

6.1040 · software studio · fall 2024

# user interaction design & review

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Slides from Daniel Jackson



**The  
User**



**The  
World**

## **Gulf of Evaluation**

*What's the current  
system state?*



## **Gulf of Execution**

*How do I use  
this system?*



**three bridges:**

**(1) usability criteria**

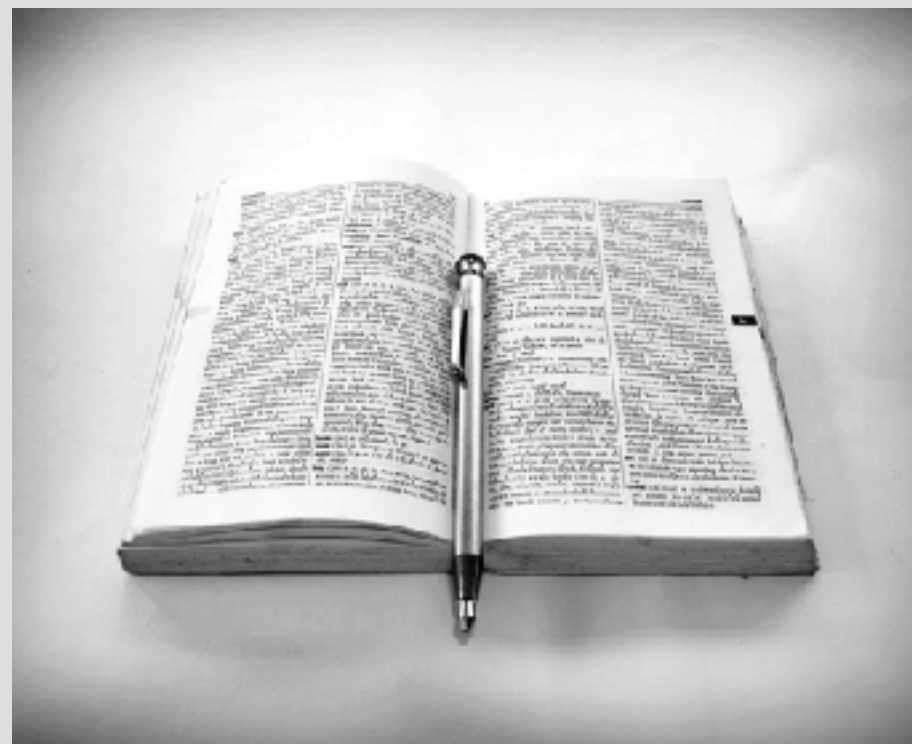
**(2) physical heuristics**

**(3) linguistic heuristics**

**usability criteria**

**ease of use**

# easy to use



discoverable  
(first use)



efficient  
(repeated use)



error-tolerant

# example: car radio presets



discoverable?

not really: who would guess?

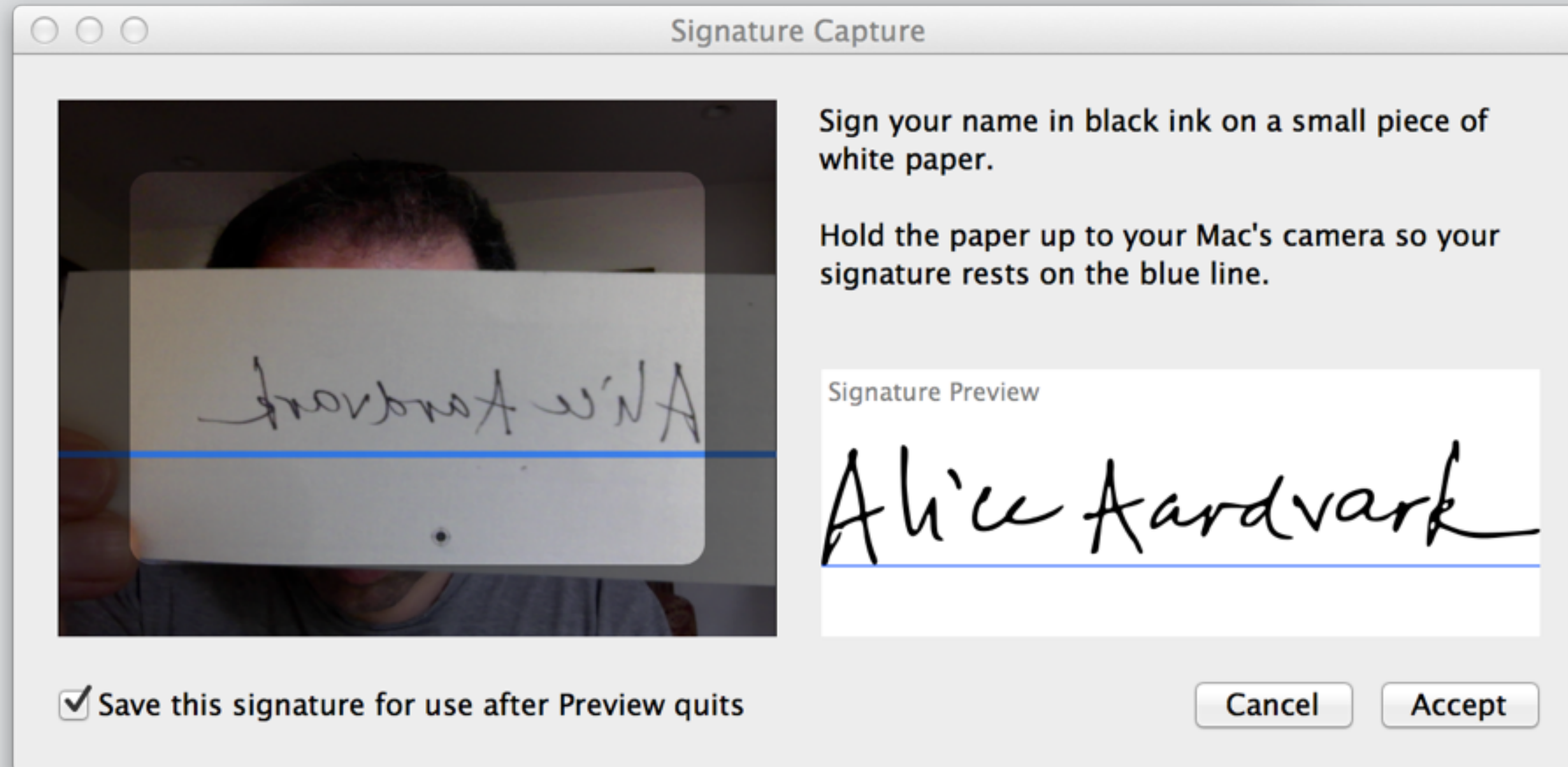
efficient?

yes, perfect

error-tolerant?

nope, can accidentally erase saved stations

# example: signatures in Apple Preview



discoverable?

yes, as good as it gets

efficient?

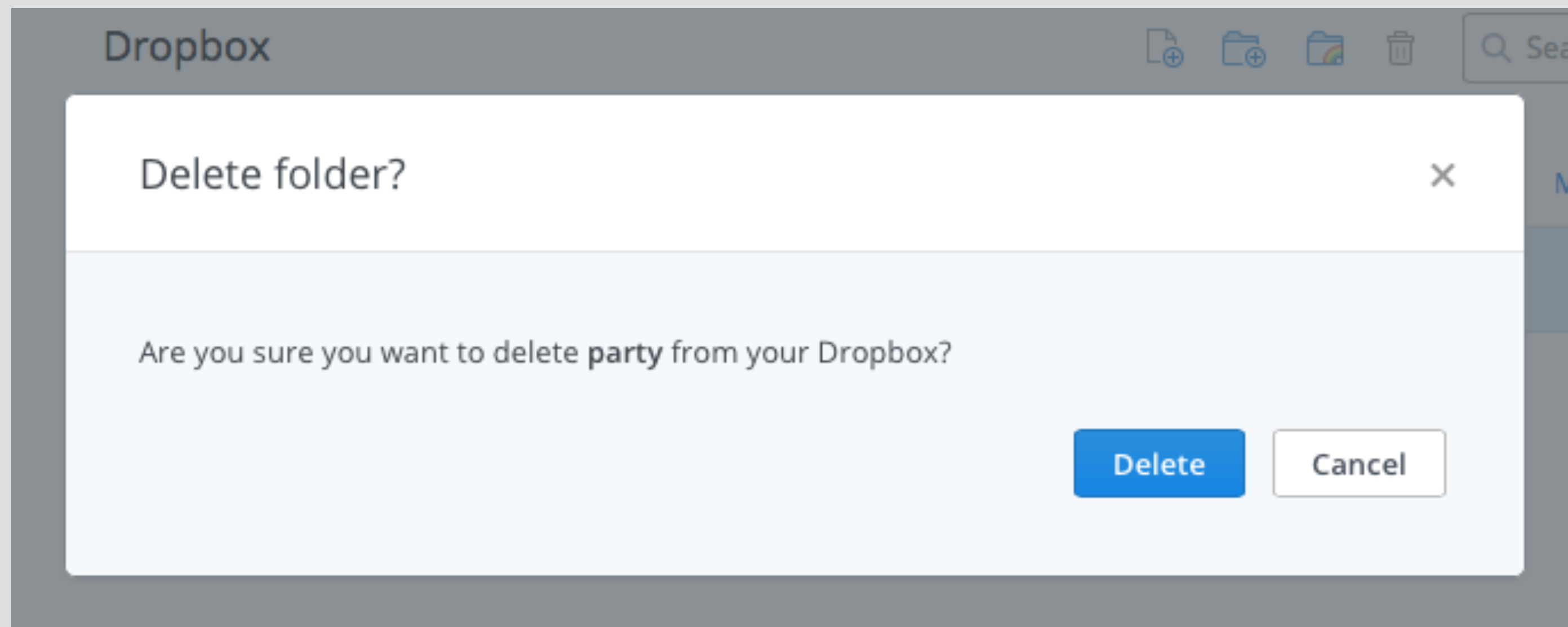
yes, but not very flexible

error-tolerant?

yes, feedback as you position it



# example: dropbox/gdrive deletion



discoverable?

yes, but might not mean what you think

efficient?

yes, just click a button

error-tolerant?

sort of: deletes other users' copies, but can undo.

**Dave Salyer**  
G-Suite (Workspace) & Google Docs/Sheets user/expert · Author has 1.2K answers and 4.4M answer views · 4y

Related **When you delete something in Google Drive, does it unshare it from whoever was a collaborator?**

Deleting a file from your My Drive that is shared with others will show you this message:

Removed 1 file. 1 removed file is still accessible by collaborators. [UNDO](#) ✕

This is a confusing message because you would think that other people who the file has been shared with would still be able to work on the file like normal.

But that is not the case. In the test I did, I was the Owner on one account and an Editor on another. In the Owner account, I removed the file and received the above message. It then appeared in the Trash (Bin).

I went in to the other, Editor account and the file was no longer visible, anywhere in Drive, not even in the Trash (Bin).

I went back to the Owner account and restored the file and it returned as an accessible file in both places as expected.

I tested this also with Link Sharing. I turned on Link Sharing for a file and shared it with my 'other self' via a link in an email. I tested to see that I could open the file and it was fine. I closed the file, went back to the other account and removed it, putting it in the Trash (Bin).

I went back to the email with the link and I got this when I clicked it:

No preview available.  
File is in owner's trash

I think the "accessible by collaborators" message is confusing but it's better to be there as a reminder that the file still exists somewhere. Even though it is not readily accessible by collaborators, the Owner can easily restore it to make that so.

Perhaps the message is there to tell the Owner that if they truly want to make it impossible for anyone to access the file, they should remove it forever by visiting their Trash (Bin).

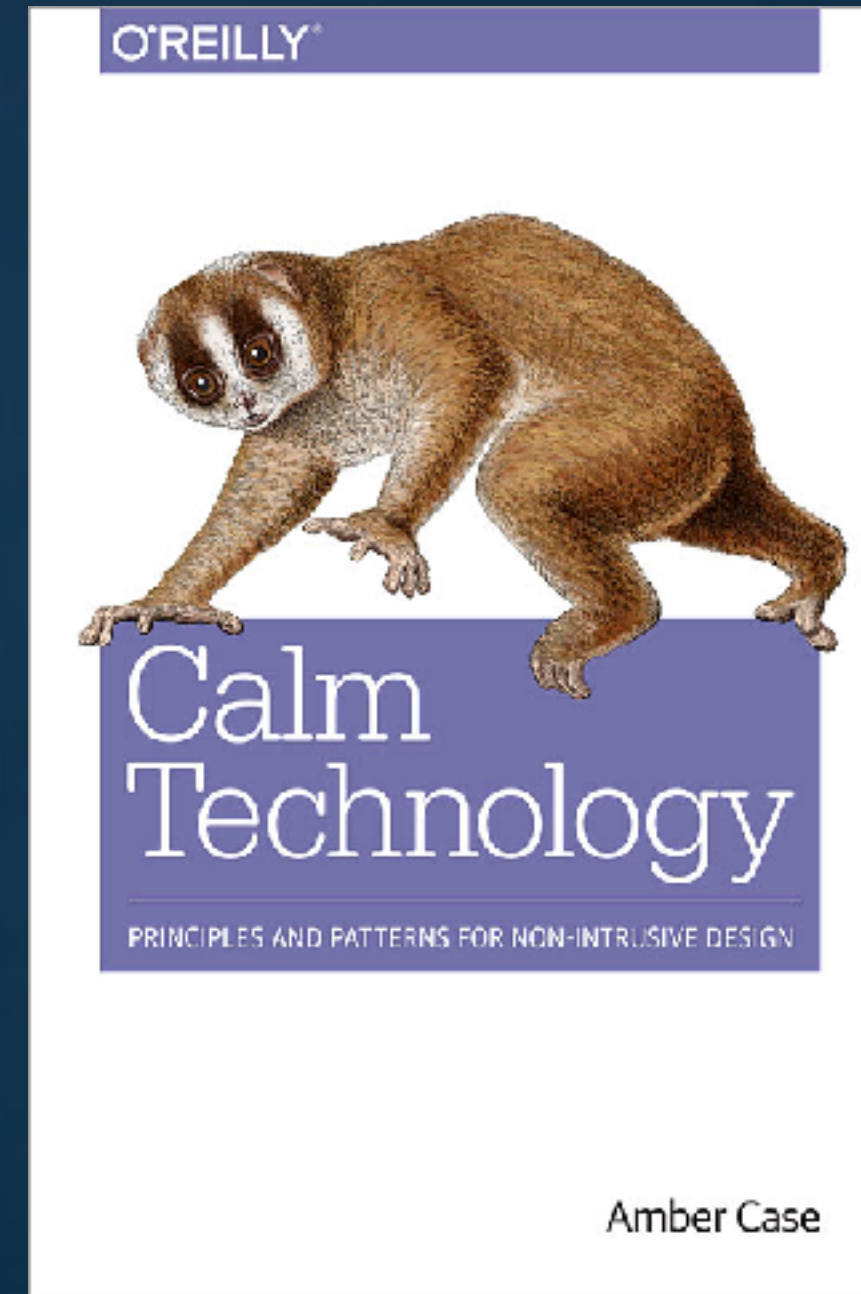
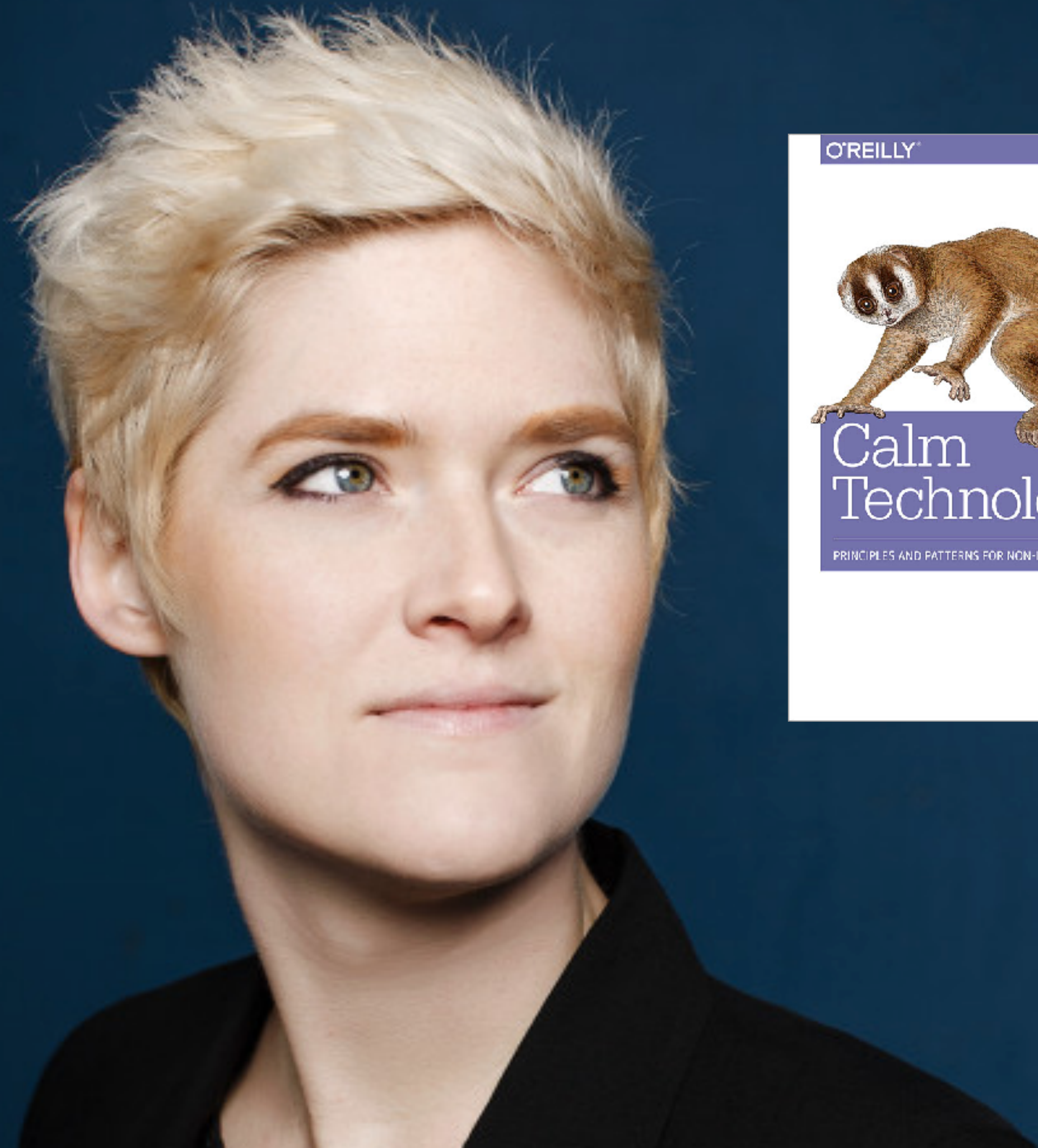
pleasantness

example: pleasantness in architecture



Ryōan-ji, Kyoto

# amber case: calm tech evangelist



require least attention possible  
communicate without noise  
respect social norms  
minimal technology needed  
use the periphery

example: grayscale filter

☰ **WIRED** [SUBSCRIBE](#)

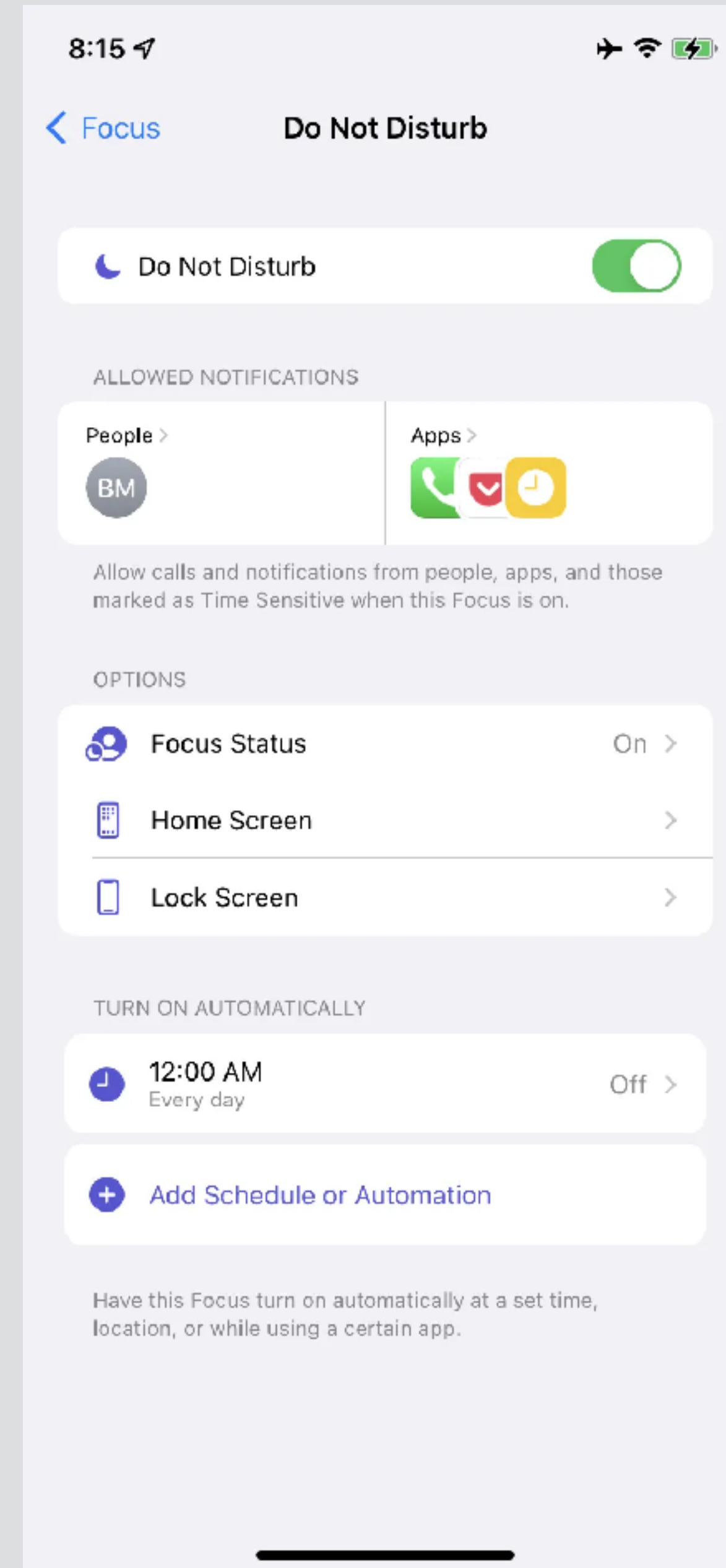
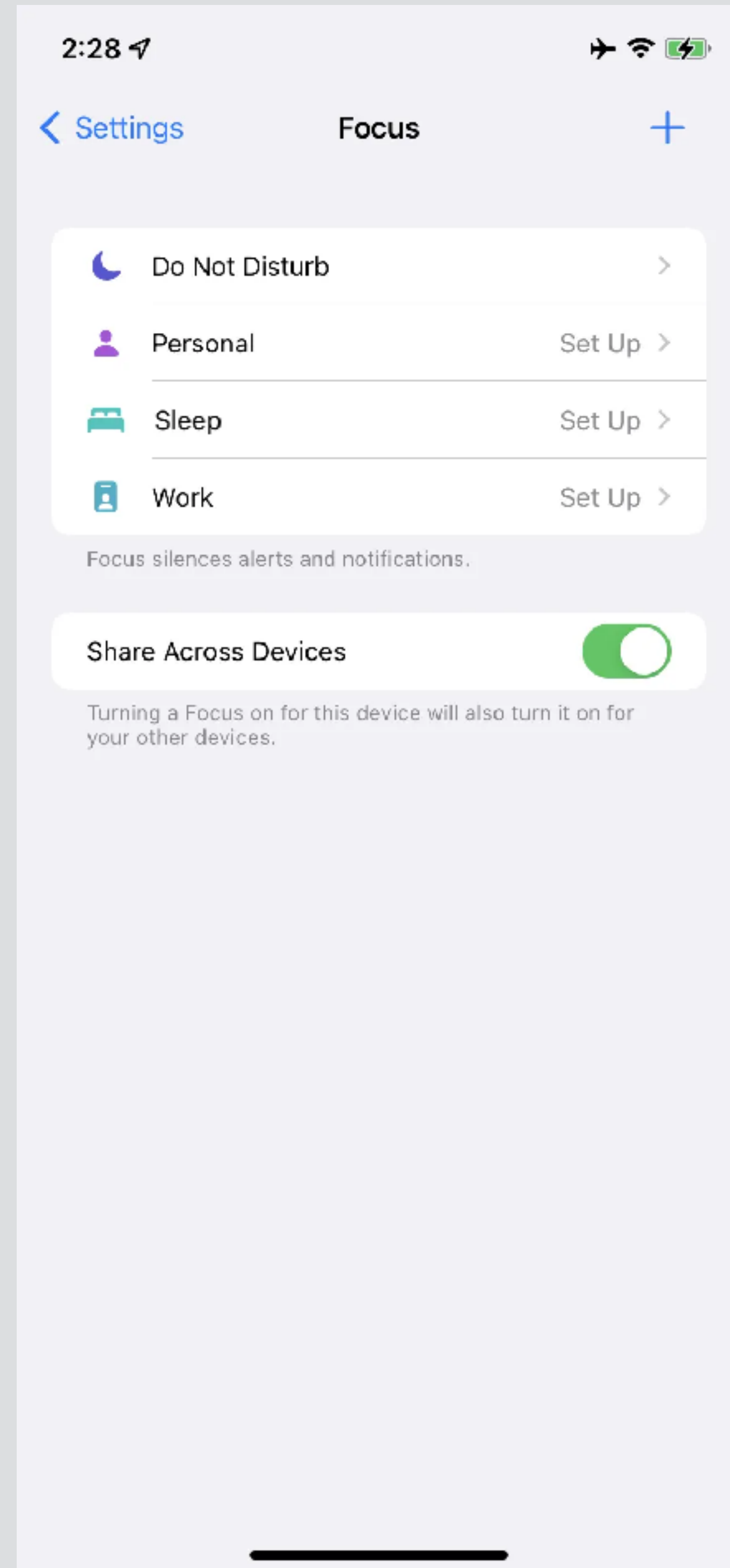
**DAVID NIELD** GEAR DEC 1, 2019 7:00 AM

# Try Grayscale Mode to Curb Your Phone Addiction

iOS and Android make it easier than ever to sap the color from your phone, and help you save some sanity in the process.



