How the Internet Works
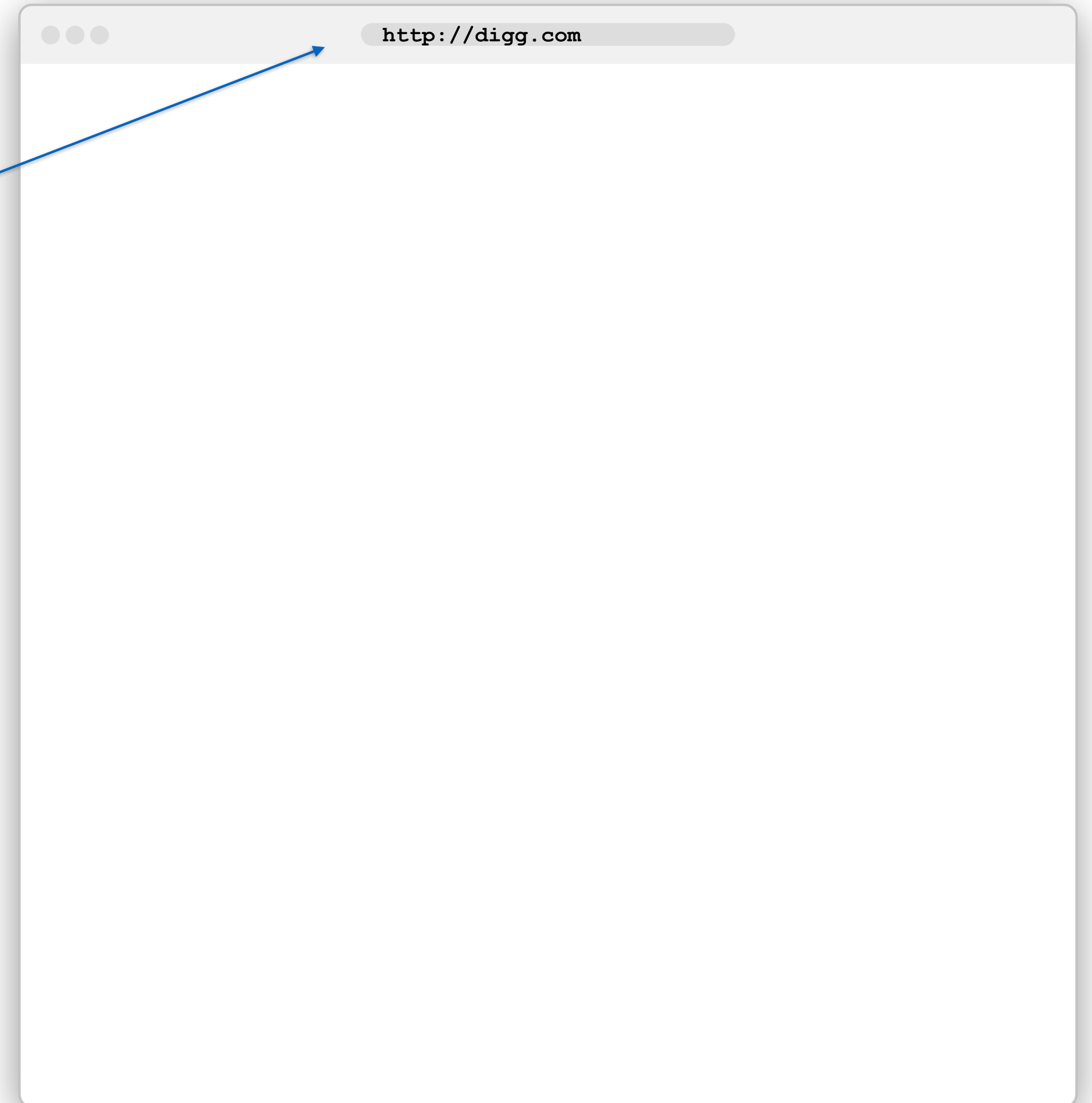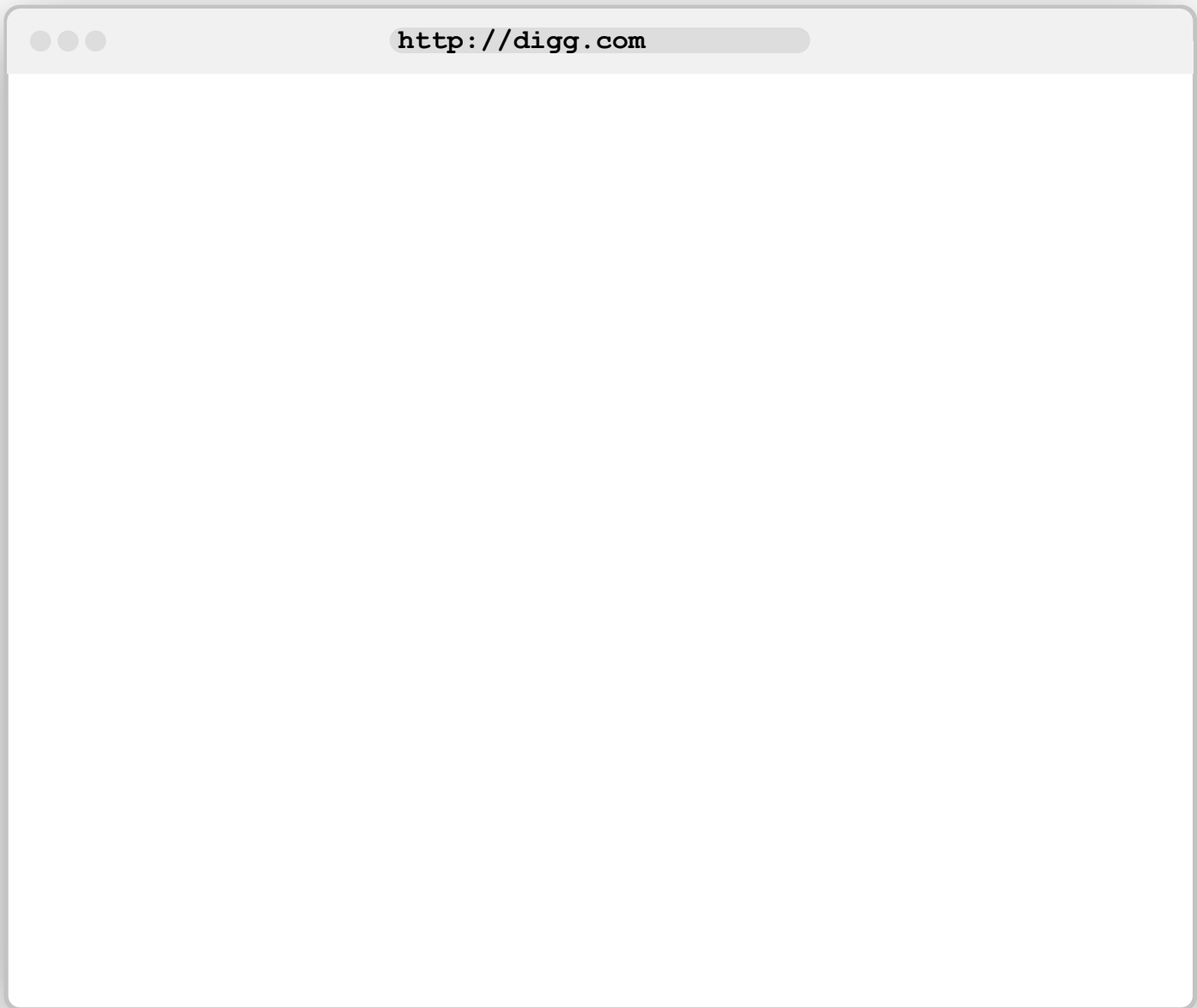
What Happens...

