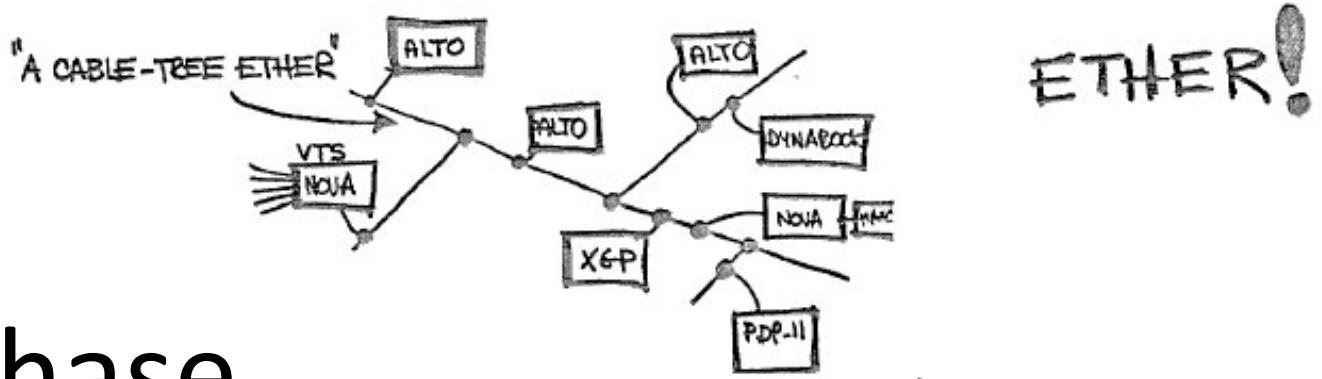
REAANZ

Effective communications:

How IT can talk to researchers about their research

Photo by Miguel Henriques on Unsplash

Photo by Trust "Tru" Katsande on Unsplash

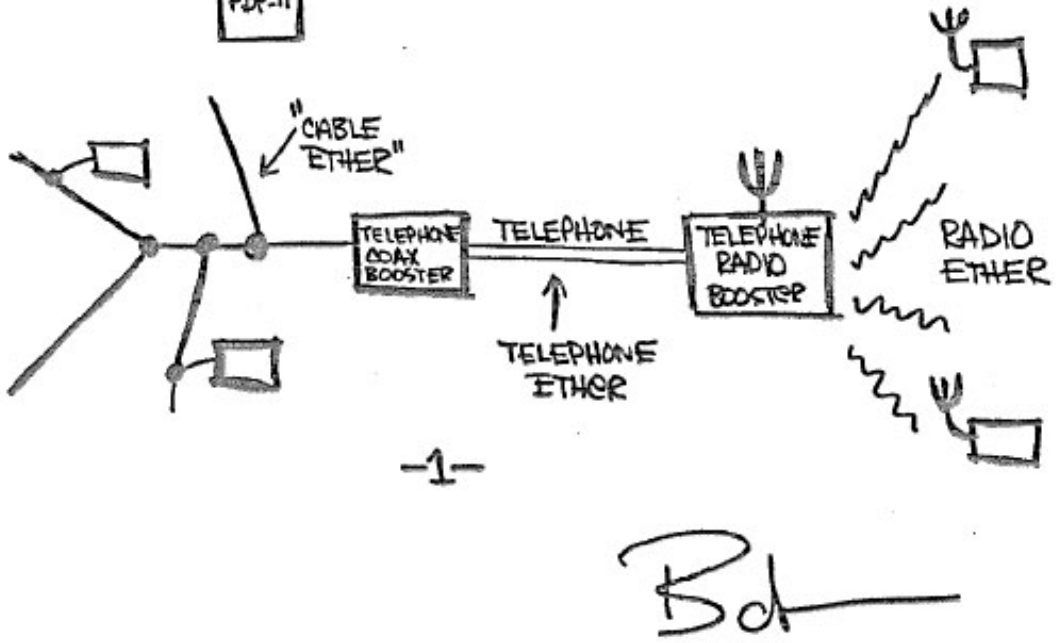


Wallace A. Chase

Technical Engagement Manager

wallace.chase@reannz.co.nz

@bmtfr



REANNZ

C Light R&E Network

WASHINGTON STATE UNIVERSITY
World Class. Face to Face.

THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

CLEMSON
COMPUTING AND INFORMATION TECHNOLOGY

SC LightRail

LSU LAKE SUPERIOR STATE UNIVERSITY

Black Hawk College

When was the last time you had a conversation with a researcher that was not break/fix?

Gaps in…

- Terminology
- Research types
- Researcher types
- Enterprise vs research
- Societal

Photo by Bruno Figueiredo on Unsplash

Is Oxygen a Metal?

How many of you believe that oxygen is a metal?

In real life…

- Atomic number 8
- Chalcogen
- Key element in life
- Also fire, rust, water etc

http://en.wikipedia.org/wiki/Oxygen

Oxygen in Astronomy

- The universe is made of the following:
  - Hydrogen
    - Atomic number 1
    - 75% of all baryonic mass
    - Most stars are made of hydrogen plasma
  - Helium
    - Atomic number 2
    - Noble gas (inert)
    - 24% of total elemental mass
  - Other: ~1%

