

The background of the slide is a composite image. The upper portion shows a deep space view of the Milky Way galaxy, with its characteristic band of stars and interstellar dust stretching across the frame. The lower portion features a close-up, low-angle shot of a rugged, reddish-brown rock formation, possibly a sea stack or cliff edge, silhouetted against the starry sky. The overall mood is contemplative and expansive.

# Does Your Company POUND or FLEX?

## Critical Thinking About Work

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SeaSPIN

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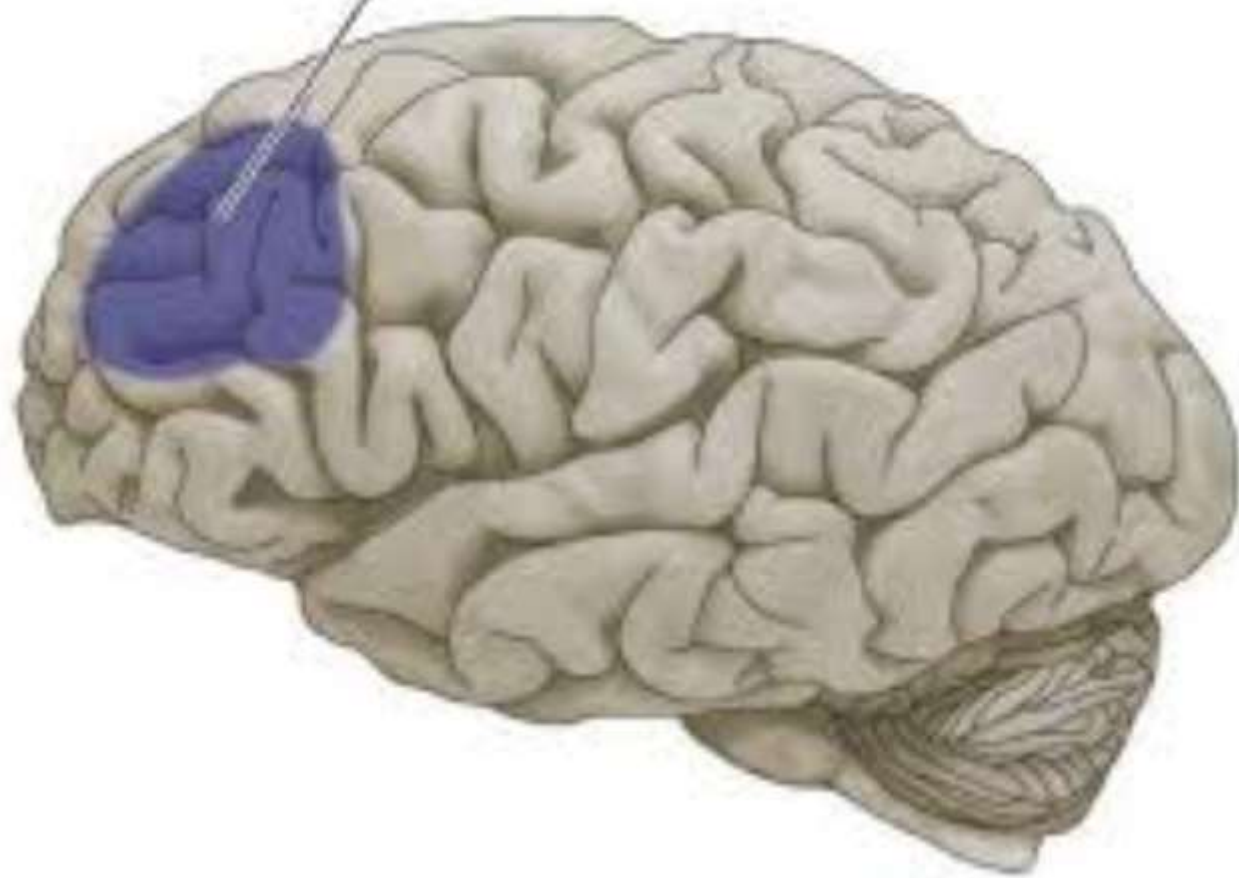
# What we'll cover

- Major brain function for paying attention
- A theory of critical thinking and supporting evidence
- Workplace opportunities (The dark side of Agile??)
- Complications: Human nature drives bureaucracy
- POUND vs. FLEX companies





Dorsolateral prefrontal  
cortex





# Prefrontal Cortex Metaphor



## Dlpfc “lightsaber” Is

- Our deep but flighty tool needed for critical thought
- Necessary but not sufficient for critical thinking

## Does

- Pay attention
- Decide (with help)

## We can't

- *Can't multi-task with it*

## We can

- Do motor cortex tasks while using it (exercise, iron, garden)

# Pre-frontal cortex can follow **or** question

I can...