...when you type this in to your browser?
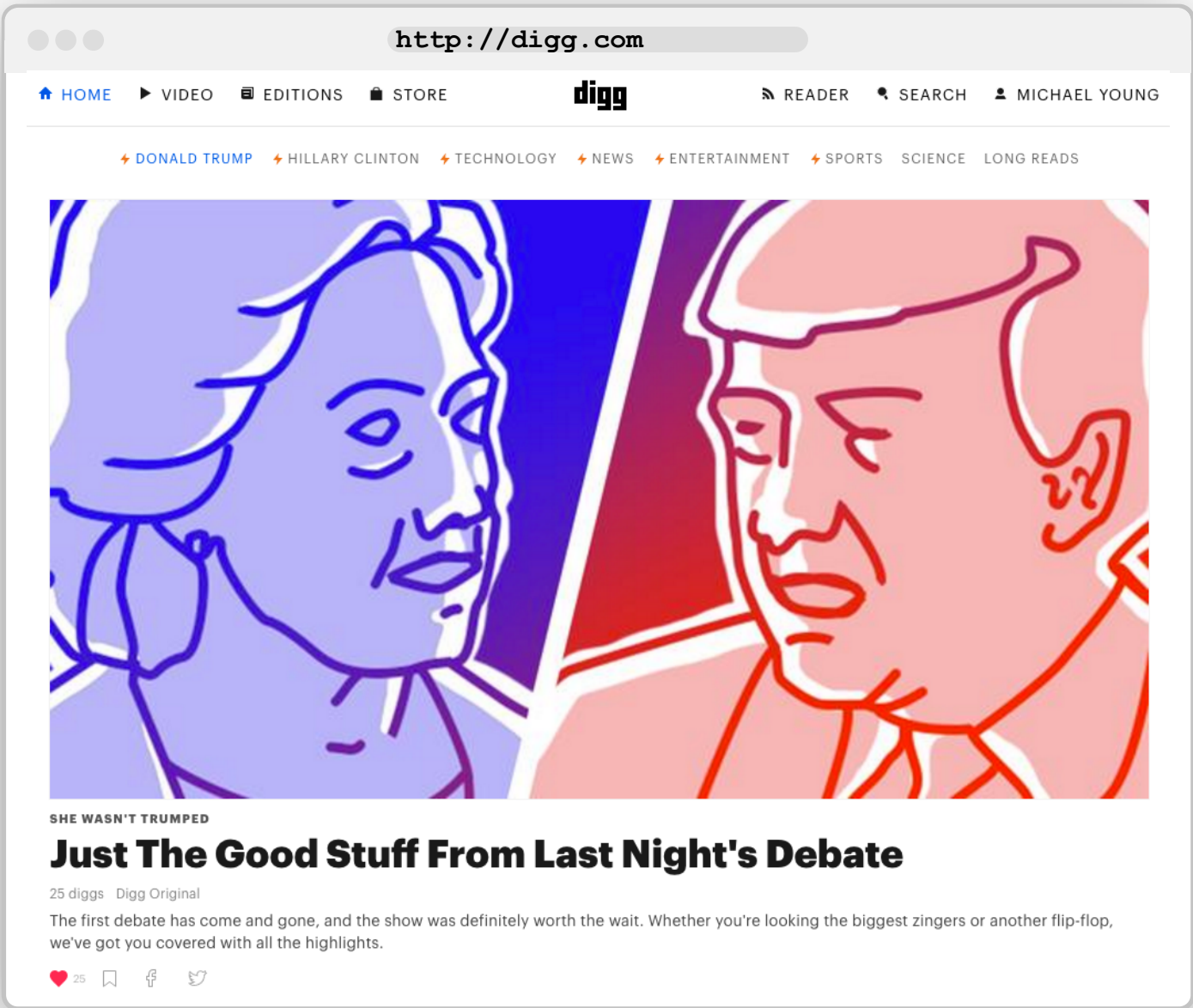
`http://digg.com`

Step 1

Step 2

???

Step 3

Before we start there...

What is the **Internet**
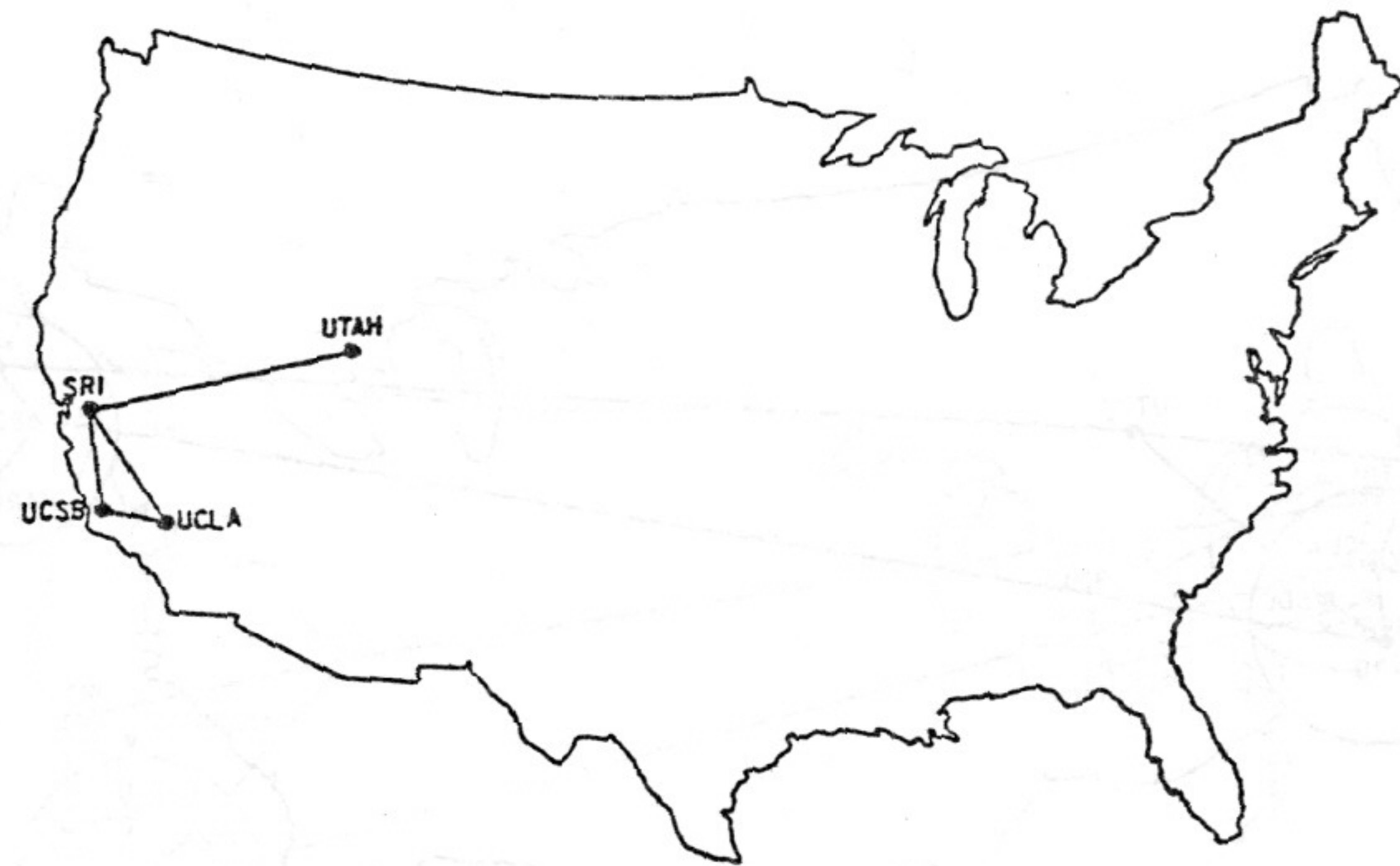
The ARPANET in December 1969