# example: focus modes



# example: the light phone

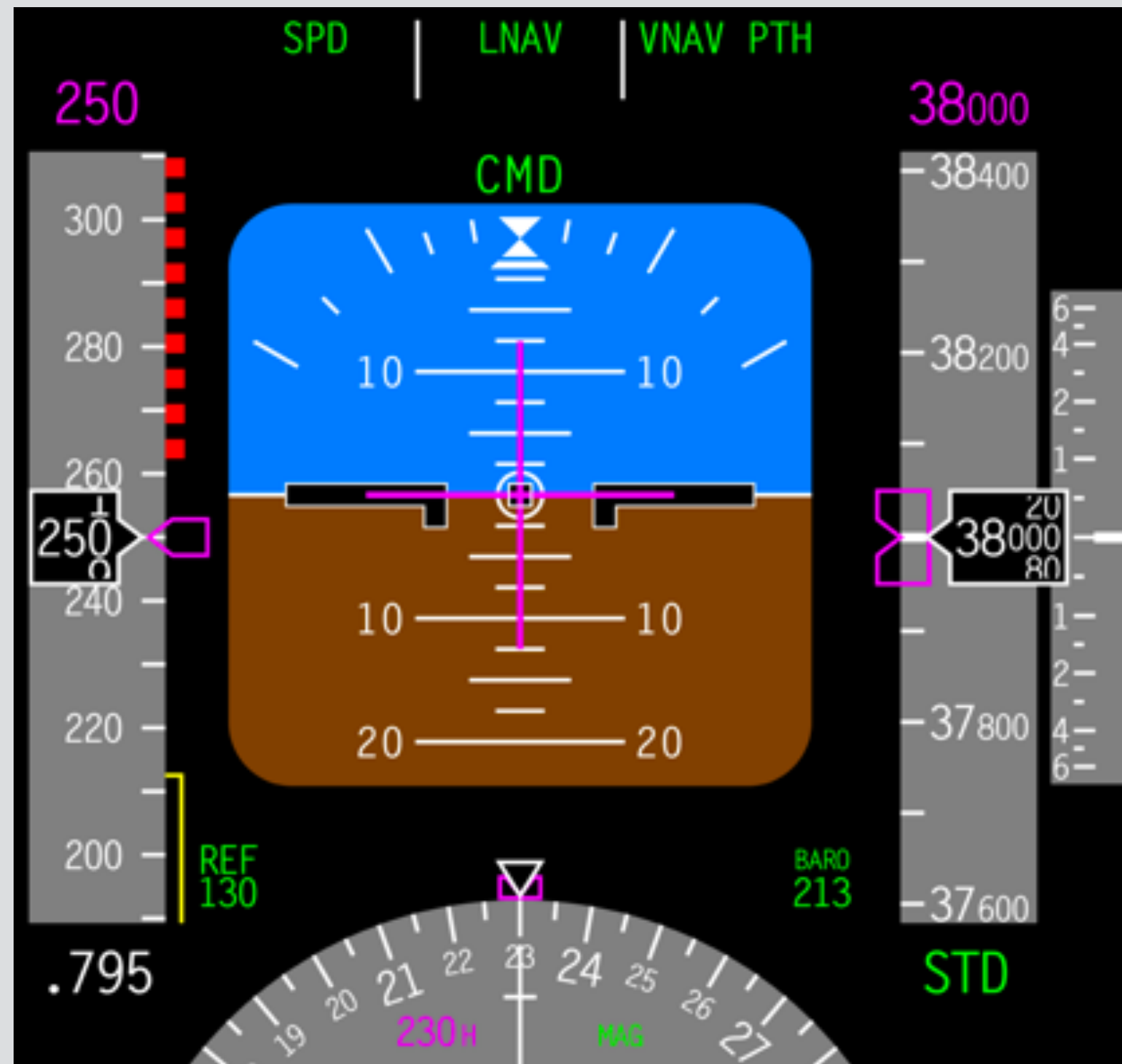


“A credit card-sized cell phone designed to be used as little as possible. The Light Phone is your phone away from phone.”

**safety**



# what's safety for?



safety-critical products



regular products

interlocks, not just messages



Heathrow Airport

# (in)tangible user experiences



not blaming the user

USS Yorktown, 1997



Managers are now aware of the problem of entering zero into database fields and are trained to bypass a bad data field and change the value... ships do go dead in the water... People sometimes make mistakes and systems break. The trick is we have trained our crew...  
— Commanding Officer, USS Yorktown

**security**

# anecdote: bad password

**From:** "TIG" <[help@MIT.EDU](mailto:help@MIT.EDU)>  
**Date:** October 13, 2008 11:04:08 AM EDT  
**To:** "Daniel Jackson" <[dnj@csail.mit.edu](mailto:dnj@csail.mit.edu)>  
**Subject:** your password

We recently ran a password checker to evaluate passwords of all CSAIL users, and your password was readily broken. Please choose a new password ASAP...

my password:

**sergeantpepper1967**

8 character UNIX limit: truncated after this

# a common password policy

## **ACTION REQUIRED TO RETAIN ACCESS TO APPLICATIONS VIA THE INTERNET SUCH AS EMAIL, WEB SITES AND REMOTE DIAL UP**

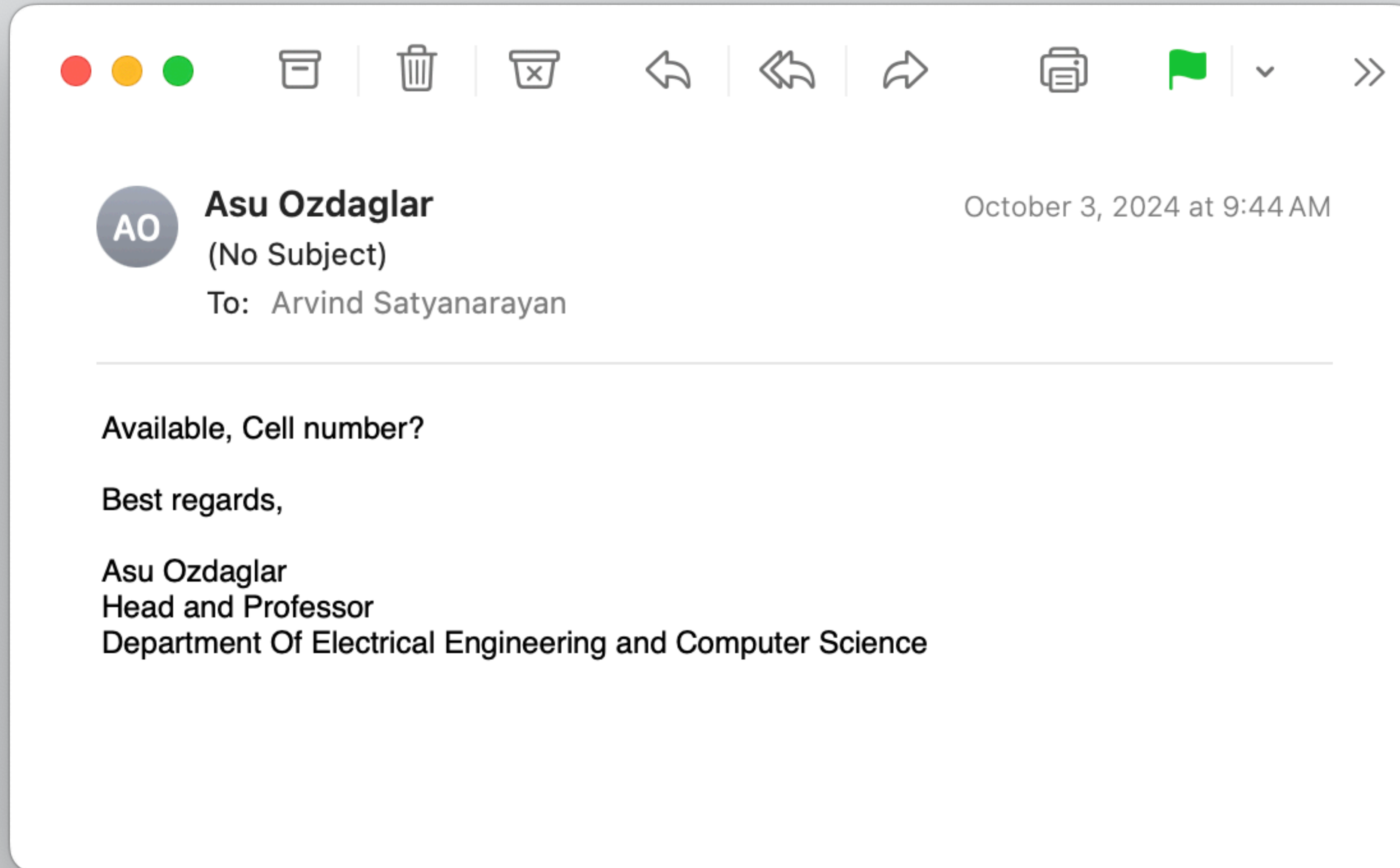
Company provides the ability to access various applications via a Company ID and password. Your password expires every 75 days.

**This reminder is being sent as it has been 60 days since your last password change.**

**If you do not change your password within the next 15 days, your password will expire and you will lose access to company applications.**

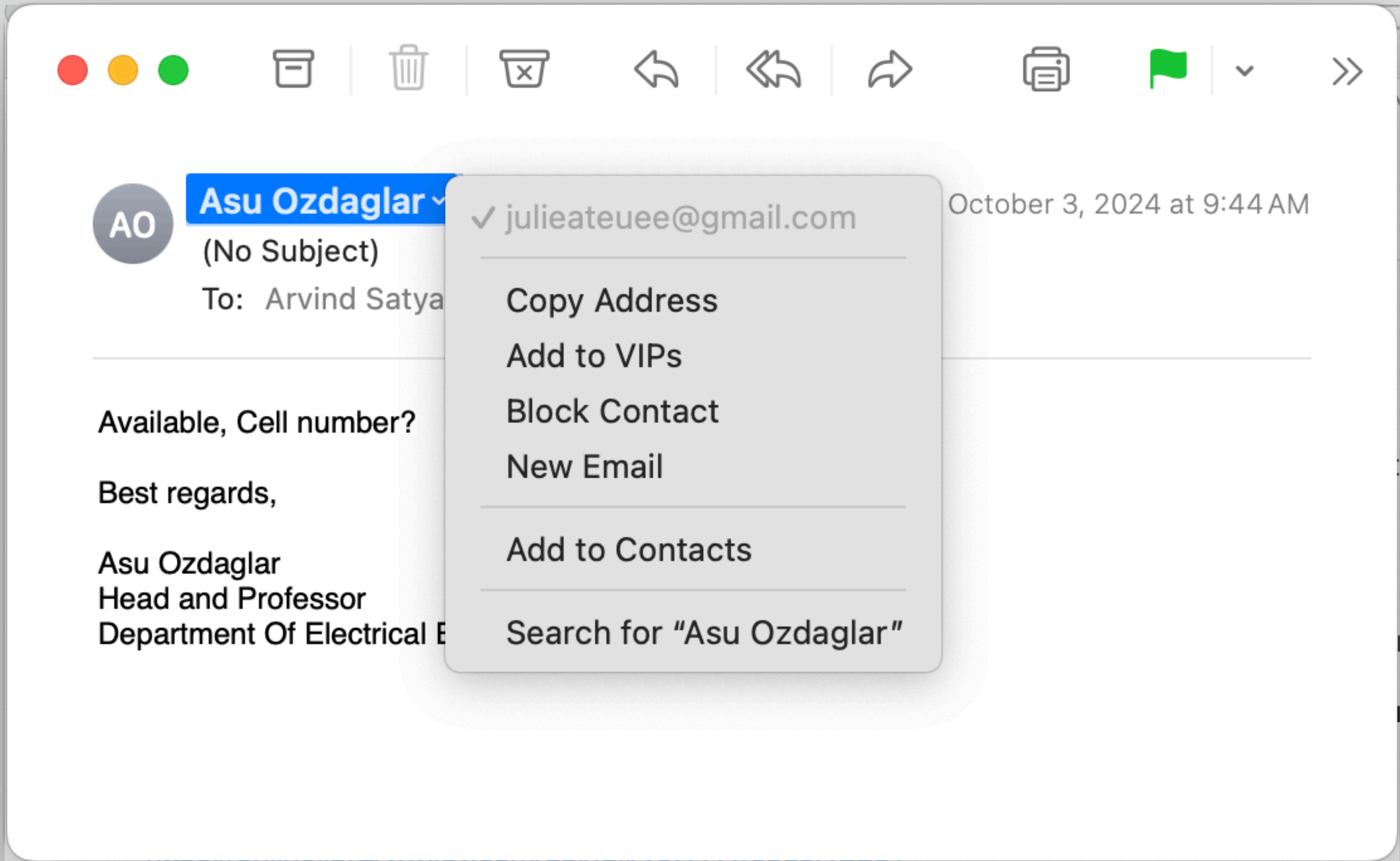
is this a good policy?

# almost all security attacks begin with social engineering

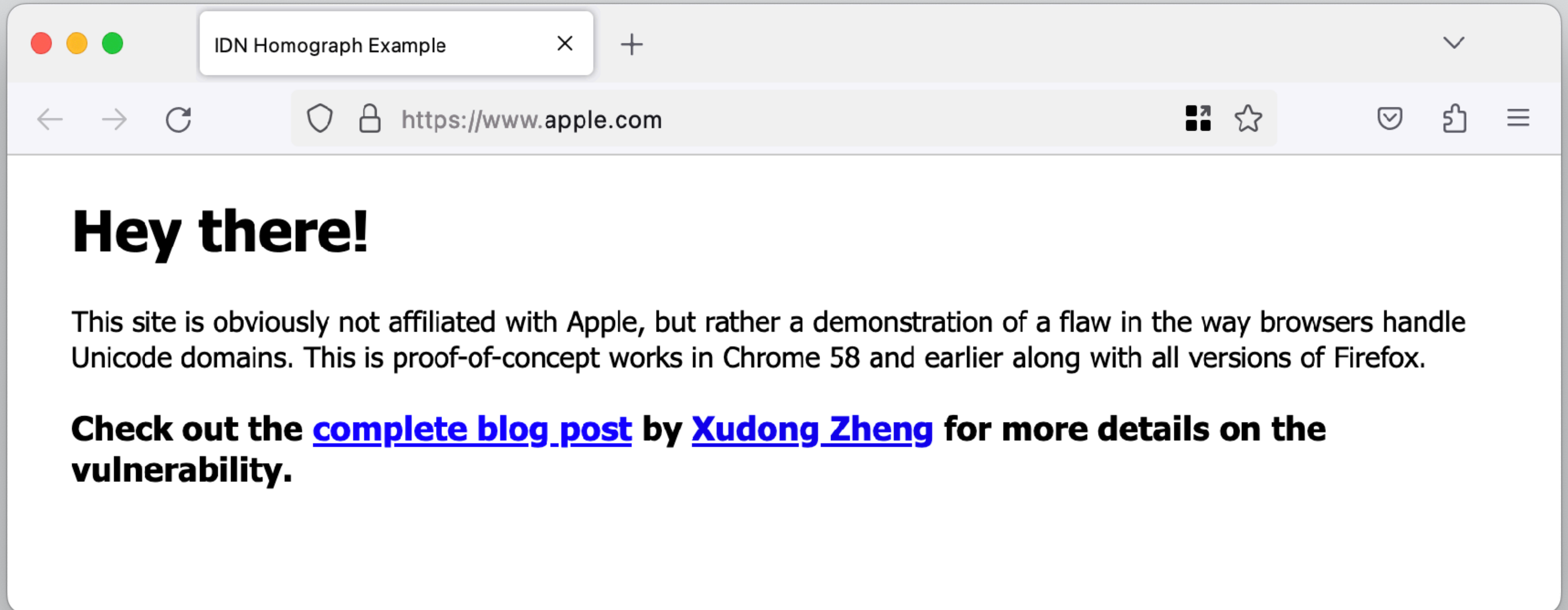




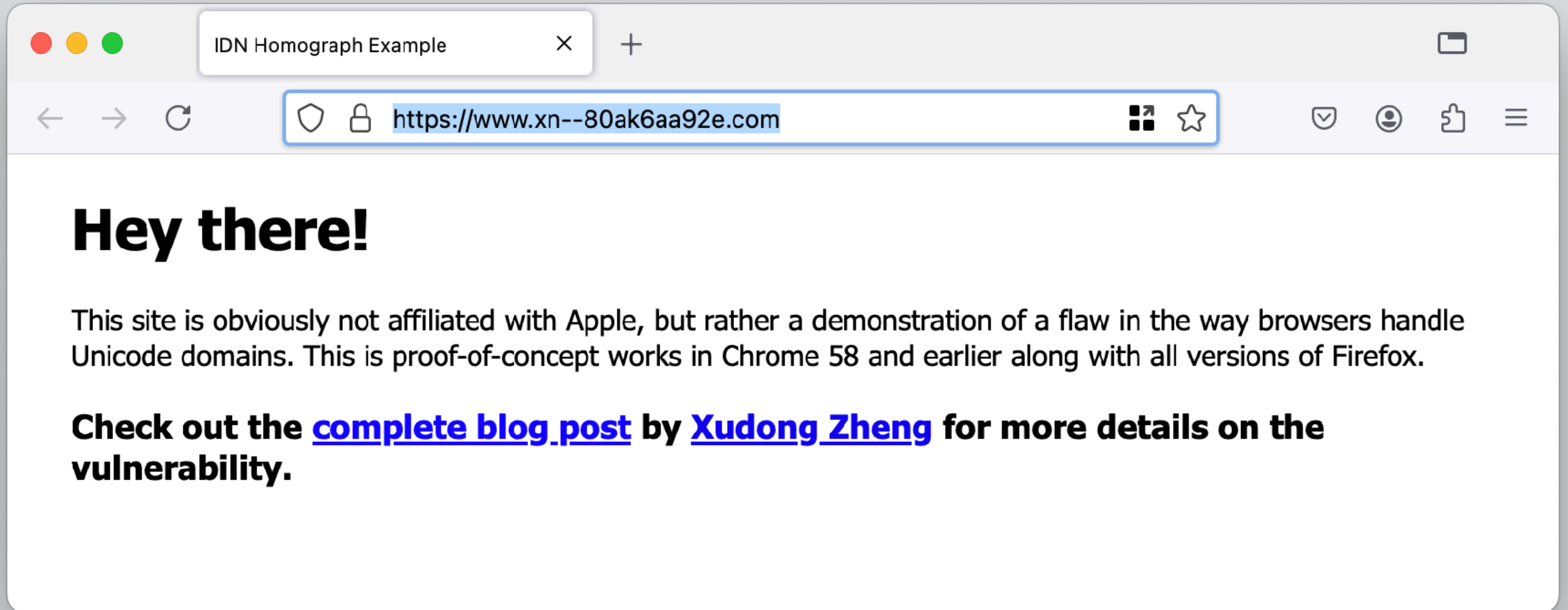
# almost all security attacks begin with social engineering



# homograph attacks

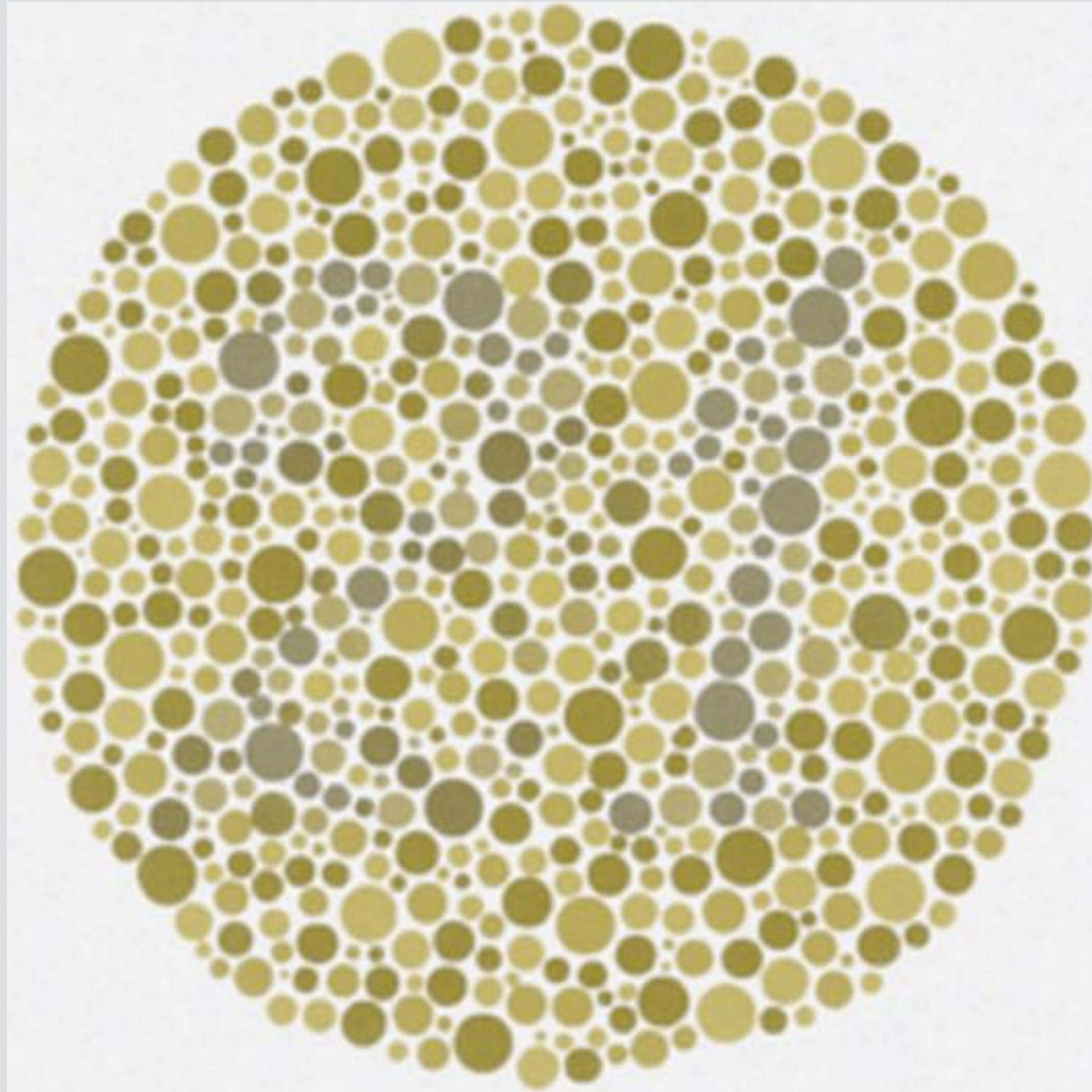


# homograph attacks



**accessibility**

# red-green colorblindness



affects 8% of men

# example: colorblindness

The image shows a news article page with a colorblindness simulation applied. The main headline is "Transport select committee warns drivers of fake websites". Below the headline is a large image of two computer keyboard keys: one labeled "Fake" and one labeled "Genuine". The "Fake" key is a light olive green, and the "Genuine" key is a darker olive green. To the right of the main image is a "Promoted Content" section with a blue header. Below it is a card titled "Innovation at work" with a small blue icon and text: "Want to find out how to unleash innovation in your organisation? Whether you're keen to learn more about hotdesking, laser printing, connectivity, mobility, security or more, check out our...". Below the promoted content is a "Latest in Strategy" section with a blue header. At the bottom of the page is a "SHARE" section with buttons for Twitter, LinkedIn, Facebook, Google+, and a generic share icon. The text "simulated with SEE Chrome plugin" is overlaid at the bottom of the image.

## Transport select committee warns drivers of fake websites

**Promoted Content**

**Innovation at work**  
Want to find out how to unleash innovation in your organisation? Whether you're keen to learn more about hotdesking, laser printing, connectivity, mobility, security or more, check out our...

