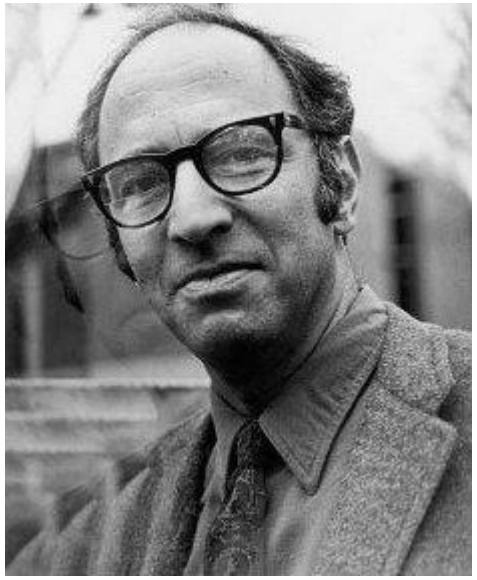
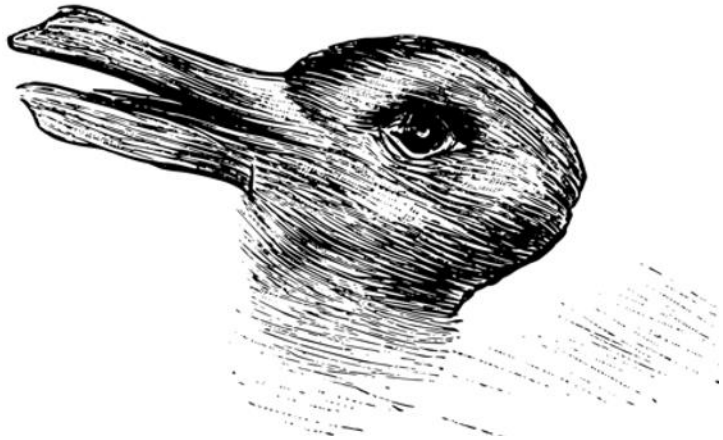
Thomas Kuhn





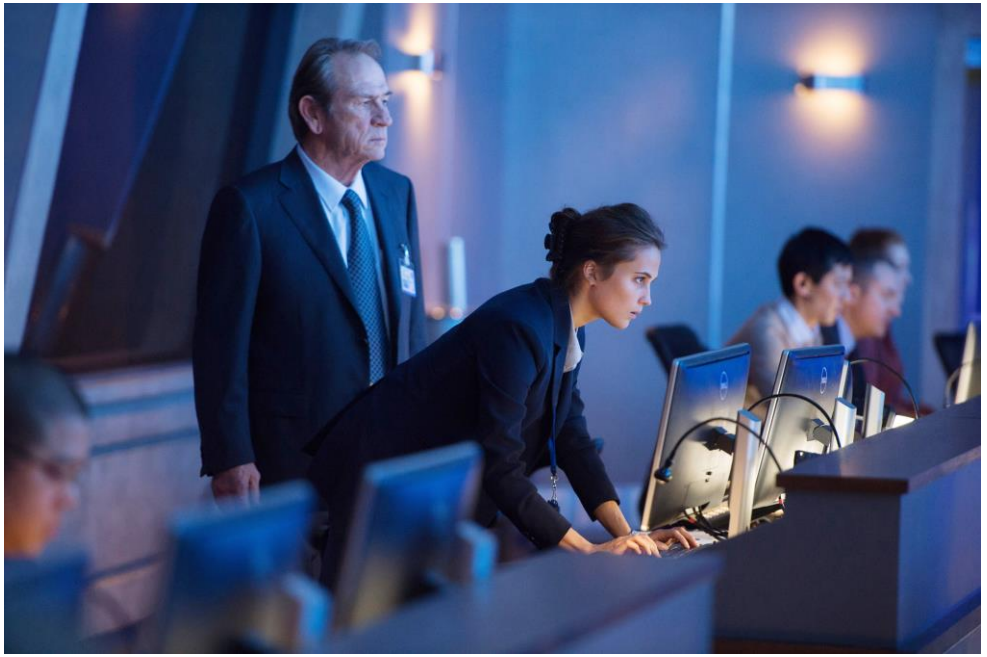
Inductive Inference and Paradigms

What are the *assumptions*?