MIT 44

LINCOLN

MIT 6

CCA

RADC

RCC 5

RCC 49

NYU

MOFFETT

LBL

AMES 16

LLL

SRI 2

XEROX

TYMSHARE

RUTGERS

DEC

BBN 40

BBN 30

UTAH

GWC

ANL

CMU

HARVARD

AMES 15

SRI 51

STANFORD

SUMEX

FNWC

DOCB

ILLINOIS

WPAFB

ABERDEEN

HAWAII

SCRL

ACCAT

UCLA

BELVOIR

NSA

NBS

NORSAR

NOSC

RAND

USC

SCOTT

DCEC

SDAC

MITRE

NRL

ISI 52

ISI 22

AFWL

ARPA

PENTAGON

LONDON

GUNTER

EGLIN

TEXAS

〰 SATELLITE CIRCUIT

○ IMP

□ TIP

△ PLURIBUS IMP

(NOTE THIS MAP DOES NOT SHOW ARPA'S EXPERIMENTAL
SATELLITE CONNECTIONS)

NAMES SHOWN ARE IMP NAMES, NOT (NECESSARILY) HOST NAMES

Geographic Map, June 1, 1984

ubc
wash-state
washington
portland
oregon-grad
tektronix
uoregon
oregon-state

waterloo
toronto
queens
dartmouth
uconn

umn-cs
wisc-ibm
wisconsin
uwm
umich
buffalo
rochester
rpi
brown
yale
gmr
case
cornell
suny-sb
rutgers
nwu
depaul
kent
penn-state
uiowa
uluc
uchicago*
pitt
upenn
princeton
purdue
cmu-cs-a
btl
jhu
ohio-state
umcp
udel
nsf
gte-labs
tufts*
virginia
vpl
icase*

berkeley
decwrl*
stanford
hp-labs
fairchild*
ibm-sj
atari
ucsc
ucsb
rand-unix
usc-cse
ucla-cs
uci

utah-20

colostate*
boulder

uni*

indiana

kansas-state
ukans

vanderbilt
utenn
duke
mcnc
src
clemson
unc
scarolina

nmt
nms*

okstate

emory
gatech
uab

arizona

ti-csl
utd
ct
smu*
tamu
mcc*
rice
utexas-20
houston
uhcl*

umiss

usl
lsu

ufl
ucf

asu
unlv

hawaii*

gte-labs
tufts*
ulowell*
unh
mitre
csnet-cic
csnet-sh
mit-mc
csnet-relay
northeastern
umass-boston
harv-10
bostonu
bbn-unix
umass
umass-ece
wang-inst
digital
brandeis

csnet

Enter the Magic of **HTTP**
(HyperText Transfer Protocol)

Tim Berners-Lee, 1989

`HTTP is a protocol that allows "clients" (browsers)`
`to request hypertext documents from "servers"`

Why Even Do This?