**Latest in Strategy**

Apple Music faces antitrust investigation

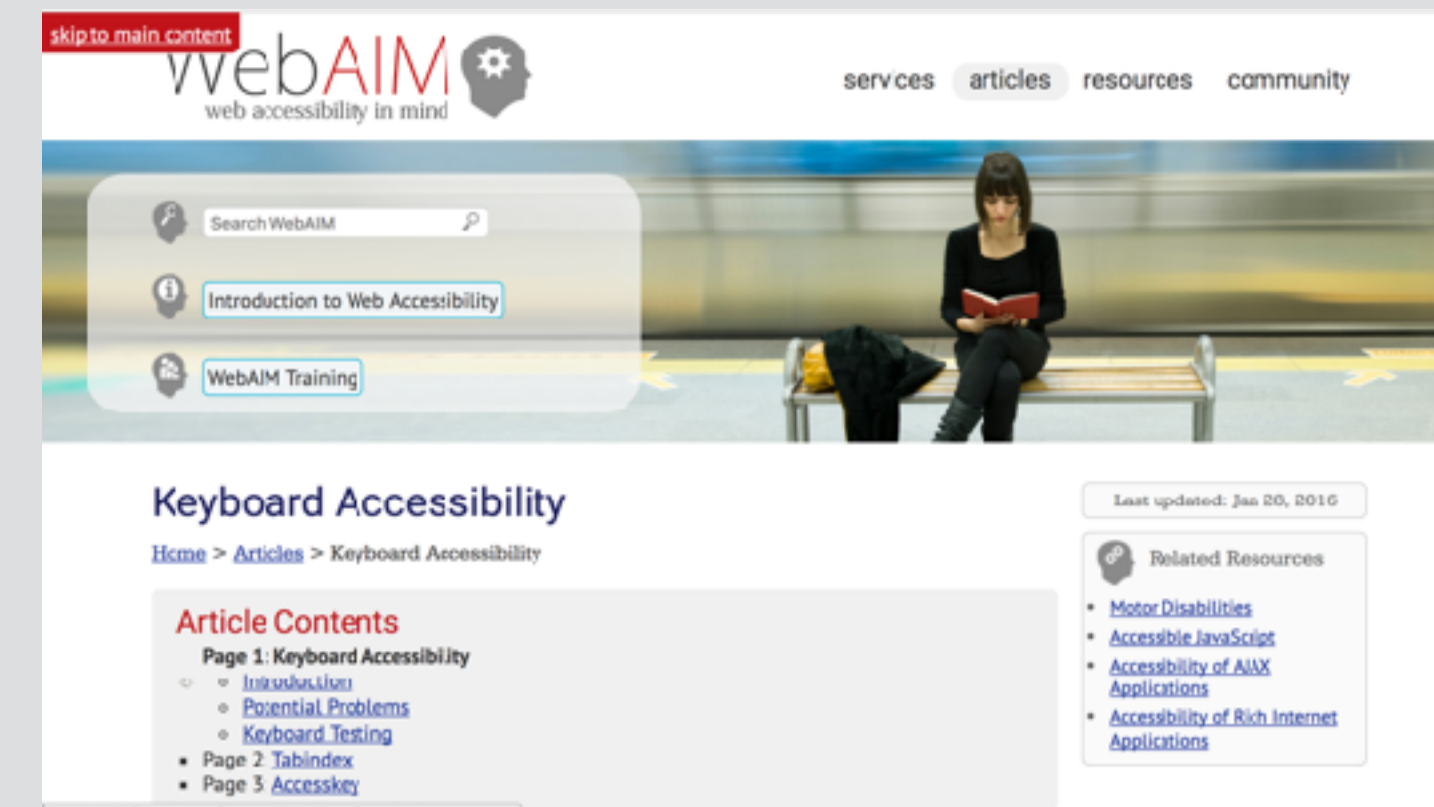
SHARE [TWITTER](#) [LINKEDIN](#) [FACEBOOK](#) [GOOGLE+](#) [@](#)

simulated with SEE Chrome plugin

# web accessibility guidelines



provide text alternatives to images

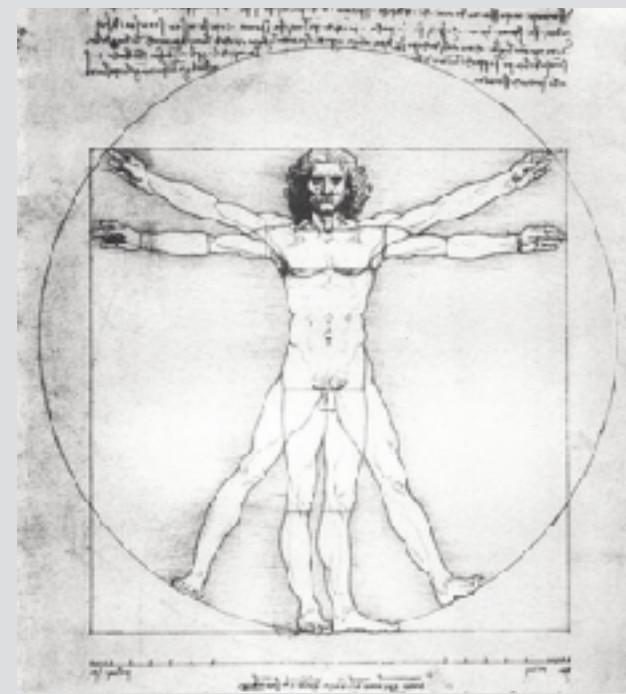


keyboard accessible



offer captioning of video content

# levels of UX design



physical



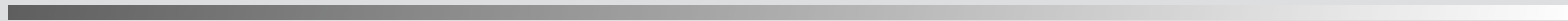
linguistic



conceptual

concrete

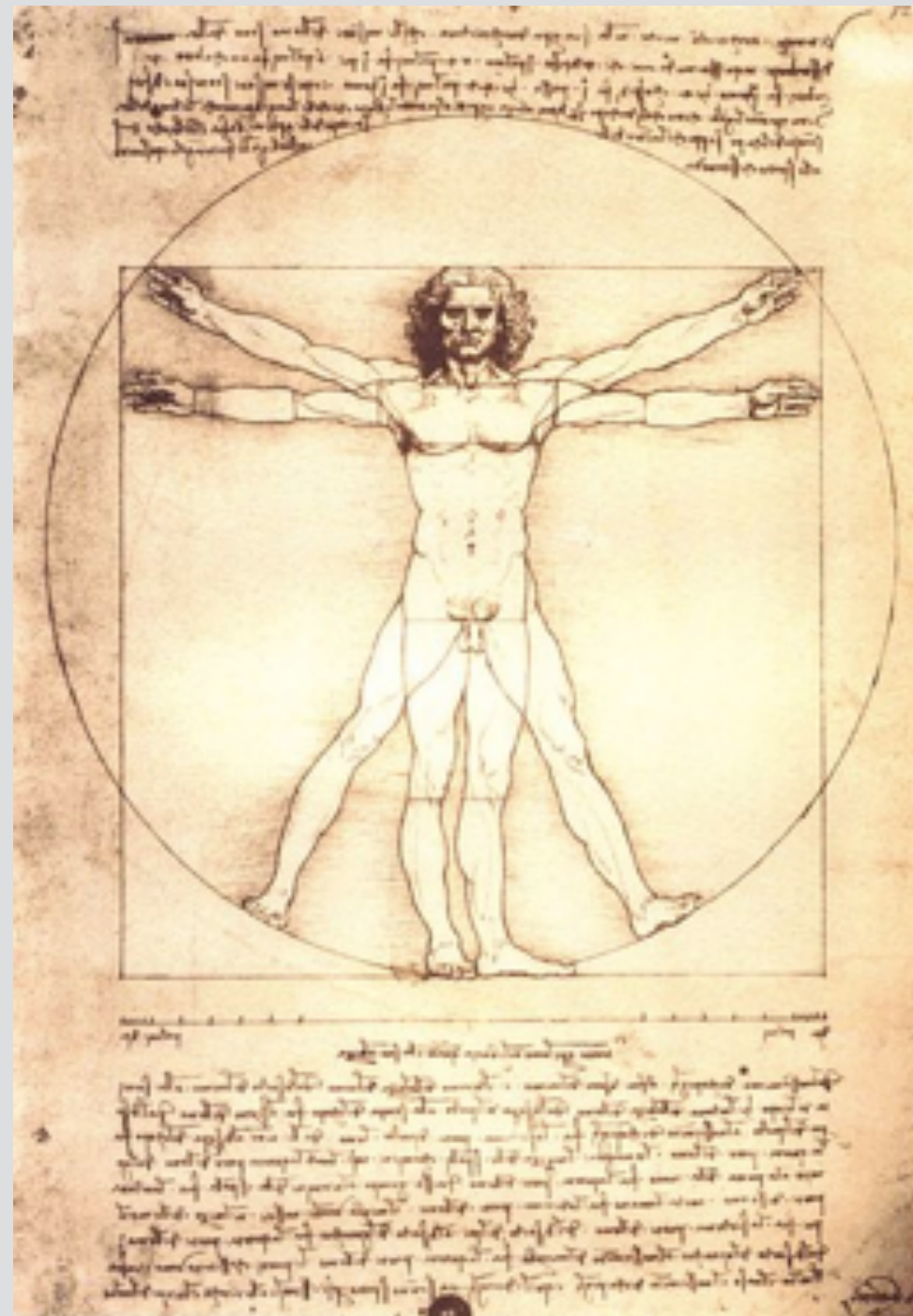
abstract





physical  
level

# concerns of the physical level



## human characteristics

time to move mouse?  
perception of delay?  
sensitivity of the eye?  
memory capacity?

touch, sight, sound



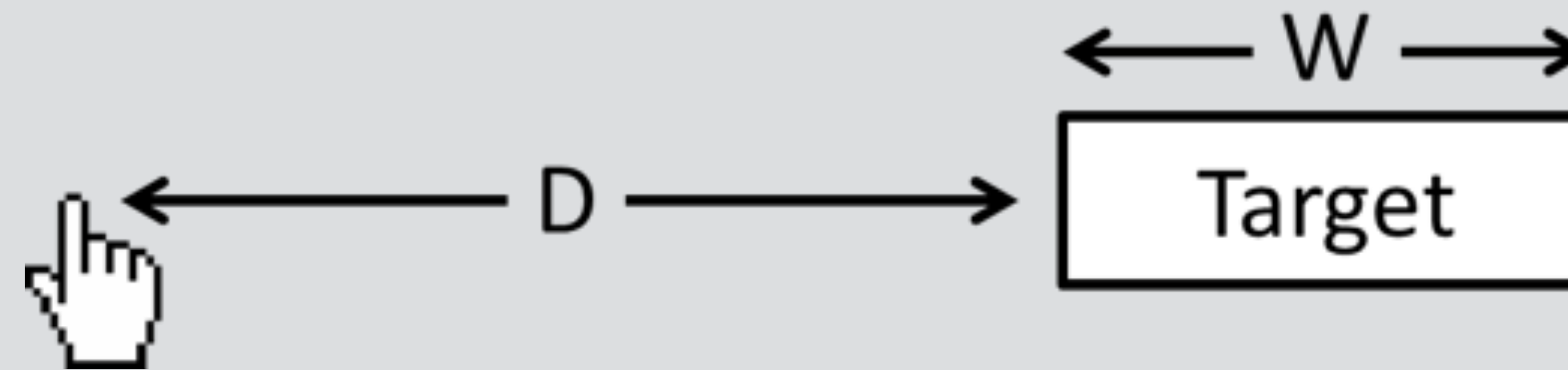
## design of interface

where to put buttons  
when to show progress bar  
what colors to use  
when to rely on recall

**fitts's law**

# fitts's law

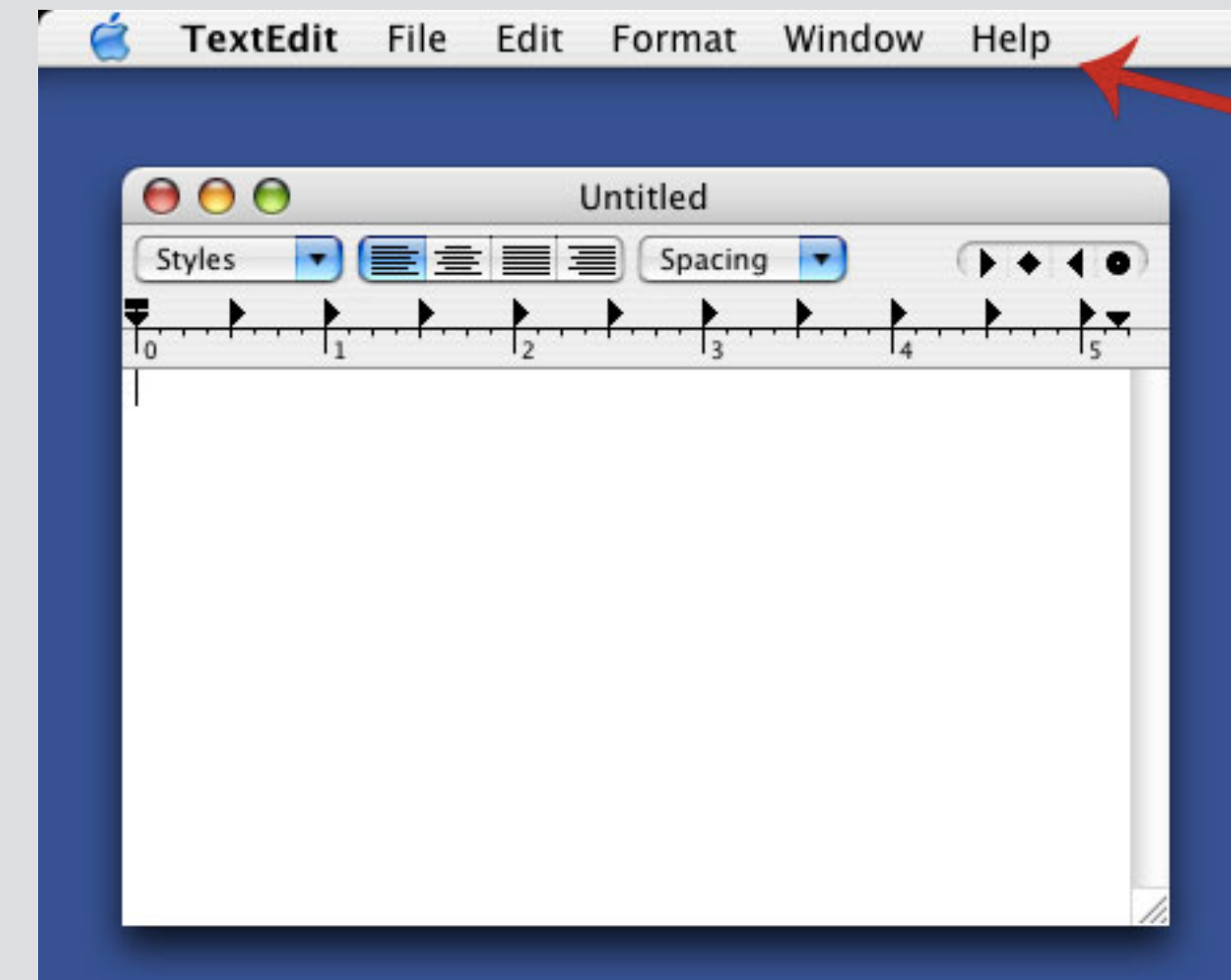
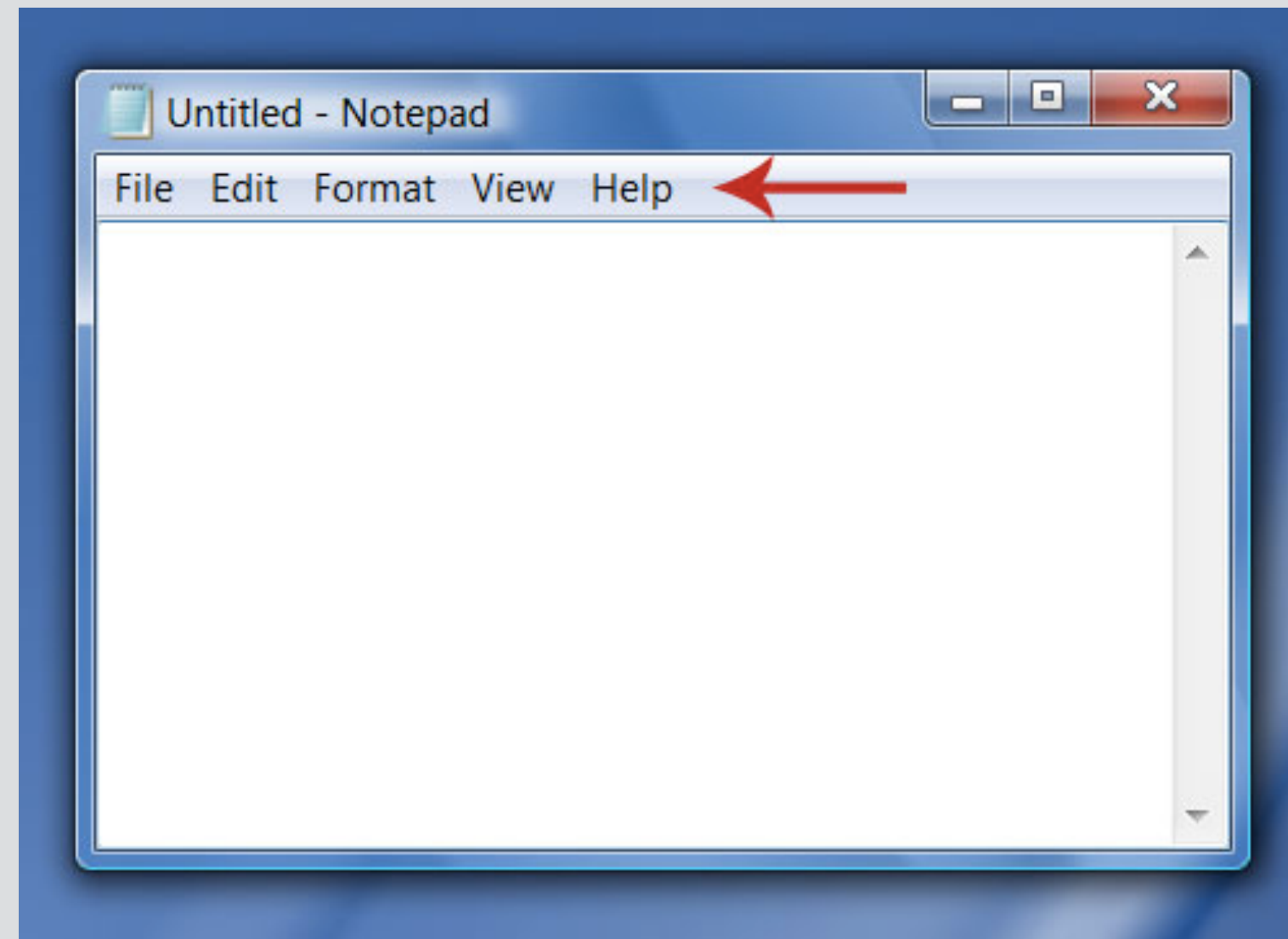
*heuristic*  
make features  
close & large



time to move to target  $T = a + b \cdot \log(D/W + 1)$   
reaction time  $a$  is fixed  
moving time depends on 'index of difficulty'  $D/W$

for demos, see <http://fww.few.vu.nl/hci/interactive/fitts/>  
and <http://simonwallner.at/ext/fitts/>

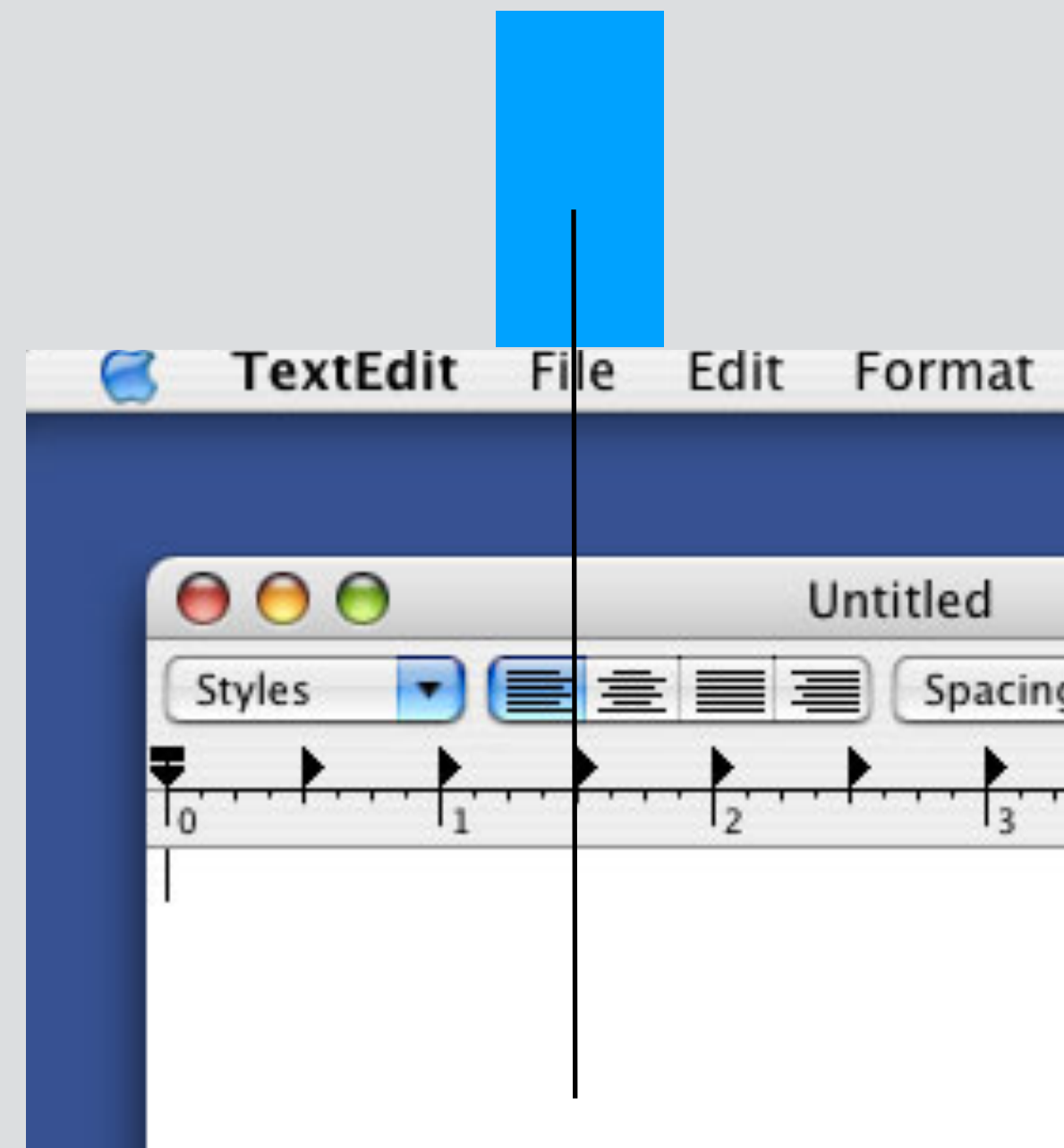
# discussion: windows vs mac



“On Windows the menu bar is right there, no need to move your eye to another part of the screen.”

An online argument. Is he right? What does Fitts's Law say?