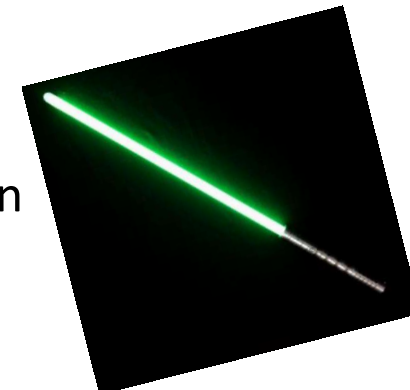
- Write code
- **Or** answer emails
- **Or** lead, follow in a meeting
- Follow any process

**But can't at the same time...**

- Question the need for the report
- Wonder whether there's another process that would be better...
- That's where critical thinking begins!

- Slow Thinking  
Daniel Kahneman

**OR**



# Remember long-term: lightsaber and scales

- **Necessary brain function** for critical thinking works like a lightsaber- but used for other things too
- **Critical thinking** at its most basic works like a scale





# Questions

How much time do you spend per day following the usual procedures (code, mail, meetings, reports)?

How much time you spend wondering whether those procedures could be different (e.g., shorter/longer/eliminated) or anything else that might save time and make people happier?

How free do you feel to propose any changes?

# Pat's Meetings

- 1.5 hours per week
- Team is not happy
- Pat thinks the meetings are worthwhile
- What could Pat and the team do about this?
- Why, critical thinking





# Critical Thinking: COMPARE by WEIGHING

- Daily life and in growth of knowledge through history
  - Should we do something instead of meeting every week for 1.5 hours?
  - Is the theory that cells self-destruct better (truer) than the theory that cells just wear out and die?
  - Should I buy an Android or iPhone?
  - Are humans intellectually equal or are some people smarter than others?
- **Compare by weighing evidence**



# How Critical Thinking Drives Knowledge

Someone gets a new idea. Others jump in and add to evidence, compare, weigh evidence

- Newton vs. Impetus Theory
- Darwin vs. Ideal Types
  - Genetics and Immunology
- J.S. Mill vs. Intellectual Inequality
  - Marie Curie, Barbara McClintock
- Behavioral Economics vs. Rational View
  - Richard Thaler
- Agile vs. Waterfall
  
- Auto safety and seatbelts?
- Exercise a good thing or not?
- Best type of diet?
- Quantum computing
- Drugs for some psychiatric issues
- Best time of day to do something





# Some possibilities with Pat's meetings

## Experimental Group

- This group does something you think could help, e.g.
  - **Meet bi-weekly OR**
  - **Don't meet, but send email update**
- Collect evidence, e.g.,
  - Team productivity (need to define)
  - Awareness of important information
  - Team morale
  - Manager satisfaction



## Control Group

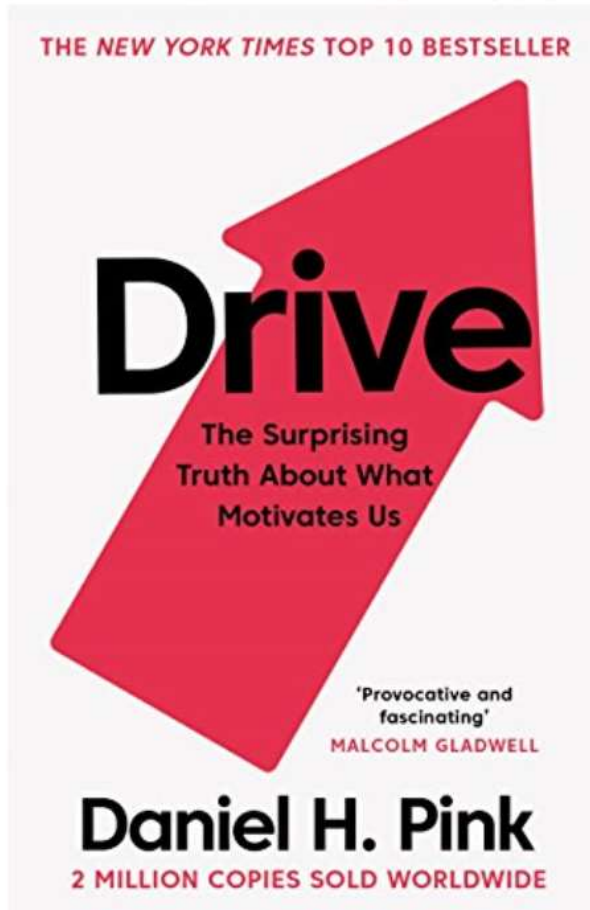
- Does the same thing it did before
- Continue to meet 1.5 hr/week
- Collect evidence, e.g.,
  - Team productivity (need to define)
  - Awareness of important information
  - Team morale
  - Manager satisfaction