"Intended Uses" from Tim Berners-Lee

General reference data - encyclopaedia, etc.
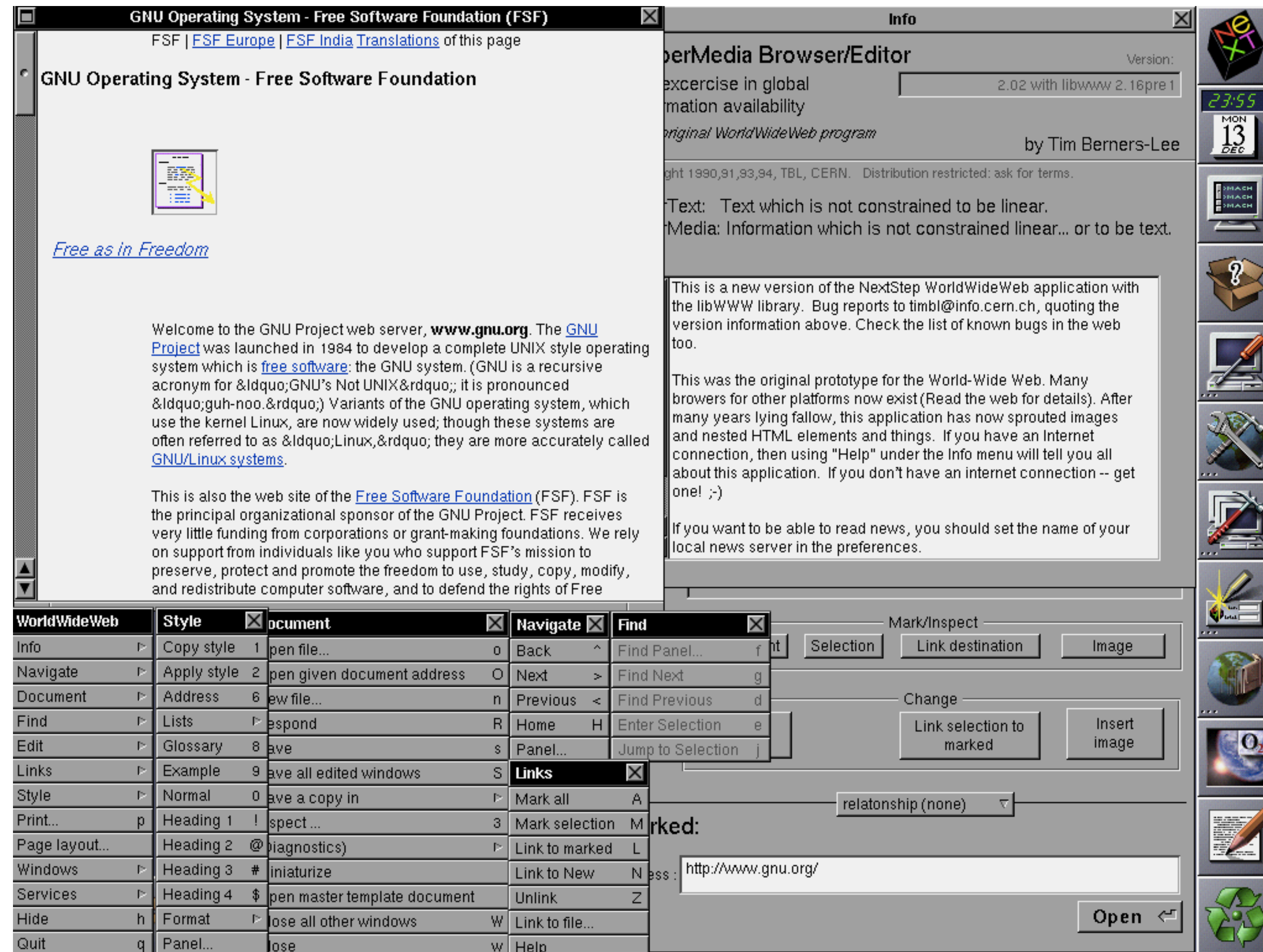Completely centralized publishing - online help, documentation, tutorial etc
More or less centralized dissemination of news which has a limited life
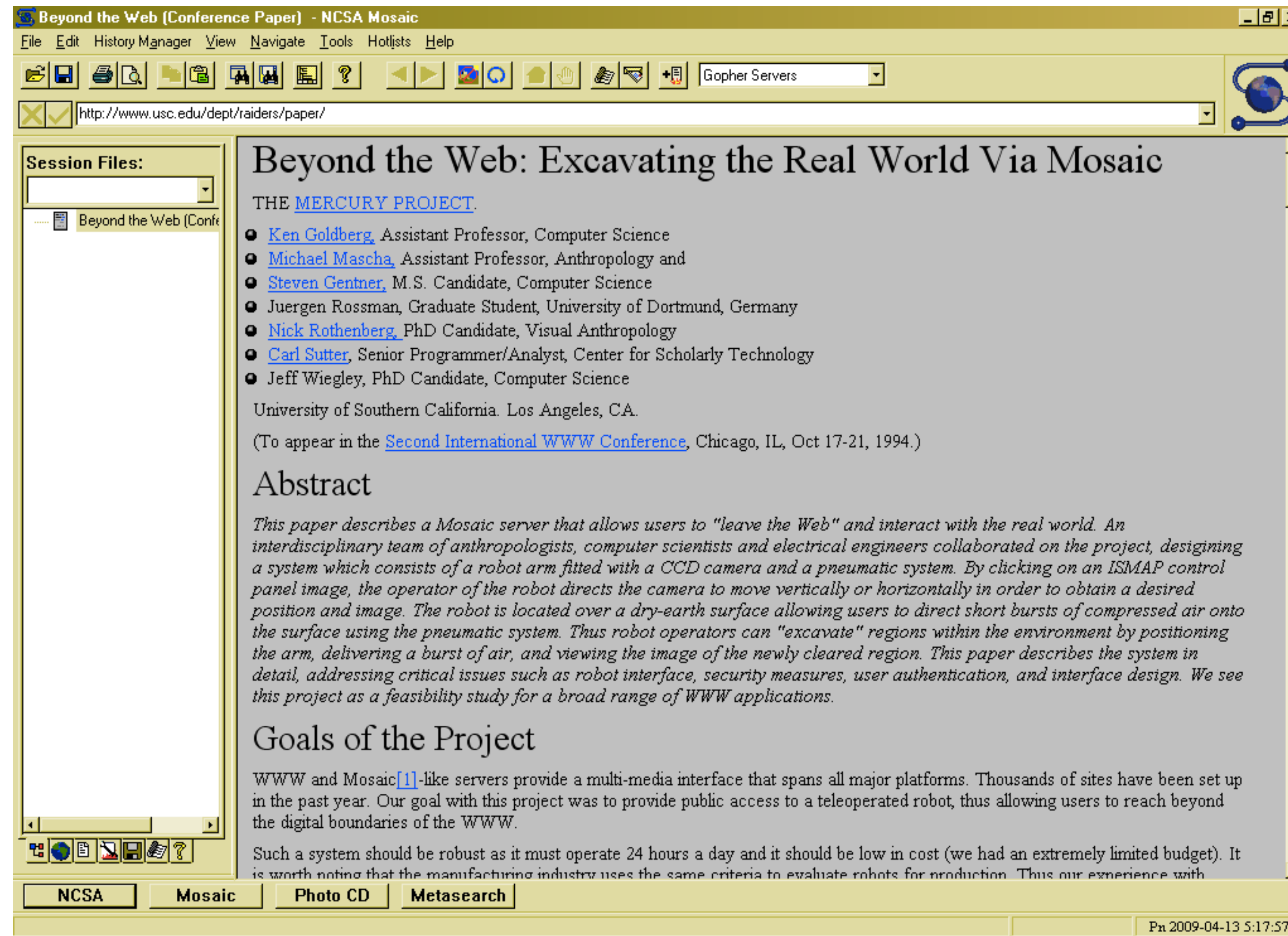Collaborative authoring
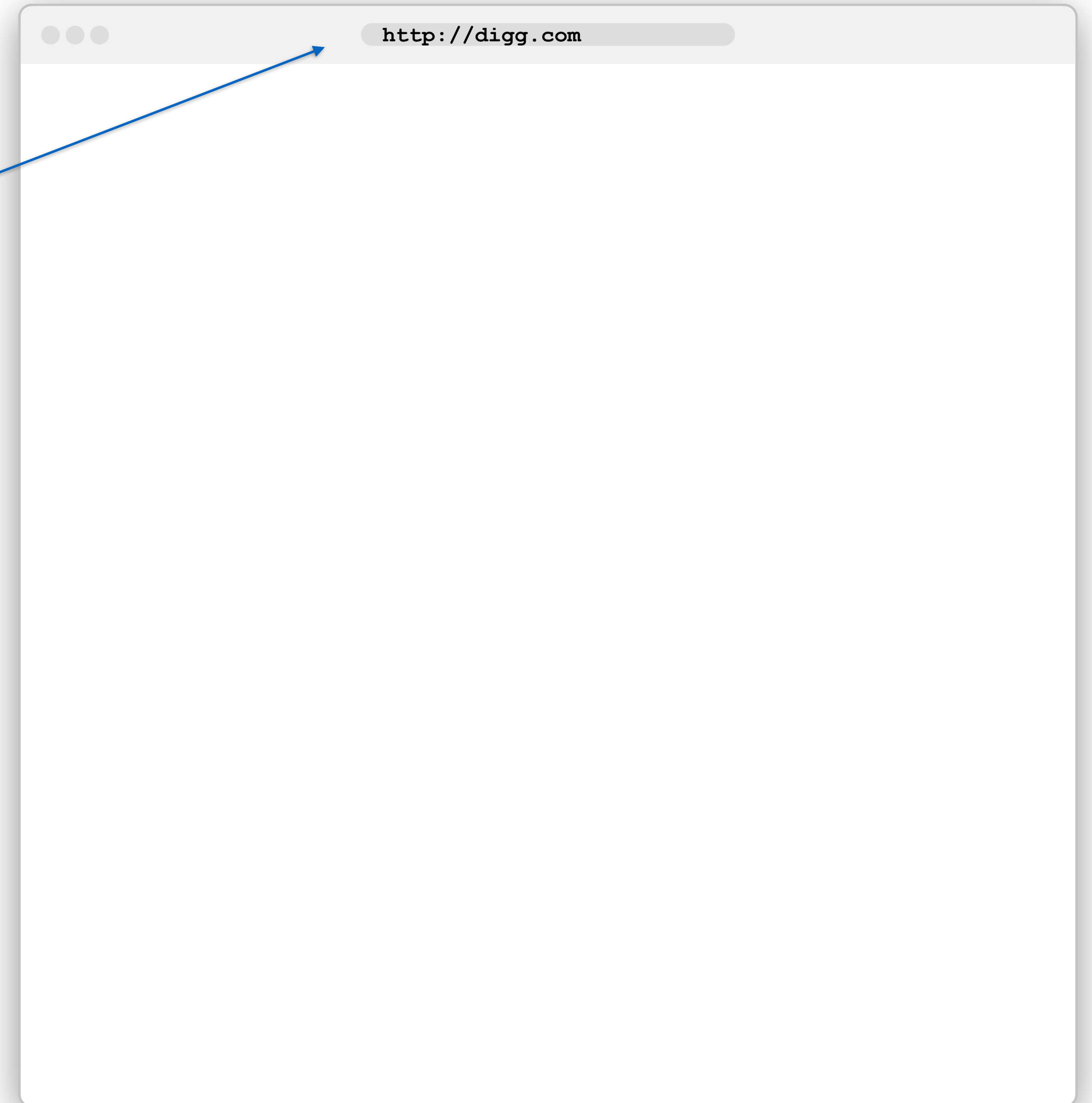Collaborative design of something other than the hypertext itself
Personal notebook

https://www.w3.org/DesignIssues/Uses.html

WorldWideWeb **1990**

Info

...erMedia Browser/Editor   Version:

...excercise in global   2.02 with libwww 2.16pre 1
...mation availability

...original WorldWideWeb program   by Tim Berners-Lee

...ght 1990,91,93,94, TBL, CERN.   Distribution restricted: ask for terms.

...Text: Text which is not constrained to be linear.
...Media: Information which is not constrained linear... or to be text.

This is a new version of the NextStep WorldWideWeb application with the libWWW library. Bug reports to timbl@info.cern.ch, quoting the version information above. Check the list of known bugs in the web too.

This was the original prototype for the World-Wide Web. Many browers for other platforms now exist (Read the web for details). After many years lying fallow, this application has now sprouted images and nested HTML elements and things. If you have an Internet connection, then using "Help" under the Info menu will tell you all about this application. If you don't have an internet connection -- get one! ;-)