# applying fitt: windows vs mac

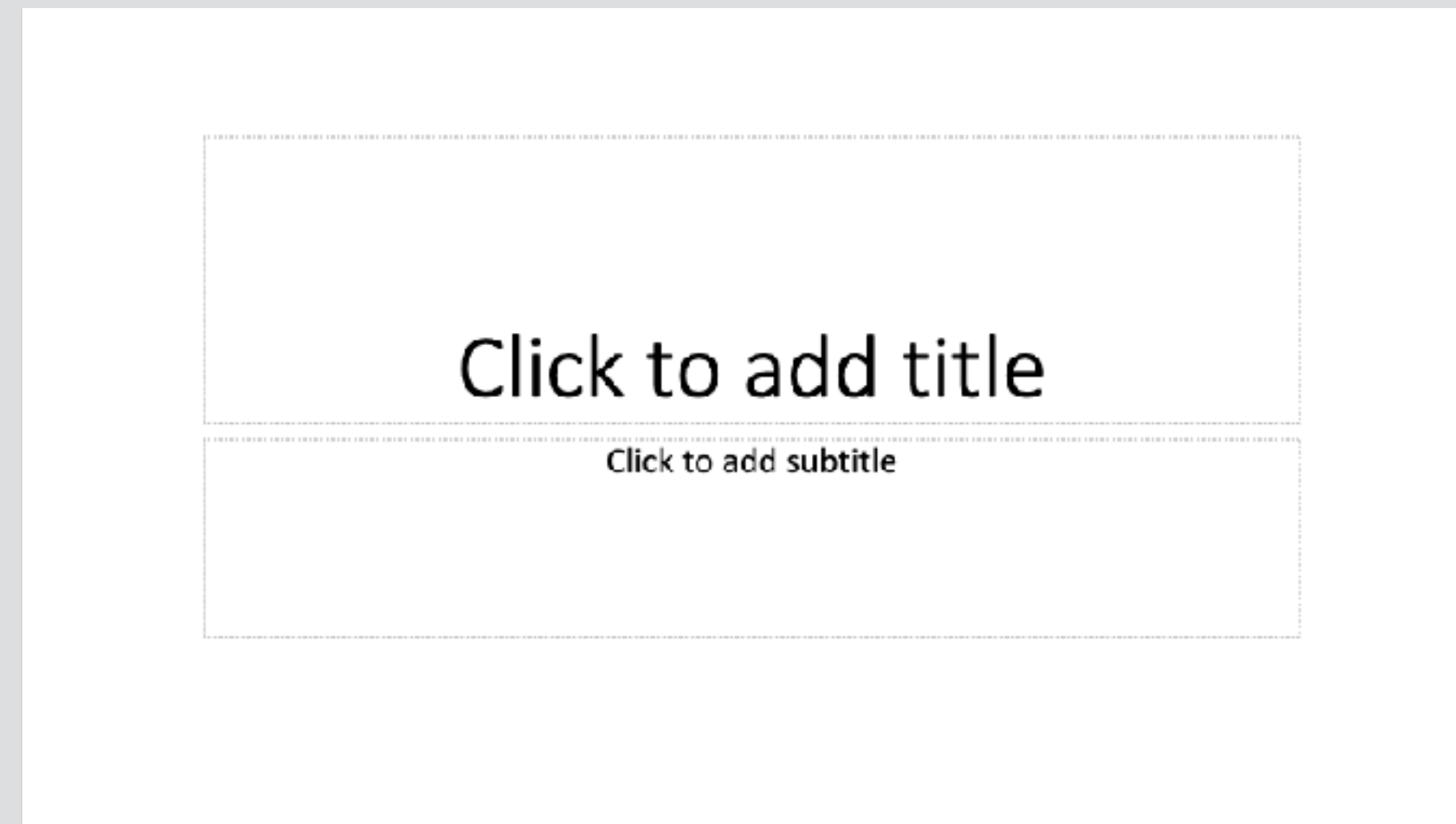


the Mac menu is a bit further away,  
but it effectively has **infinite size**, so  
it's much quicker to locate

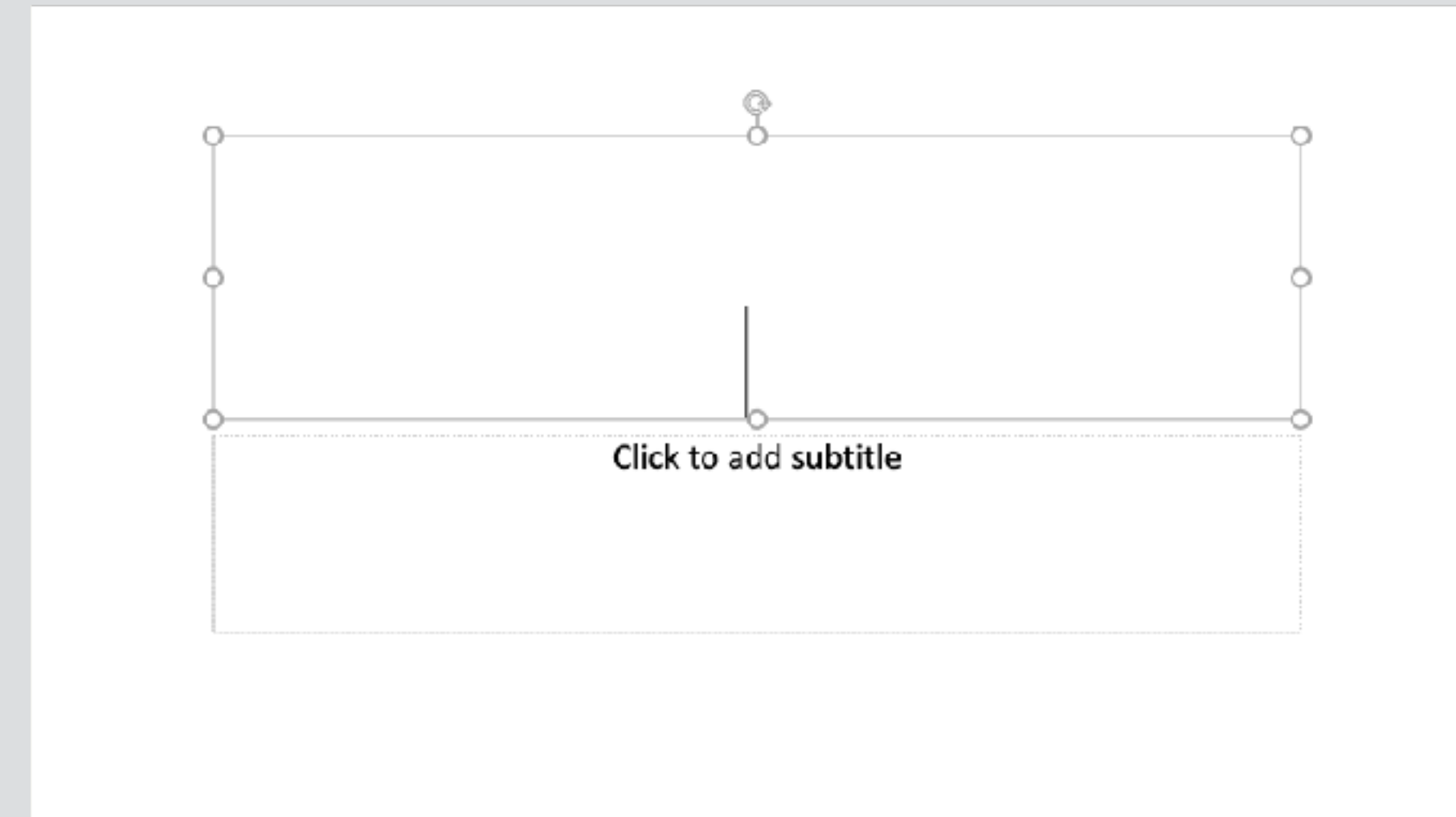
example: closing app on iPhone



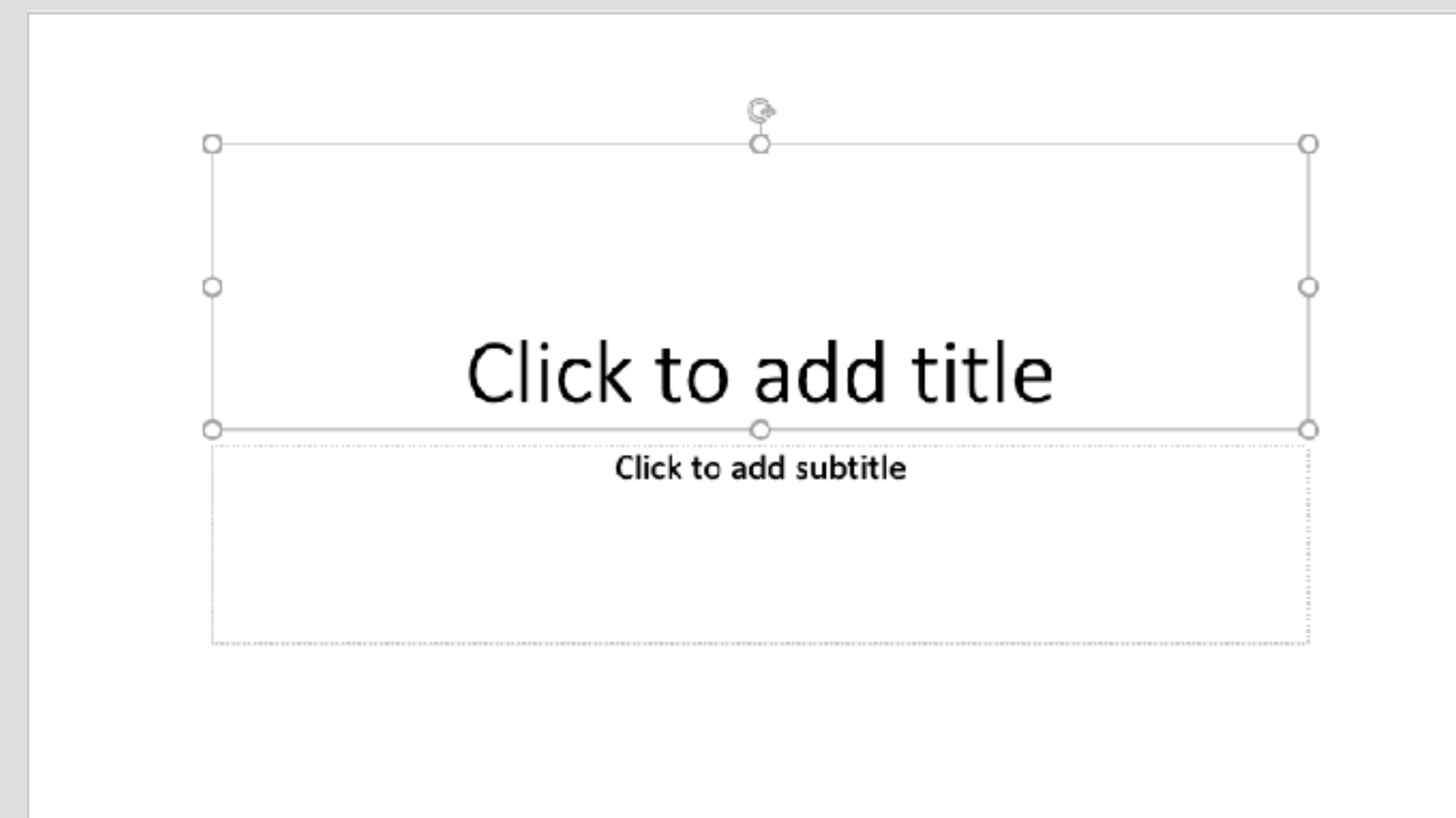
# selecting objects in powerpoint



slide when first viewing



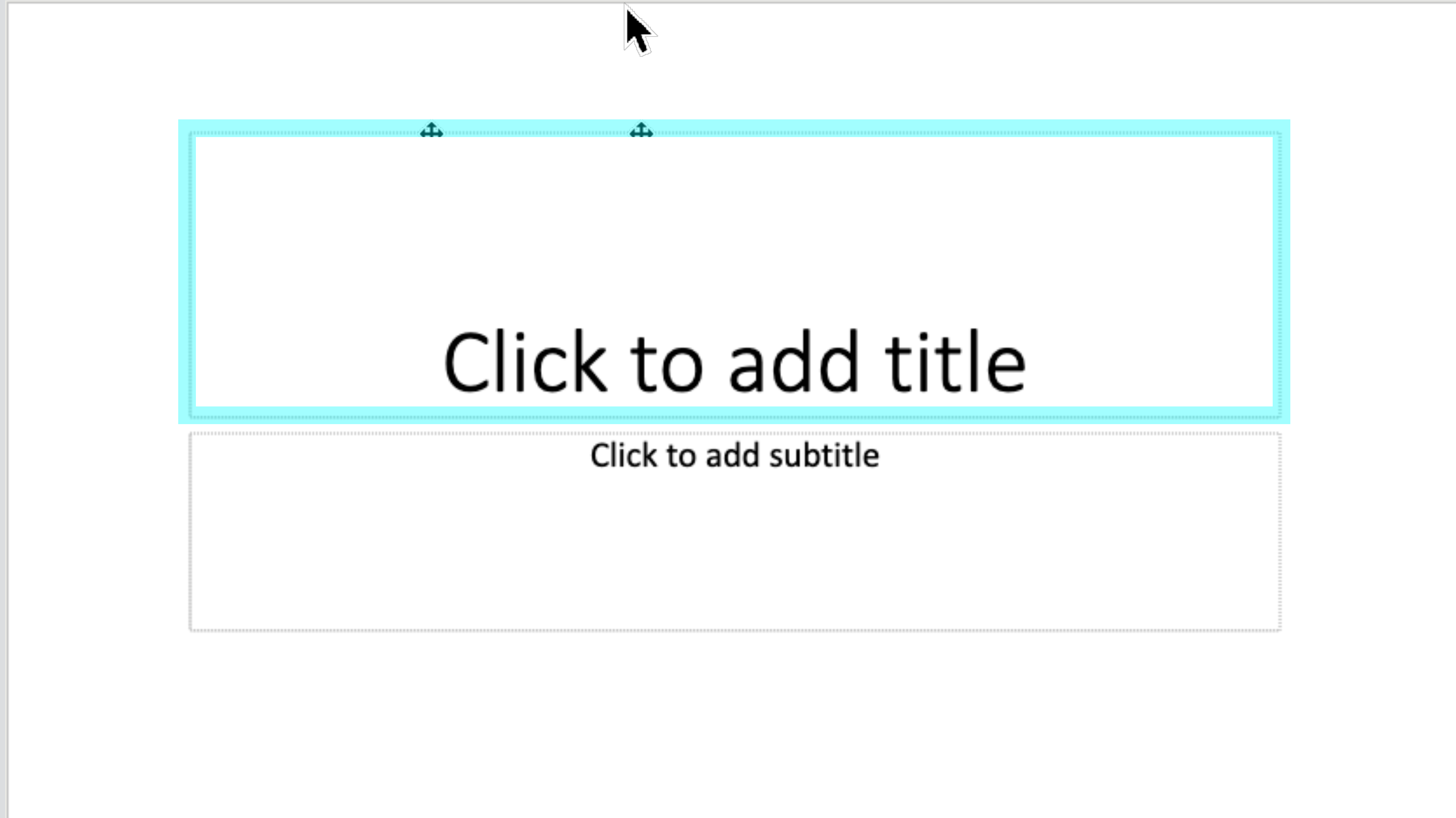
slide after clicking on object



slide after selecting object



# how to select an object in *powerpoint*



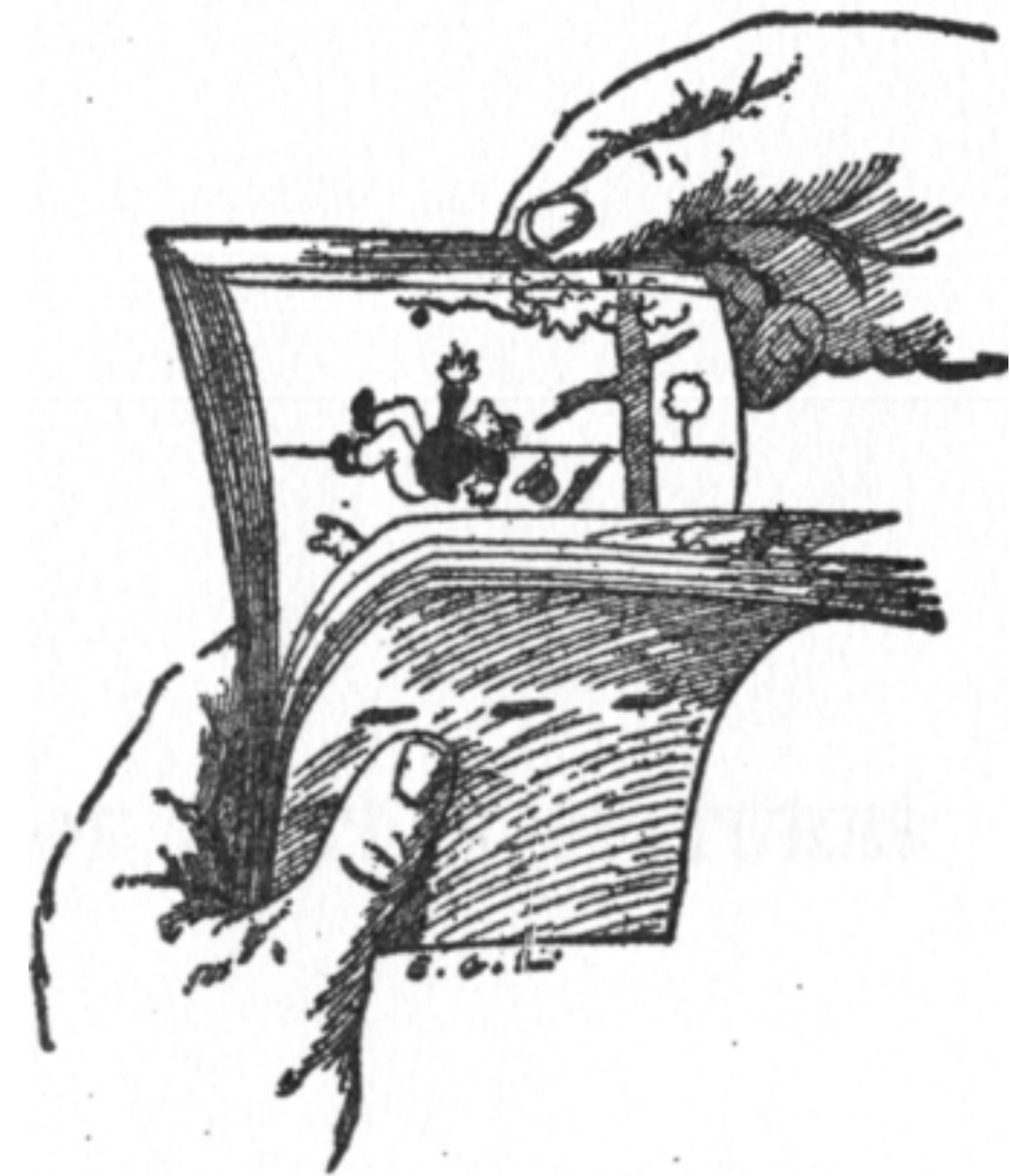
how to select an object in *keynote*

**Double-click to edit**

Double-click to edit

# perceptual fusion

*heuristics*  
avoid delays  $> 0.1s$   
for longer, show progress



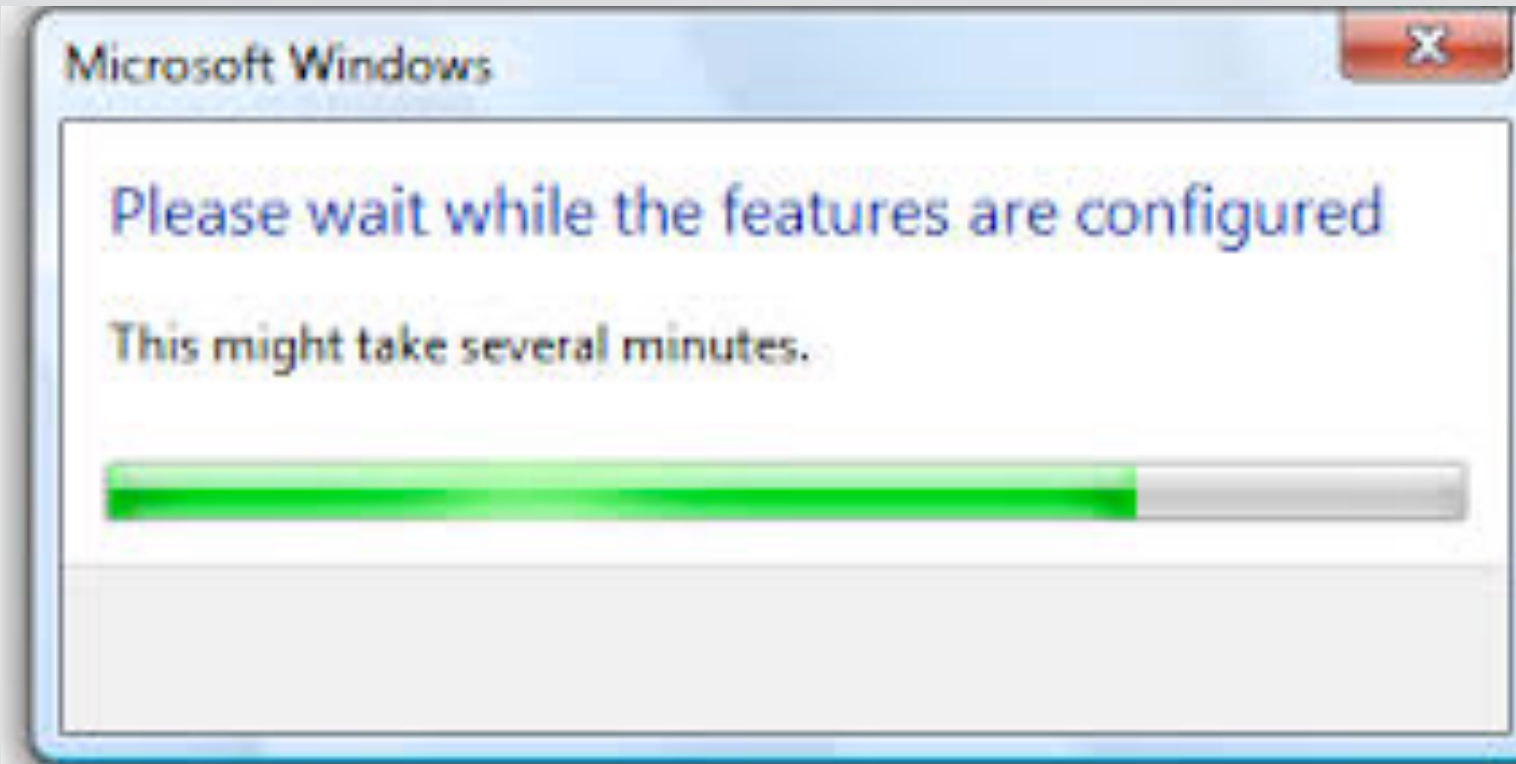
THE KINEOGRAPH.

an early flipbook

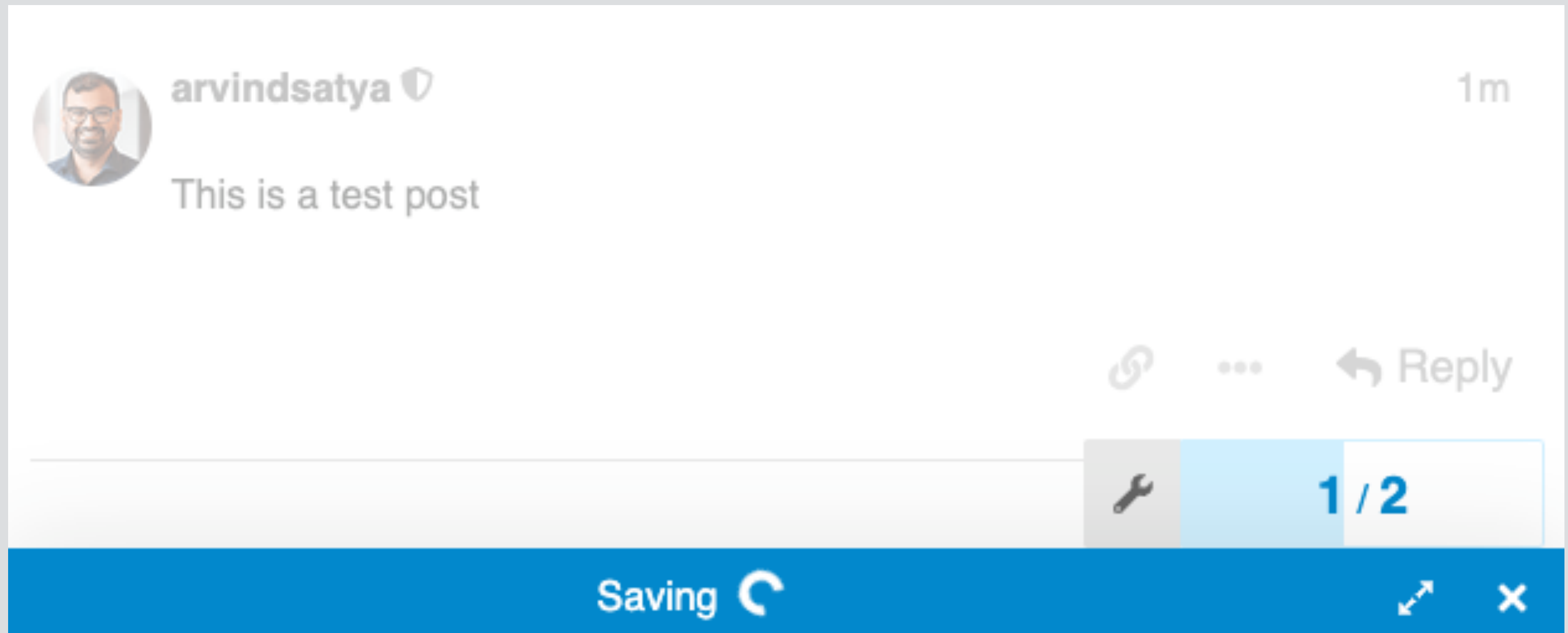
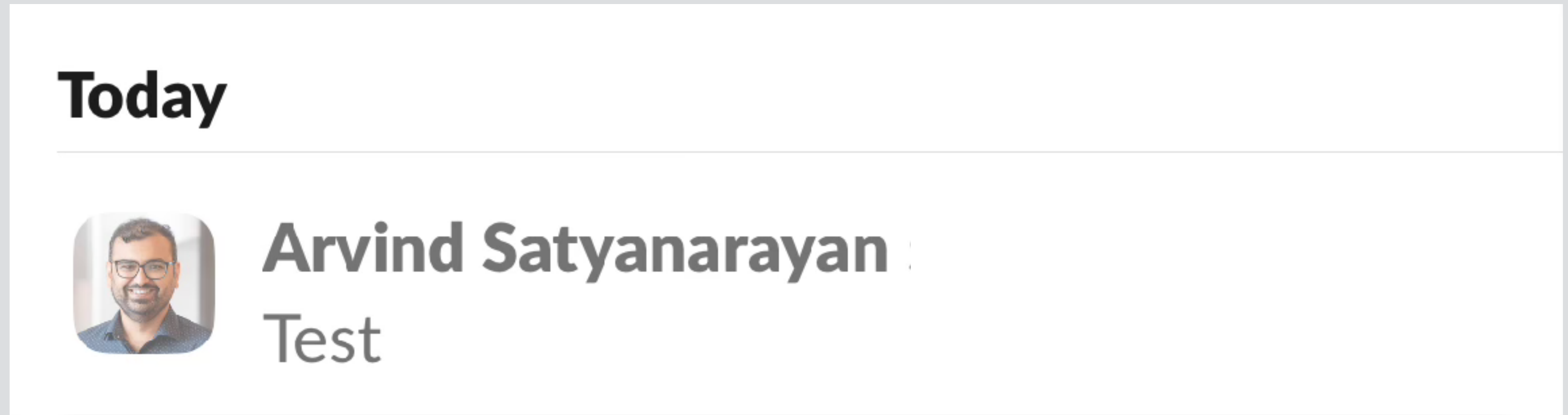
stimuli within 100ms are fused  
less than this feels instantaneous

