



James David (JD) Long

It's Abstractions... All the Way Down

Quick Disclosure:

I am not my employer nor am I representing them

I am not discussing reinsurance

All these ideas are mine and mine alone unless otherwise stated

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1 "Generalized Additive Models: An Introduction with R (Chapman & Hall/CRC Texts in Statistical Science)"

Simon Wood; Hardcover; \$68.76

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Gift wrap no

Gift note:Thanks for helping me kick ass with Plyr and R. I appreciate the tools and the help you've given me on Stack Overflow.

-JD Long
@CMastication



I.J. Allaire (RStudio) and Jeremy Howard (fast.ai): "2-way AMA"

if you think about how you help both new users ramp into things and make experienced users productive, you provide these abstractions and there's a dial of how leaky you want you let the abstractions be

JOEL ON SOFT- WARE

YOUR HOST



NOVEMBER 11, 2002 by JOEL SPOLSKY

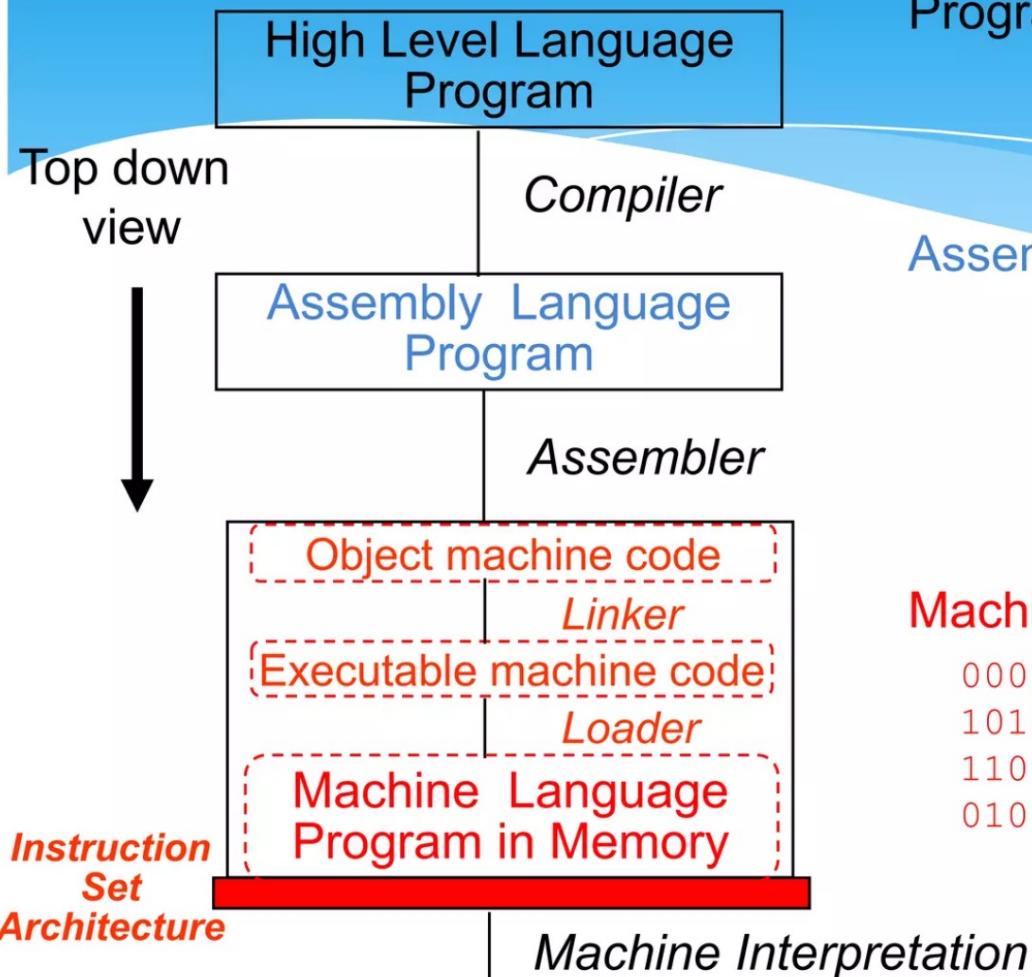
The Law of Leaky Abstractions

TOP 10, ROCK STAR DEVELOPER, NEWS

All non-trivial abstractions, to some degree, are leaky.

Abstractions fail. Sometimes a little, sometimes a lot. There's leakage. Things go wrong. It happens all over the place when you have abstractions. Here are some examples.