http://en.wikipedia.org/wiki/Hydrogen

http://en.wikipedia.org/wiki/Helium

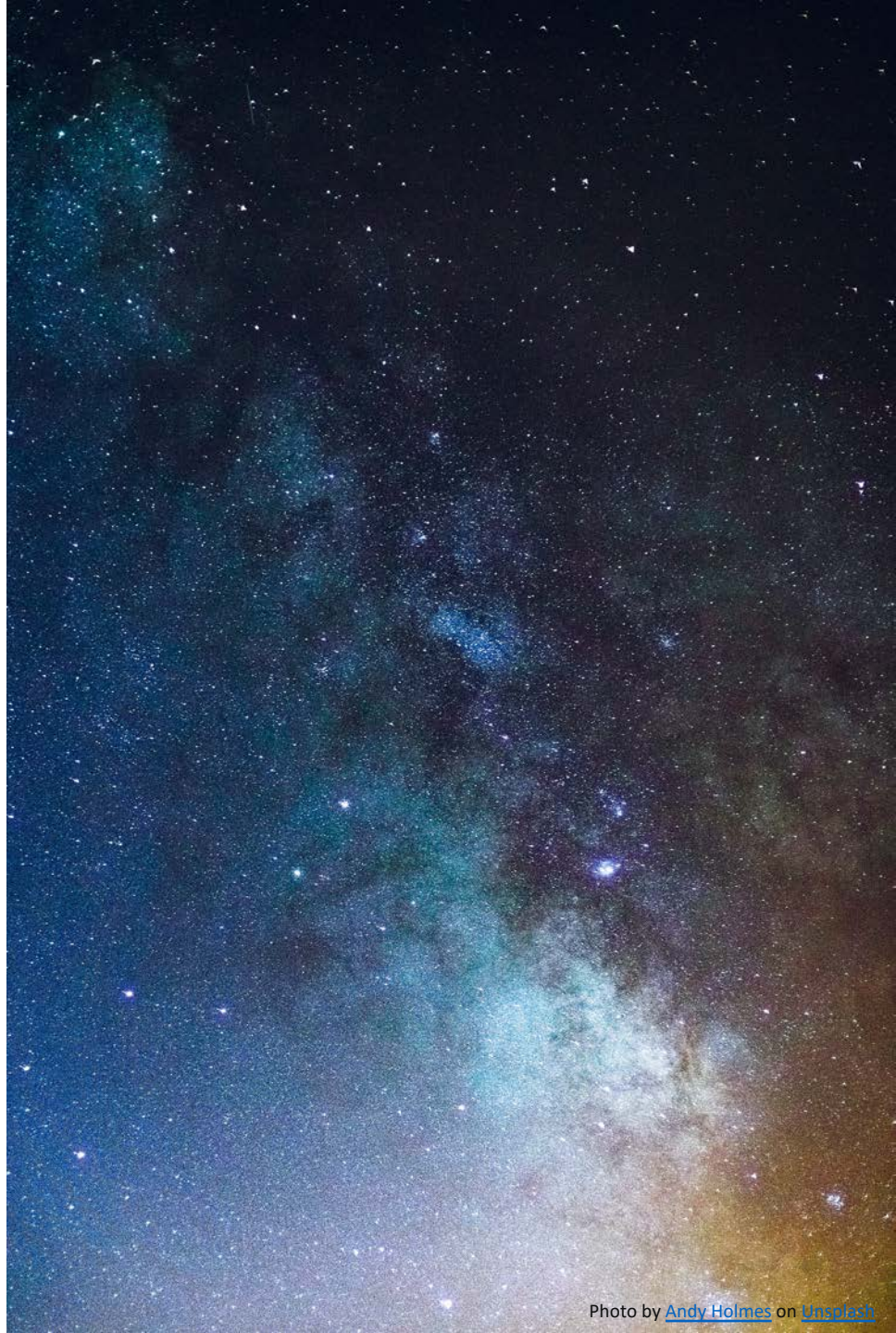


Photo by Andy Holmes on Unsplash

What are planets made of?

- Cores of iron, nickel etc
  - Earth's core is 89% iron, 6% nickel, 5% other
- Mantles of silicates

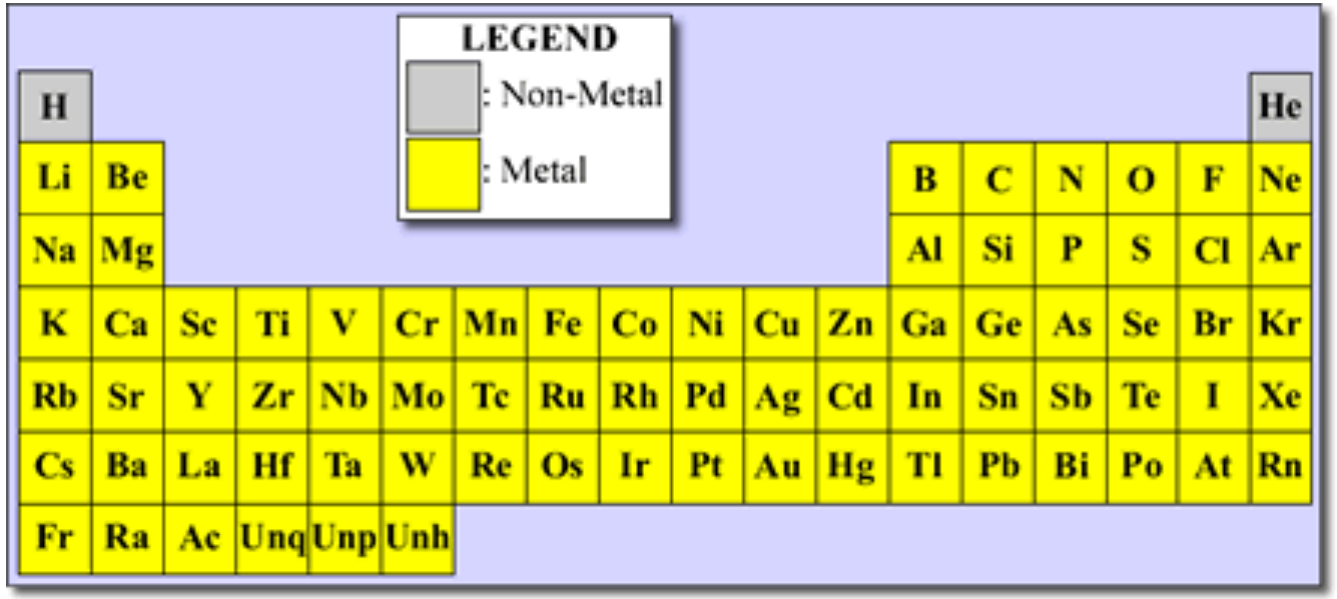
http://en.wikipedia.org/wiki/Planets#Mass

http://en.wikipedia.org/wiki/Earth

Rose Eveleth, "Barns Are Painted Red Because of the Physics of Dying Stars."

http://www.smithsonianmag.com/smart-news/barns-are-painted-red-because-of-the-physics-of-dying-stars-58185724/?utm_source=keywee-facebook.com&utm_medium=socialmedia&utm_campaign=keywee&kwp_0=283306&kwp_4=1091891&kwp_1=506963

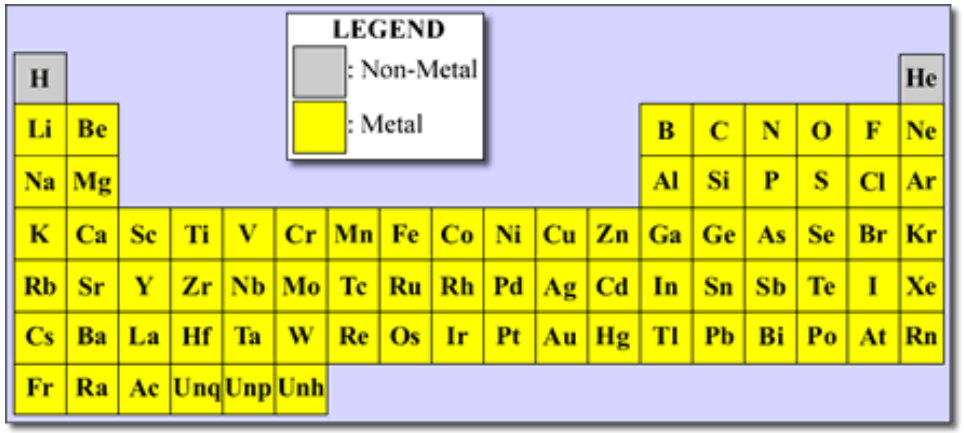
Astronomers refer to all the chemical elements heavier than hydrogen and helium as ‘metals’, even though this includes elements such as carbon and oxygen which are not considered metals in the normal sense.