# perceptual fusion

*heuristics*  
avoid delays  $> 0.1s$   
for longer, show progress

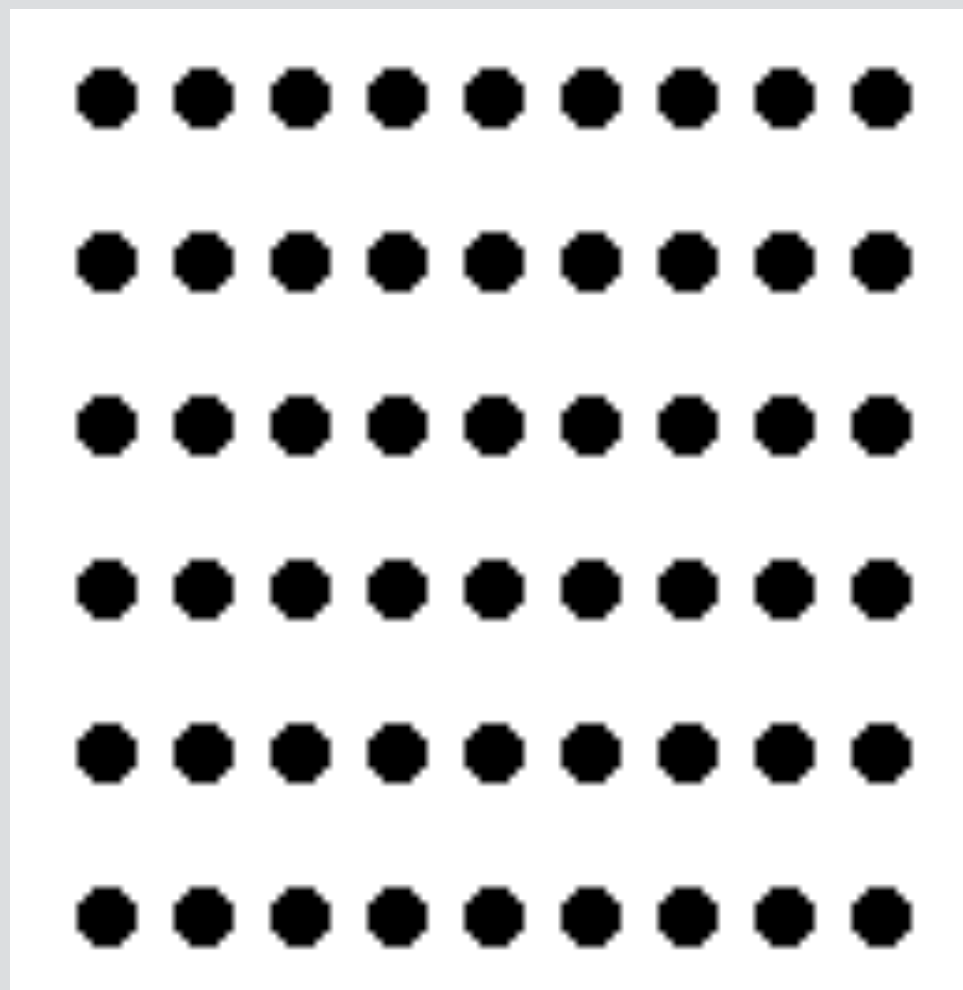
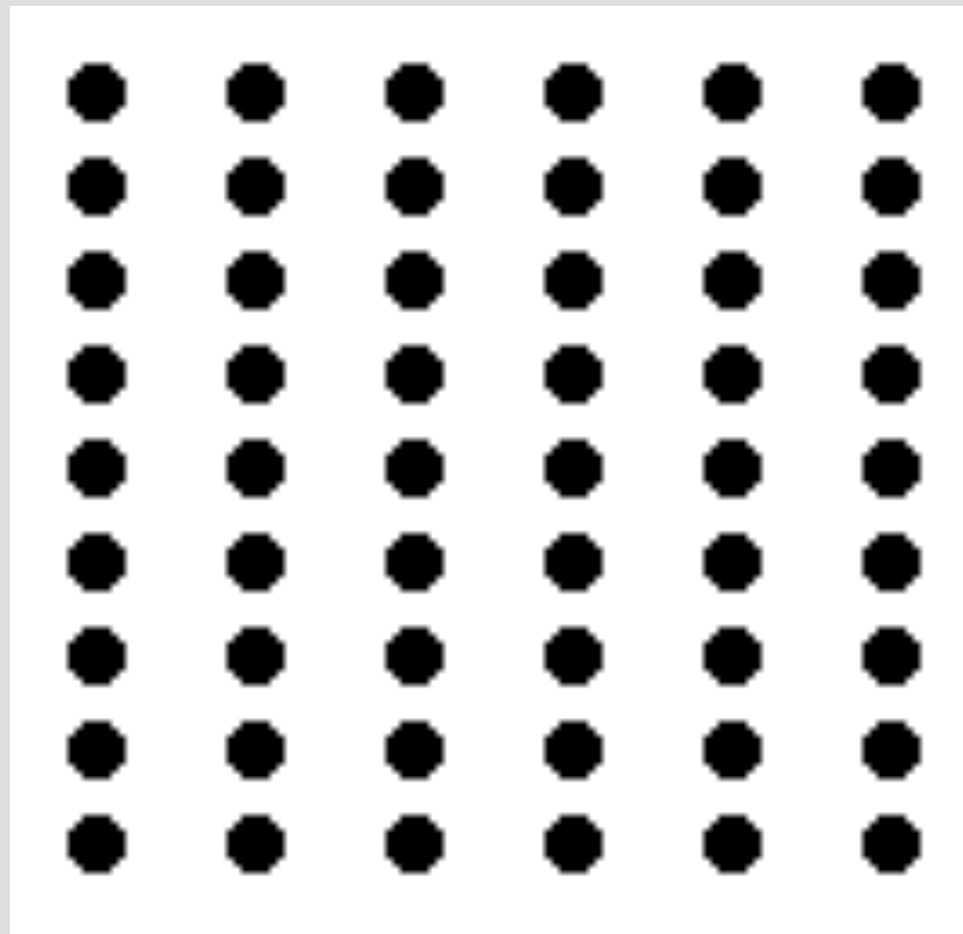


progress bar



# gestalt principles of grouping

*heuristic*  
use visual layout  
to convey structure



# gestalt principles of grouping

USER   
password

username   
password

username   
password

*heuristic*  
use visual layout  
to convey structure

<https://mtc.dor.state.ma.us>

## Taxpayer Identification

Individual Name

ID Type

SSN

ID <sup>\*</sup>

*Required*

Confirm ID <sup>\*</sup>

*Required*

Phone Number <sup>\*</sup>

*Required*

# example: aggregate actions in Google groups

The screenshot shows the Google Groups interface for the 'alloytools' group. At the top, there is a search bar and navigation buttons: 'NEW TOPIC', a refresh icon, 'Mark all as read', 'Actions', and 'Filters'. The left sidebar contains navigation options: 'My groups' (Home, Starred), 'Favorites' (with a yellow callout box), and 'Recently viewed' (listing 'Alloy Board', 'alloytools', 'tlaplus', 'Mongoose Node.JS ODM', and 'microsoft.public.mac.office.word'). The main content area shows the group name 'alloytools', its privacy status 'Shared privately', and a welcome message. Below the welcome message are two links: 'Edit welcome message' and 'Clear welcome message'. A list of topics follows, with the first topic 'What is a deterministic state machine?' (4 replies) having its checkbox checked. Other topics include 'ABZ 2018 call for contributions' (1), 'Alloy grammar' (4), and 'When, What, Why of Alloy models' (1). A blue circle highlights the 'Actions' button, and another blue circle highlights the checked checkbox in the first topic, with a line connecting them.

Google

Search for messages

Groups

NEW TOPIC

Mark all as read

Actions

Filters

My groups

Home

Starred

Favorites

Click on a group's star icon to add it to your favorites

Recently viewed

Alloy Board

alloytools

tlaplus

Mongoose Node.JS ODM

microsoft.public.mac.office.word

Recently posted to

Privacy - Terms of Service

alloytools Shared privately

14 of 14 topics (11 unread) ☆

Welcome to the Alloytools discussion group.

The purpose of this group is to discuss Alloy development and promoting Alloy.

alloy

Edit welcome message Clear welcome message

☆ What is a deterministic state machine? (4)

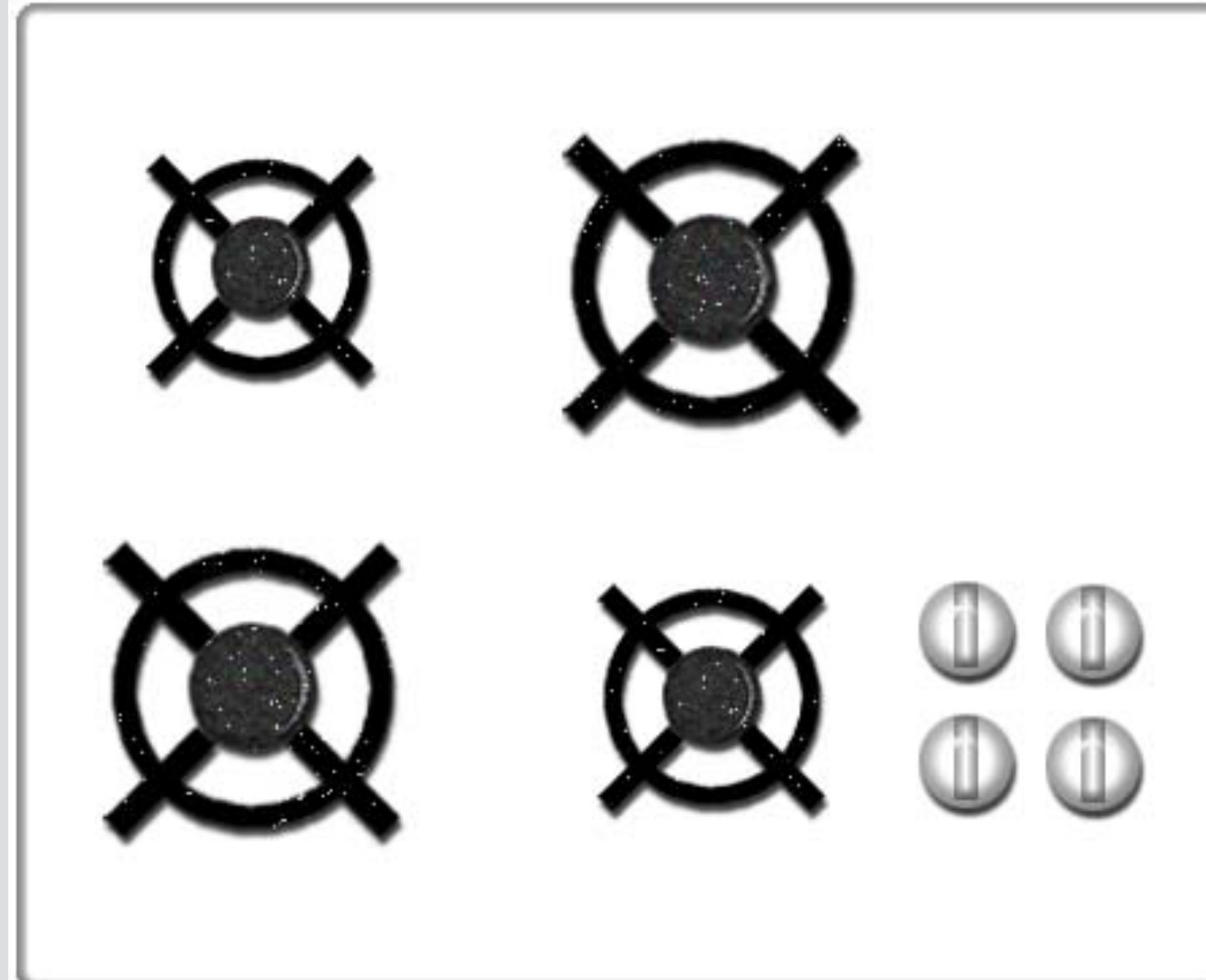
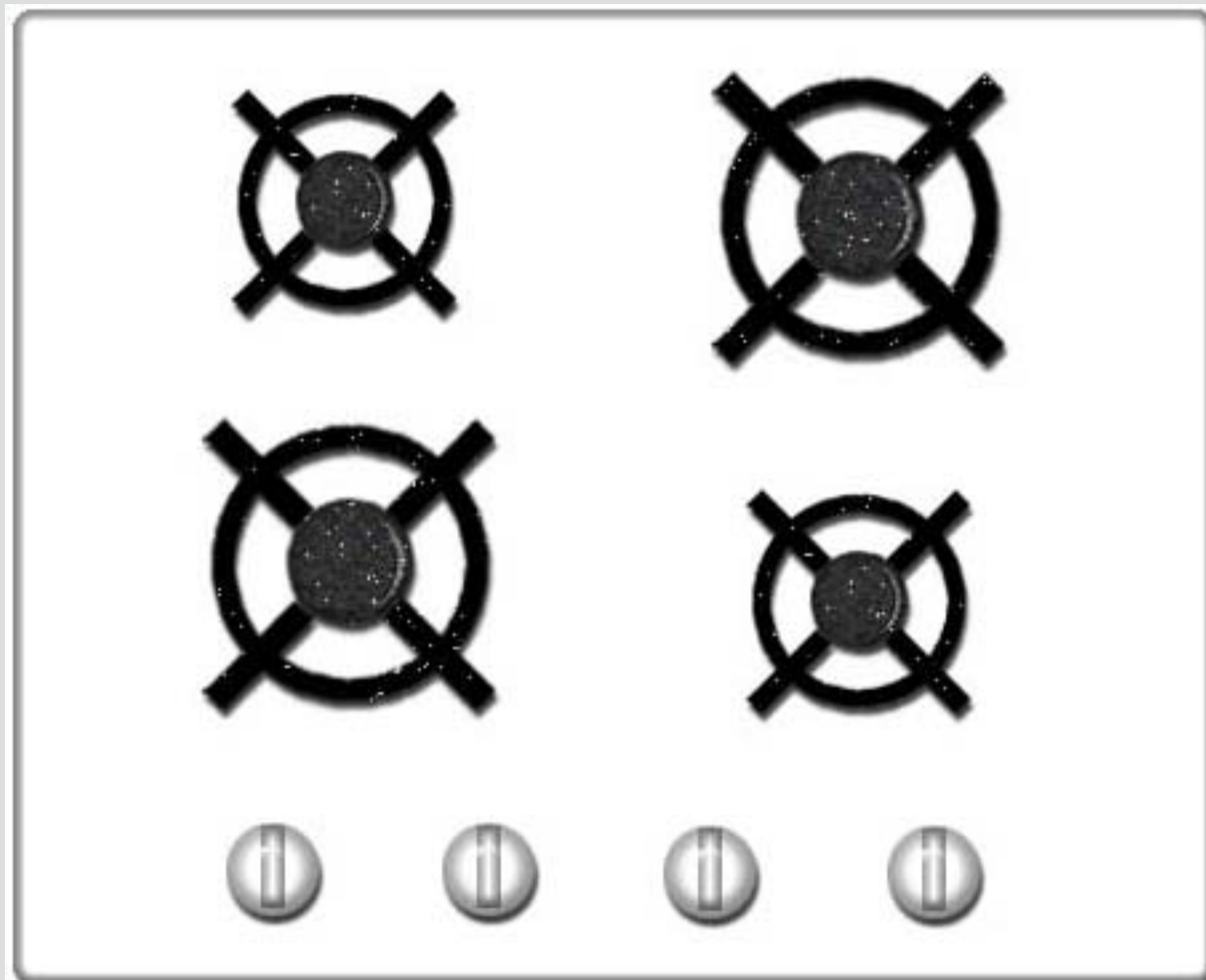
☆ ABZ 2018 call for contributions (1)

☆ Alloy grammar (4)

☆ When, What, Why of Alloy models (1)