Knowledge of things unobserved

- How can you know about things that you haven't seen? (or heard, smelled, etc.)

Inference!



What is “inference”?

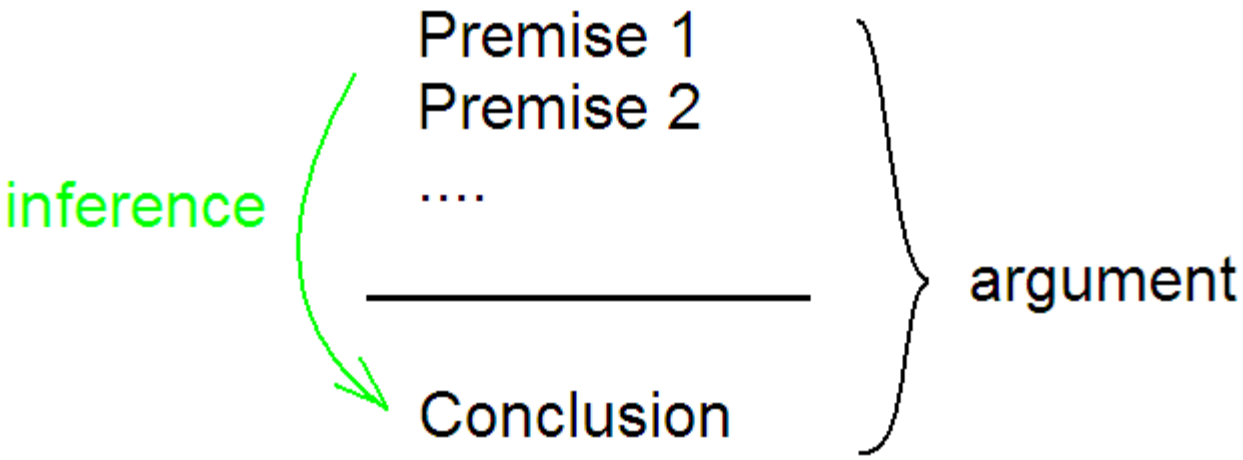
- The process of forming a belief (conclusion), on the basis of evidence (or data, or premises) is called an *inference*.

- Some inferences are (inductively) *strong*, and others are *weak*.
  - A strong inference is one where the evidence at least makes the conclusion highly *probable*.

	***Given* these …**	**… *infer* these?)**
(i)	Janet is a famous rock climber	Janet is a mother
(ii)	X = 7	X > 4
(iii)	Fred is at least 21 years old	Fred is at least 22 years old.
(iv)	All swans are white	At least some swans are white
(v)	Smith is a banker	Wilson is a journalist
(vi)	Smith is an Albertan	Smith is an Albertan farmer
(vii)	Smith robbed a bank five years ago	Smith has been to jail

Argument

- The premises of an inference, together with the conclusion, are called an *argument*.



Argument

- Arguments may also be good or bad, strong or weak, but in *two* ways.

- A good argument has:
    1. *Plausible* premises
    2. *Strong support* of the conclusion by the premises

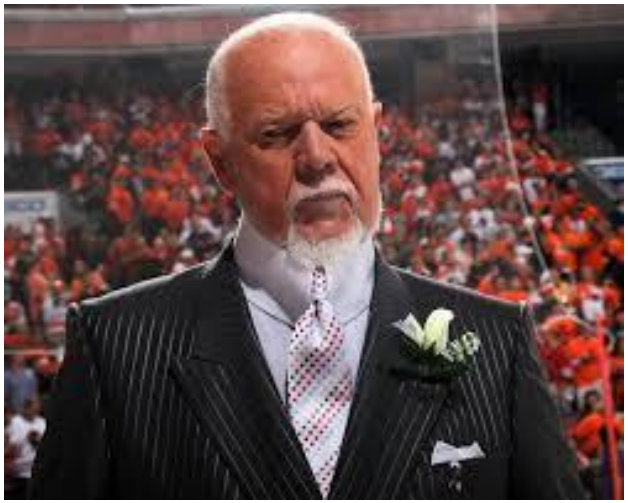
“Deductively Valid”

- The conclusion of a deductively valid argument is *certain*, given the premises.
  - Such an argument is often just called “valid”.