Layer of Representations



Program: $\text{temp} = v[k];$

$v[k] = v[k+1];$

$v[k+1] = \text{temp};$

Assembly Program:

lw \$15, 0(\$2)

lw \$16, 4(\$2)

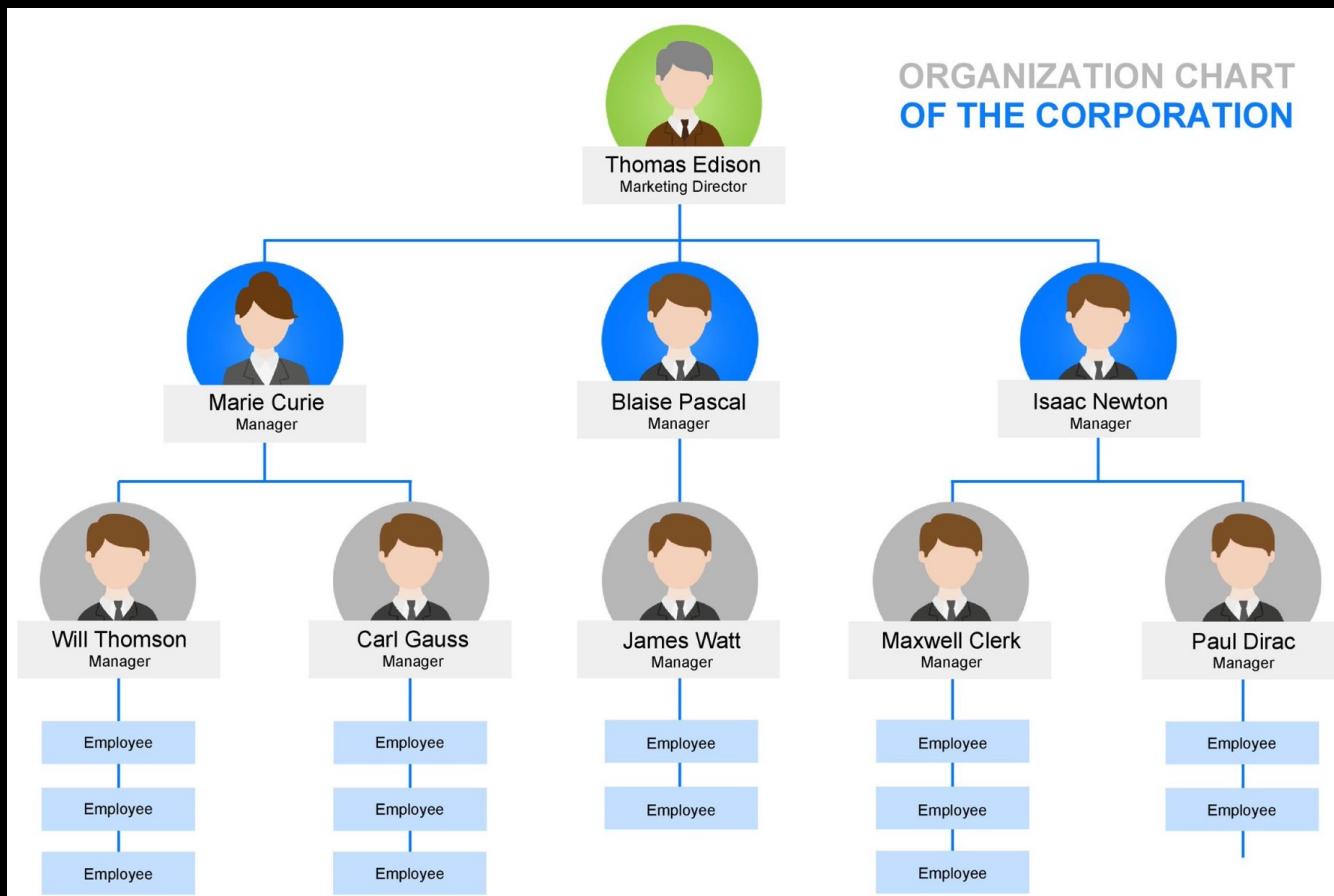
sw \$16, 0(\$2)

sw \$15, 4(\$2)

Machine Language Program:

```
0000 1001 1100 0110 1010 1111 0101 1000
1010 1111 0101 1000 0000 1001 1100 0110
1100 0110 1010 1111 0101 1000 0000 1001
0101 1000 0000 1001 1100 0110 1010 1111
```

Organizational Abstraction



Board of Directors

Executive Management

Department Heads

Team Leads

Team Contributors

Y Tho?



