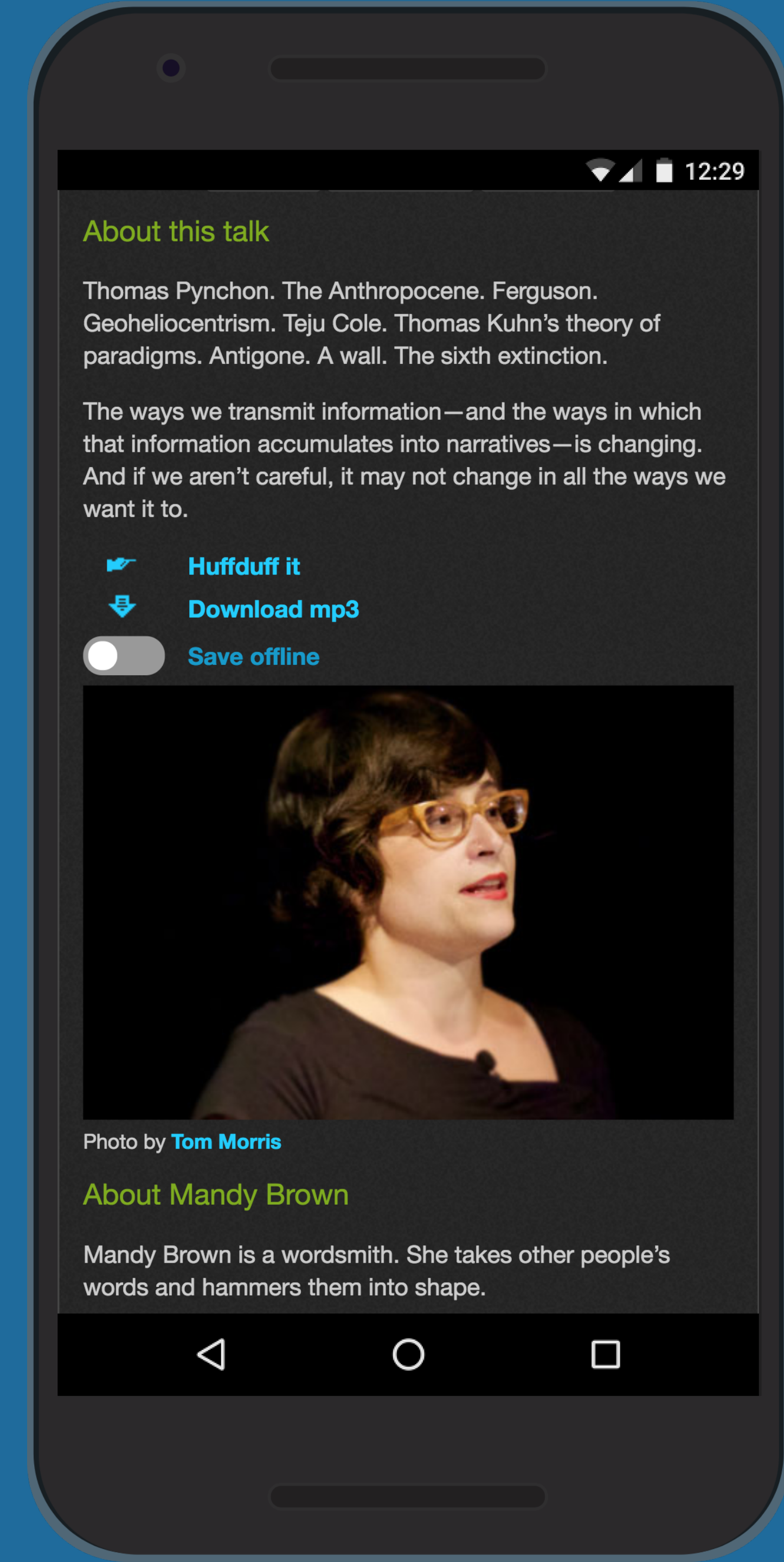
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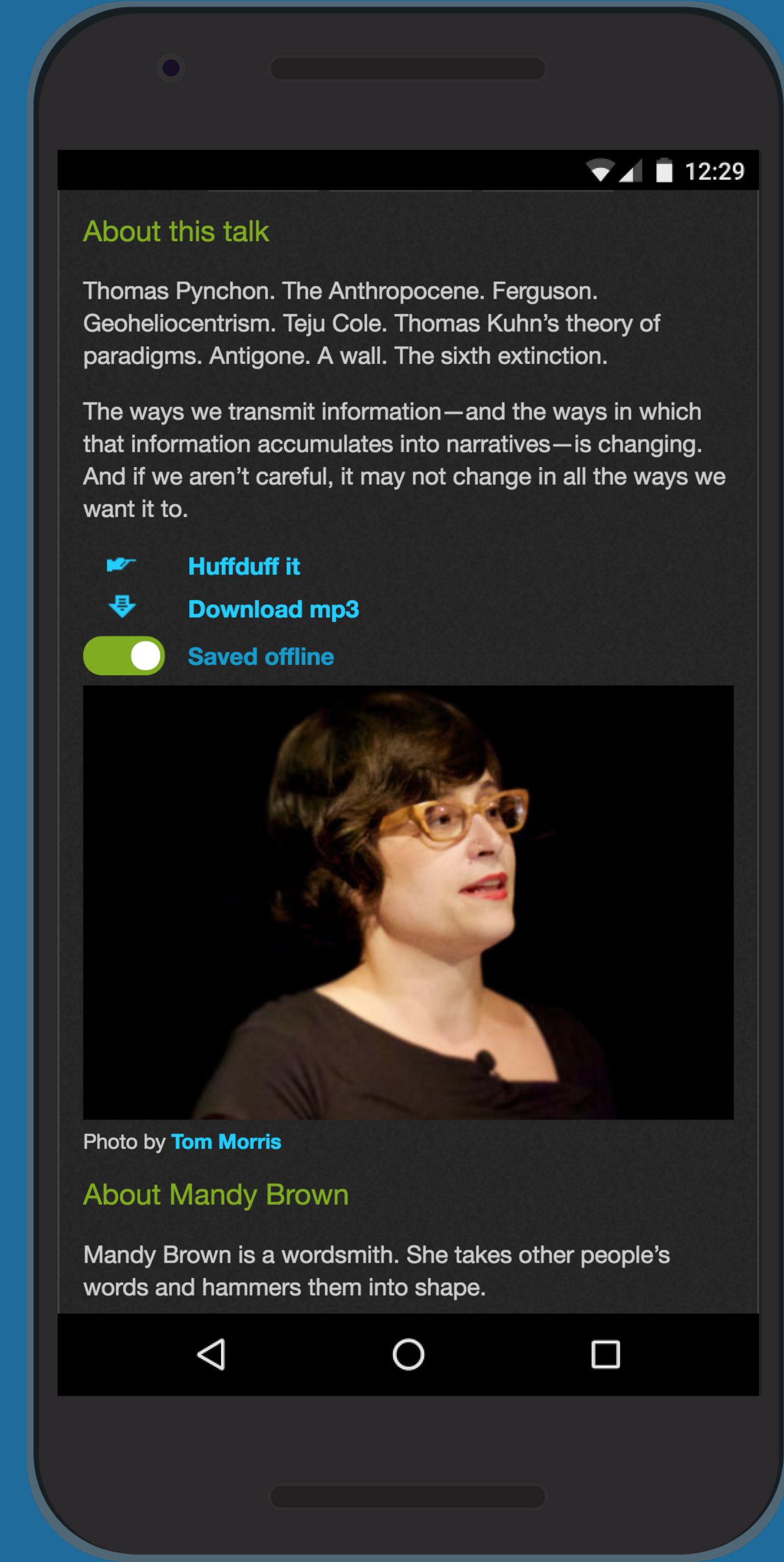
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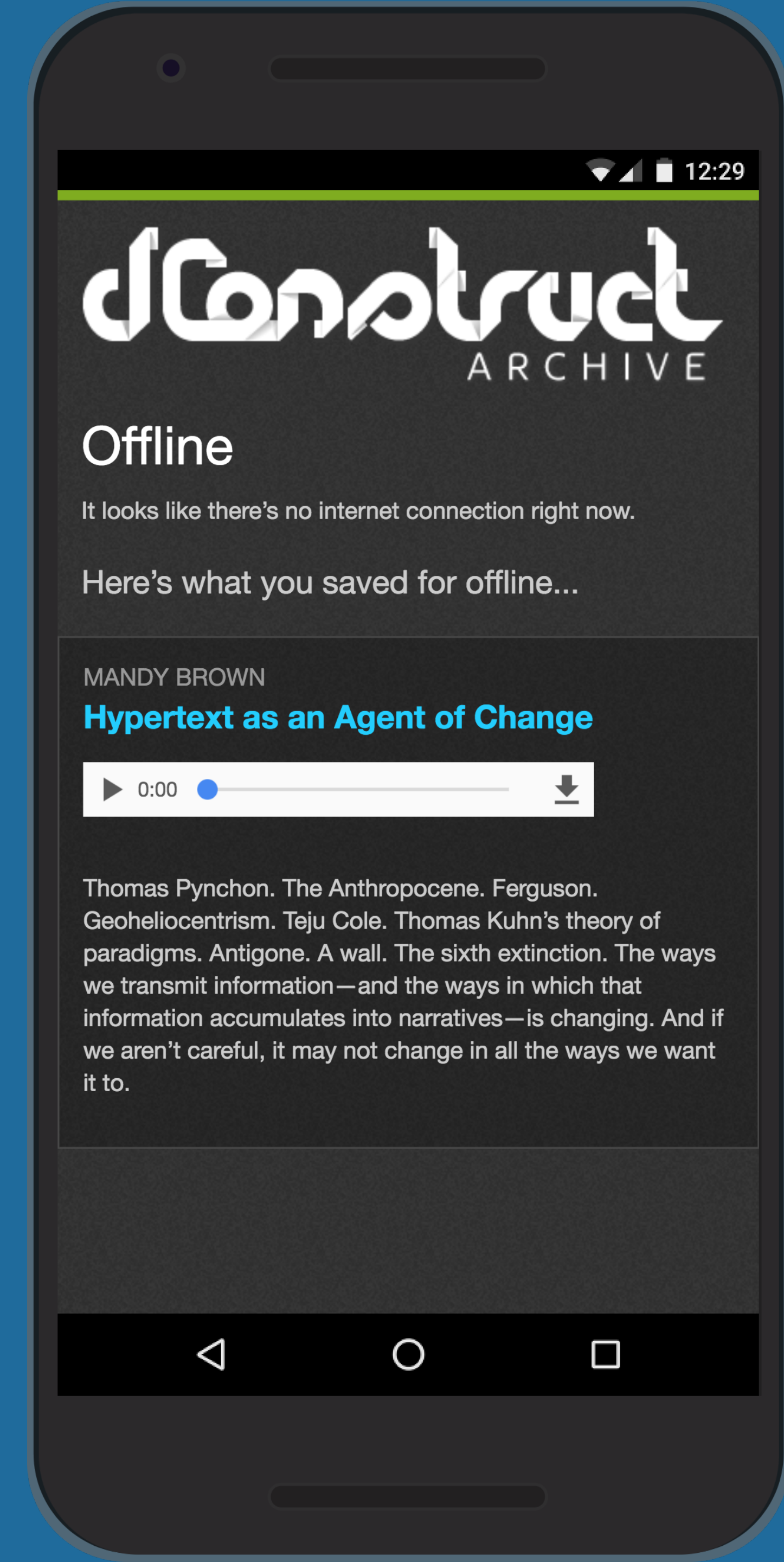