# mapping

*heuristic*  
make layout consistent  
with function



from: Donald Norman, The Design of Everyday Things



# situational context



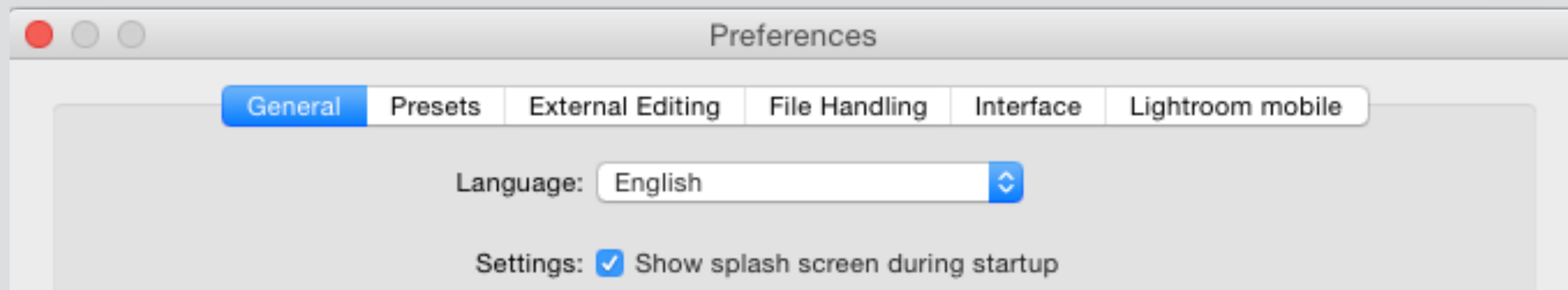
pagination

Library of Congress > Collections > Fine Prints

a breadcrumb from <http://www.loc.gov>

Refined by: Sites and Collection: Fine Prints × Location: Italy ×

filters from <http://www.loc.gov>

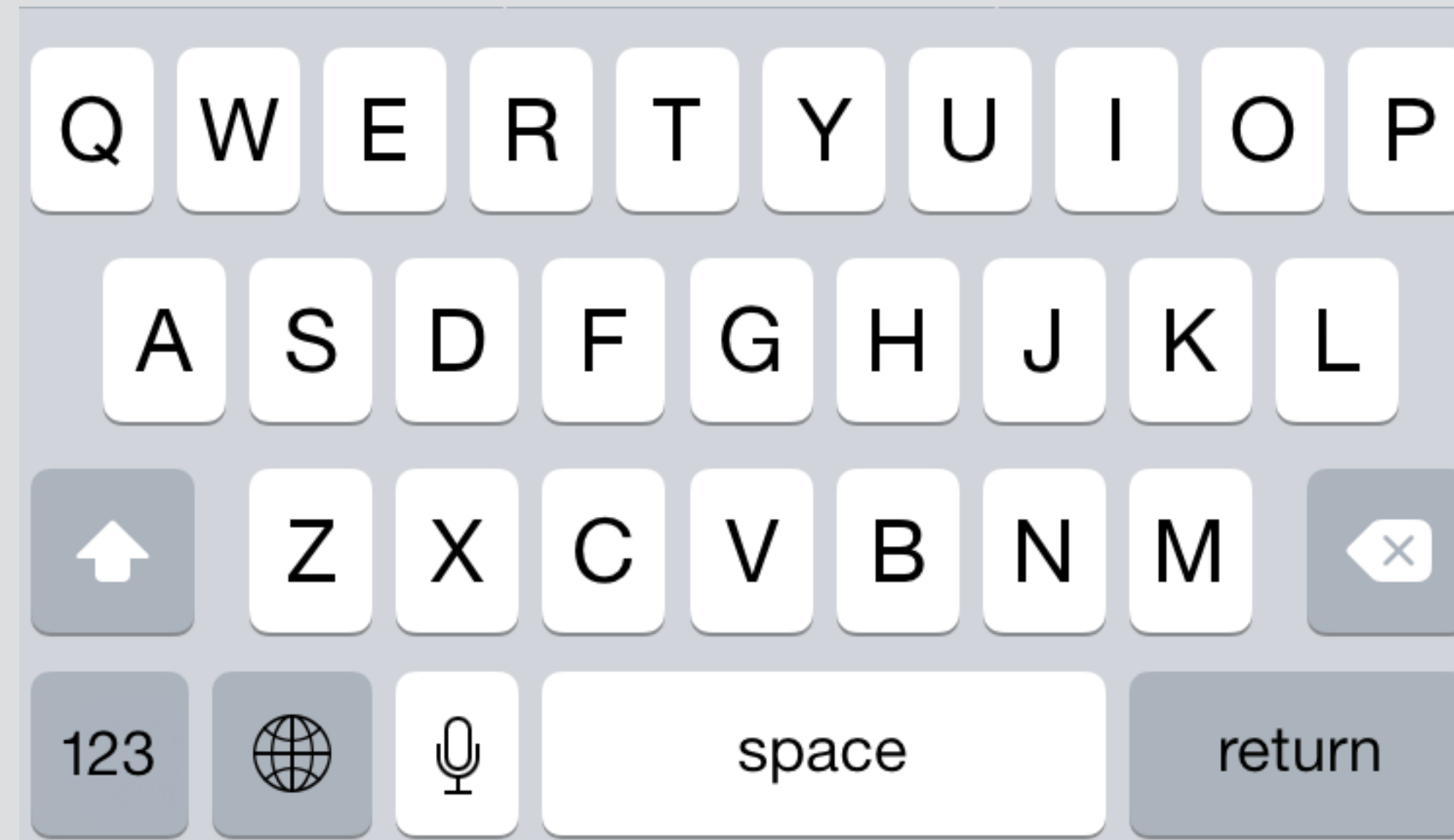


tabs from Adobe Lightroom

*heuristic*  
make user's location  
(and state) visible

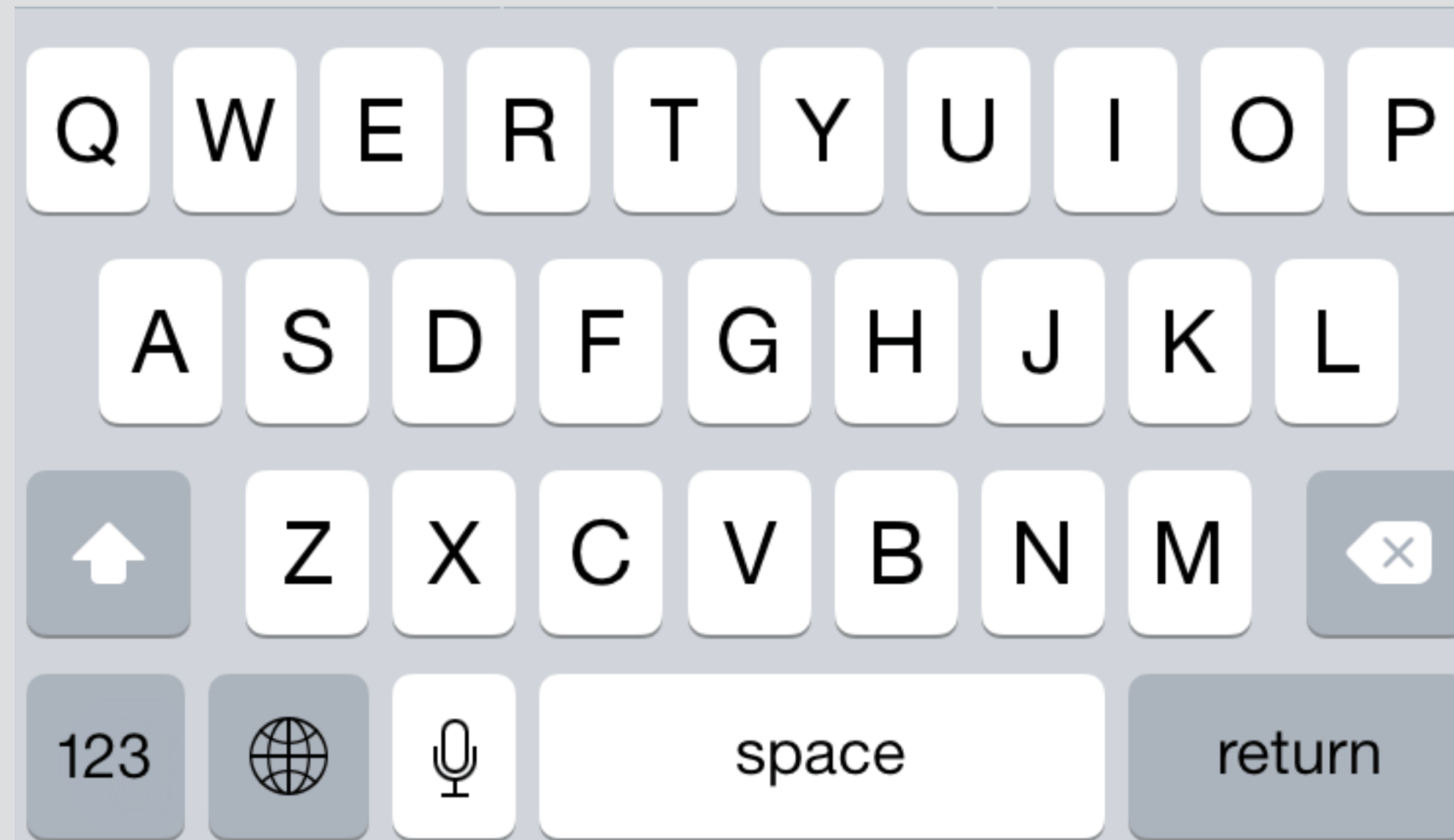
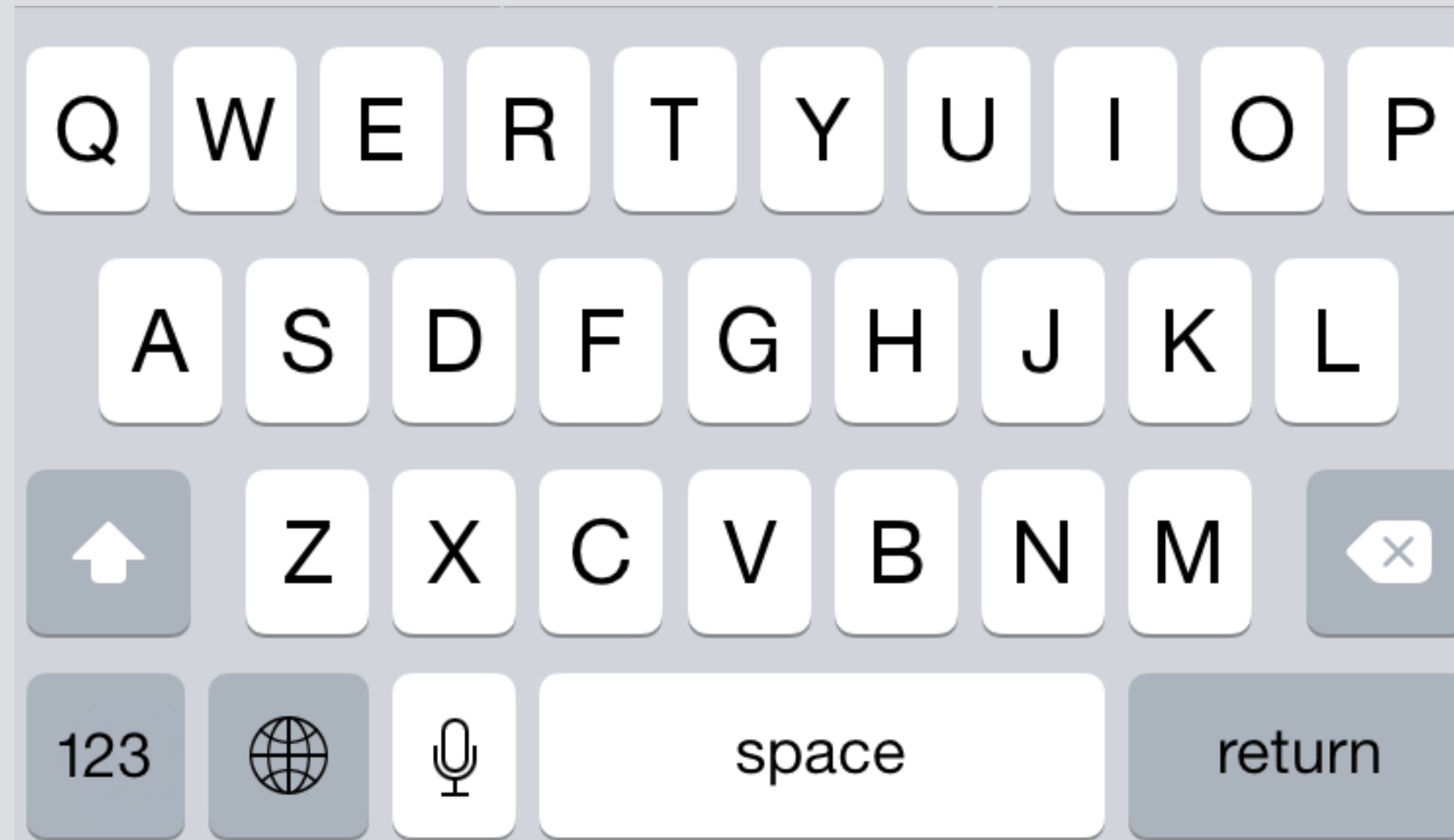
# situational context

*heuristic*  
make user's location  
(and state) visible



iOS Keyboards from [Allen Pike](#)

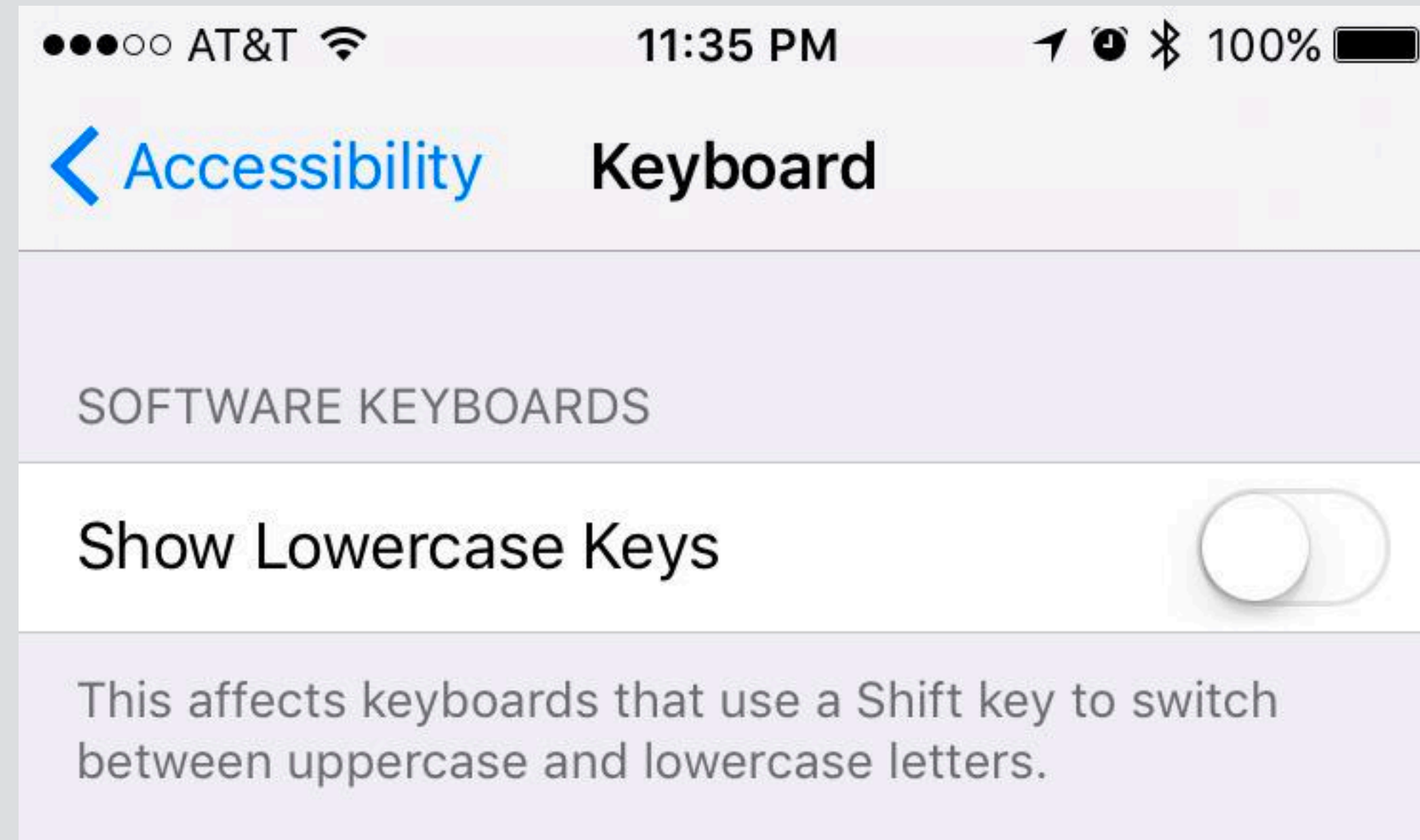
# situational context



*heuristic*  
make user's location  
(and state) visible

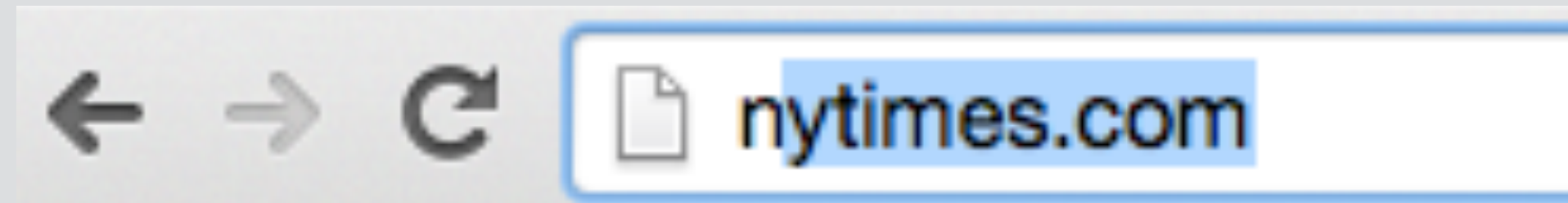
# situational context

*heuristic*  
make user's location  
(and state) visible

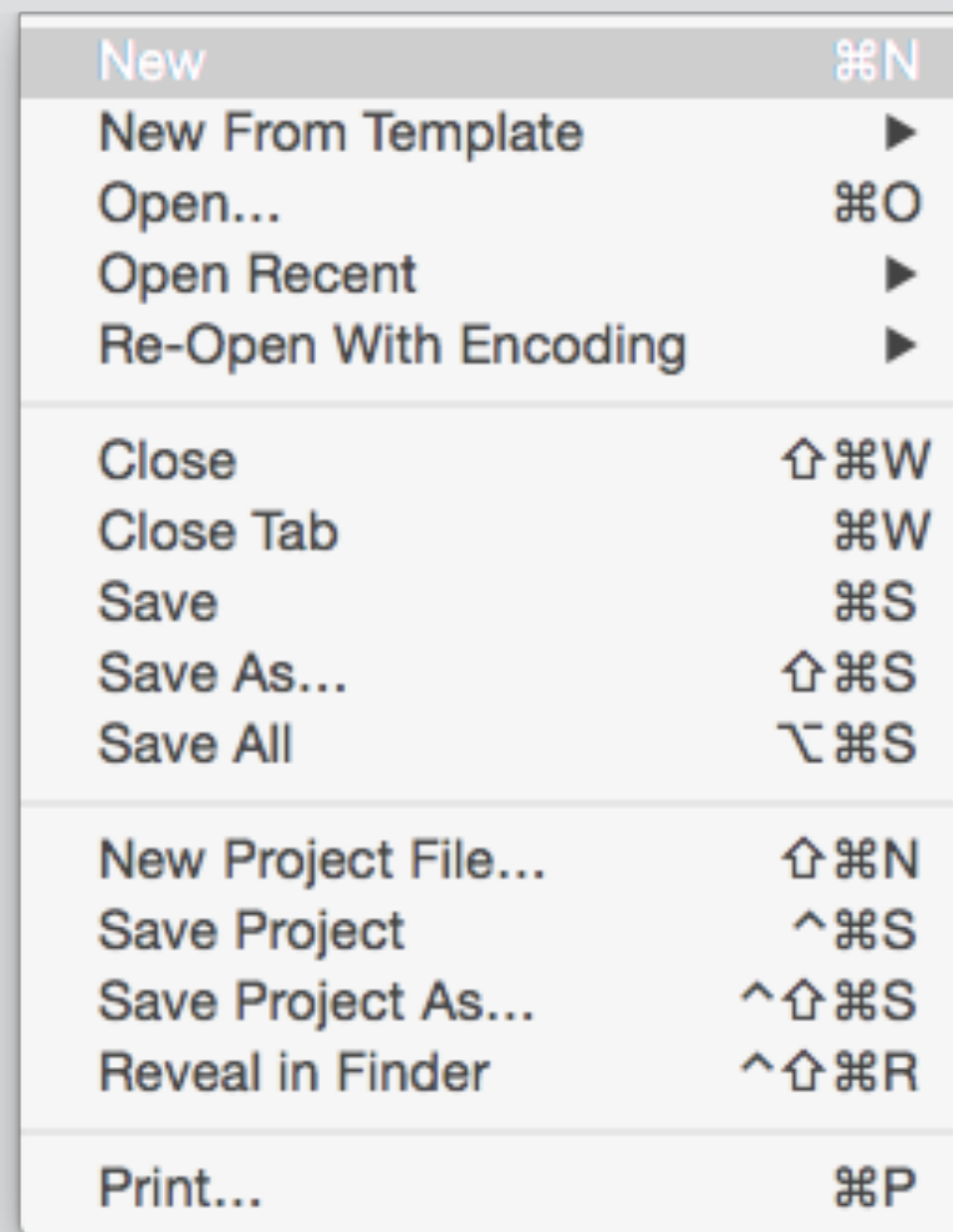


# accelerators

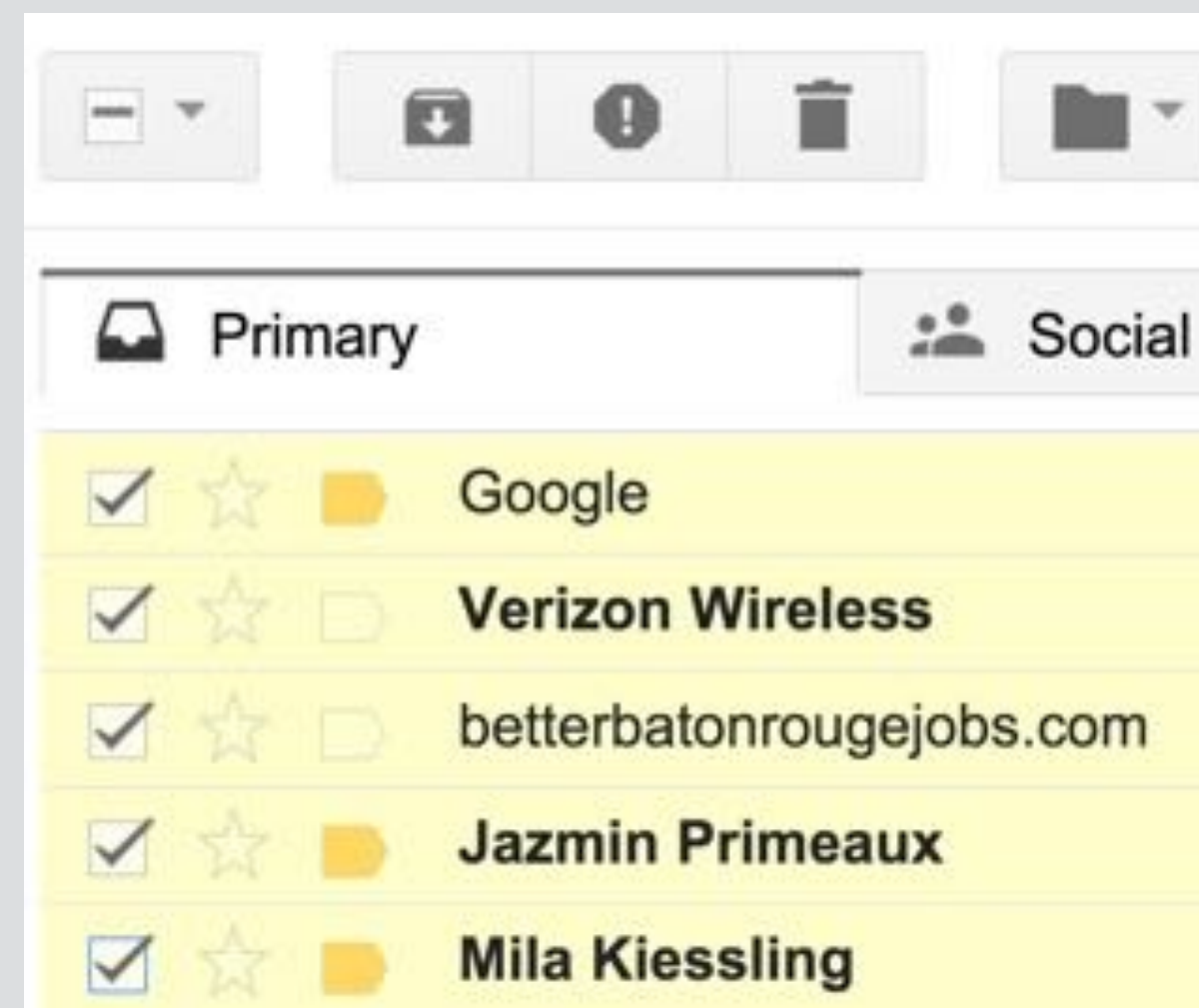
*heuristic*  
provide accelerators for  
expert users