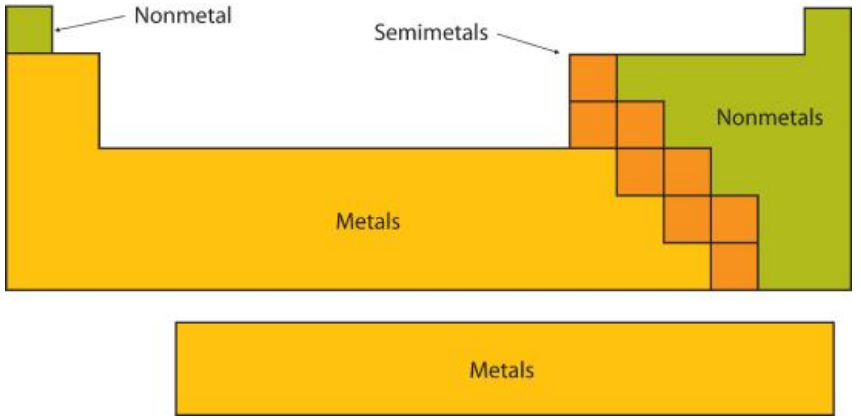
http://astronomy.swin.edu.au/cosmos/M/Metals

So what IS a metal?!?

- To a chemist, “metals” have a very specific chemical definition.
- But, to an astronomer (especially a cosmologist), “metals” are anything that isn’t hydrogen or helium.



http://astronomy.swin.edu.au/cosmos/M/Metals



https://chem.libretexts.org/Courses/College_of_Marin/Marin%3A_CHEM_114_-_Introductory_Chemistry_(Daubenmire)/04%3A_Atoms_and_Elements/4.6%3A_Looking_for_Patterns%3A_The_Periodic_Law_and_the_Periodic_Table

Projection

- What happens if you put a mathematician, a psychologist and a movie producer into a room and ask them to discuss projection?

What Are Fluids?

- Colloquial definition: Liquids.

- Mom's and physician's definition:

  Something you should drink plenty of when you're sick.

https://www.zocdoc.com/answers/9591/does-drinking-fluids-help-when-you-have-a-cold

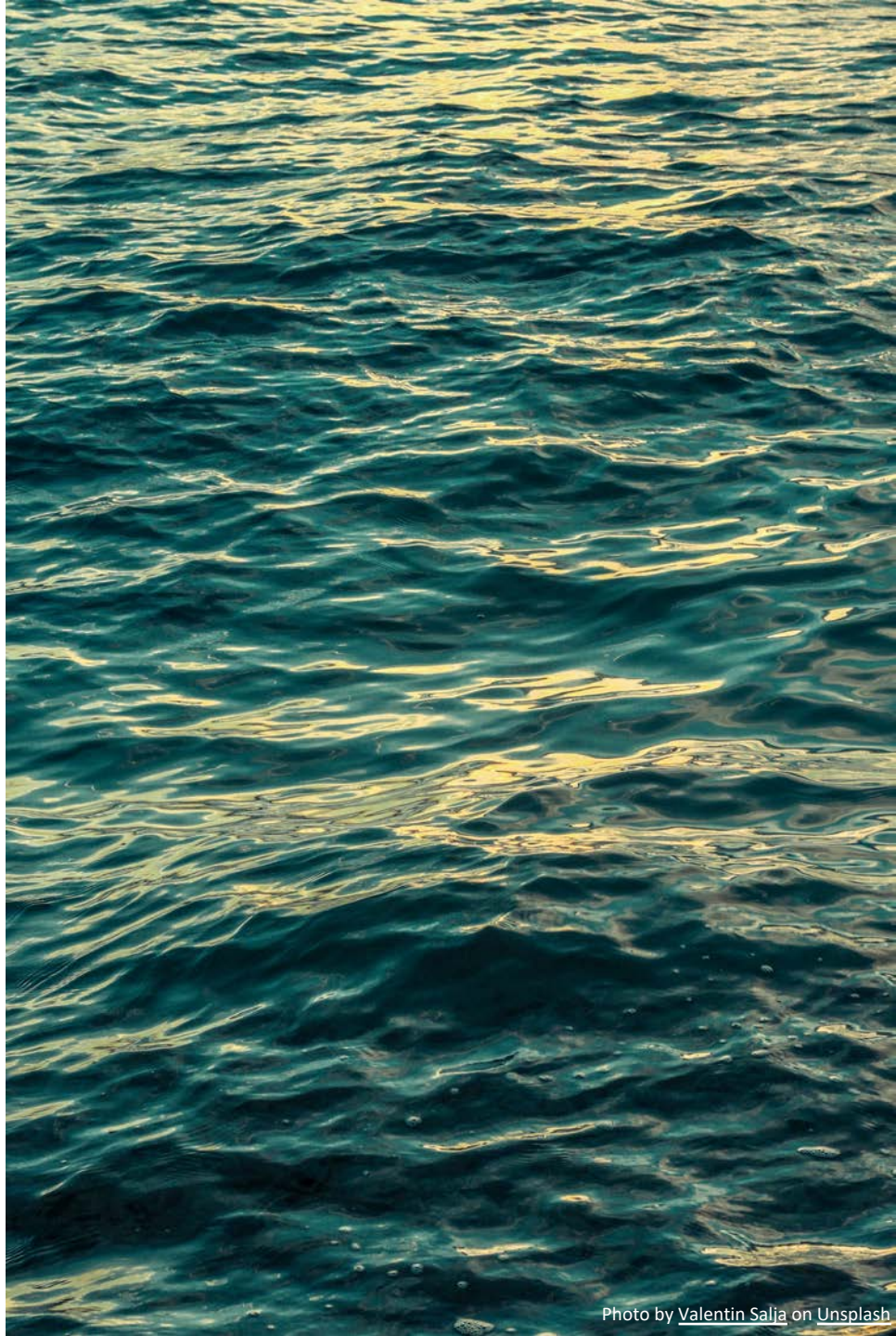


Photo by Valentin Salja on Unsplash

- Physical science & engineering definition: Not solids.
  - Computational **Fluid** Dynamics
    - The most popular fluid studied is air (Earth's atmosphere).
  - "[A] substance, as a liquid or gas, that is capable of flowing and that changes its shape at a steady rate when acted upon by a force tending to change its shape." – dictionary.com
  - Liquids are ***incompressible*** fluids.

Photo by Nick Tsinonis on Unsplash

Scale

- At quantum scale during femtoseconds, how much does gravity matter?

- How about at cosmological scale over eons?

Photo by Markus Spiske on Unsplash

CS or IT?

What happens if a domain scientist refers to CS as IT?

Wait - CS people do research?

I thought they were just there to help everyone else with their real research … ?

Enterprise IT
vs
Research Infrastructure:

Natural Enemies or Natural Allies?