Herbert A. Simon

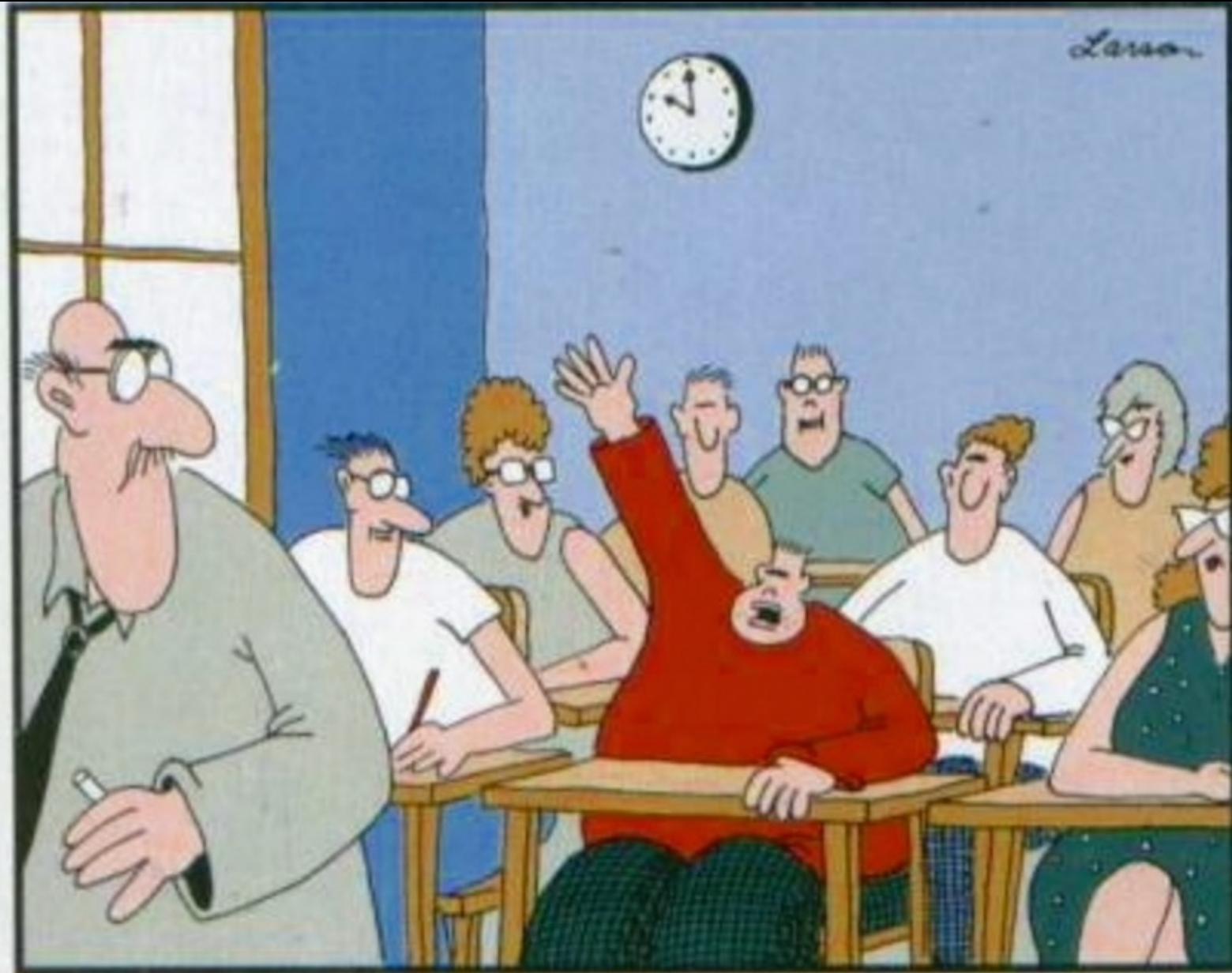


Simon circa 1981

Bounded Rationality

1957a, *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organization*, second edition, New York: Macmillan.

tl;dr: “Head trunk only hold so much junk”



**"Mr. Osborne, may I be excused?
My brain is full."**



Know your limits...

- Know which abstractions you really understand
- Recognize when you are up against an abstraction you don't grok
- Choose between learning the new abstraction and partnering with an expert
- Don't blame an abstraction for your problems if you haven't learned it