E.g. All Canadians are polite

Don Cherry is Canadian

∴ Don Cherry is polite



Good or Bad Argument?

All fish have gills

Tadpoles have gills

∴ Tadpoles are fish

Bad. (The premises only weakly support the conclusion.)

Good or Bad Argument?

All fish are aquatic animals

Dolphins are aquatic animals

∴ Dolphins are fish

Bad. (The premises only weakly support the conclusion. The premises are true.)

Good or Bad Argument?

No mammal lays eggs

Platypuses lay eggs

∴ Platypuses are not mammals

Valid, but P1 is false

Platypus

From Wikipedia, the free encyclopedia

The **platypus** (*Ornithorhynchus anatinus*) is a semi-aquatic mammal endemic to eastern Australia, including Tasmania. Together with the four species of echidna, it is one of the five extant species of monotremes, the only mammals that lay eggs instead of giving birth to live young. It is the sole living representative of its family (Ornithorhynchidae) and genus

Good or Bad Argument?

Chris is an avid fly-fisher

Chris enjoys hunting black bears and caribou

Chris drives a large, rugged pickup truck

∴ Chris is not a vegetarian

Strong inference, but not conclusive.

Inductive Inference

- The basic format is:

  Evidence (data, premises)

  ∴ Hypothesis (conclusion)

Inductive Inference

- When we say an inference is *inductive*, we mean that **the conclusion isn't guaranteed**, or certain, even if all the premises are true.
- It would be possible to have premises that are all true, and a false conclusion.
  - I.e. the data may be entirely correct, and yet the hypothesis is wrong.

- E.g. Harry Potter had good evidence that Snape was evil.
- (Snape apparently murdered Dumbledore, and he was once a Death Eater, among other things.)

- Here's Potter's argument in standard form:

  Snape killed Dumbledore

  Snape used to be a Death Eater

  Snape hates me (etc.)

  ∴ Snape is a servant of Voldemort

- But it turned out that Snape was a double agent.
  - Snape's killing of Dumbledore was part of Dumbledore's master plan to defeat Voldemort!

- The premises are all true, and give strong support to the conclusion, but the conclusion is false.

“Inductively Strong”

- An inductively strong argument is one whose conclusion is *probable*, given the premises.
  - Someone who believes the premises (with certainty) ought to believe the conclusion to a high degree (though perhaps not with certainty).

Examples

Eric has been convicted of 4 separate murders

$\therefore$ Eric has killed someone.

Very strong, but not quite valid. (Eric might have powerful enemies, who framed him. Or he might be very unlucky.)

Examples

Rob is a member of Canada's armed forces

∴ Rob has shot and killed someone.

Weak. Most people in Canada's armed forces haven't killed anyone.

Kim is good at presenting arguments, so she's a lawyer.

Fairly weak. Even though lawyers are good at presenting arguments, so are a lot of other people.

Background knowledge

E.g. Michael Gershon, Columbia University, talking about Wakefield's hypothesis that the MMR vaccine causes autism.

"From the point of view of the physiology of the bowel, blood circulation and the brain, **this theory of the link between MMR and autism is implausible**. For the theory to be correct a series of miracles would have to occur. …

… The liver would have to forget to function as a filter. It normally removes foreign molecules from the blood. Autistic patients, however, are not jaundiced so there's no reason to suspect liver failure. The blood-brain barrier, which is impermeable to large molecules, would have to part, like the Red Sea did for Moses and the Israelites, to let toxins from the bowel into the brain. Once there they'd have to do something to the human brain that they've never even been demonstrated to do in animals."