Enterprise IT : HARDENED

- Secure
- Redundant
- Tight change control
- Established technology
- Best practices
- 5 nines: 99.999% uptime = 5.25 **minutes** of downtime per year

Photo by Markus Spiske on Unsplash

Research Infrastructure: SQUISHY

- Fast and flexible (turn on a dime)
- Cutting edge technology (= broken)
- In some cases, no such thing as best practices
- 1.5 nines: 95% uptime = 18.25 **days** of downtime per year

As an example this is the NSF's standard, from NSF solicitation 17-558:

"… [$60M NSF-funded] production resources should be unavailable as a result of scheduled and unscheduled maintenance no more than 5% of the time."

https://womeninhpc.org/2019/03/scinet-at-sc18-inspirations-and-experiences-of-a-volunteer/

Enterprise IT Example

- On Aug 8 2016, Delta Air Lines experienced a power outage in their Atlanta data center that lasted 5 hours.
  - Cost: $150M ($1M every 2 minutes of downtime)

https://money.cnn.com/2016/09/07/technology/delta-computer-outage-cost/

Enterprise vs Research: Incentives

- Suppose payroll is going out tomorrow, and the payroll system goes down tonight.
  - On payroll day, what happens on the Enterprise IT people who are accountable for the outage?
  - Therefore, what must Enterprise IT people do to stay in business?

- Suppose Research Infrastructure isn't on the cutting edge, and so proposals from the institution are less competitive.
  - Eventually, what will happen to the researchers?
  - Therefore, what must researchers do to stay in business?

Research grade infrastructure

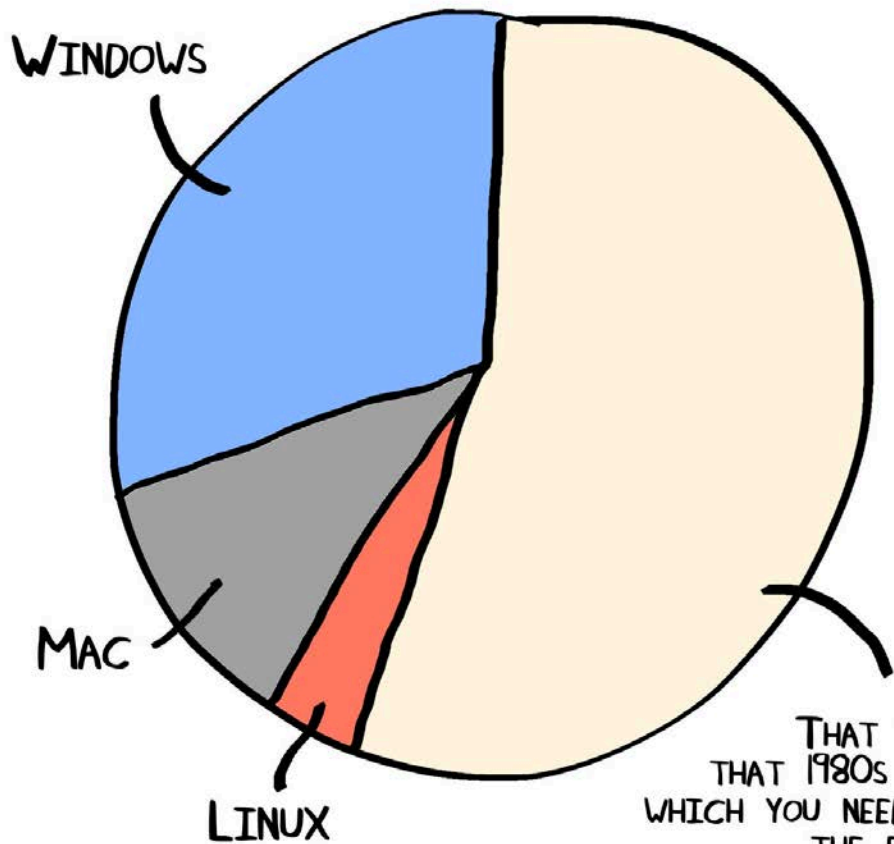
- **Research infrastructure wont be as "good" in an enterprise context**: A system that's mostly up but crashes occasionally is fine if it offers considerably more capacitary
- **Cost of 5 Nines vs 1.5 Nines**: 5-10x,

  However - budgets are fixed – so the actual cost is *cutting* computing-intensive and data-intensive research productivity by that factor.

- **Therefore**: Let the infrastructure go down from time to time, as a tradeoff for having more (but less resilient) resources, to maximize research productivity per year, at the cost of occasional lost days.

WHAT OPERATING SYSTEM DO SCIENTISTS USE

ERRANTSCIENCE.COM



Research as the Enterprise Testbed

- Research infrastructure has only limited best practices.
- But, technologies currently being adopted by Research (e.g., Software Defined Networking) are often enterprise requirements in a few to several years.
- So, let Enterprise IT watch Research infrastructure make mistakes, and use those observations to develop best practices for Enterprise IT.