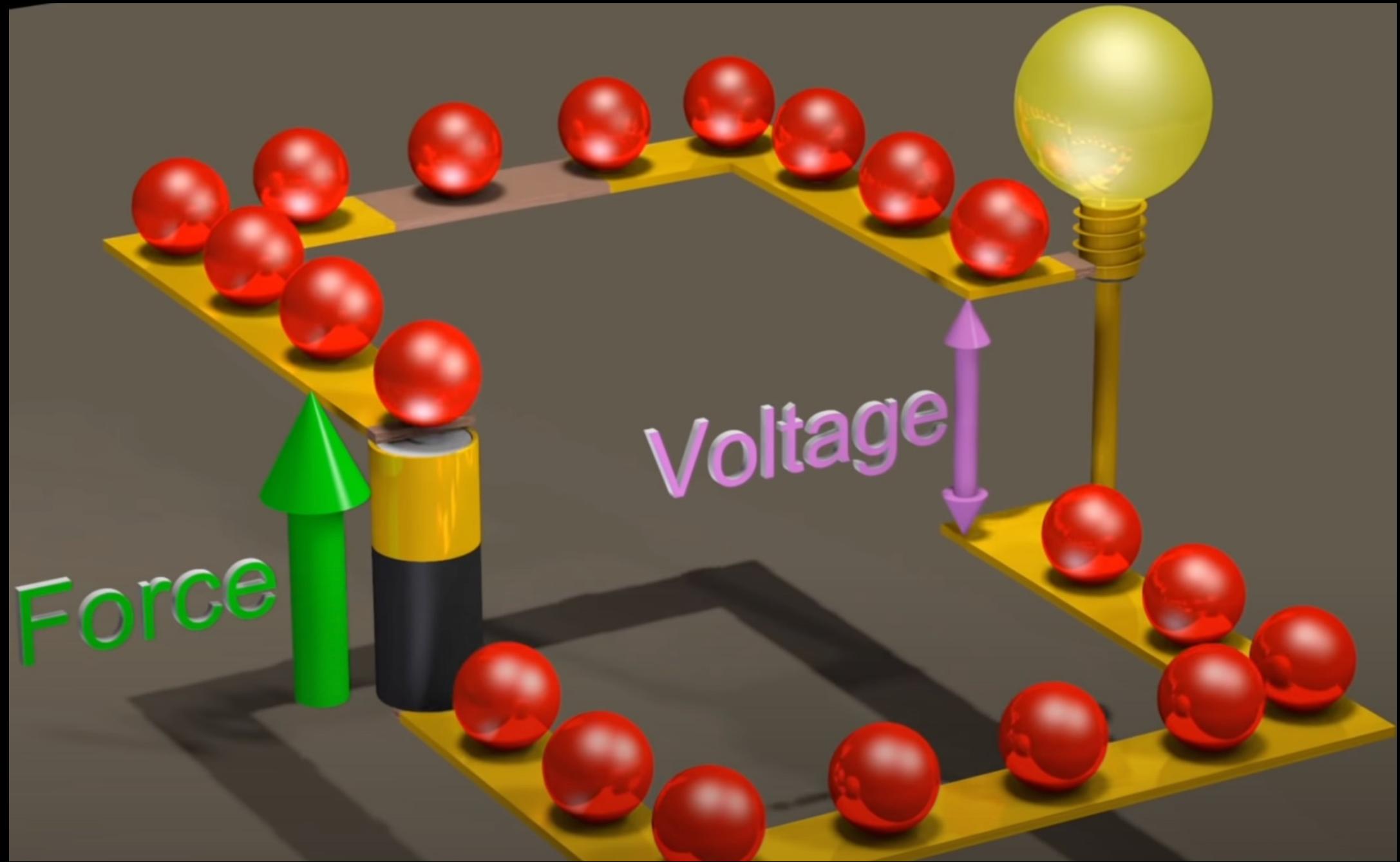
“Programming, when stripped of all its circumstantial irrelevancies, boils down to no more and no less than very effective thinking so as to avoid unmastered complexity, to very vigorous separation of your many different concerns.”