# Isn't that more work??





# Humans crave autonomy



## Critical thinking is disciplined autonomy

- You get to seek the answer
- But the answer may not be what you want
- Data-driven decision-making

Is the “dark side” of Agile (still) a thing?



# What about testing flavors of Agile?





# What about testing within Agile?

No? They wouldn't allow it?

# Experiment with(in) Agile

## Experiment

- Independent variable is  
\_\_\_\_\_
- Collect evidence, e.g.,
  - Team productivity (need to define)
  - Quality
  - Team morale
  - Manager satisfaction

## Control

- Does the same thing it did before
- Collect evidence, e.g.,
  - Team productivity (need to define)
  - Quality
  - Team morale
  - Manager satisfaction

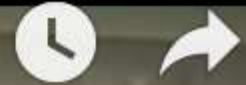
# Why so little critical thinking at work?

- Pinned-down dlpc
- Don't realize we can (if it's allowed)
- Human nature





## selective attention test

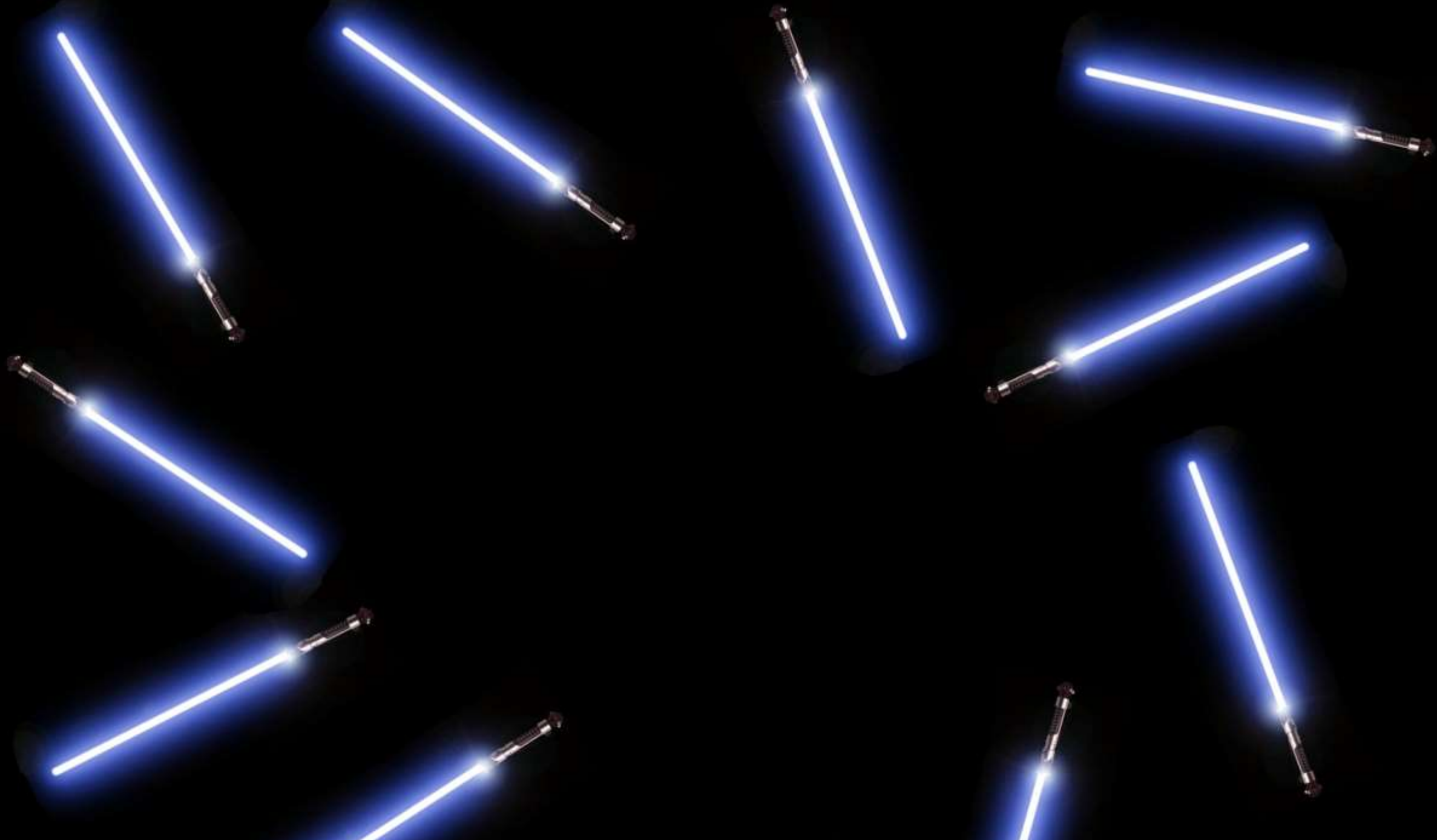


# A gorilla walks through the group!



- About 50% do not notice the gorilla!
- Much repeated test