If you want to be able to read news, you should set the name of your local news server in the preferences.

Mark/Inspect
...t   Selection   Link destination   Image

Change
Link selection to marked   Insert image

relatonship (none)

...rked:

...ess :   http://www.gnu.org/

Open

WorldWideWeb		Style		Document		Navigate		Find	
Info	▶	Copy style	1	Open file...	o	Back	^	Find Panel...	f
Navigate	▶	Apply style	2	Open given document address	O	Next	>	Find Next	g
Document	▶	Address	6	New file...	n	Previous	<	Find Previous	d
Find	▶	Lists	▶	Respond	R	Home	H	Enter Selection	e
Edit	▶	Glossary	8	Save	s	Panel...		Jump to Selection	j
Links	▶	Example	9	Save all edited windows	S				
Style	▶	Normal	0	Save a copy in	▶				
Print...	p	Heading 1	!	Inspect ...	3				
Page layout...		Heading 2	@	(diagnostics)	▶				
Windows	▶	Heading 3	#	Miniaturize					
Services	▶	Heading 4	$	Open master template document					
Hide	h	Format	▶	Close all other windows	W				
Quit	q	Panel...		Close	w				

Links

Mark all	A
Mark selection	M
Link to marked	L
Link to New	N
Unlink	Z
Link to file...	
Help	

23:55
MON 13 DEC

Mosaic **1993**

What Happens...