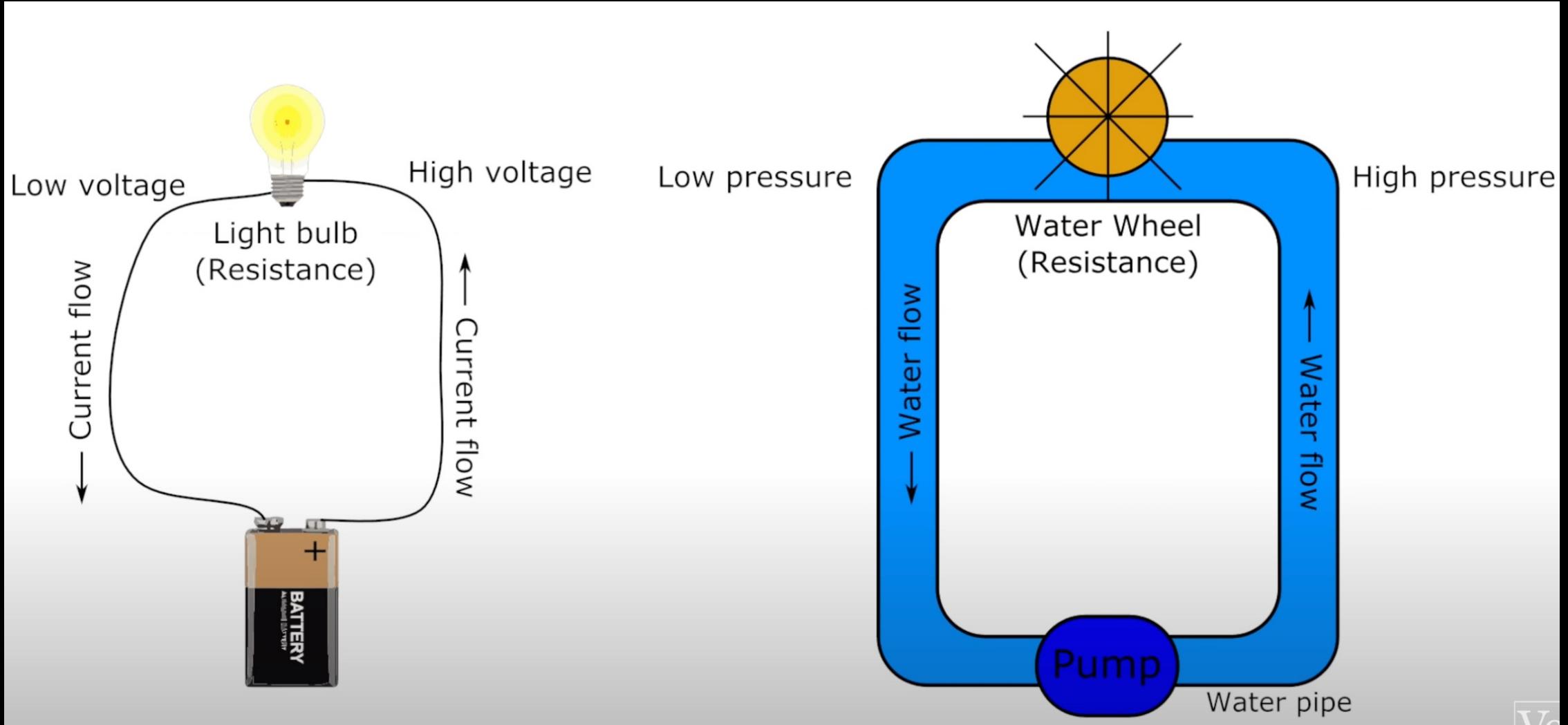
— Edsger W. Dijkstra in 1975

tl;dr – constrain complexity and separate concerns

Electricity is a fundamental abstraction for computing...

How fast do the electrons flow in our wires?





How fast do the electrons flow in our wires?

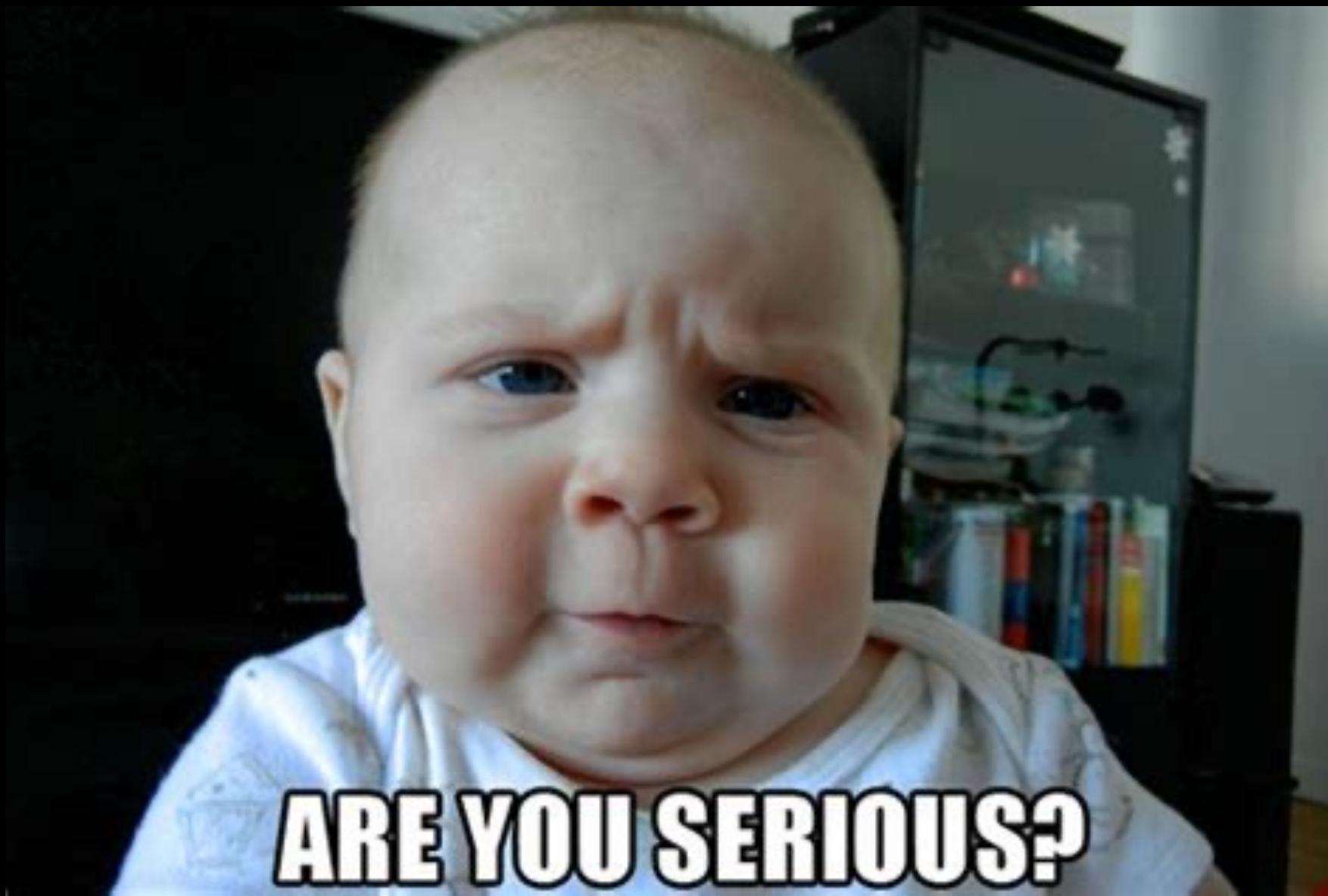
Electric drift [edit]