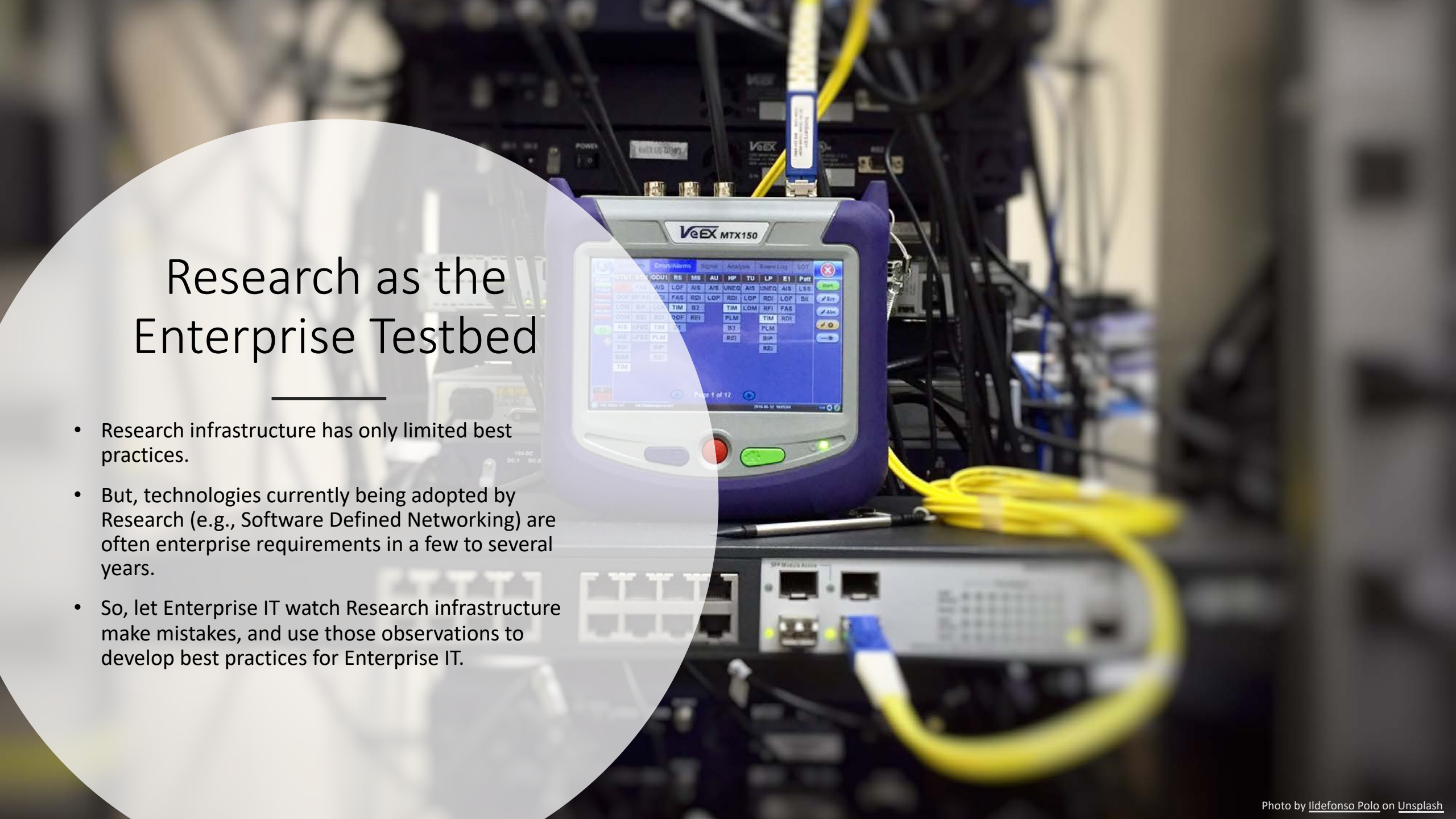


Photo by Ildefonso Polo on Unsplash

- Researchers are often trying to do things *that have never been done before*.

- To expect things researchers need to always neatly fit into existing services, products and categories will only frustrate everyone!

Photo by Jaron Nix on Unsplash

The Mindset Gap

- In the olden days – say, 10 years ago – we used to say that our typical new Cyberinfrastructure user came from a Windows desktop or laptop background.
  - Those days are long gone ….
- Nowadays, we say that our typical new user comes from an iOS or Android background.
- How has that changed our job?

Photo by Rahul Chakraborty on Unsplash

Mental Distance

What's the mental distance between a handheld vs Linux, command line, data transfer, remote, shared, batch computing?

- Transferring data
  - Handheld: AirDrop, share on FB messenger
  - Large scale: Build/use a specialty data transfer node, GridFTP, encryption, Globus
- Installing software
  - Handheld: Tap 3 times.
  - Large scale: EasyBuild if you're lucky, configure/make with modest dependencies if you're unlucky, bizarre random weirdness in practice.
- Installing storage
  - Handheld: Buy a card for $10-50, pop it into the slot, the OS automatically recognizes it and starts using it or pay an extra $9.99 per month for additional public cloud storage
  - Large scale: RFP, bid evaluation, configuration, purchase, deployment, maintenance, decommissioning.

What's the Cost of Storage?

- Handheld: tens or hundreds of dollars (which gets you tens or hundreds of GB).
- Laptop: tens or hundreds of dollars (which gets you TBs of spinning disk or GB/TB of SSD).
- Large scale (per copy)
  - ~1 PB raw tape: ~$6K
  - ~1 PB raw spinning disk : ~$63K (ultra-cheap version)
  - ~1 PB raw SSD: ~$228K (ultra-cheap version)

Motivations

- Researchers
- Professors
- Postdocs

Probably of success

2019 Endeavour Fund

414 applications for research funding from the 2019 Endeavour Fund
71 approved for funding

- CRI – 18.10%
- University – 16.47%

- Funding is governed by the Law of Large Numbers: You have to submit lots of proposals to get any funding.

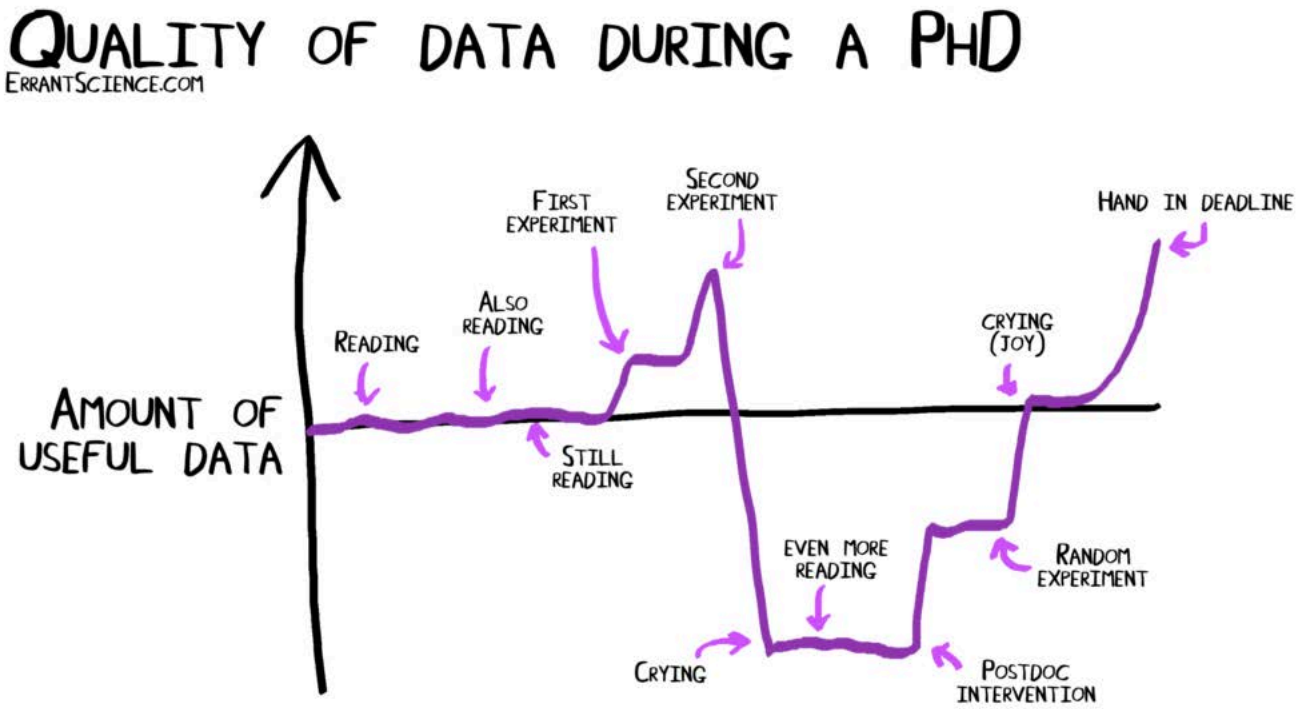
https://www.mbie.govt.nz/science-and-technology/science-and-innovation/funding-information-and-opportunities/investment-funds/endeavour-fund/success-stories/

Students

My first goal is to graduate.

Anything that delays graduation costs me money:

- I may or may not have an assistantship.
- While I'm in school, I'm giving up that many years of salary and benefits.



Things to Say to a Researcher

Photo by Fabien Bazanegue on Unsplash

Things not to say

“Why would you do it that way?”