- You can try it too
- <http://theinvisiblegorilla.com>





We can miss what's hiding in plain sight



# Other Human Nature Bits

# Five other barriers

## 1. Emotion run amok

- “Nothing hath an uglier look to us than reasons, when they are not on our side.”



## 2. Tribalism

- We-they instinct in all humans
- Transcend by critical thinking



## 3. Lack of time to think critically, habit

- Transcend by carving out time



## 4. Pecking Order

- Status, power and perspective-taking
- Transcend by giving status for critical thinking, not rank



## 5. Misunderstanding about gaining knowledge, innovating



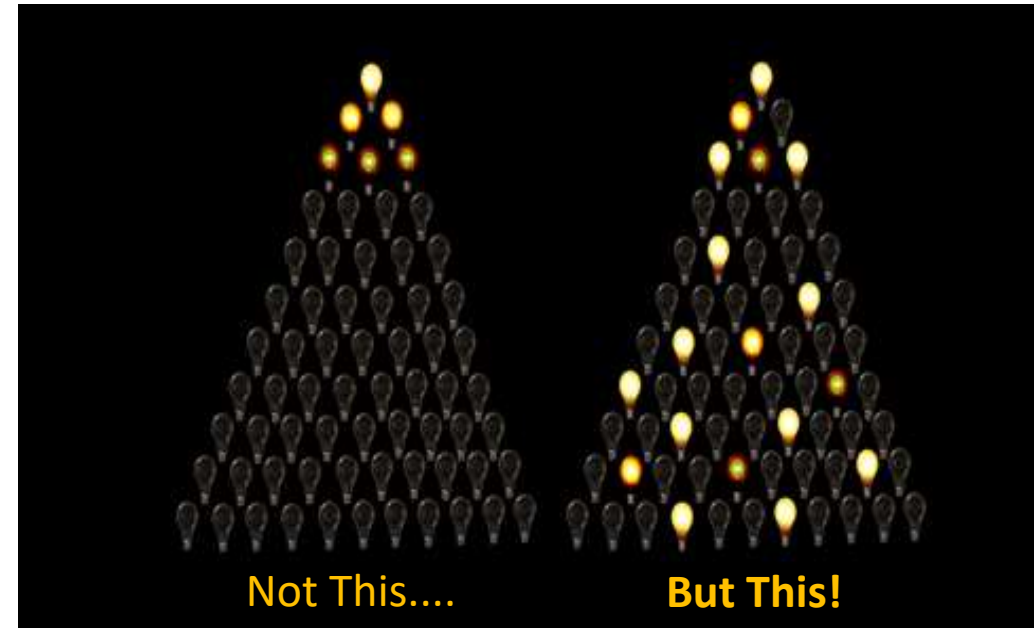
# The political is often in tension with the empirical



Empirical = What we've been talking about- creating alternatives and weighing evidence

# Ways to address the barriers

- Create an environment that promotes ideas and evidence-gathering from everybody
- Do critical thinking and pilot testing on internal barriers
- Expect unusual/unpopular ideas
- What can make or save money while making people happier?