Main article: [Drift velocity](#)

The [drift velocity](#) deals with the average velocity of a particle, such as an electron, due to an electric field. In general, an electron will propagate randomly in a conductor at the [Fermi velocity](#).^[5] Free electrons in a conductor follow a random path. Without the presence of an electric field, the electrons have no net velocity. When a [DC voltage](#) is applied, the electron drift velocity will increase in speed proportionally to the strength of the electric field. The drift velocity in a 2 mm diameter copper wire in 1 ampere current is approximately [8 cm per hour](#). [AC voltages](#) cause no net movement; the electrons oscillate back and forth in response to the alternating electric field (over a distance of a few micrometers – see [example calculation](#)).

8 cm per hour

We conflate electromagnetic fields with electron movement



ARE YOU SERIOUS?

<https://bit.ly/jdl-electron>

Why do many of us not know this?

Why do many of us not know this?



To understand abstractions we build mental models.

Often we use metaphors.

Often **WRONG** metaphors.

What if our mental model is wrong and it
DOES matter?

Let's talk about floating point math

Addition and Multiplication are Associative

(Associative Property
of Addition)

$$(2+3)+4 = 2+(3+4)$$

Do first!

Do first!

$$5+4=9$$

is the
same as

$$2+7=9$$

```
c = (1.11 + 2.22) + 3.33  
d = 1.11 + (2.22 + 3.33)
```

```
c == d
```

False

Floating Point Addition and Multiplication are NOT Associative

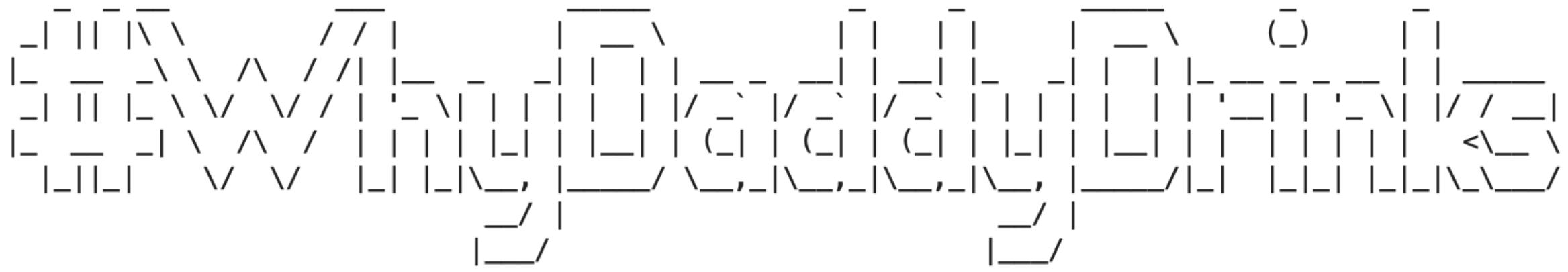
i.e. order of execution matters

```
c = (1.11 + 2.22) + 3.33  
format(c, '.17f')
```

'6.6600000000000014'

```
d = 1.11 + (2.22 + 3.33)  
format(d, '.17f')
```

'6.6600000000000103'



Most of us are NOT computer scientists

The screenshot shows a white header with the name "Julia Evans" in large orange font. To the right is a vertical menu with links: ABOUT, TALKS, PROJECTS, TWITTER, MASTODON, and GITHUB. Below the menu is an orange navigation bar with links: FAVORITES, ★, ZINES, ★, and RSS. The main content area has a thin red border and contains the text: "Hello! I've been thinking about writing a zine about how things are represented on computers in bytes, so I was thinking about floating point."