Google search bar autocompletion



Textmate shortcuts



Gmail aggregation



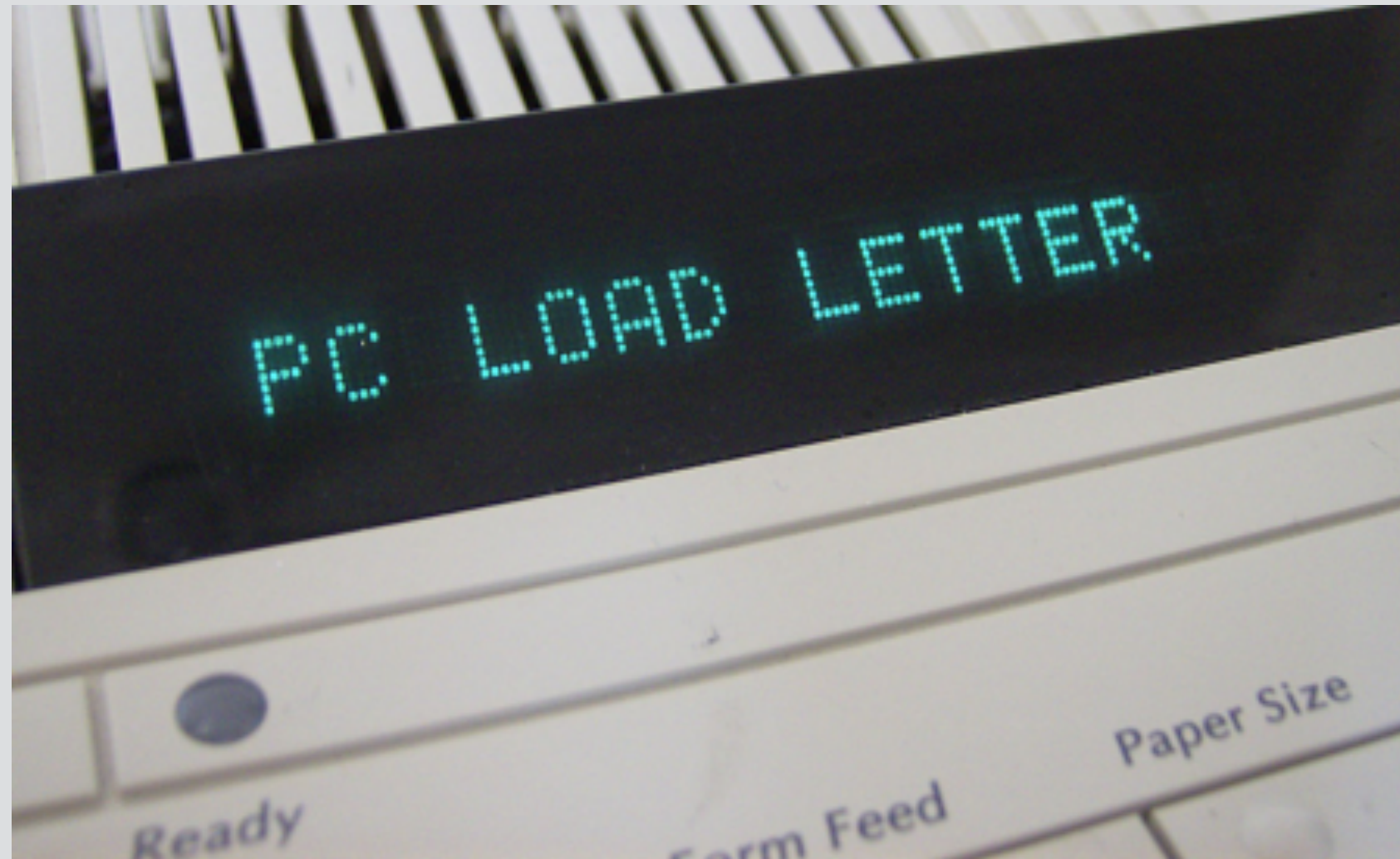
linguistic  
level

Speak the  
user's language

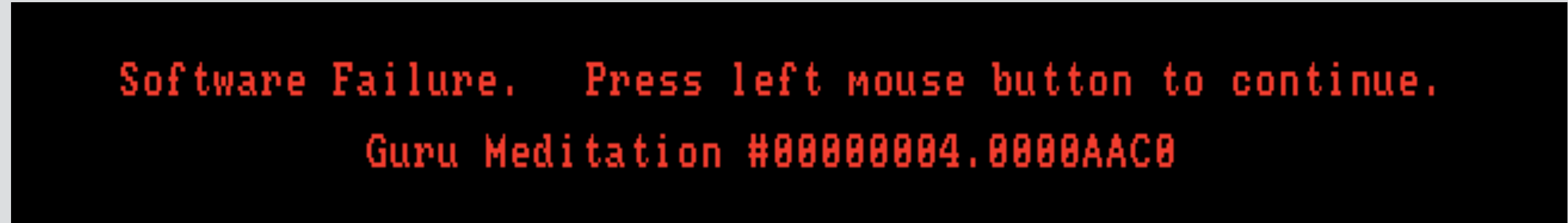
*heuristics*

use simple terms  
word very carefully  
never blame the user

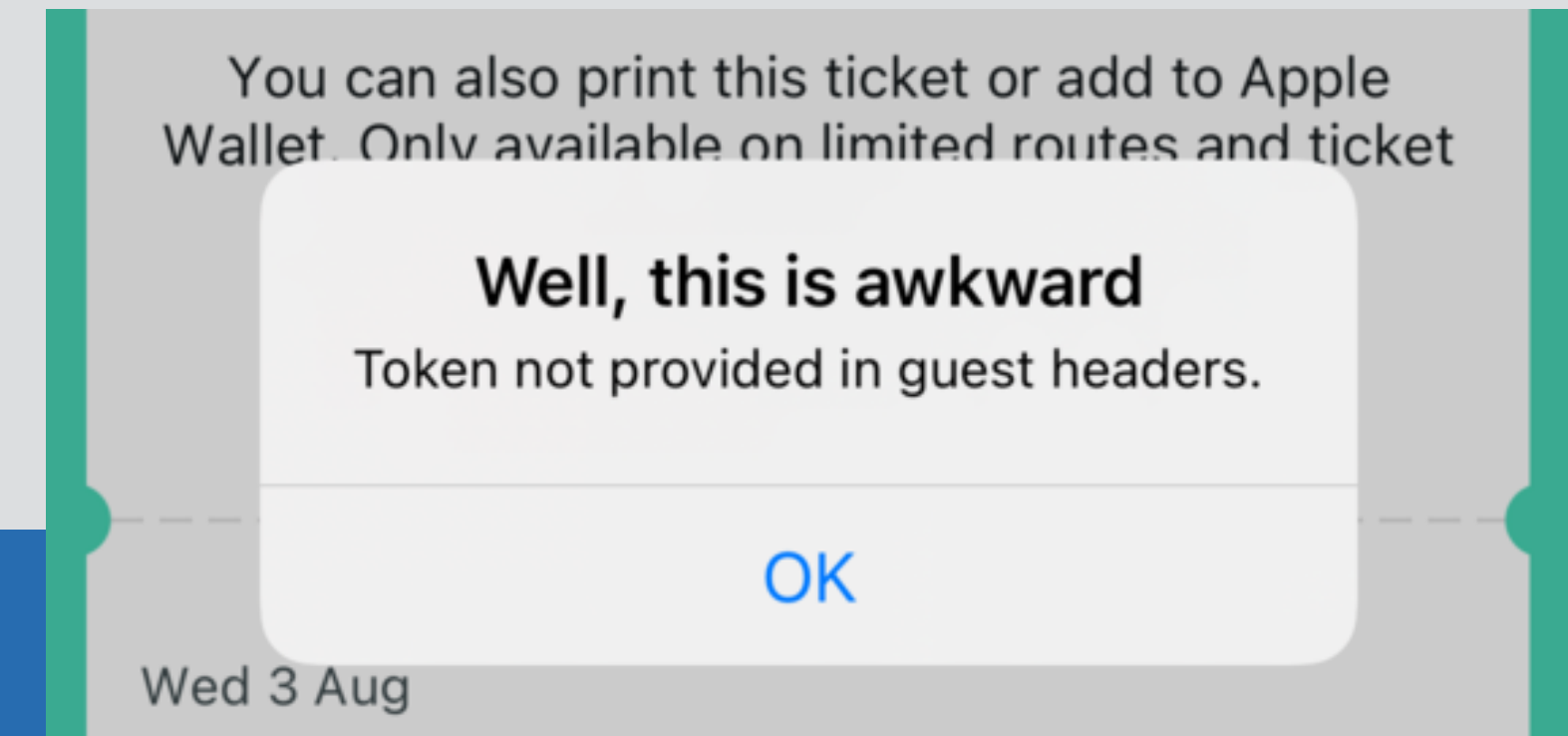
# Speak the user's language



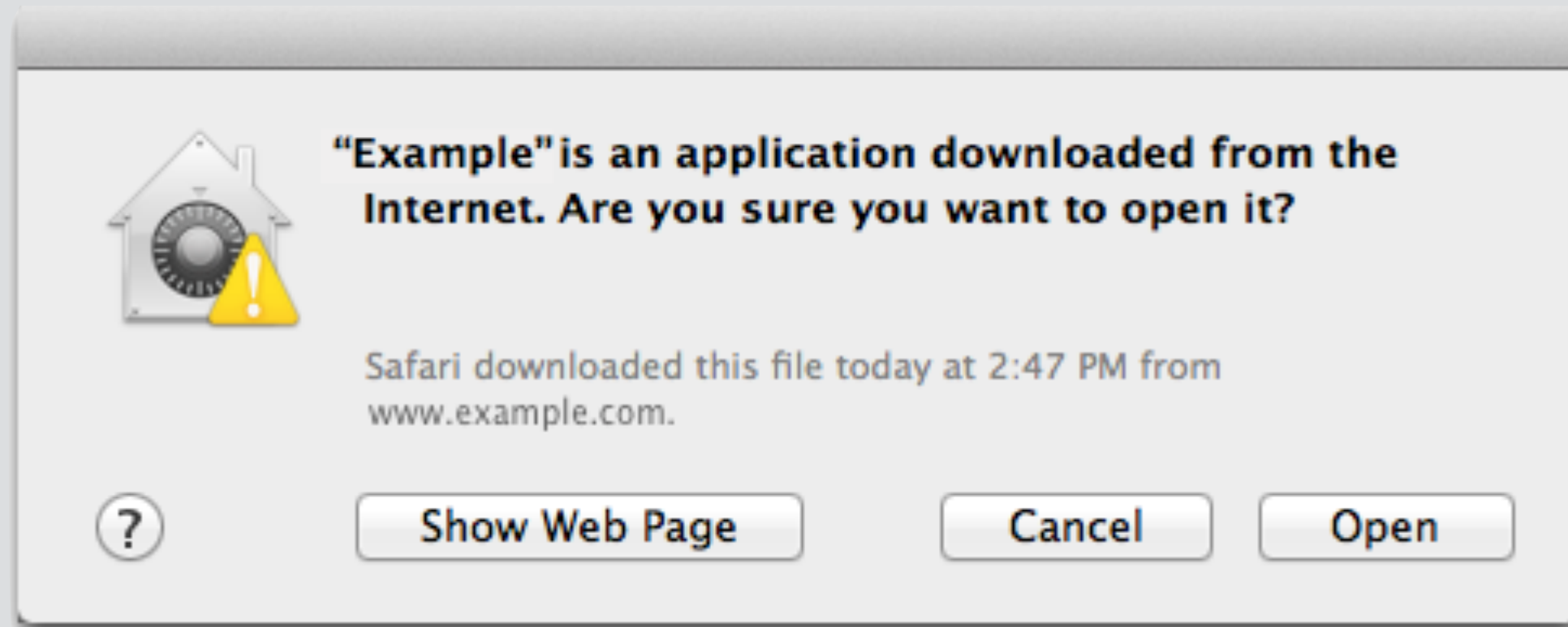
infamous HP printer error



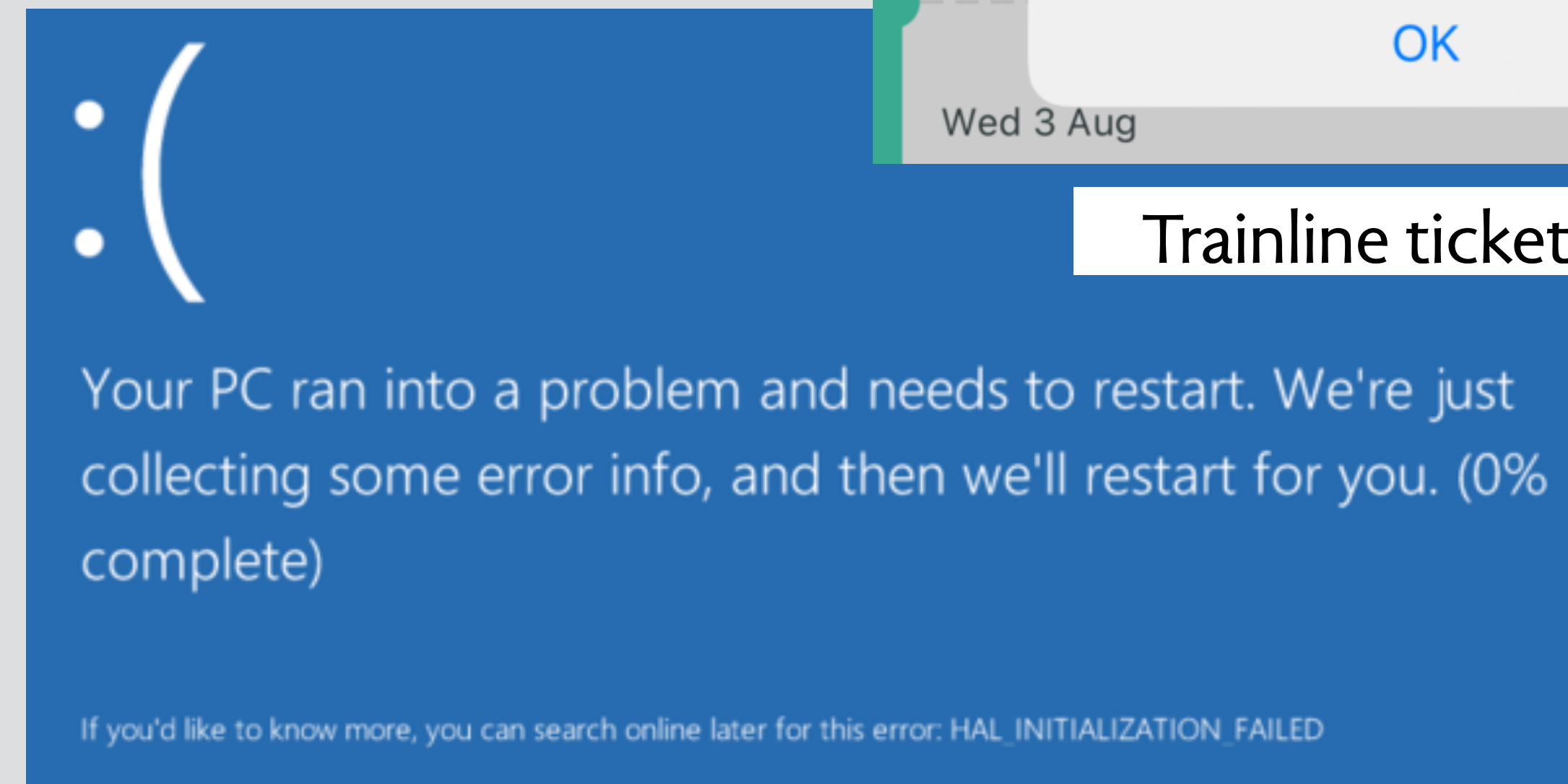
Commodore Amiga crash



Trainline ticket error



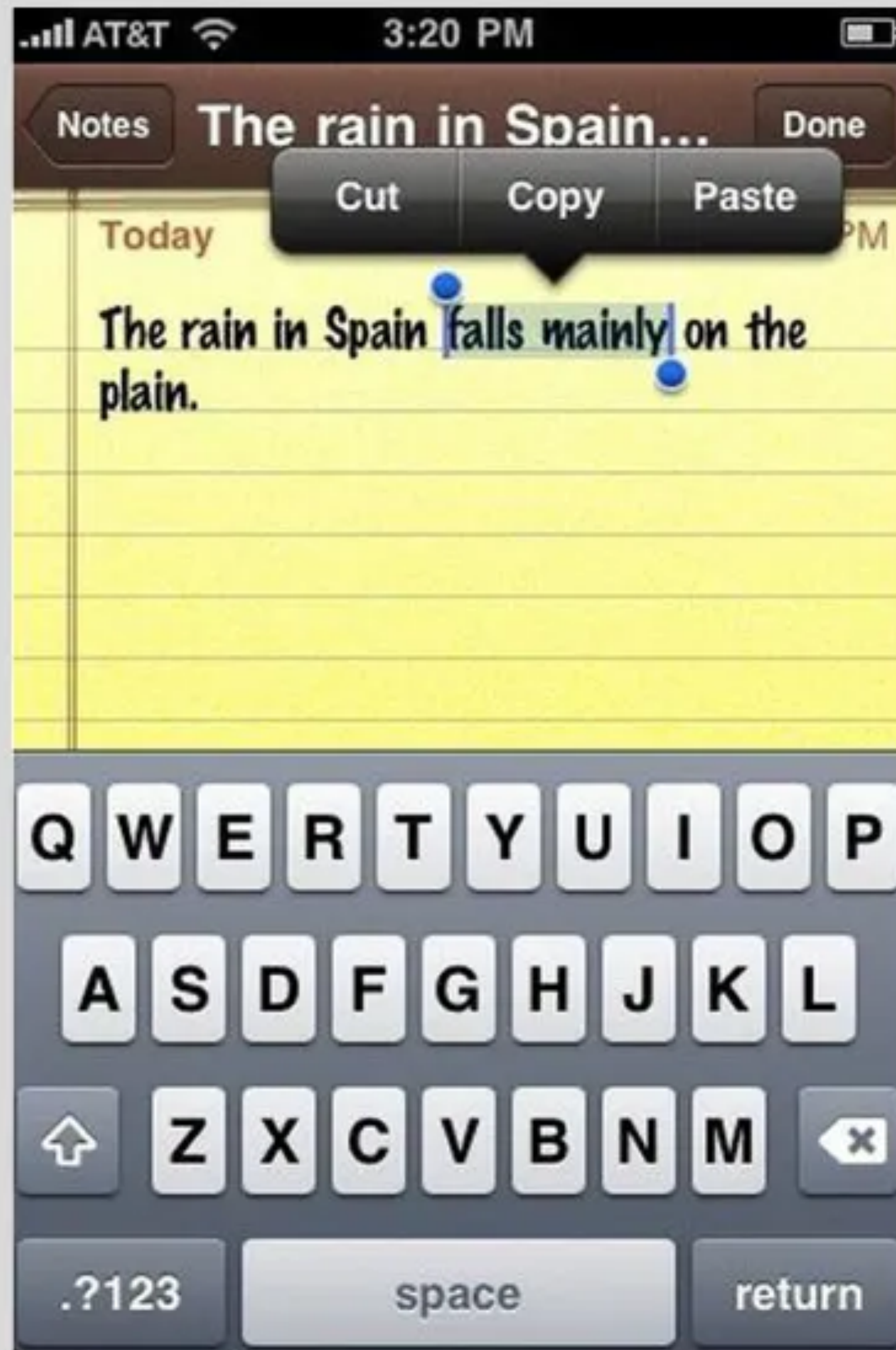
a helpful and informative message



Windows blue screen of death



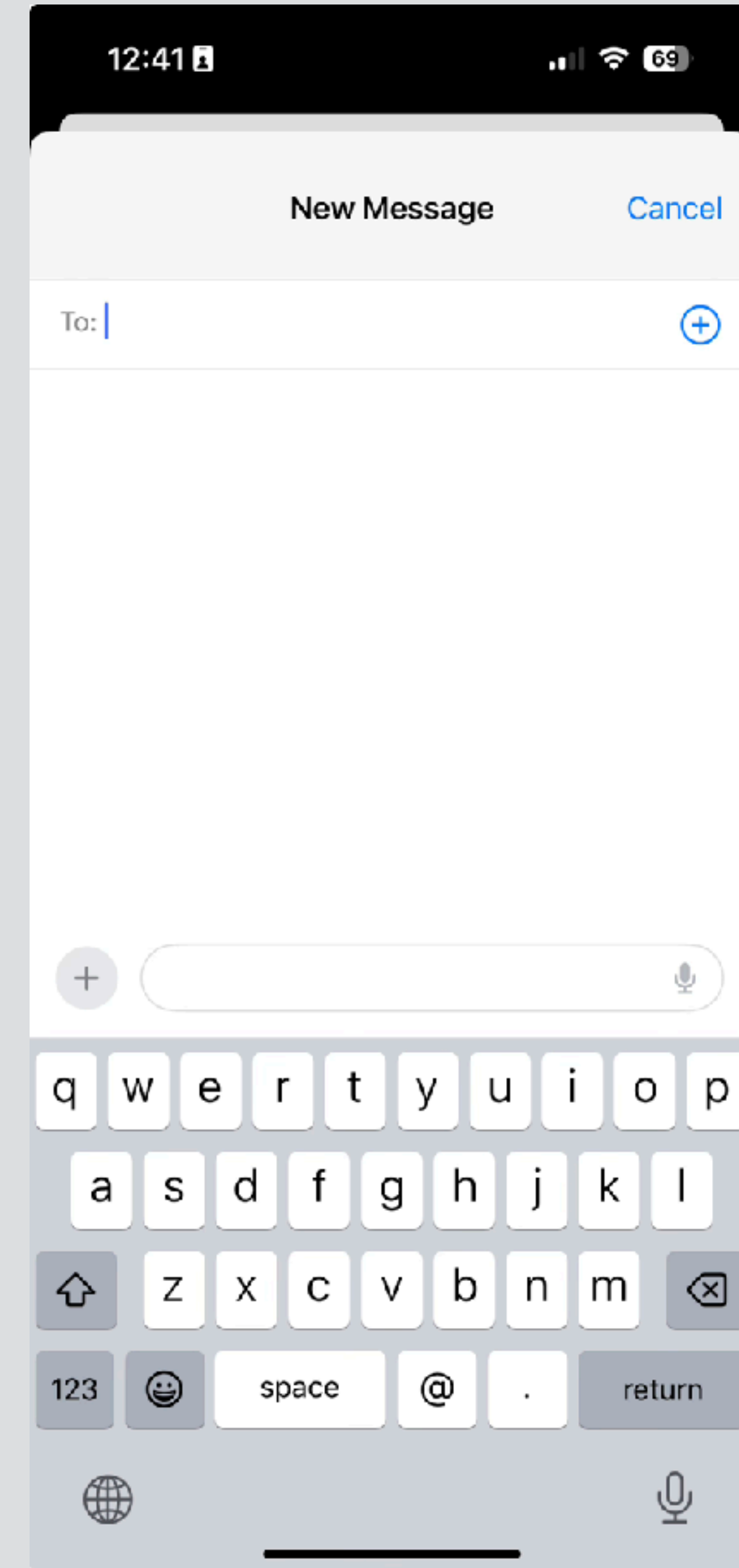
# Speak the user's language: using metaphors



Speak the user's language: using metaphors

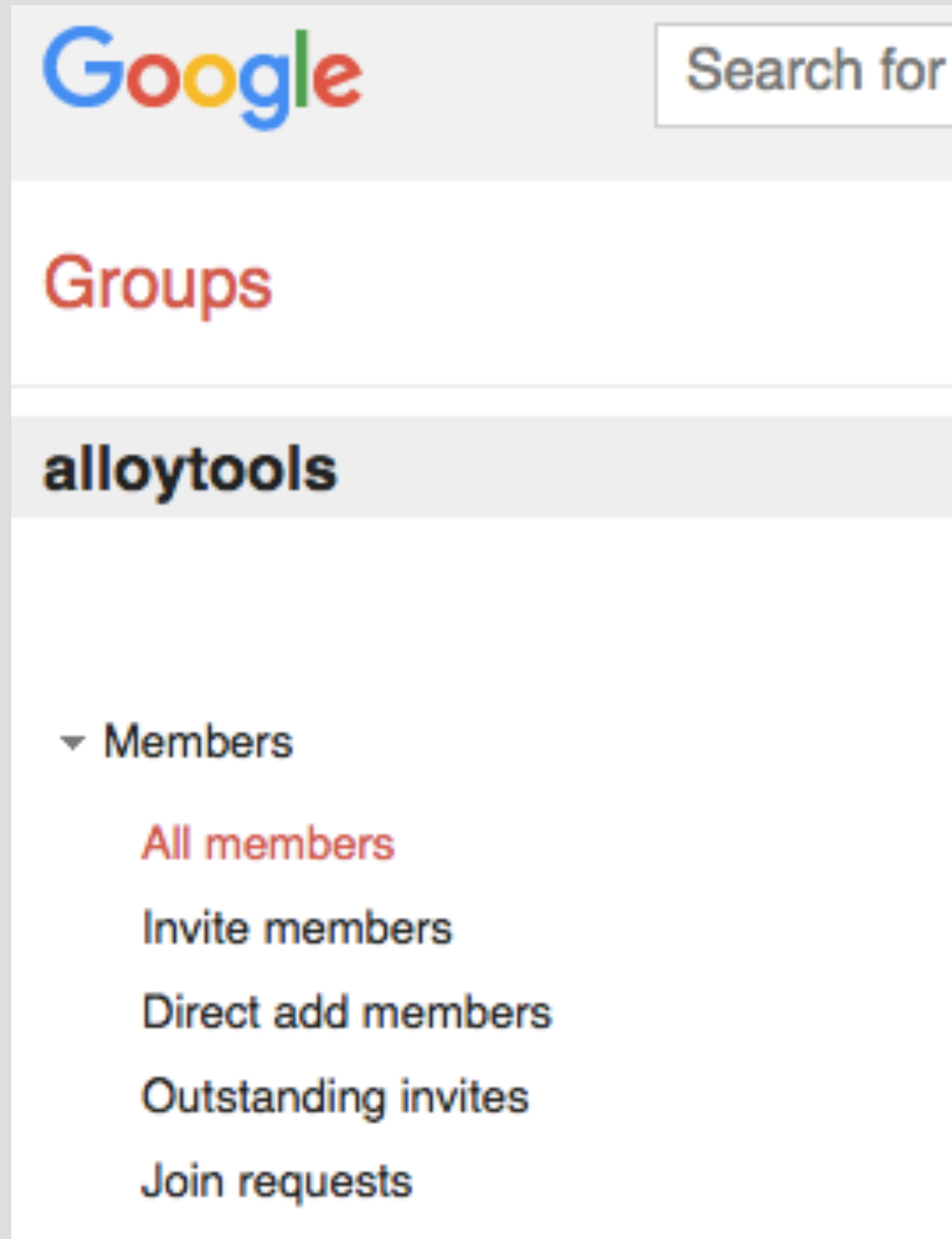


# Speak the user's language: using metaphors

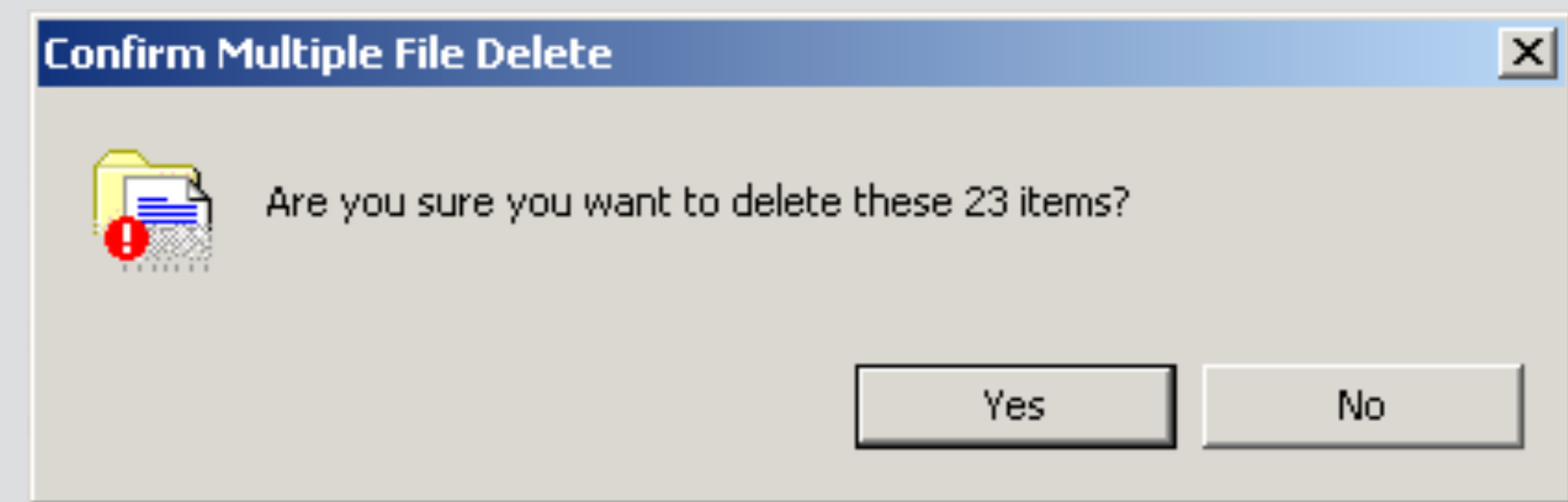


# Speak the user's language: parts of speech

*heuristic*  
use verbs/nouns for actions/queries, and be consistent

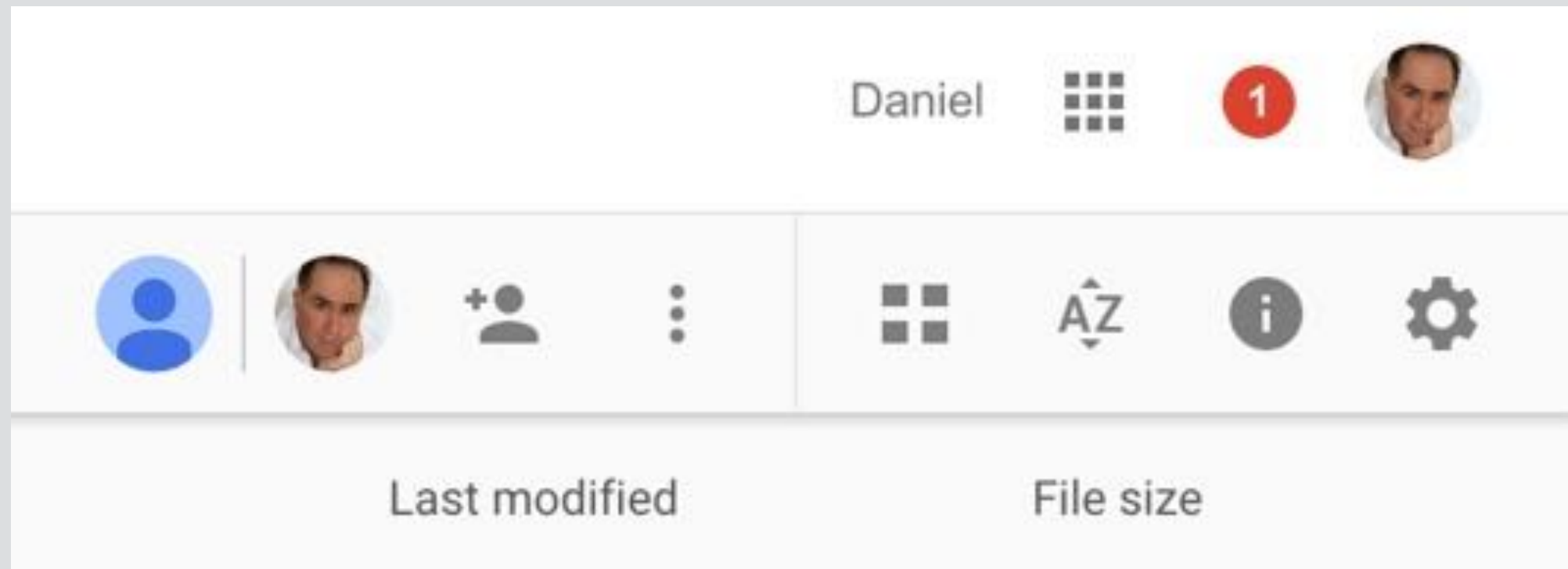


The screenshot shows the Google Groups navigation menu. At the top is the Google logo and a search bar labeled "Search for". Below this are the main navigation items: "Groups", "alloytools", and a "Members" section with a dropdown arrow. The "Members" section is expanded, showing a list of options: "All members", "Invite members", "Direct add members", "Outstanding invites", and "Join requests".