4. Jim offers the following argument that wearing a bike helmet reduces the likelihood of a fatal accident.

"In this city, we have found that 40% of cyclists wear helmets while riding their bikes. But, in all cases where cyclists have been killed while riding, only 10% of them were wearing helmets at the time. So, clearly, wearing a helmet while riding a bike significantly reduces the chance of being killed."

In evaluating the inductive strength of this argument, it is useful to imagine other hypotheses that would explain the same data. What are (one or two) alternative explanations of this evidence?

- *In assessing which of these explanations is the best, what background ideas come into play?*

Which explanation?

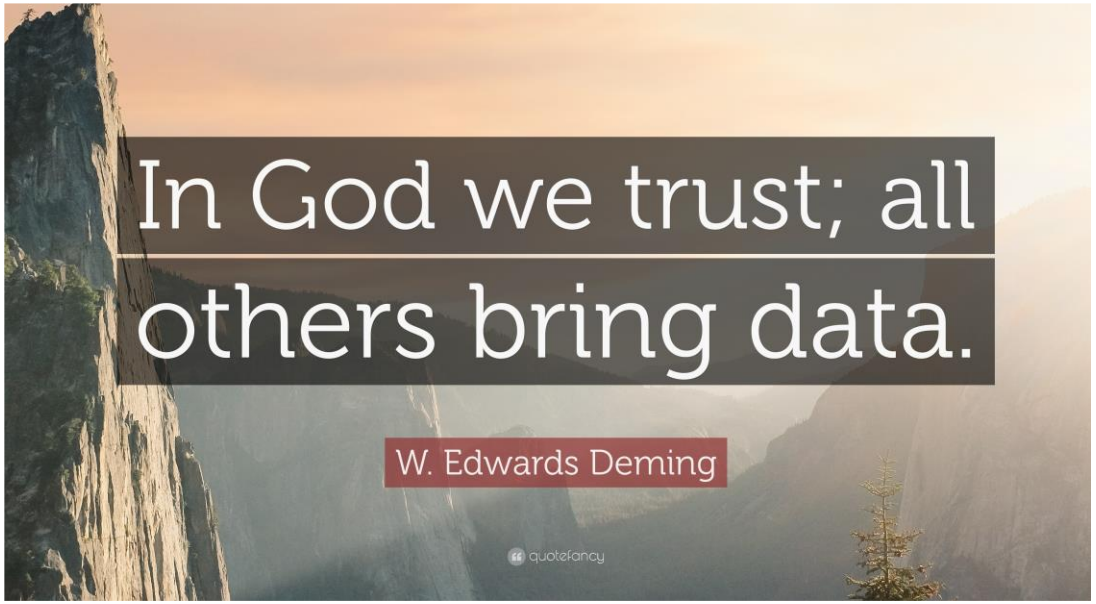
- Basically, the data here are that people who wear bike helmets less often get head injuries while cycling.
  - **Original conclusion**: Helmets reduce the chance of head injury (presumably by providing a soft cushion between the head and hard surfaces).
  - **Alternative conclusion**: Cyclists who ride more safely are also more likely to wear helmets.
- Which of these is more likely? How can we decide?

How can we decide?

- We can try to get *more data*.
  - For example, if we find that helmeted cyclists also get less *non-head* injuries (chest, shoulder, back injuries, etc.) then the 2nd explanation is more likely.
- If no more data is available, we just have to use our *background knowledge* to decide which is more likely.

Critical thinking → empiricism

Sign displayed in pubs



Who's the thief?

At a certain bank, money has often gone missing, and the branch manager suspects that one of her employees is stealing it. She compiles the following table, showing which of her five employees were at work each day, and the amount of money that went missing that day.

	March 4	5	6	7	8	11	12
Jan	✓		✓	✓		✓	✓
Mike		✓	✓	✓	✓	✓	
Hazel	✓	✓		✓	✓		✓
Curtis	✓	✓		✓	✓	✓	
Dan	✓		✓		✓	✓	✓
	$210	$0	$0	$90	$130	$0	$75

- It looks like Hazel, since she's the only person who was present on every day when money went missing. (On March 5 Hazel didn't steal, for some unknown reason.)
  - But here we're *assuming* that there's just one thief. What if two (or more) people are working together? Any other hypotheses?