Julia Evans

ABOUT
TALKS
PROJECTS
TWITTER
MASTODON
GITHUB

FAVORITES ★ ZINES ★ RSS

Hello! I've been thinking about writing a zine about how things are represented on computers in bytes, so I was thinking about floating point.

“Doing numerical computations on a computer inherently involves some approximation and rounding”
https://bit.ly/evans_floating

What about organizational abstraction fails?



Org Abstraction Leakage:

- Where did this number in the DB come from?
- Who do I talk to about solving this?
- How was this decision made?

General Evidence of Leaking Abstractions?

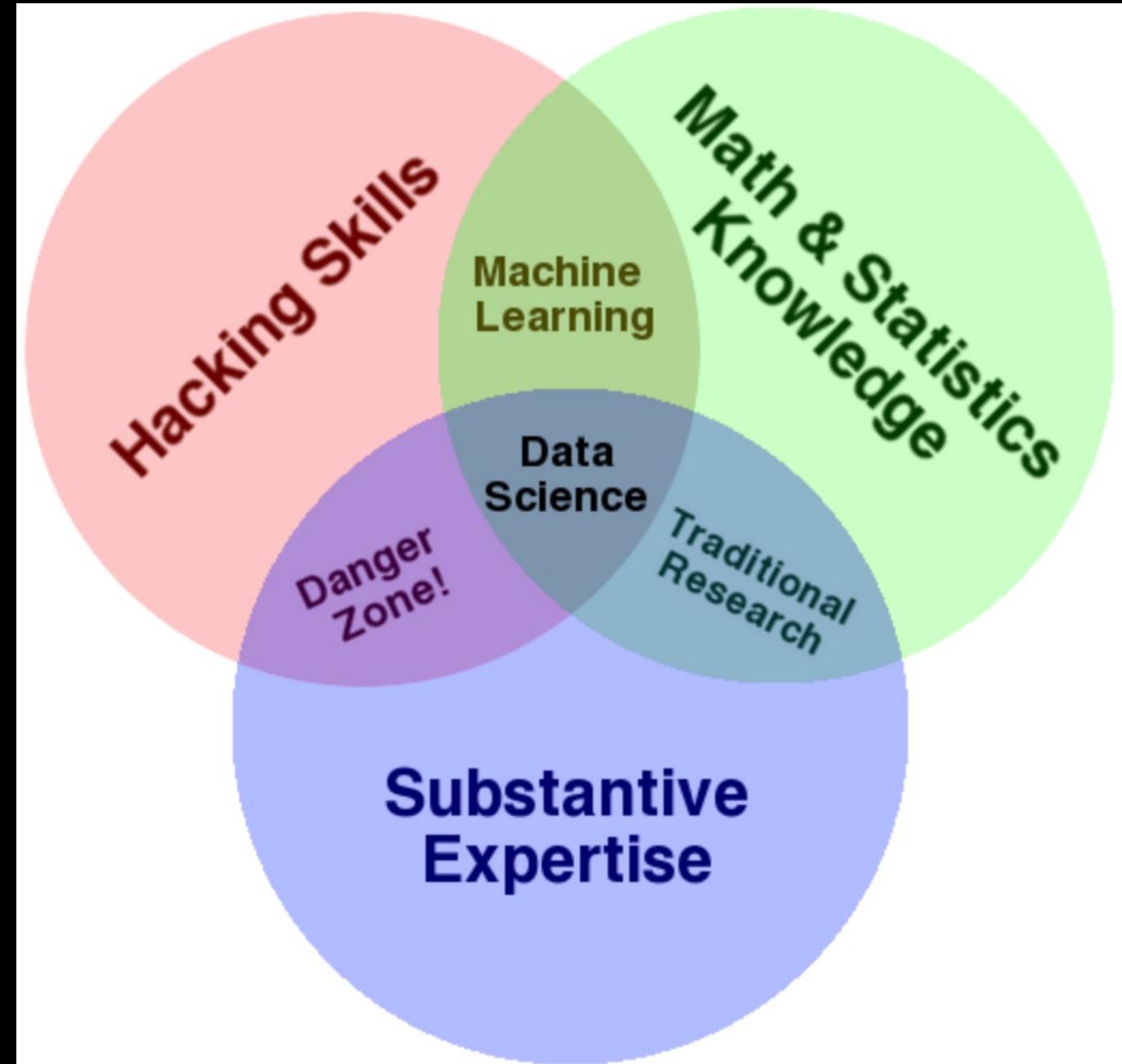
- Unexpected behavior
- Uninterpretable responses
- Logical errors

It's Like Beer...

Communication is the source of, and solution to, all our problems.

- Where did this number in the DB come from?
 - Code accessibility in Version Control
 - Wiki pages describing processes
- Who do I talk to about solving this?
 - Clear Ownership of everything in the org
- How was this decision made?
 - Better transparency
 - Leadership communication

A Little History:
Drew Conway's
Venn Diagram 2010



JD's Assertion 1:

"The single biggest business value derived from the data science movement in the last 13 years is making it legitimate to code outside of IT roles"

Data Science type roles break previous organizational abstractions.