# Exploring nature vs. human-made things

- Nature: We ask “What is true (truer, compared to....)”
- Human-made: We ask “What is more beautiful, useful, and/or fun?”

Every thing made by a human is an implicit theory of the beautiful, the useful, and/or the fun

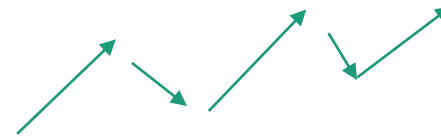
Use critical thinking to weigh in on both

# Three views about knowledge

- **Progressivist**

- The view that truth is real, and we're on a never-ending journey towards it
- **Critical thinking enabled**

## Progressivism

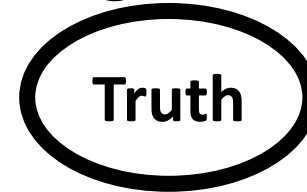


Truth

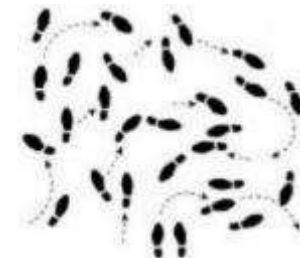
- **Dogmatic**

- The belief that one has already arrived at the truth; any alternative view must be false

## Dogmatism



## Relativism



~~Truth~~

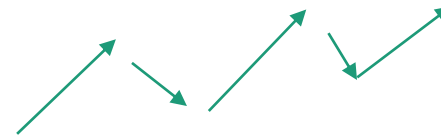


# How these knowledge views play out at work

- **Progressivist**

- “What if we tried a different way to build software to see if it’s better?”
- **Critical thinking enabled**

**Progressivism**

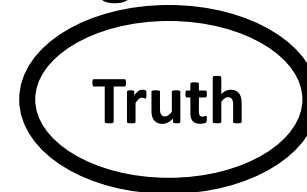


**Truth**

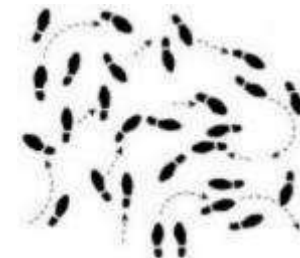
- **Dogmatic**

- “This is how we do it . Don’t waste your time thinking about how to do it differently.”

**Dogmatism**



**Relativism**



**Truth**

# Can you recollect

Is there a comment you heard at work that represented one of these approaches to knowledge?

Dogmatic (must be done this way)

Relativism (it always changes, so can't ever know)

Progressivism (let's try to do something different and see what happens)

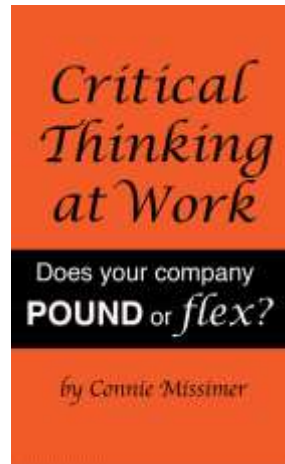
# POUND vs. FLEX Organizations

## POUND

- **P**rocess-heavy
- **O**versight heavy
- **U**nderused employees
- **N**egativity
- **D**ogmatism