“Paradigm” = framework of assumptions

- If we assume that there are *two* thieves, then a decent hypothesis is that Jan and Dan are working together, and (rather cleverly) trying to make it look as if Hazel is the thief!
  - In other words, the ‘right’ conclusion to infer from the data depends on the background assumptions.
  - In general, a scientific hypothesis is grounded upon some framework of assumptions, or *paradigm*.

Inductive Inference

- Hence inductive inference might be represented as follows:

Empirical evidence/data

Paradigm

∴ Hypothesis

What is a paradigm?

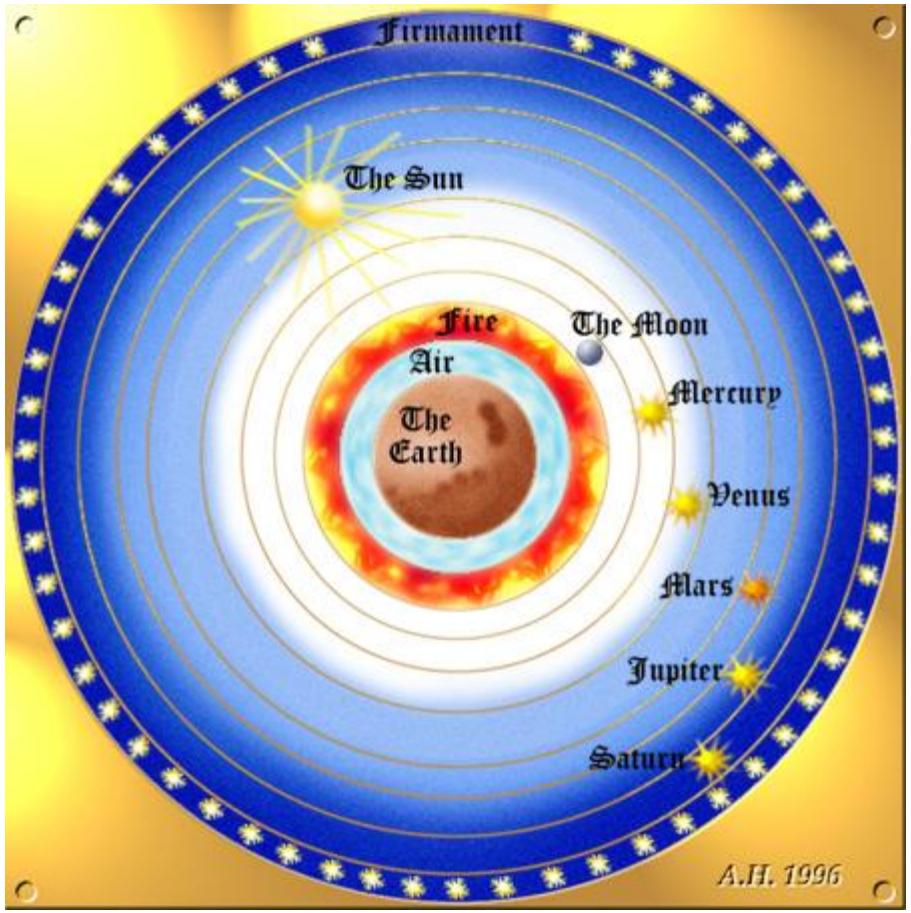
- The term is used rather loosely, with a variety of meanings (even by Kuhn himself). The following give the basic idea. A paradigm provides:

  -- a *framework* within which specific hypotheses can be constructed.

  -- a *basic picture* of the thing being investigated

  -- a *set of methods and tools* for the investigation

E.g. Aristotelian vs. Copernican paradigms



- Researchers in a scientific field don’t start from scratch. They inherit a basic picture from earlier scholars.

- They may tinker with this basic picture, but very rarely discard it altogether.