JD's Assertion 2:

"Abstractions will leak. Therefore, abstractions must be permeable to allow debugging."

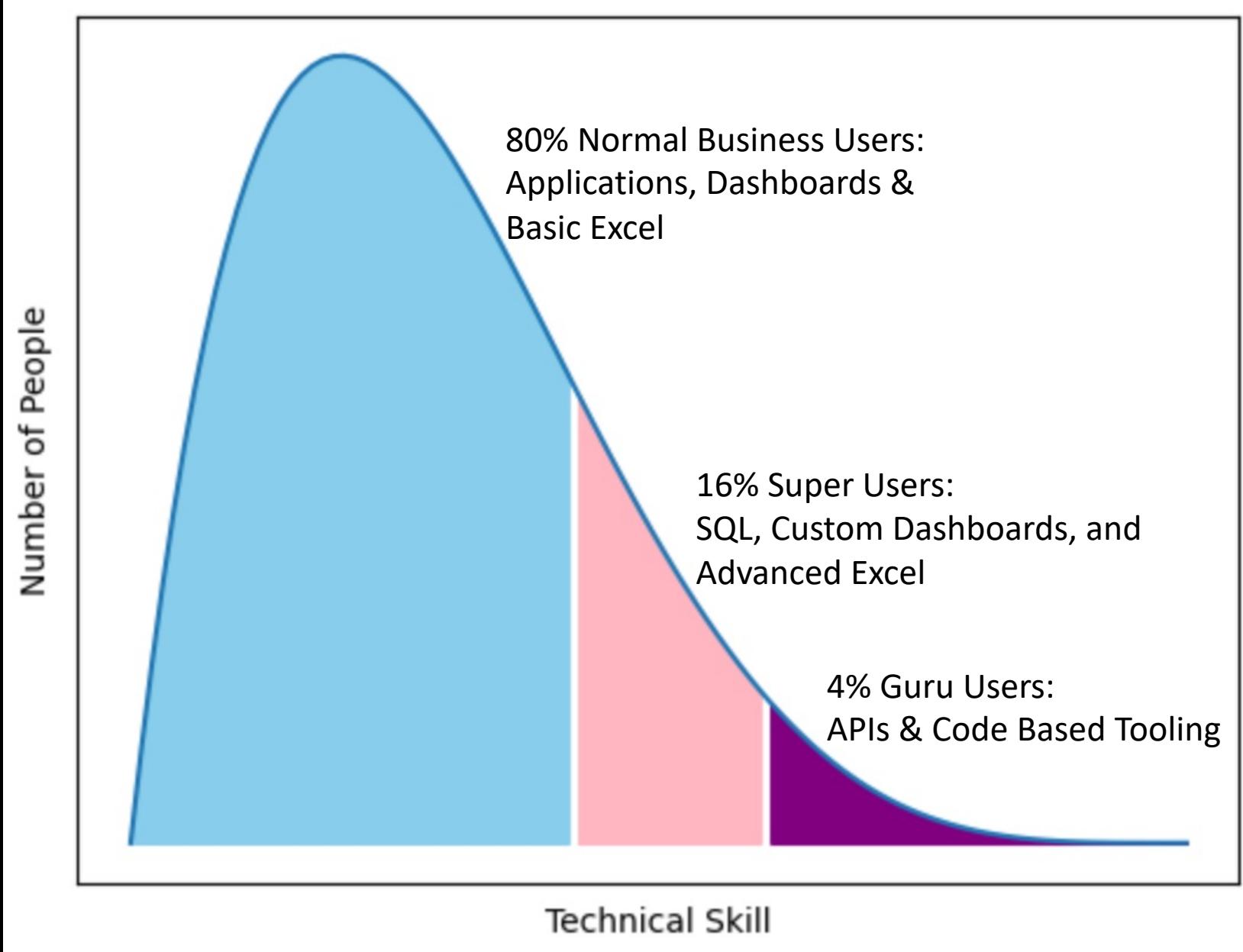
Holds for both organizations and computers.

JD's Assertion 3:

"No single abstraction is right for everyone."



80-16-4



Multiple Abstractions is a High Empathy Move

Big Idea Recap:

- Abstractions Start WAAAAY Up With Leaders and go Down to the Hardware
- To Debug an Abstraction You Have to See Below It
- We're Building Mental Models of Complex Systems
- You Can't Master All Abstractions
- Decide if You're Going to Learn or Partner
- Ensure an Abstraction for Everyone: 80-16-4
- Help Everyone Kick Ass!



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<https://www.linkedin.com/in/jamesdlong/>

Mastodon:

<https://mastodon.social/@Cmastication>