“There are better ways to do this”

“Who came up with this plan?”

“We can solve that with a l2 vlan over the switch fabric across the LAN to the router as long as BGP sends the traffic to the correct AS over the WAN connection”

“Wow - that’s going to be a pain to support”

“What are your requirements?”

…and here is how we are going to do it…

“Don’t worry we already bought everything we need”

“Here is our design”

“We are past that stage”

Don’t discount others ideas

Even when they are stupid.

Especially when they are stupid.

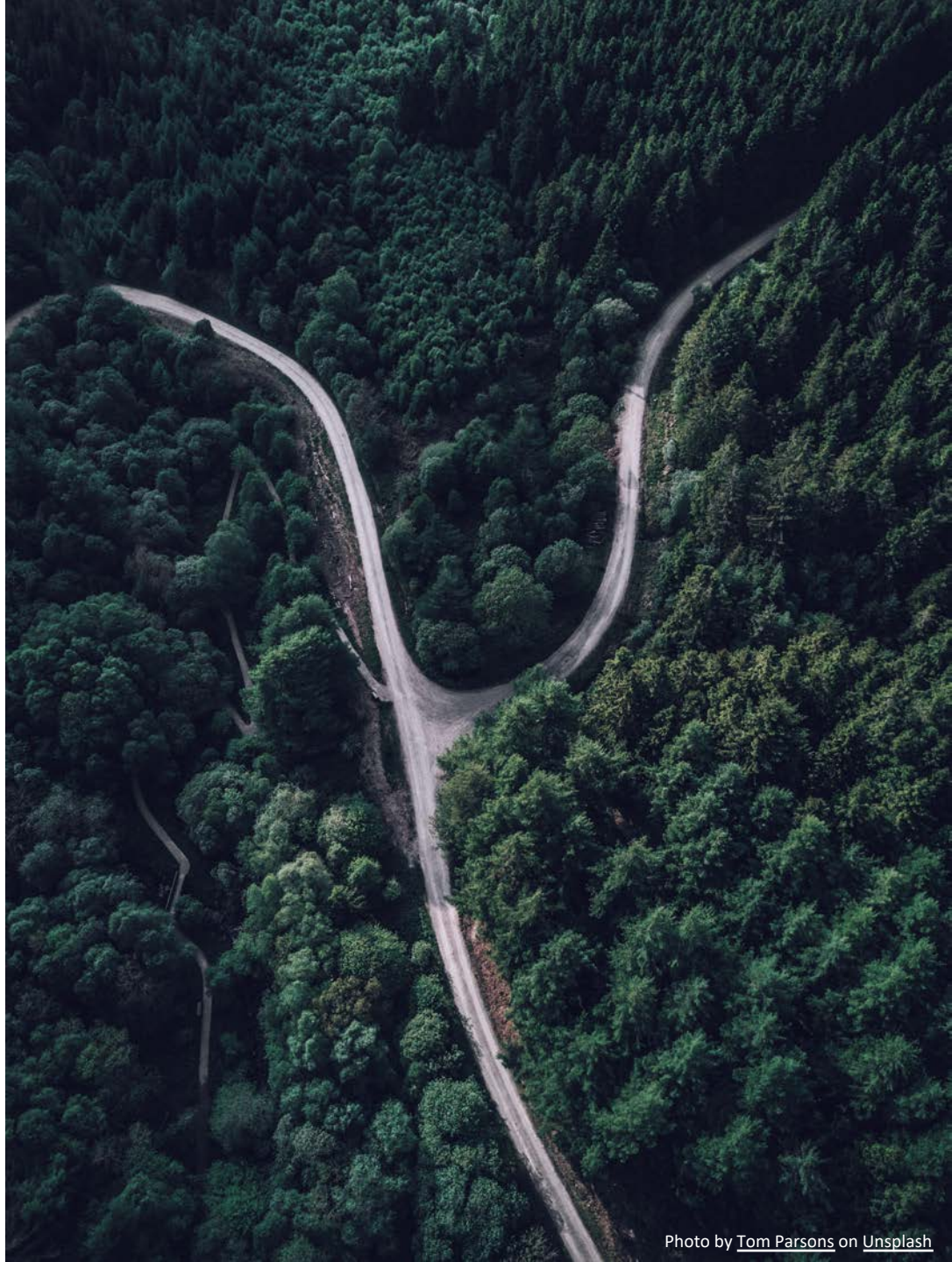
You might be wrong.

Gary Dahl sold 1.5 million Pet Rocks for $4 each

https://en.wikipedia.org/wiki/Pet_Rock

- Why did they suggest that solution?
  - Cheaper?
  - Faster?
  - Supportable?
  - That’s all the knew to do?

- Why do you want to do it another way?
  - Cheaper?
  - Faster?
  - Supportable?
  - That’s all you know to do?



Things to say

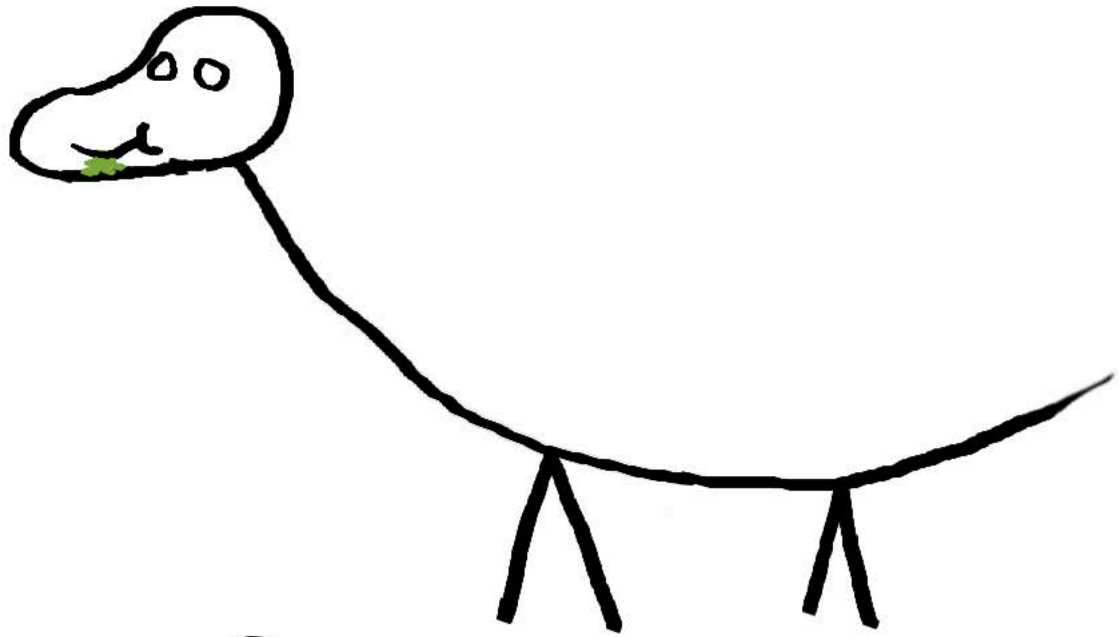
“This other way of doing it is cheaper than how you’re currently doing it.”