Paradigm for mainstream news

- Western governments regulate and have power over corporations.
- Western governments are generally benign, even benevolent, in their dealings overseas. The harm they do is rare, accidental, etc.
- Western countries are democracies, accountable to the people. Other places, like Latin America, the Middle East, etc. are less democratic.
- Western political leaders have real power and are able to do what they think is necessary.

Paradigm for (some) alternative news

- Western political leaders (e.g. the US President) have little real power, being so constrained (e.g. by the military-industrial complex) as to be little better than puppets.
- Western governments, or their corporate masters, routinely interfere in other countries' affairs, organising coups, assassinating leaders, staging "false flag" terrorist attacks.
- Western countries aren't really very democratic. It's an illusion. The real power is in the hands of an unelected, hidden network of people and groups, referred to as the 'deep state', that operates the elected government as a front.
- The mainstream (corporate) media does not report what is really going on, because it is controlled by the deep state. (And most 'alternative' media as well!)

E.g.

We're Living In A Neofeudal Bubble

BY TYLER DURDEN

WEDNESDAY, SEP 06, 2023 - 01:20 PM

Authored by Charles Hugh Smith via OfTwoMinds blog,

If you want to understand the neofeudal reality, study these charts.

Outside the bubble of wealthy, protected elites that generate the statistics and the "news," the global economy is completely, totally neofeudal--and so is the American economy. What does neofeudal mean? It refers to a two-tiered socio-economic system in which an aristocracy owns the vast majority of the wealth and collects the lion's share of the income, and uses this financial dominance to buy political and narrative dominance.

Paradigms concerning racism

- Critical Race Theory:
  - Racism is present everywhere and always
  - Racism persistently works against people of color, and for the benefit of white people.
  - Racism is invisible to white people (this is part of their white privilege) unless they're trained in critical race theory.
  - People of colour see racism clearly, because they experience it on a daily basis.
  - Racism is "systemic" in the sense that it is part of all white people's subconscious language and thought to see themselves as superior to people of colour.

Liberal paradigm for racism

- Racism used to be very bad in the USA, but is much improved today (not eliminated). The USA is now one of the *least* racist countries in the world.
  - Slavery was abolished in the USA in 1865.
  - Racist pseudoscience has been repudiated
  - Jim Crow laws repealed.
  - KKK, white supremacists get very little public support
  - Public racism is socially unacceptable, though a few individuals are still privately racist
  - Many high-ranking public figures are black (a president, mayors, police chiefs, actors, musicians, sports heroes)

Paradigms affect inferences

- For liberals, racism is rare and exceptional, so they judge an incident to be racist only if there's specific evidence for it.
- For critical race theorists, since all white people are racist, the only question is 'How did racism manifest in that situation?'
- This affects judgements about:
  - Was the killing of George Floyd racist?
  - Is segregation of black students on campus (e.g. dorms, graduation ceremonies) a good idea?
  - Is racism responsible for the income and education gaps between white and black people? (Etc.)

Kuhn's 'gestalt shift' metaphor

e.g. the duck-rabbit

(For the short story, see "Duck-Rabbit parable" in the Readings page on my iweb site.)

- A grad student (Alice) is taught to see this aspect of the world as *Duck*.
- Within the Duck paradigm, the “posterior cranial indentation” (PCI) is an irrelevant detail, of no scientific interest.
- Alice finds anomalies:
  - Bill is too soft, and has hair on it.
  - Enamel is found in tissue samples drawn from PCI
- Alice undergoes a radical conceptual shift, and now sees Rabbit rather than Duck. (PCI = mouth, bill = ears)