...when you type this in to your browser?

`http://digg.com`

50.18.185.231

aka digg.com

You!

Remember **HTTP**? (HyperText Transfer Protocol)

Tim Berners-Lee, 1989

HTTP is a protocol that allows "clients" (browsers) to request hypertext documents from "servers"

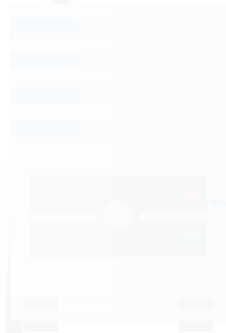# The HTTP **Request**

50.18.185.231

aka digg.com

Mike: "Hey Digg, it's me Mike, can I get the homepage?"

http://digg.com

The HTTP **Response**

Digg: "Ok Mike, sure, here you go!"

(sends back the homepage HTML)

50.18.185.231

aka digg.com

http://digg.com

The HTTP **Request**

```
GET / HTTP/1.1

Host: digg.com
Accept: text/html
Accept-Encoding: gzip
Connection: Keep-Alive
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_3) Chrome/53.0.2785.116
Cookie: username=myoung; user_id=123456;
```

The HTTP **Response**

```
HTTP/1.1 200 OK

Content-Type: text/html; charset=UTF-8
Date: Tue, 27 Sep 2016 18:34:06 GMT
Server: TornadoServer/2.3
Set-Cookie: preferred_view=desktop; Path=/
Content-Length: 230330
Connection: keep-alive

<!DOCTYPE html>
<head>
<meta charset="utf-8">
<title>Digg - What the Internet is talking about right now</title>
<link rel="stylesheet" href="http://static.digg.com/homepage.css" type="text/css"
media="screen" />
</head>

<body class="homepage">

[a lot more HTML goes here :-)]

<script src="http://static.digg.com/frontpage.js"></script>

<!-- built with love by amateurs! -->
</body>
</html>
```

50.18.185.231
aka digg.com

http://digg.com

The HTTP **Response**

```
HTTP/1.1 404 Not Found

Content-Type: text/html; charset=UTF-8
Date: Tue, 27 Sep 2016 18:34:06 GMT
Server: TornadoServer/2.3
Set-Cookie: preferred_view=desktop; Path=/
Content-Length: 230330
Connection: keep-alive

<!DOCTYPE html>
<head>
<meta charset="utf-8">
<title>Digg - What the Internet is talking about right now</title>
<link rel="stylesheet" href="http://static.digg.com/homepage.css" type="text/css"
media="screen" />
</head>

<body class="homepage">

[a lot more HTML goes here :-)]

<script src="http://static.digg.com/frontpage.js"></script>

<!-- built with love by amateurs! -->
</body>
</html>
```
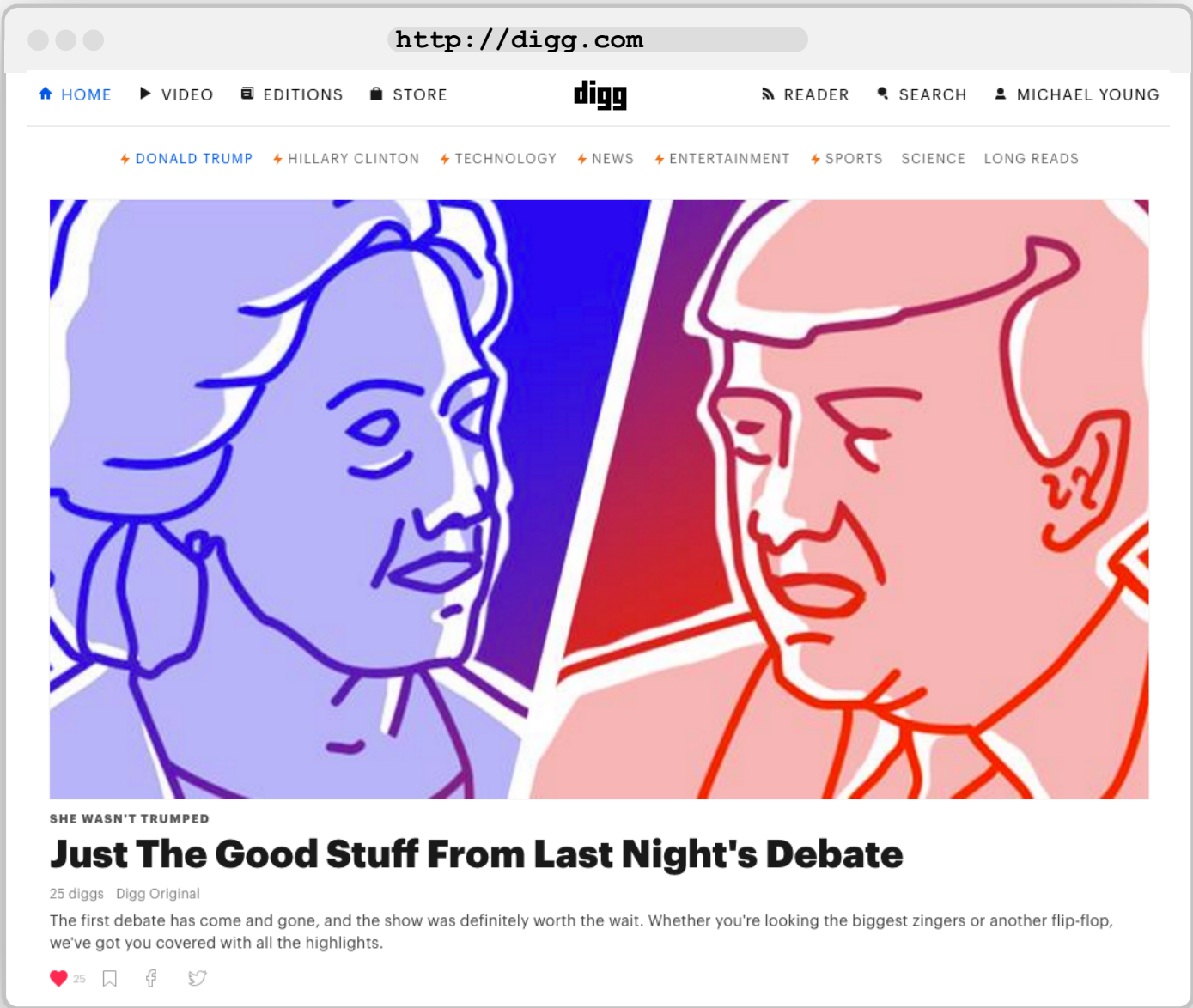
Now What !?!

```html
<!DOCTYPE html>
<head>
<meta charset="utf-8">
<title>Digg - What the Internet is talking about right now</title>
<link rel="stylesheet" href="http://static.digg.com/homepage.css" type="text/css" media="screen"/>
</head>

<body class="homepage">

<a href="http://digg.com/2016/debate-recap-trump-clinton-video">
<img src="http://static.digg.com/images/hillarytrump_www_large_thumb.jpeg" width="312" height="170"/>
</a>

<div class="digg-story__content">
<header class="digg-story__header">

<div class="digg-story__kicker">SHE WASN'T TRUMPED</div>

<h2 itemprop="headline" class="digg-story__title">
<a class="digg-story__title" href="http://digg.com/2016/debate-recap-trump-clinton-video">
Just The Good Stuff From Last Night's Debate
</a>
</h2>

<div class="digg-story__metadata">
<span class="digg-story__metadata-diggs">
<span class="js--digg-count">33</span>
<span class="js--digg-label">diggs</span>
</span>

<script src="http://static.digg.com/frontpage.js"></script>

<!-- built with love by amateurs! -->
</body>
</html>
```
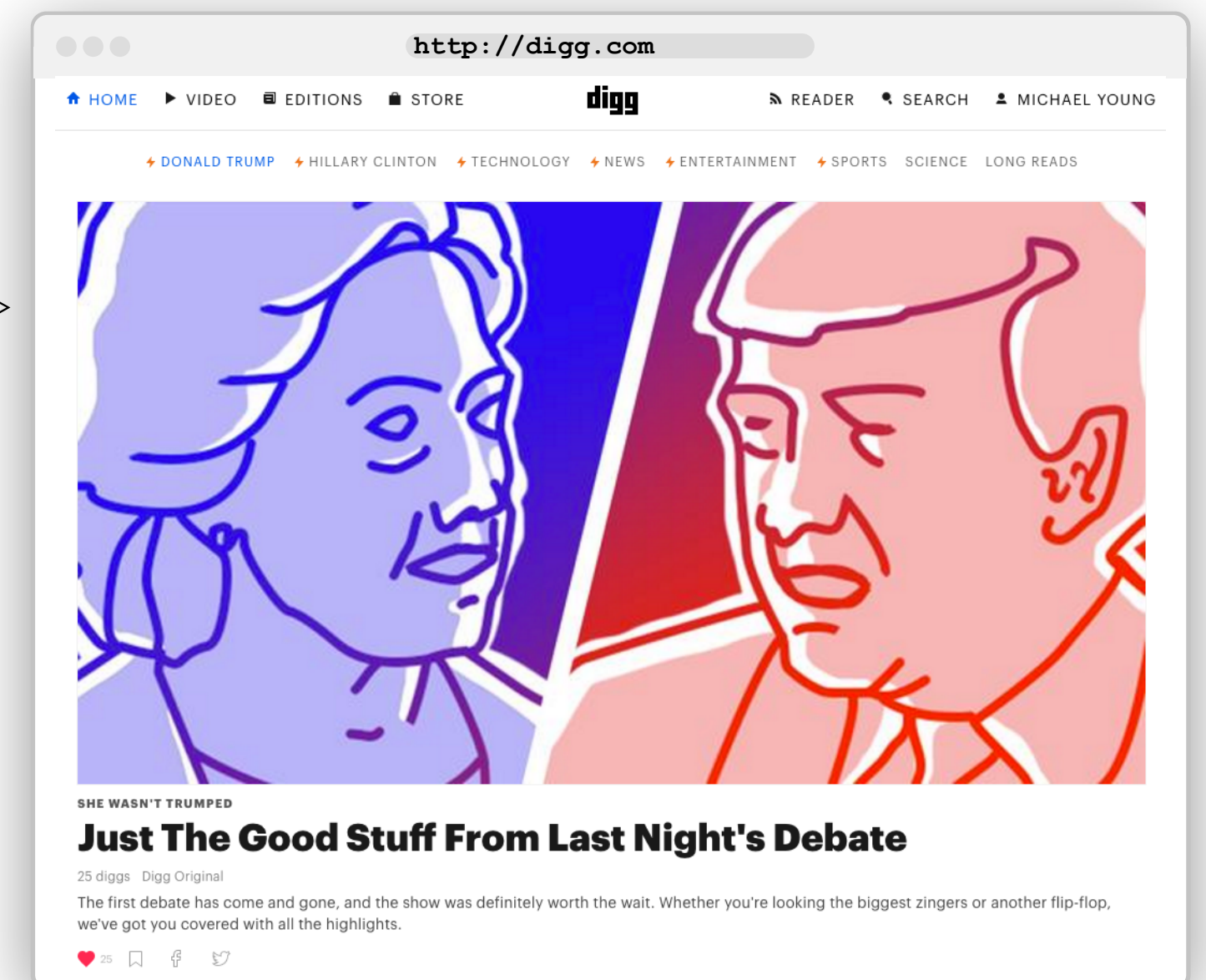
HTTP = HyperText Transfer Protocol