“For the same cost, it could be so much better.”

“Here is a simpler way that achieves the same result”

“Here is how we can allow for simple access you control”

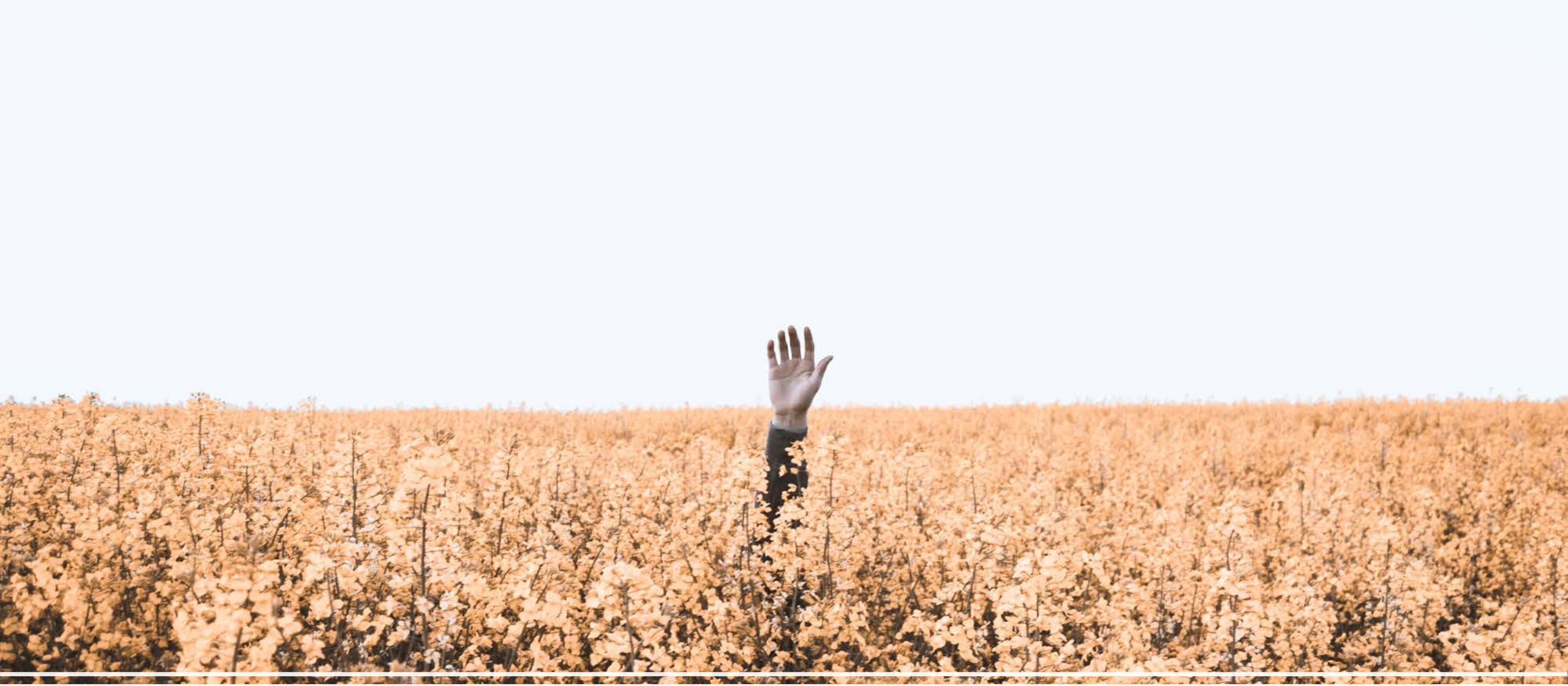
“Help me understand your workflow"



STICK DINOSAUR

HISTORICALLY ACCURATE IF YOU IMAGINE THE REST OF IT RIGHT

ERRANTSCIENCE.COM



How to find researchers

Google-fu

1. Go to your institution's website.
2. Click on Academics.
3. Search for departmental websites.
4. On each departmental website, find the list of faculty (the link is usually "Faculty" or "People").
5. Read their research descriptions.

What to look out for

- Computational
- Numerical
- Parallel (especially in CS)
- Informatics
- International collaborations
- AI, VR
- For Chemistry, look for Computational Chemists, Physical Chemists and Biochemists.

There are plenty of others – over time you'll develop a feel for it.

Make your move…

- Contact those faculty.
- Tell them what your role is.
- Ask them what their computational/storage/network/whatever needs are.
- Don’t do all the talking – the goal is to get them to talk about what they do!

Go to New Faculty Meet-n-Greets

- Does your institution have events for new faculty?
- Go to them!

Photo by Antenna on Unsplash

Visit Them!

- Make an appointment to visit with them.
  - Even better, offer to take them to lunch.
    - If you can get your institution to pay for the lunch, even better.
- Ask them questions:
  - At a high level, what's your research about?
  - What are the computing-intensive and/or data-intensive aspects of your research?
  - Suppose you had an infinitely large, infinitely fast computer/network/storage. What research would you want to do?

Questions

- What is the expected typical size of each dataset being transferred?

(It would be helpful to know expected growth rate: Are you expecting it to stay roughly the same over the next several years, or to double every two years, or what?)

Questions cont…

- Where are such datasets originating, and where are they being transferred to?

- Why do such datasets need to be transferred between these endpoints?

(That is, what requirement do these data transfers address for your team’s research?)

Questions cont…

- What is the time window for transferring each such dataset?

- Why does each such dataset need to be transferred during that specific time window?

That is, what's the negative impact of the transfer taking
(a) marginally longer and (b) much longer?

- How often do you expect to have such a data transfer need?