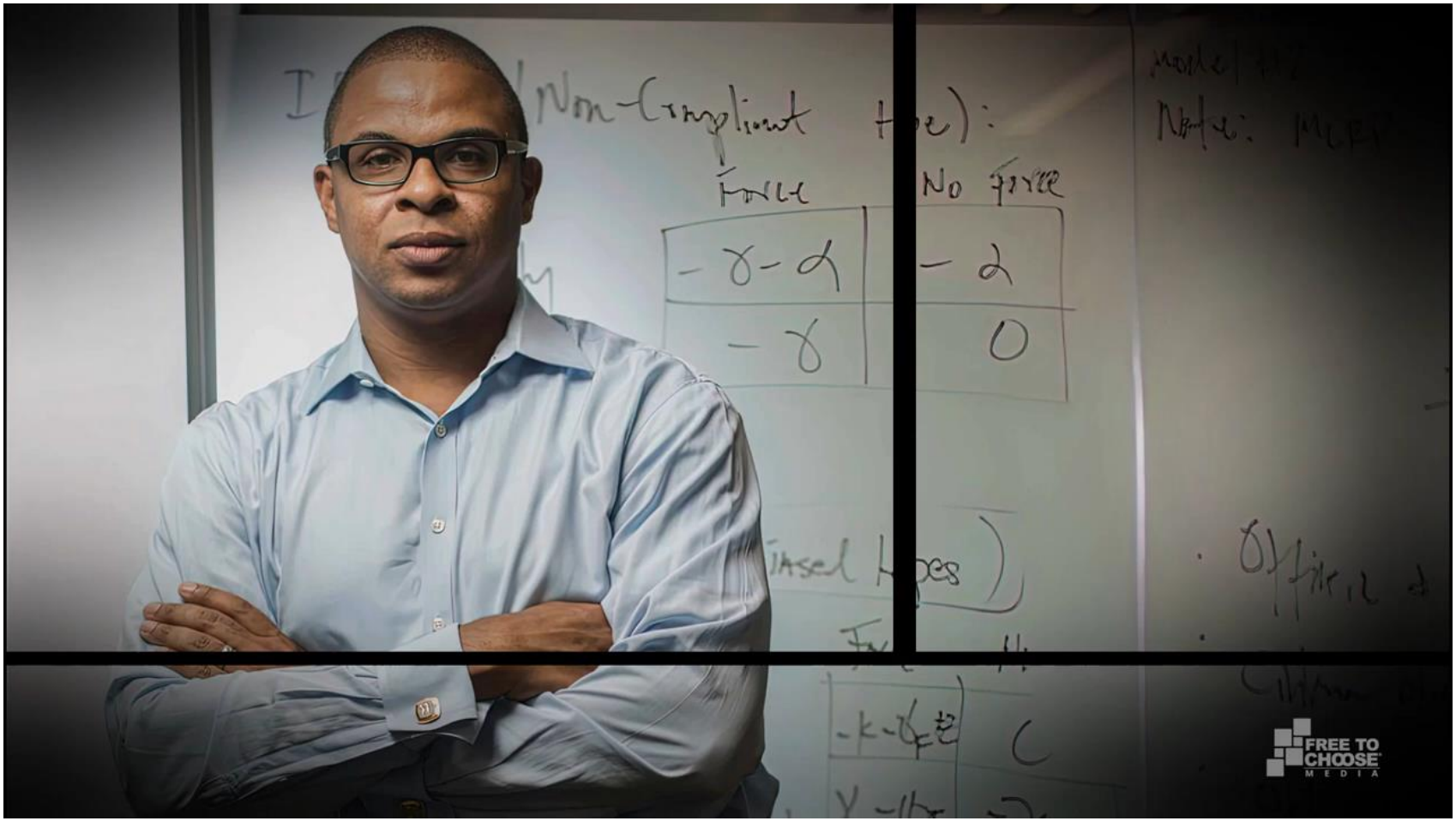
“Irrelevant Details”

- Notice how, on the Duck paradigm, the PCI was an irrelevant detail. Asking “What is the PCI for?” is a mistake. It’s a bad question.

- It’s a common situation that some fact will be crucial according to one paradigm, but irrelevant (and so ignored) in another paradigm.

- E.g. pioneering medical researcher Esther M. Sternberg on her choice of research topic while at graduate school. ‘That field was disparaged … The chair of my department said, “Esther **you’re going to ruin your career** by doing this”.’

Roland Fryer



“You’re going to ruin your career”