HTML = HyperText Markup

‹head›

```html
<!DOCTYPE html>
<head>
<meta charset="utf-8">
<title>Digg - What the Internet is talking about right now</title>
<link rel="stylesheet" href="http://static.digg.com/homepage.css" type="text/css" media="screen"/>
</head>

<body class="homepage">

<a href="http://digg.com/2016/debate-recap-trump-clinton-video">
<img src="http://static.digg.com/images/hillarytrump_www_large_thumb.jpeg" width="312" height="170"/>
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<div class="digg-story__metadata">
<span class="digg-story__metadata-diggs">
<span class="js--digg-count">33</span>
<span class="js--digg-label">diggs</span>
</span>

<script src="http://static.digg.com/frontpage.js"></script>

<!-- built with love by amateurs! -->
</body>
</html>
```
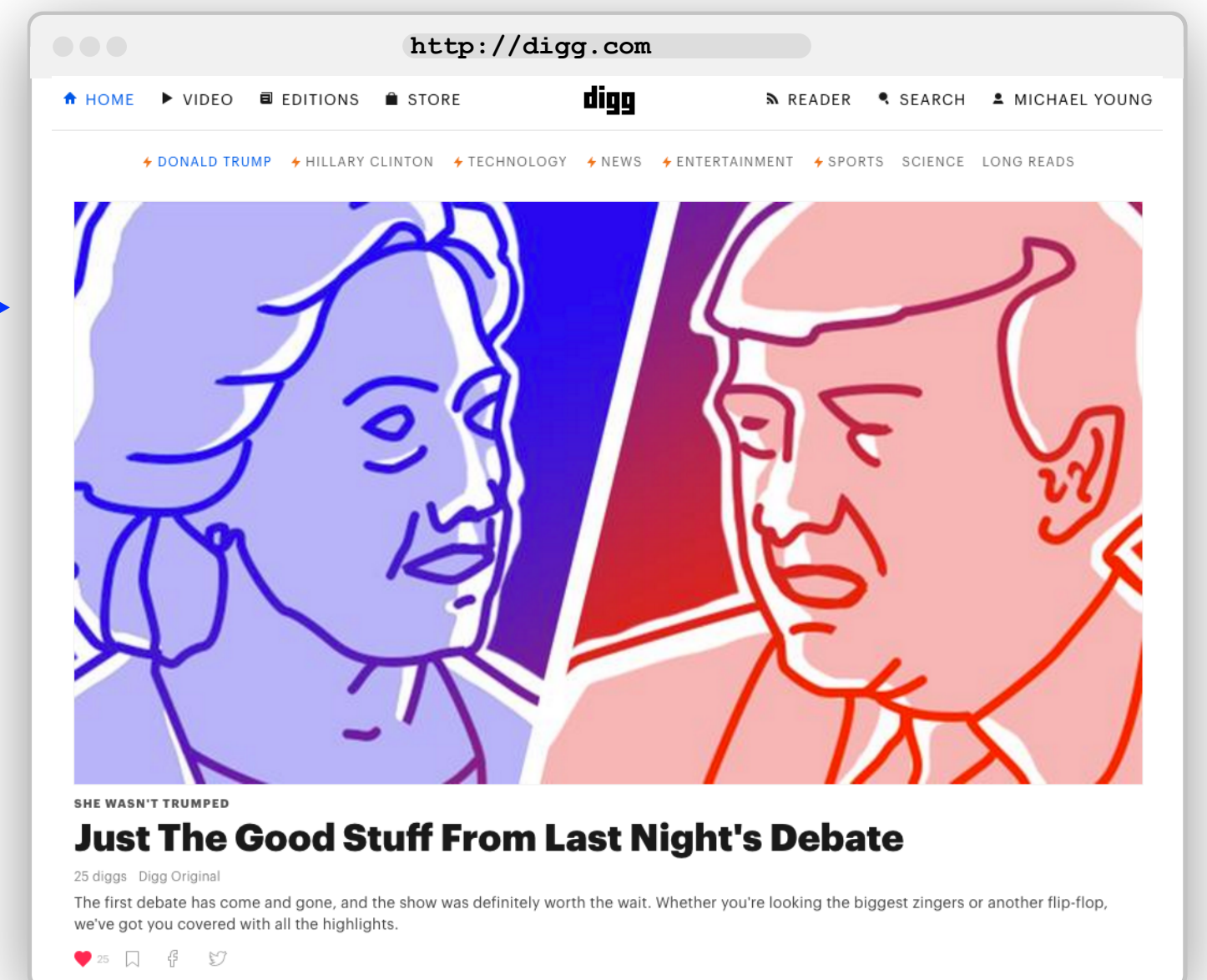
\<body>

```html
<!DOCTYPE html>
<head>
<meta charset="utf-8">
<title>Digg - What the Internet is talking about right now</title>
<link rel="stylesheet" href="http://static.digg.com/homepage.css" type="text/css" media="screen"/>
</head>

<body class="homepage">

<a href="http://digg.com/2016/debate-recap-trump-clinton-video">
<img src="http://static.digg.com/images/hillarytrump_www_large_thumb.jpeg" width="312" height="170"/>
</a>

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<h2 itemprop="headline" class="digg-story__title">
<a class="digg-story__title" href="http://digg.com/2016/debate-recap-trump-clinton-video">
Just The Good Stuff From Last Night's Debate
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<div class="digg-story__metadata">
<span class="digg-story__metadata-diggs">
<span class="js--digg-count">33</span>
<span class="js--digg-label">diggs</span>
</span>

<script src="http://static.digg.com/frontpage.js"></script>

<!-- built with love by amateurs! -->
</body>
</html>
```
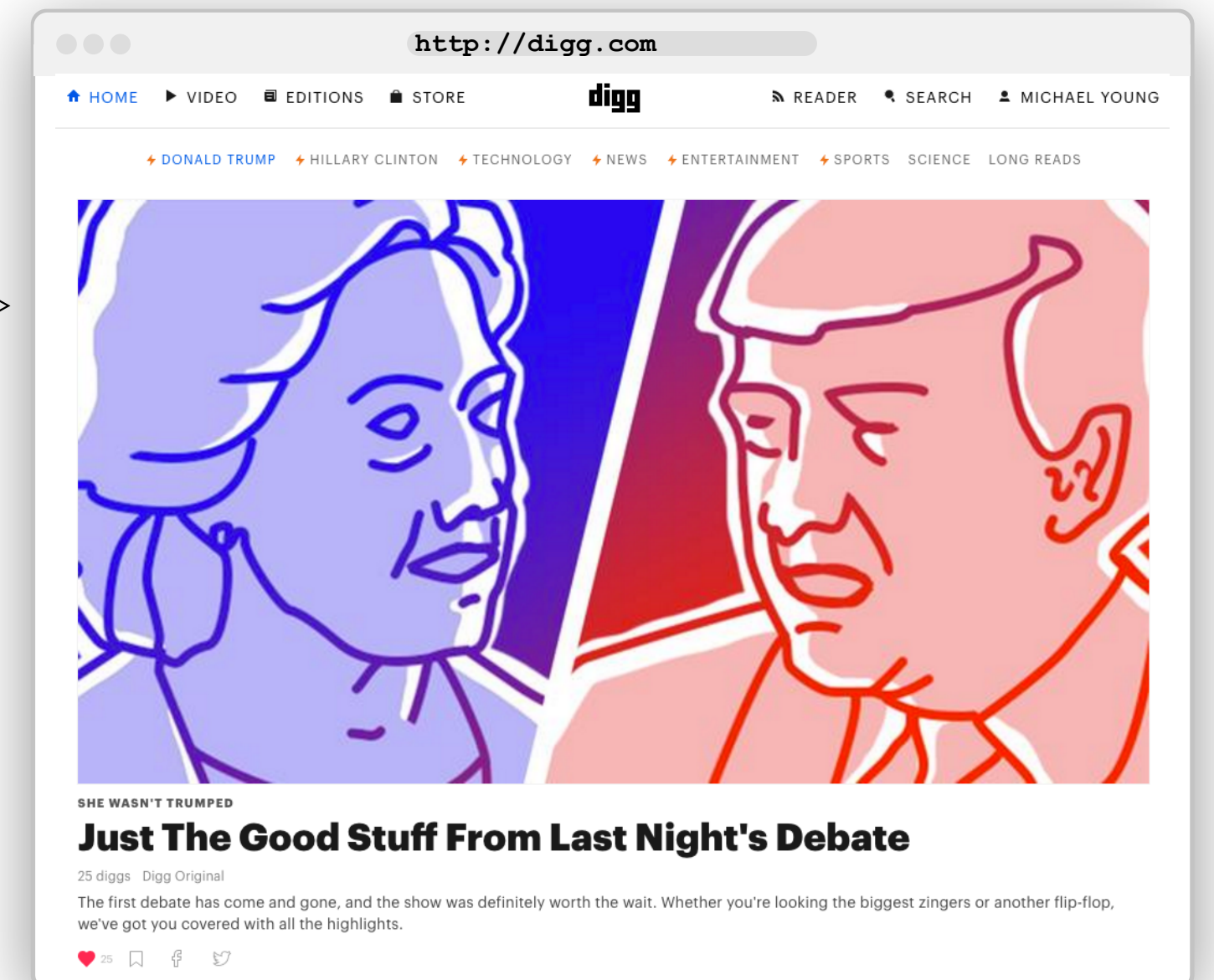
Styling

```html
<!DOCTYPE html>
<head>
<meta charset="utf-8">
<title>Digg - What the Internet is talking about right now</title>
<link rel="stylesheet" href="http://static.digg.com/homepage.css" type="text/css" media="screen"/>
</head>

<body class="homepage">

<a href="http://digg.com/2016/debate-recap-trump-clinton-video">
<img src="http://static.digg.com/images/hillarytrump_www_large_thumb.jpeg" width="312" height="170"/>
</a>

<div class="digg-story__content">
<header class="digg-story__header">

<div class="digg-story__kicker">SHE WASN'T TRUMPED</div>

<h2 itemprop="headline" class="digg-story__title">
<a class="digg-story__title" href="http://digg.com/2016/debate-recap-trump-clinton-video">
Just The Good Stuff From Last Night's Debate
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<div class="digg-story__metadata">
<span class="digg-story__metadata-diggs">
<span class="js--digg-count">33</span>
<span class="js--digg-label">diggs</span>
</span>

<script src="http://static.digg.com/frontpage.js"></script>

<!-- built with love by amateurs! -->
</body>
</html>
```