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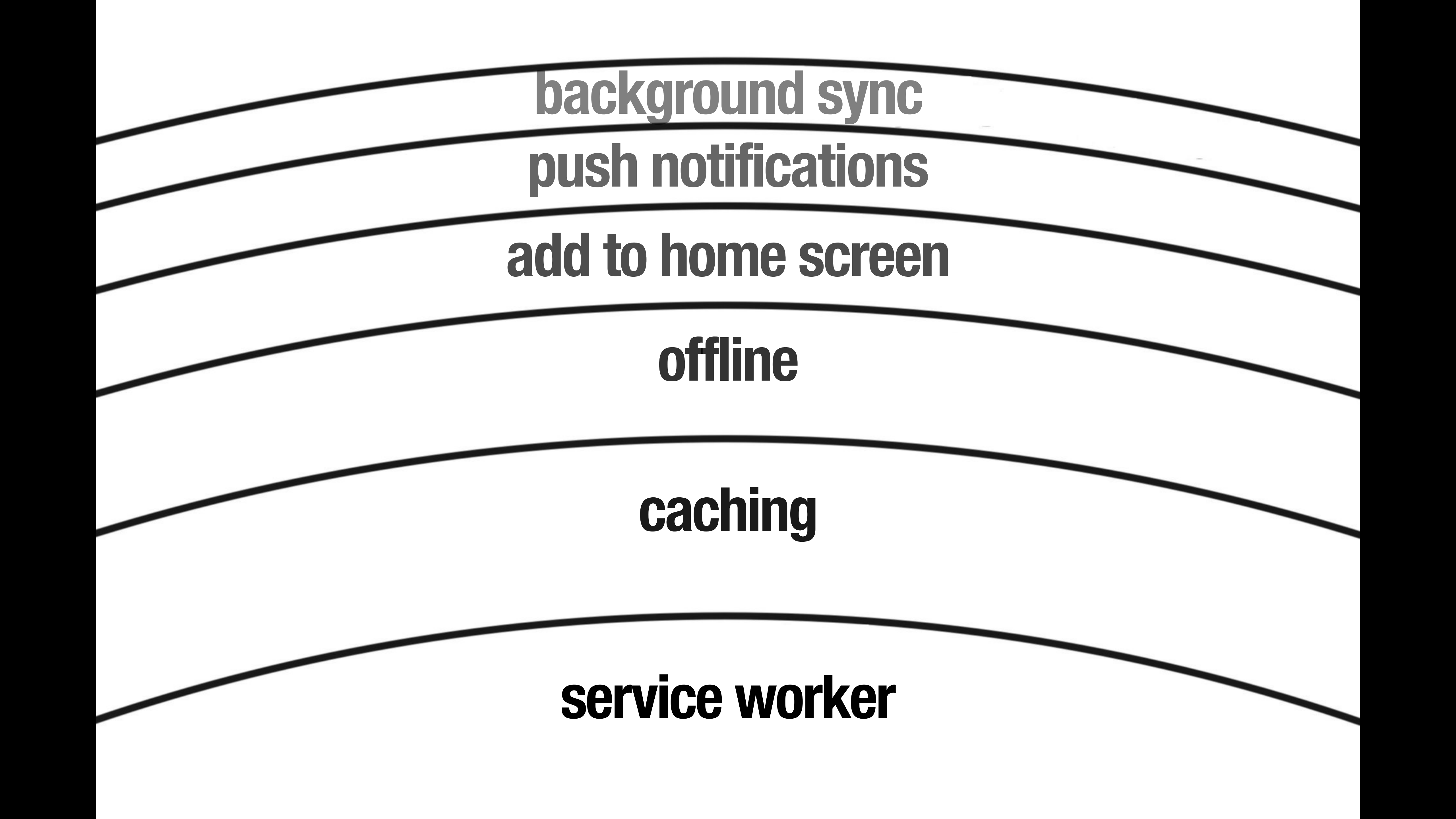


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background sync

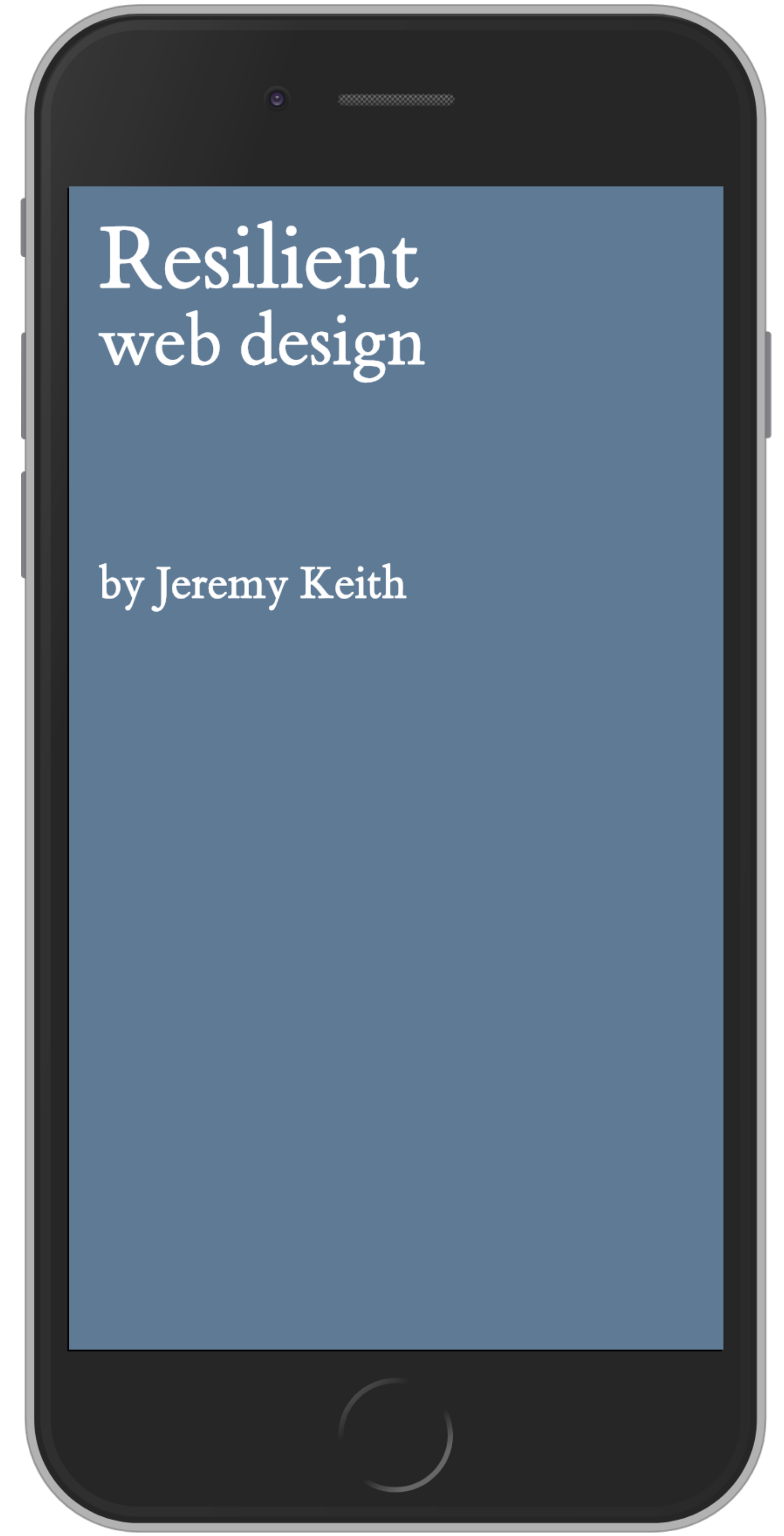
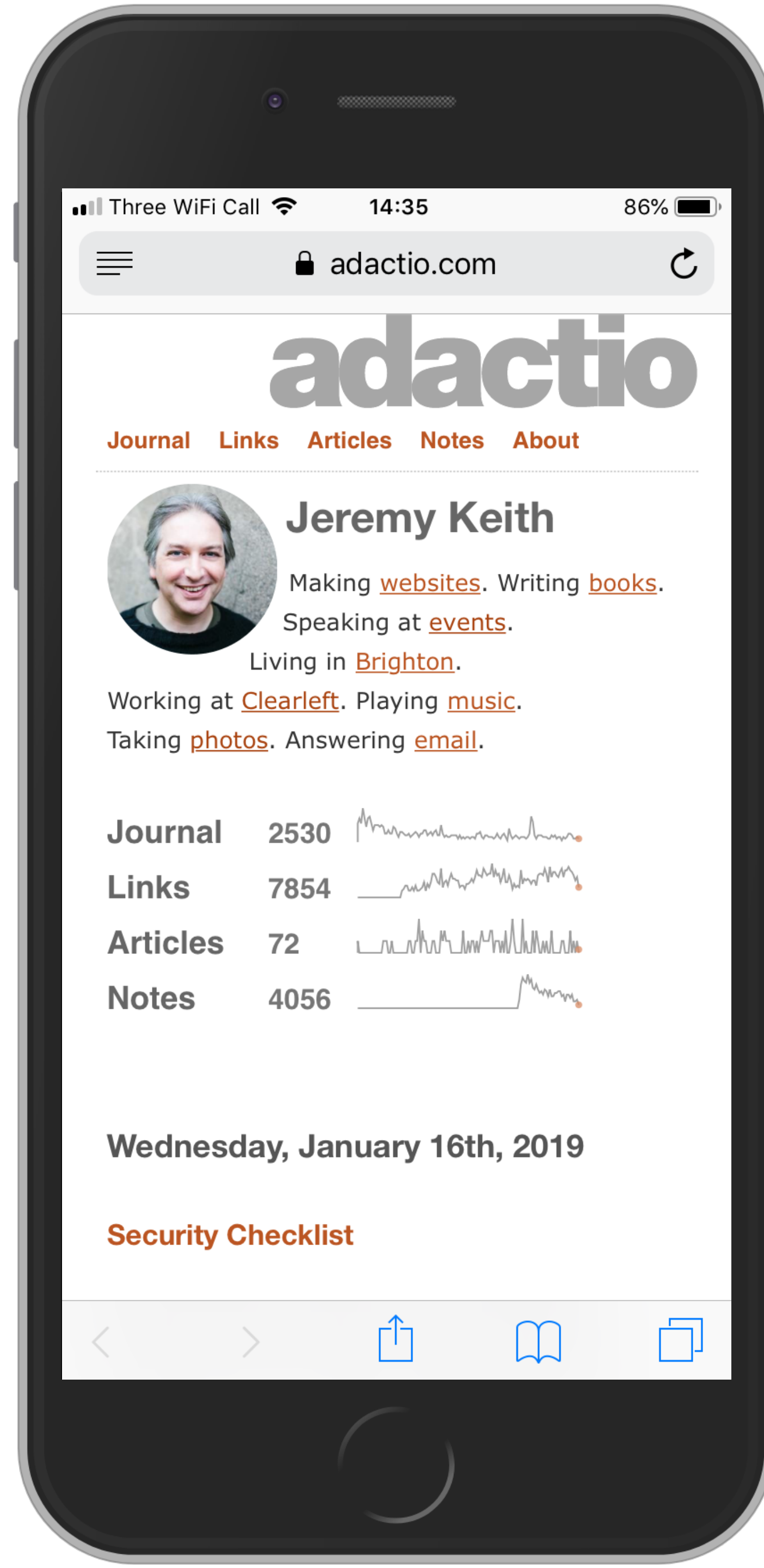