Build trust

The IT department is most likely not well regarded

Some of that is fair
Some is unfair

People trust people – not faceless bureaucracies

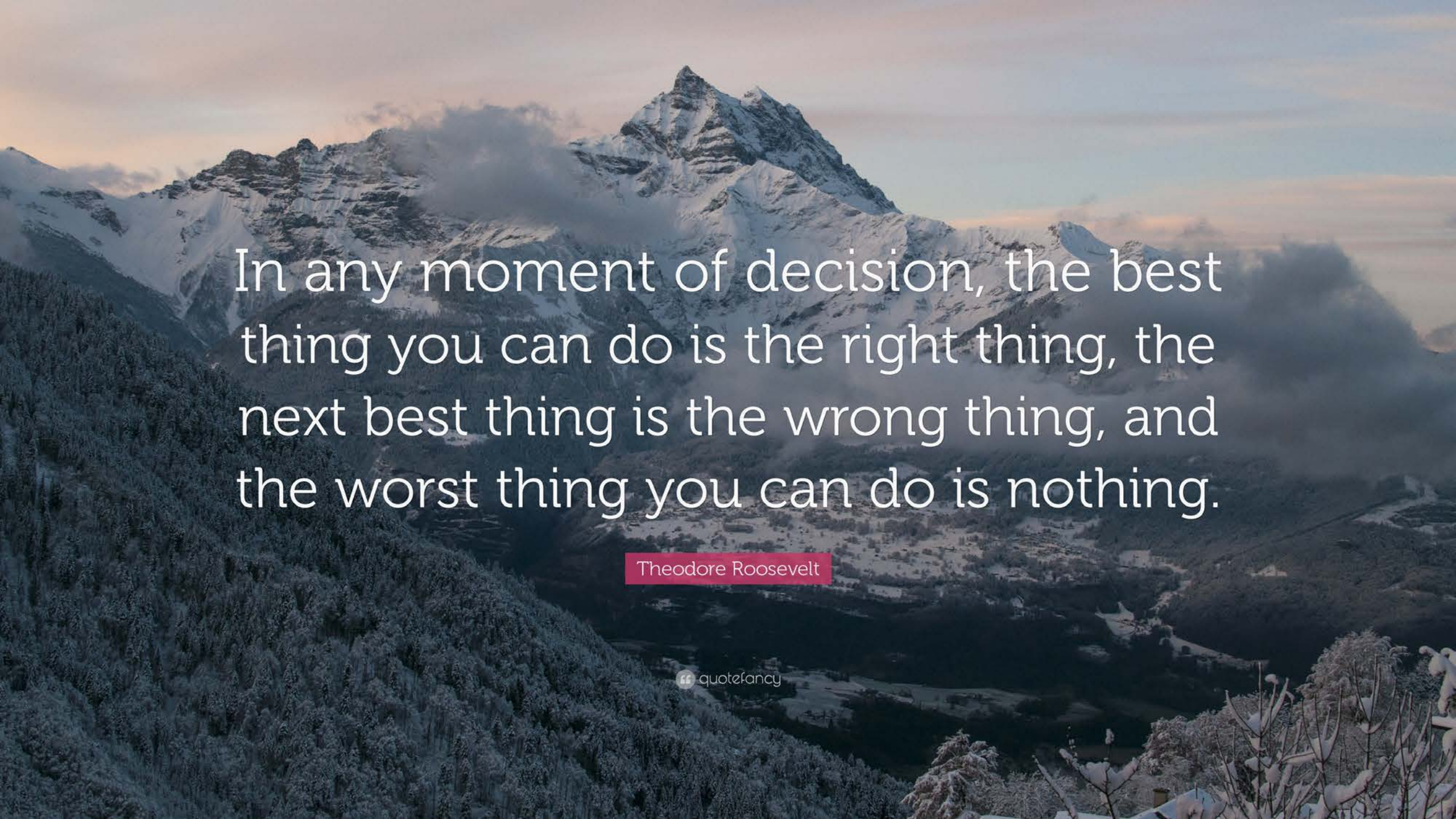
Who is responsible for doing this?

You are.

A major part of your organization values research.

If you don’t know what is going on you are not doing your job.

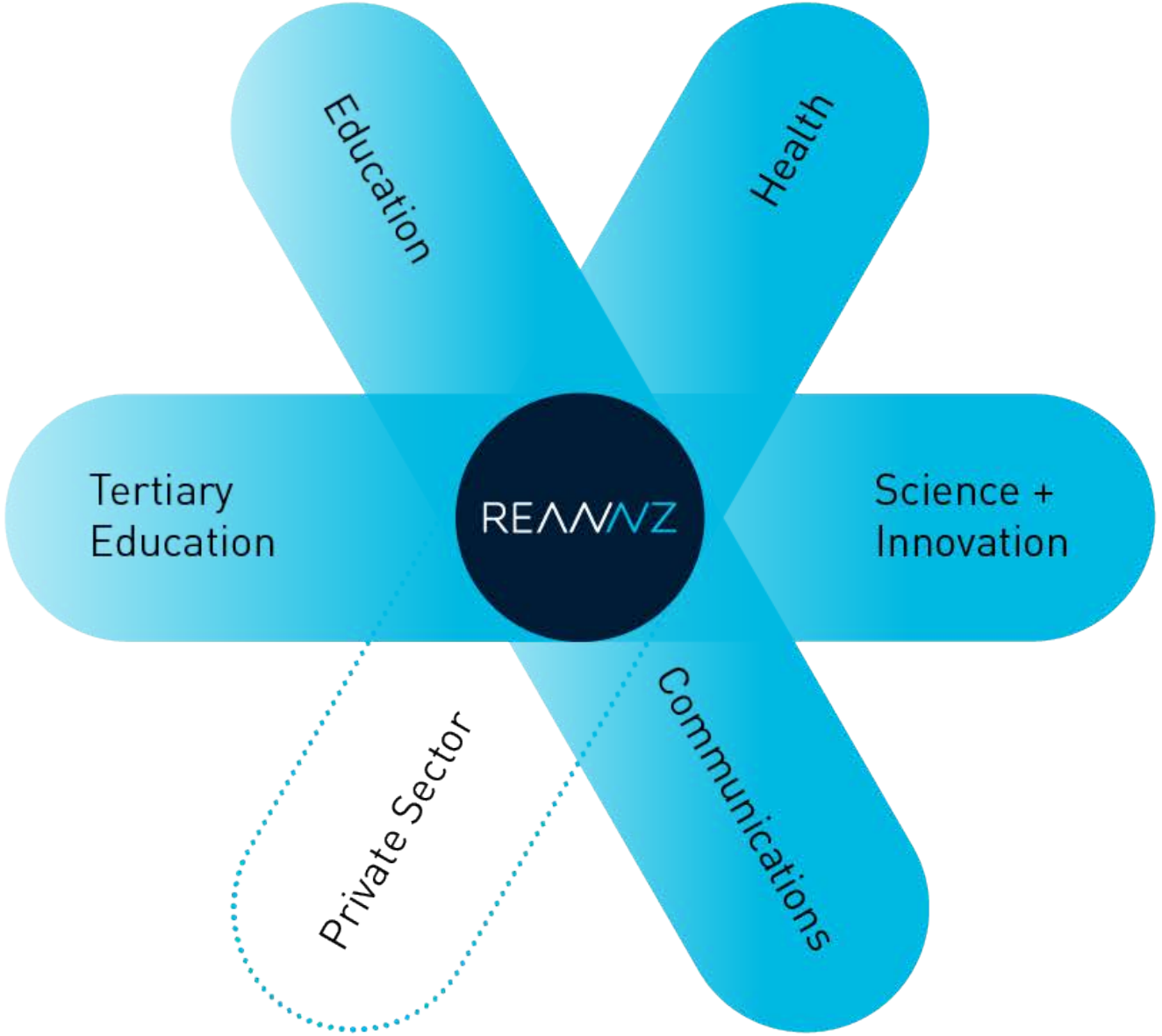
Enabling research is interesting and exciting!


In any moment of decision, the best thing you can do is the right thing, the next best thing is the wrong thing, and the worst thing you can do is nothing.
Theodore Roosevelt
quotefancy

Thank you!

How can we help?

engagement@reannz.co.nz



wallace.chase@reannz.co.nz
@bmtfr

Many thanks to Henry Neeman, University of Oklahoma