Images

```html
<!DOCTYPE html>
<head>
<meta charset="utf-8">
<title>Digg - What the Internet is talking about right now</title>
<link rel="stylesheet" href="http://static.digg.com/homepage.css" type="text/css" media="screen"/>
</head>

<body class="homepage">

<a href="http://digg.com/2016/debate-recap-trump-clinton-video">
<img src="http://static.digg.com/images/hillarytrump_www_large_thumb.jpeg" width="312" height="170"/>
</a>

<div class="digg-story__content">
<header class="digg-story__header">

<div class="digg-story__kicker">SHE WASN'T TRUMPED</div>

<h2 itemprop="headline" class="digg-story__title">
<a class="digg-story__title" href="http://digg.com/2016/debate-recap-trump-clinton-video">
Just The Good Stuff From Last Night's Debate
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<span class="js--digg-count">33</span>
<span class="js--digg-label">diggs</span>
</span>

<script src="http://static.digg.com/frontpage.js"></script>

<!-- built with love by amateurs! -->
</body>
</html>
```
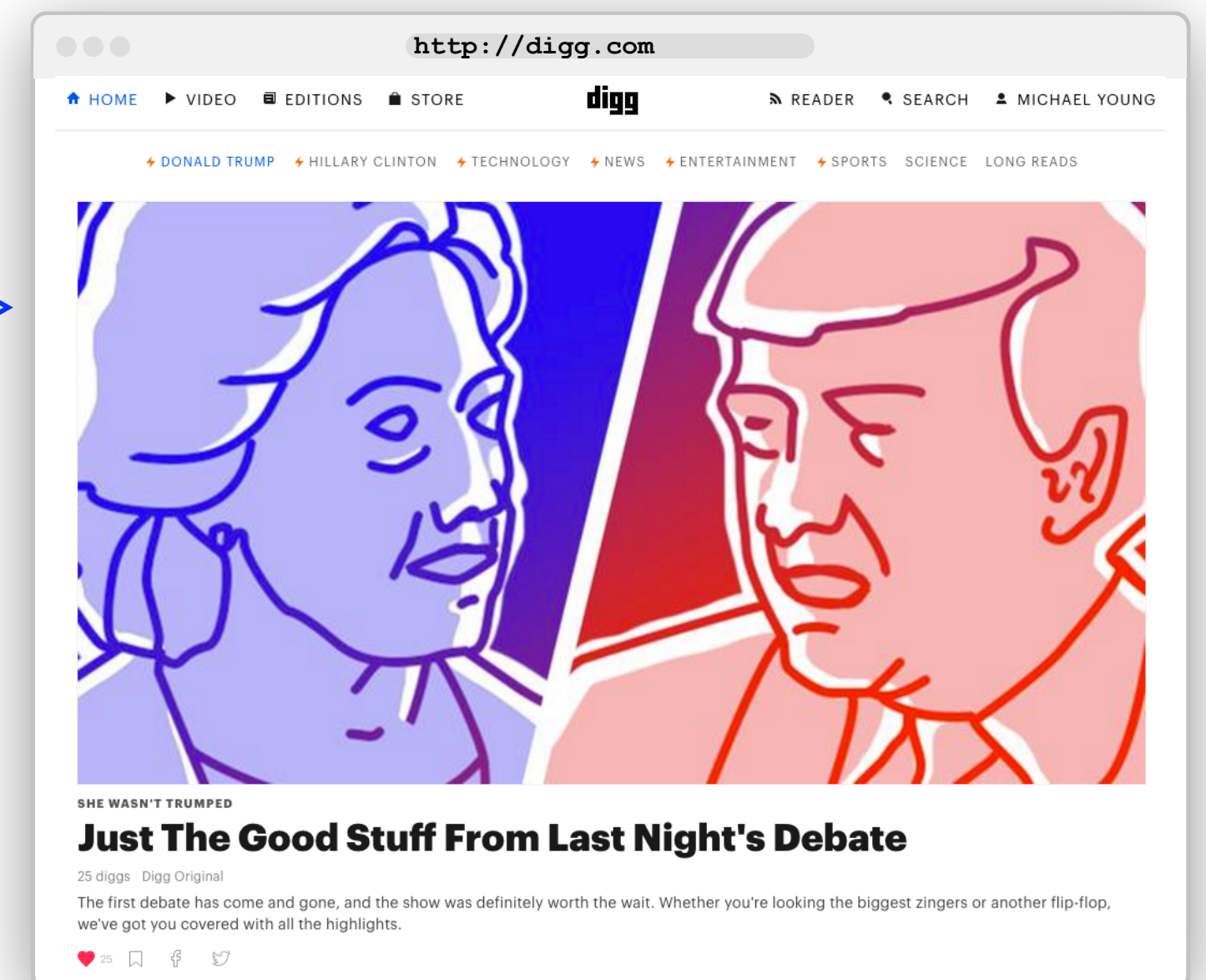
JavaScript

```html
<!DOCTYPE html>
<head>
<meta charset="utf-8">
<title>Digg - What the Internet is talking about right now</title>
<link rel="stylesheet" href="http://static.digg.com/homepage.css" type="text/css" media="screen"/>
</head>

<body class="homepage">

<a href="http://digg.com/2016/debate-recap-trump-clinton-video">
<img src="http://static.digg.com/images/hillarytrump_www_large_thumb.jpeg" width="312" height="170"/>
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<div class="digg-story__content">
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</span>

<script src="http://static.digg.com/frontpage.js"></script>

<!-- built with love by amateurs! -->
</body>
</html>
```
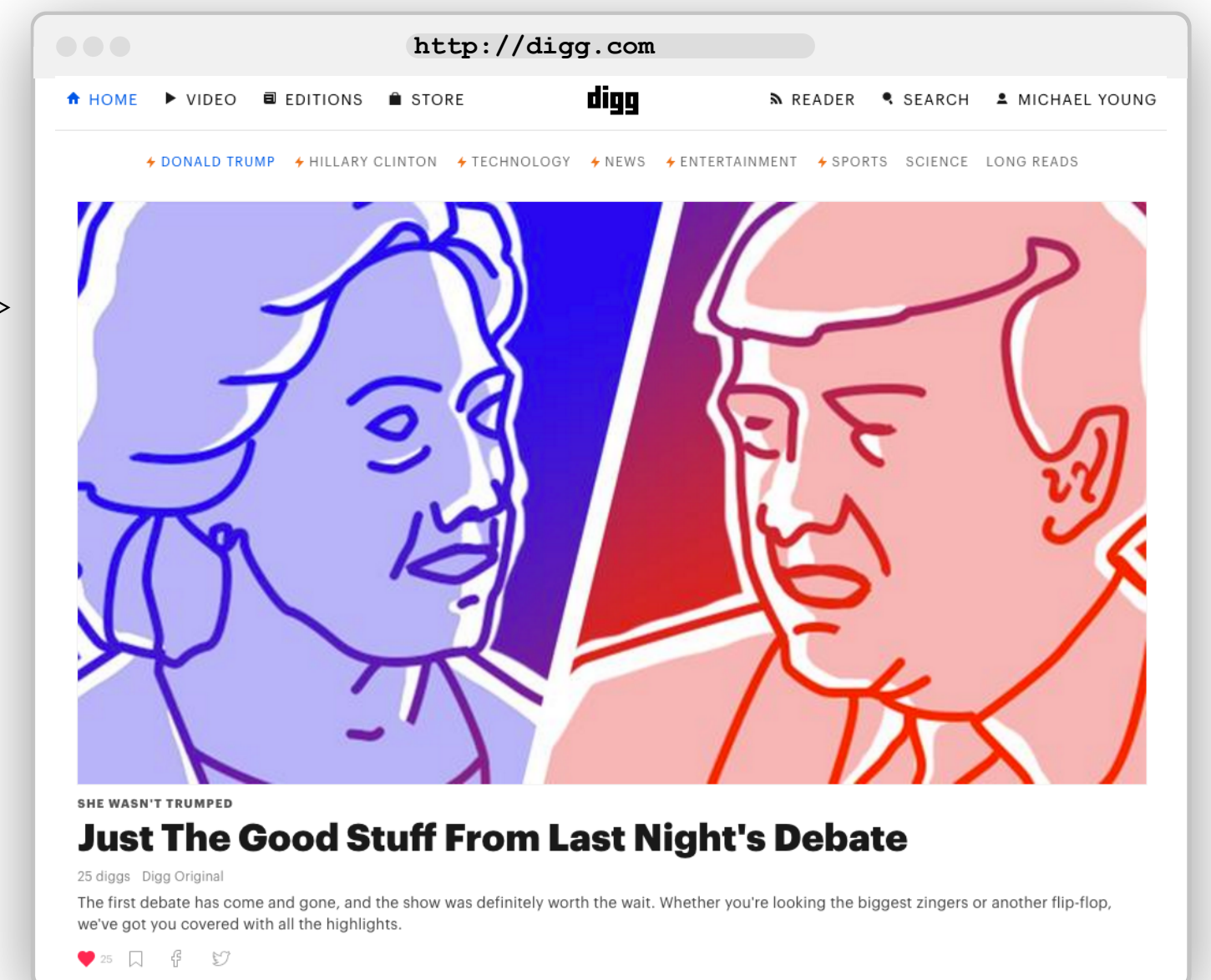
To **Recap**

You: type digg.com in to your browser

Browser: What is digg.com!?!

DNS: I've got this! digg.com is over at 50.18.171.253

Browser: Sweet, thanks DNS.

Browser: Takes x-country road trip to 50.18171.253 and asks,
"Can I get that homepage of yours?"

Server (aka 50.18.171.253**):** Sure, here you go: <sends back a big pile of HTML>

Browser: Thanks. Ok, this is where the magic happens (renders the page)

You: 💯