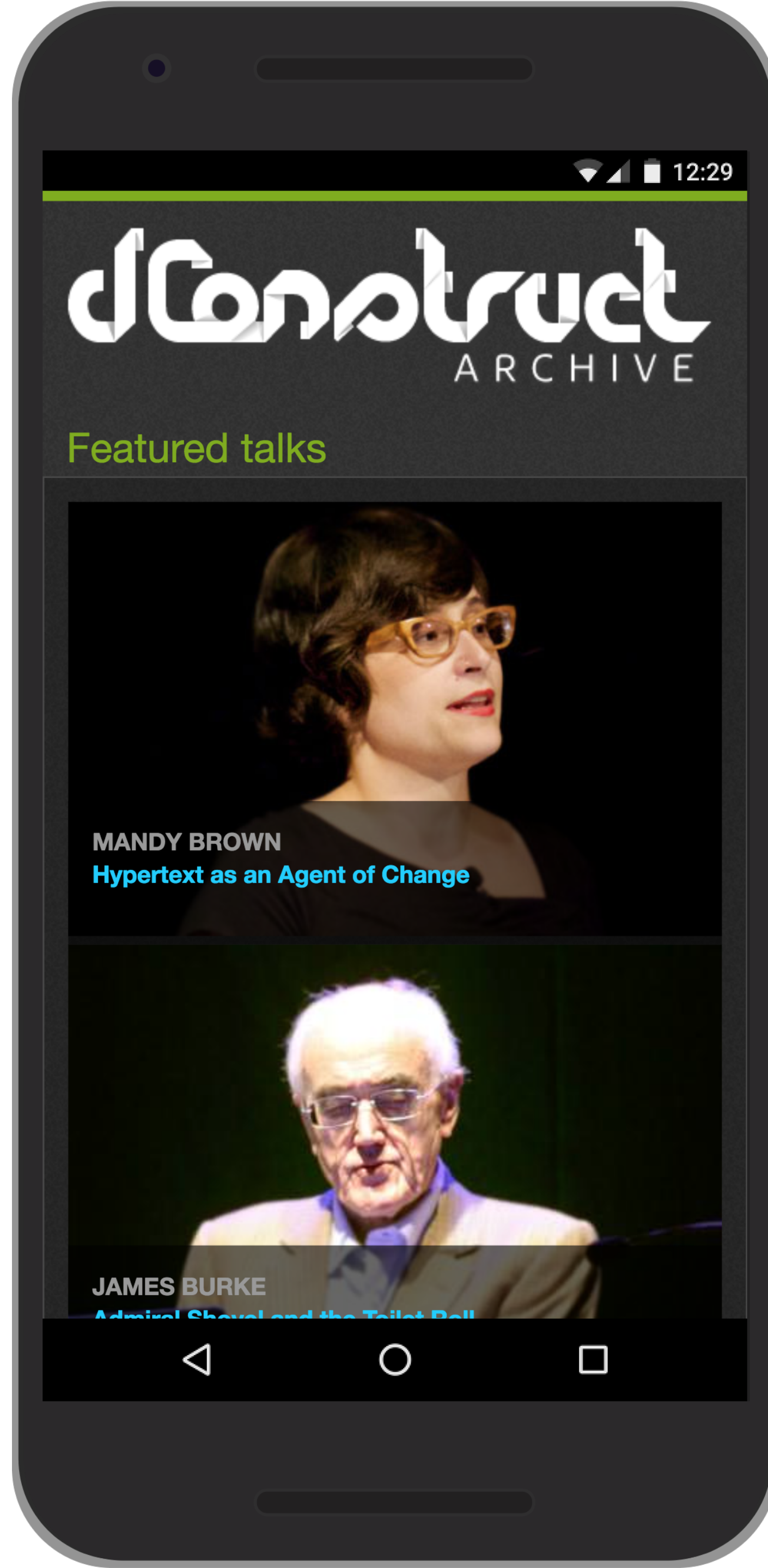
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9:13am

Resilient web design

by Jeremy Keith

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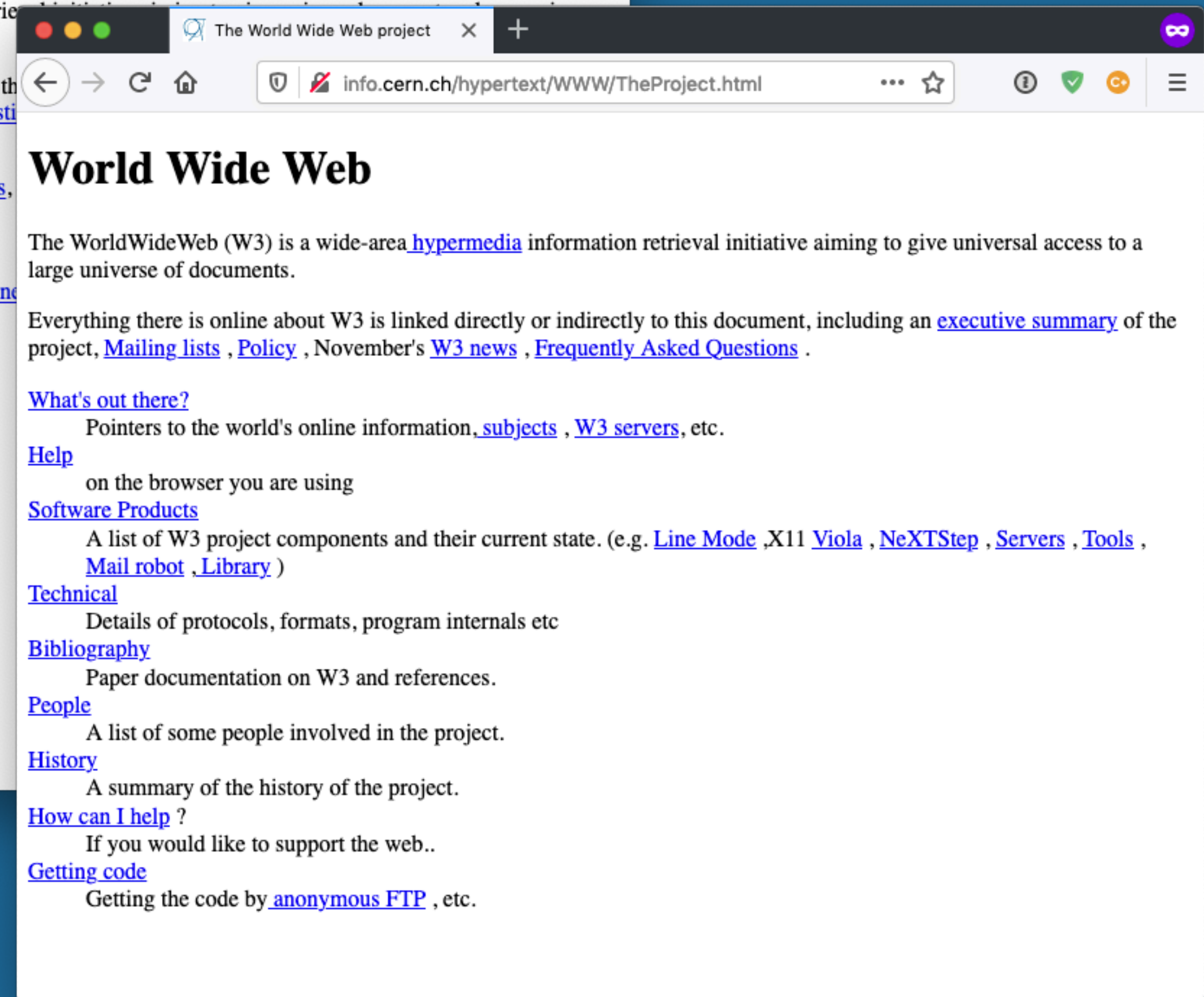