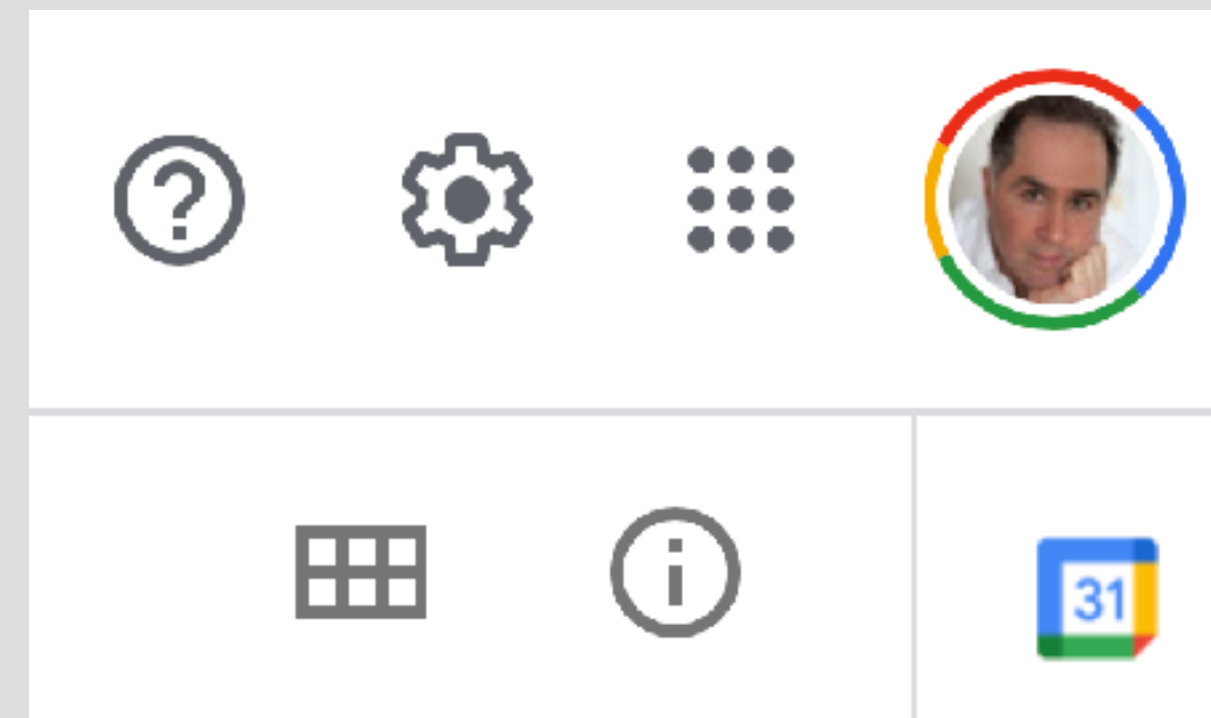


**consistency**

# consistent naming & icons

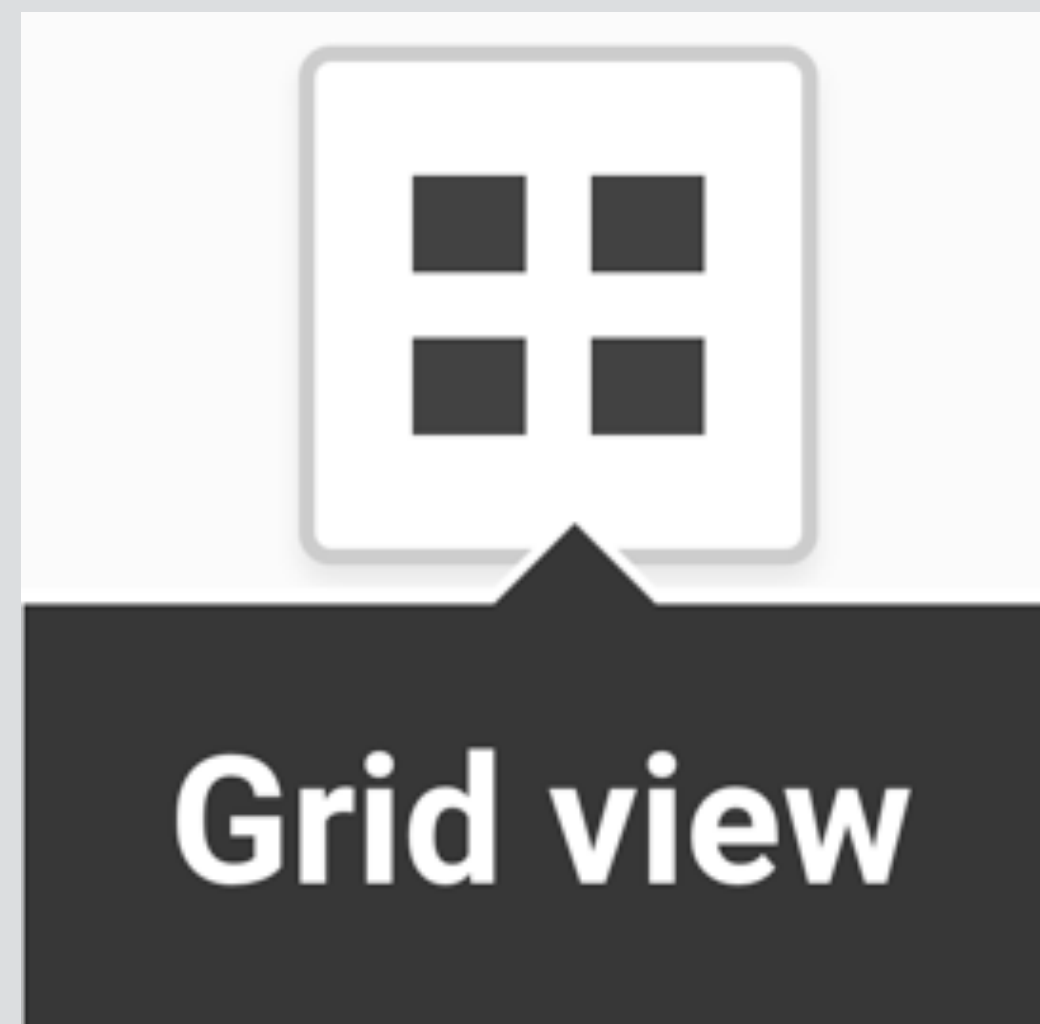


icons shown in Google Drive, c. 2020



2022

*heuristic*  
be consistent;  
same name or symbol for a  
concept or action



consistency  
across  
**application,**  
**platform,**  
**domain**

# consistent conventions

**Chrome**


History

Extensions

Settings


**About**

**About**

 **Google Chrome**  
A web browser built for speed, simplicity, and security

Get help with using Chrome Report an issue

Version 43.0.2357.130 (64-bit)

 Nearly up-to-date! Relaunch Google Chrome to finish updating.

Set Up Automatic Updates for All Users Relaunch

*lesson*  
beware of violating conventions

why is 'History' greyed out?



# Settings



You and Google



Autofill



Privacy and security



Appearance



Search engine



Default browser



On startup



Languages



Downloads



Accessibility



System



Reset settings



Extensions



About Chrome



Search settings

## Appearance

Theme

Open Chrome Web Store



Show home button

Disabled



Show bookmarks bar



Font size

Medium (Recommended)



Customize fonts



Page zoom

100%



Pressing Tab on a webpage highlights links, as well as form fields



Show warning before quitting with ⌘Q

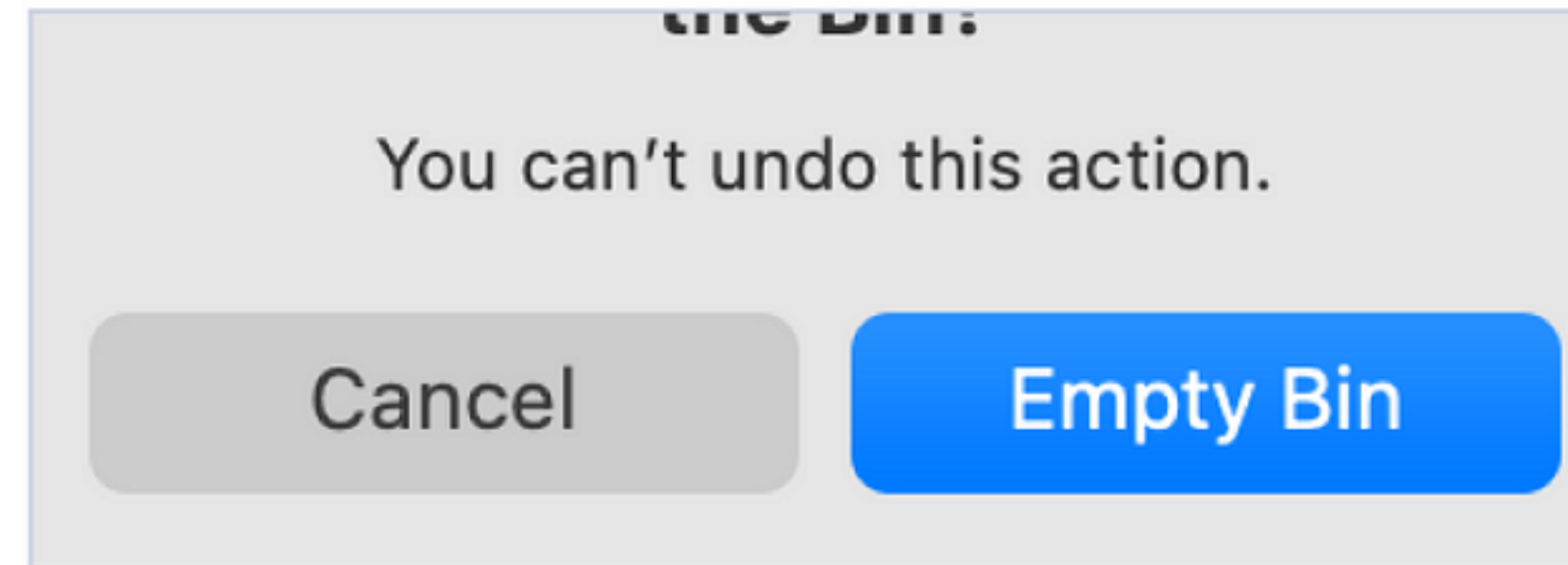
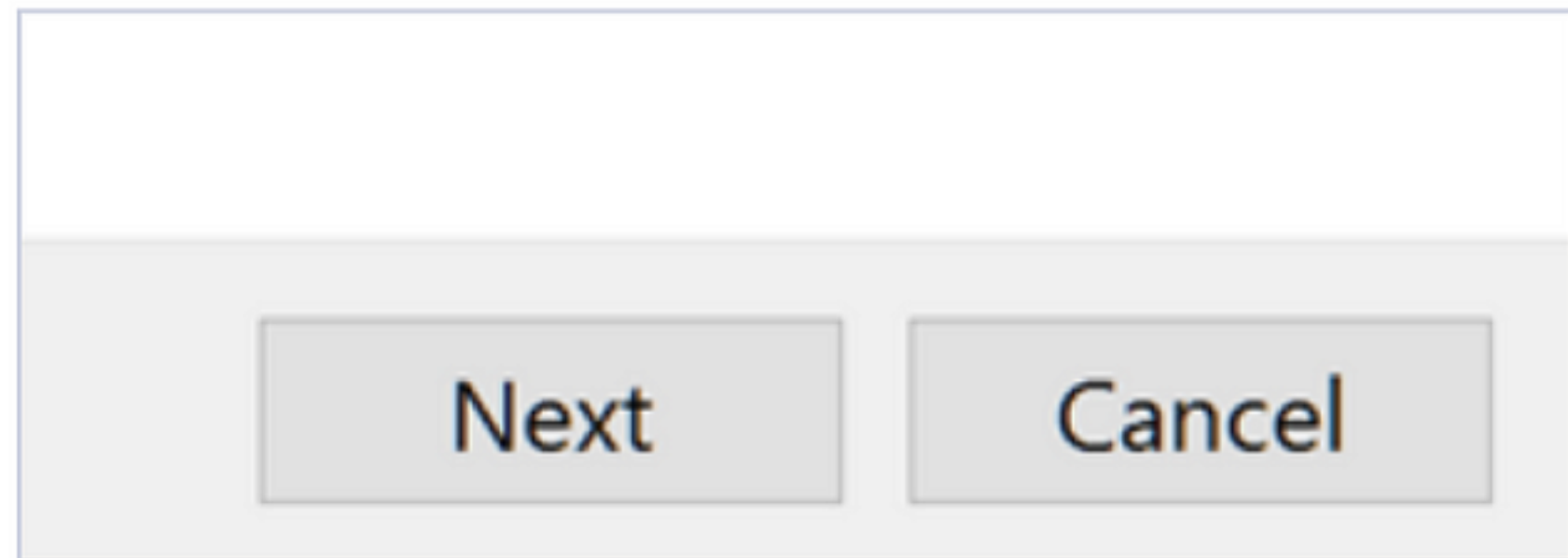




# consistent conventions

 Windows puts **OK first**

 Apple puts **OK last**



*lesson*  
beware of violating  
conventions

“AudioTest” Would Like to  
Access the Microphone

Don't Allow

OK

“Foursquare” wants to open  
“Uber.”

Open

Cancel

# information scent

*heuristic*  
use 'scent' to aid  
information 'foraging'

**Award Winners**  
Caldecott Medal (107)  
Man Booker Prize (54)  
National Book Award (49)  
Newbery Medal (84)  
The Pulitzer Prize (46)  
Hugo & Nebula Awards (25)  
Eisner Award (39)

**Packaging Option**  
 Frustration-Free Packaging (9)

**Promotion**  
 Bargain Books (142,908)

**Avg. Customer Review**  
★★★★☆ & Up (2,903,157)  
★★★★☆ & Up (3,274,714)  
★★★★☆ & Up (3,378,179)  
★★★★☆ & Up (3,481,555)

amazon.com

## books

**what's new**  
new releases  
pre-orders  
NY Times bestsellers  
Target Club Picks  
Only at Target

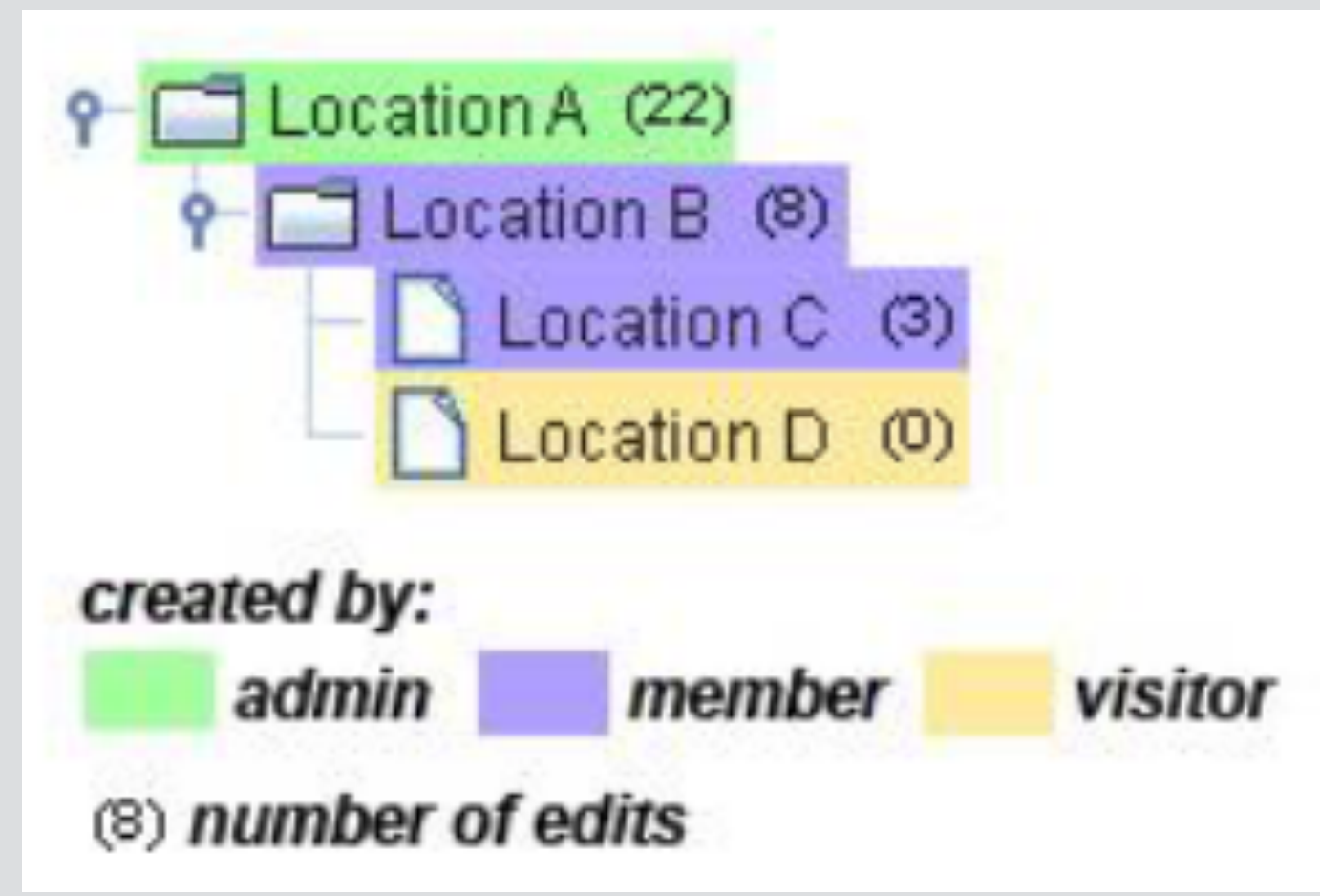
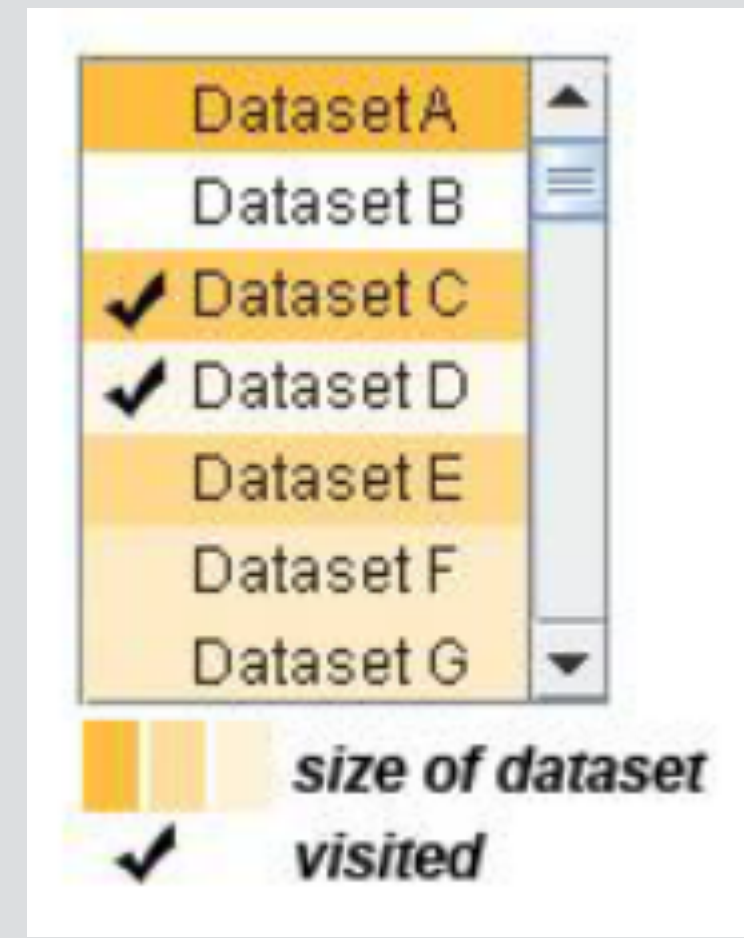
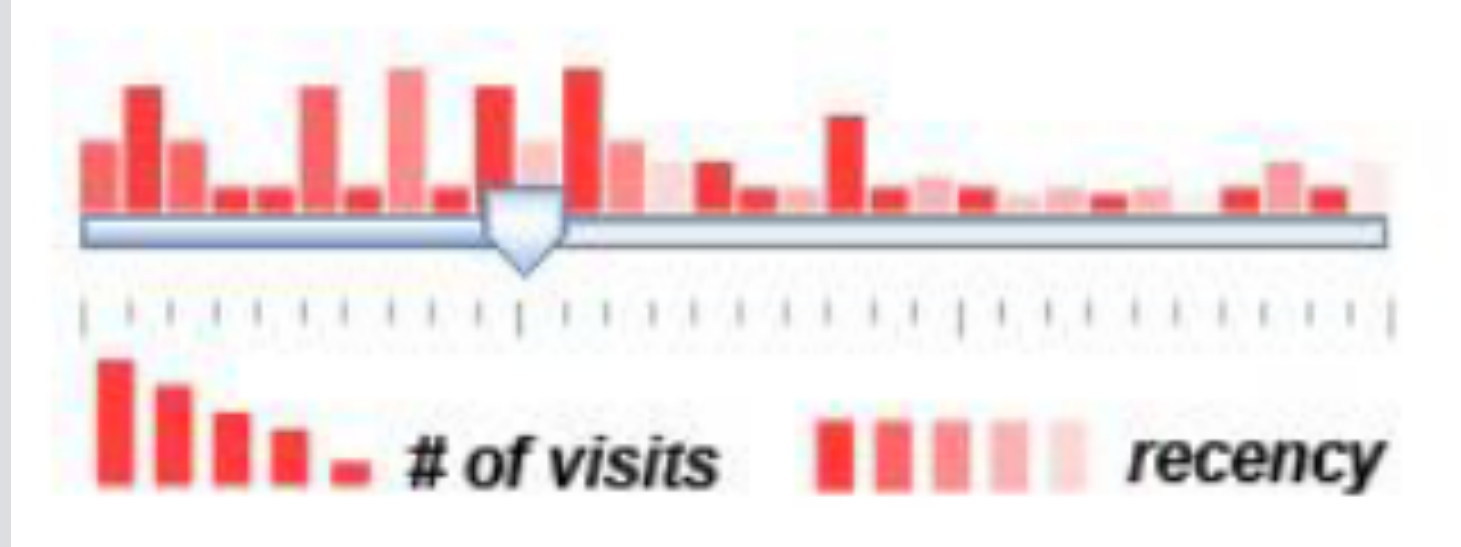
---

**featured categories**  
book deals  
Rosetta Stone  
John Green  
Dr. Seuss  
signed books

---

**kids' books**  
baby-3 years  
4-8 years  
9-12 years  
teen  
Common Core State Standards  
all kids' books

target.com



not  
just  
GUIs!

which criteria and principles are violated here?

```
$ ls  
a b d  
$ mv d c  
$ ls  
a b c
```

*mv = rename*

```
$ mv a b  
$ ls  
b c
```

*mv = overwrite*

```
$ mv b c  
$ ls  
c  
$ ls c  
b
```

*mv = move*

```
$ ls  
f1.c f2.c ... f1.o f2.o ...  
$ rm *>o  
$ ls
```

*look at where >  
is on keyboard*

```
$ ls  
a b c d  
$ mv a *  
$ ls  
* b c d  
$ rm *  
$ ls
```

*file called \**

See: *The Unix Hater's Handbook*

# takeaways

## heuristics offer

codification of knowledge  
basis for critique  
a systematic approach

## but remember

no rules are perfect  
must be applied thoughtfully  
surprises always possible!

cheatsheet for heuristic evaluation of user interfaces / 61040, software studio

| criteria  | physical  | linguistic  |
|---|---|---|
| <b>learnability</b><br>can users learn quickly and easily?  | <b>fitt's law</b><br>how quick to point?                              | <b>speak user's language</b><br>not developer's language      |
| <b>efficiency</b><br>can experts work fast and efficiently? | <b>perceptual fusion</b><br>respect human perception of time          | <b>consistency</b><br>are names, icons etc consistent?        |
| <b>error tolerance</b><br>are user errors mitigated?        | <b>gestalt principles</b><br>convey structure by visual layout        | <b>recognition vs. recall</b><br>reduce recall burden on user |
| <b>pleasantness</b><br>is the app pleasant to use?          | <b>mapping</b><br>layout interface to match function                  | <b>information scent</b><br>provide hints for navigation      |
| <b>safety</b><br>is it safe?                                | <b>situational context</b><br>provide features appropriate to context |   |
| <b>security</b><br>are privacy and integrity ensured?       | <b>accelerators</b><br>allow quick access to common features          |   |
| <b>accessibility</b><br>usable by everyone?                 | <b>typography</b><br>readable text, accessible & effective color      |   |