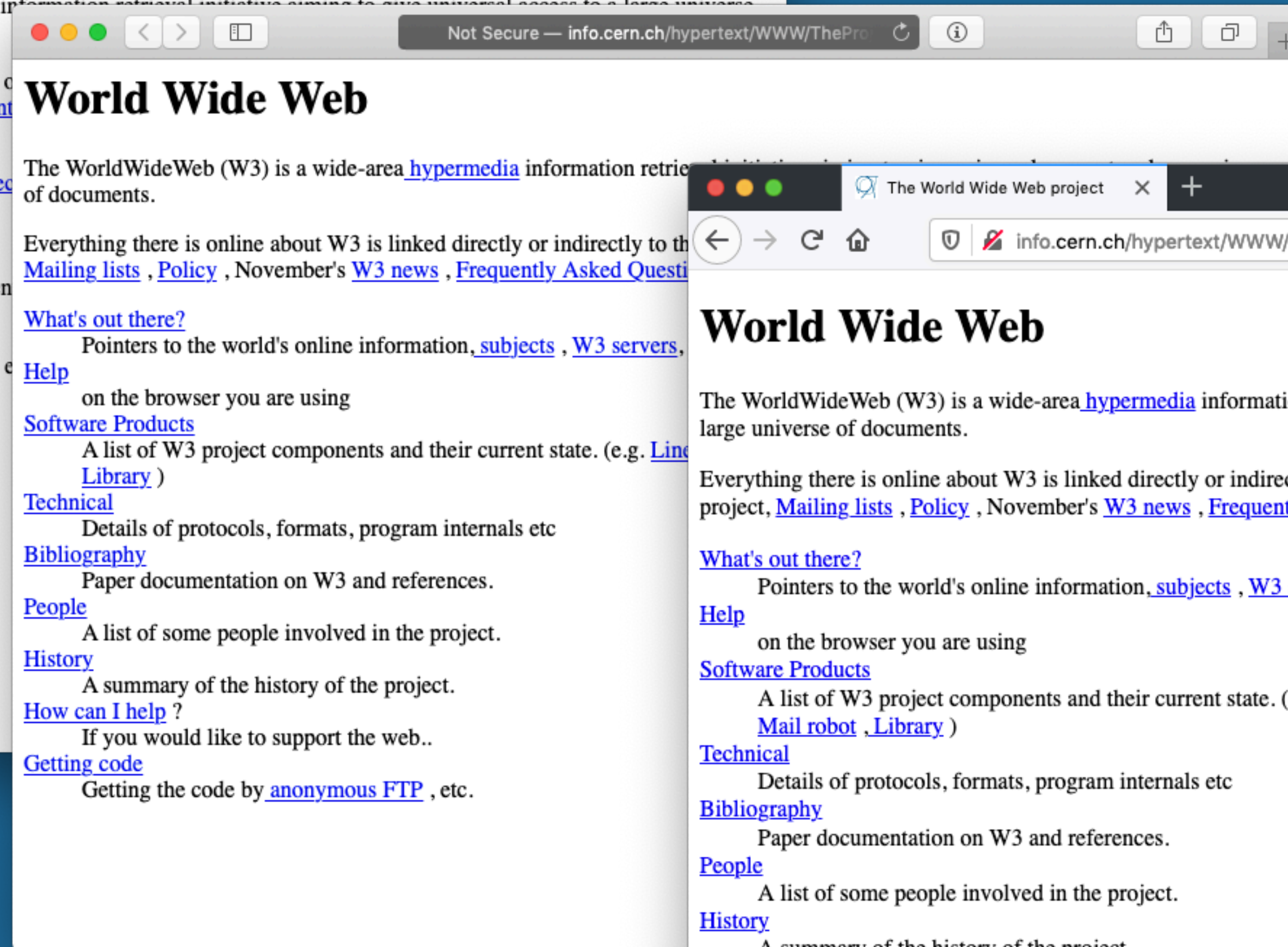
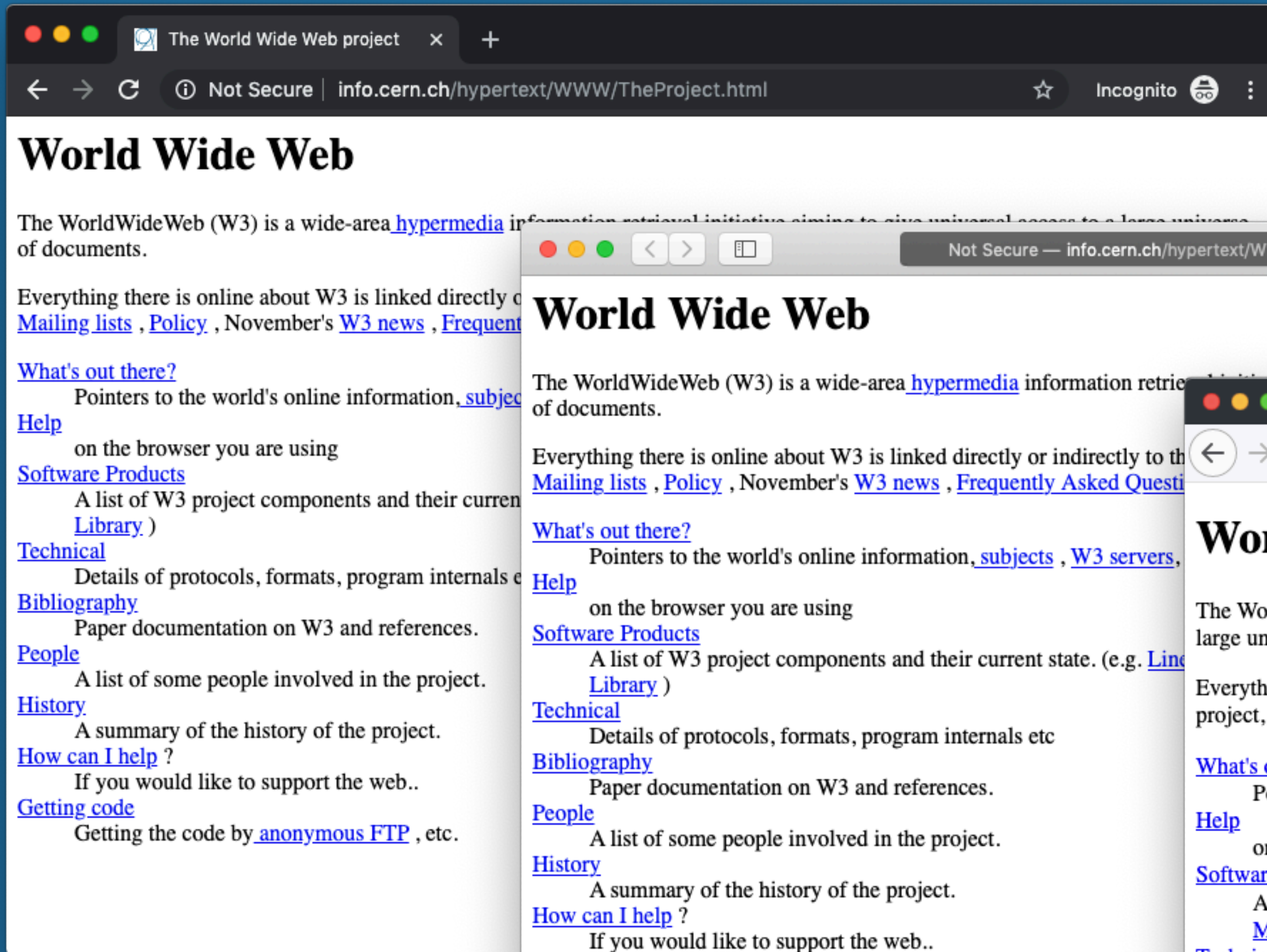
The World Wide Web project

World Wide Web

The WorldWideWeb (W3) is a wide-area hypermedia information retrieval initiative aiming to give universal access to a large universe of documents.

Everything there is online about W3 is linked directly or indirectly to this document, including an executive summary of the project, Mailing lists , Policy , November's W3 news , Frequently Asked Questions .

<u>What's out there?</u>	Pointers to the world's online information, <u>subjects</u> , <u>W3 servers</u> , etc.
<u>Help</u>	on the browser you are using
<u>Software Products</u>	A list of W3 project components and their current state. (e.g. <u>Line Mode</u> , <u>X11 Viola</u> , <u>NeXTStep</u> , <u>Servers</u> , <u>Tools</u> , <u>Mail robot</u> , <u>Library</u>)
<u>Technical</u>	Details of protocols, formats, program internals etc
<u>Bibliography</u>	Paper documentation on W3 and references.
<u>People</u>	A list of some people involved in the project.
<u>History</u>	A summary of the history of the project.
<u>How can I help ?</u>	If you would like to support the web..
<u>Getting code</u>	Getting the code by <u>anonymous FTP</u> , etc.



Thank you