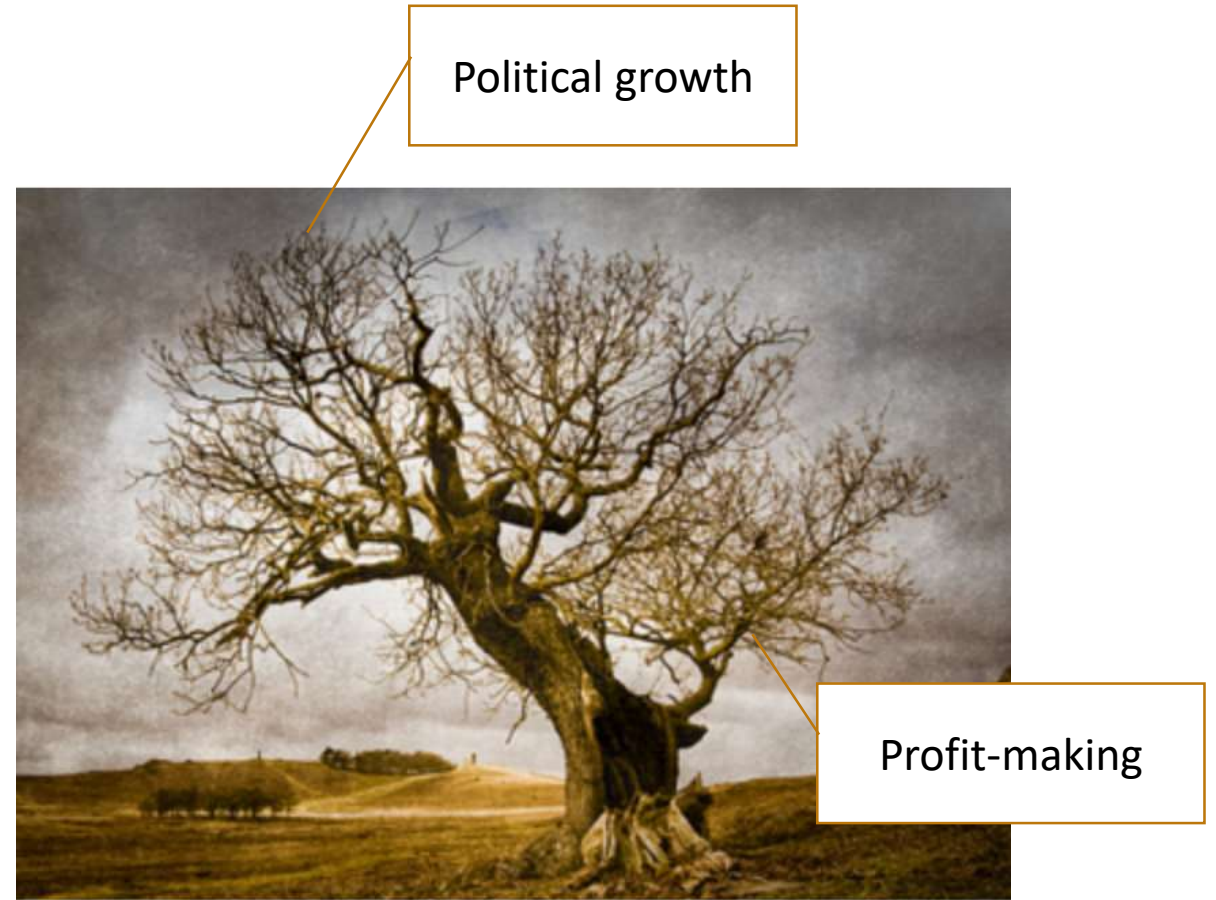
## FLEX

- **F**luid
- **L**oyal opposition expected/needed
- **E**xperimental



# A Brief Theory of Bureaucracy

- A new company revs up
- A few people do everything
- New people hired
- Put new processes/features to be noticed, promoted
- Over time, a two-page document becomes 300 pages
- Unused features → complexity
- But these processes burnish resumes



Bureaucracy is the detritus of habit  
encrusted by unthinking authority



How could critical thinking lessen  
(or even dissolve) bureaucracy?

# Laura, harried director



- As company grew, Laura took on more responsibilities
- If something goes wrong with billing, for instance, if payments are late, vendors contact her to sort out the problem and get paid.
- She is so busy, she just puts out the fires.

# Applying Critical Thinking to Daily Business— Sara's Process

- Team reviews a range of software products and logs any issues
- New employee wants to impress management
- Logs 4x defects as team did
- Team and developers unhappy
  - Defect numbers inflated?
  - Needless work downstream to fix the defects?
- But maybe Sara has done a great thing
- How would you apply critical thinking to this situation?



# Critical Thinking on Sara's Process

- Two alternatives
  - Old habit of x number of bugs
    - Used to doing about that number
    - It seemed to work well
  - New idea of 4x number of bugs
    - Assumption: More is better
    - More is more impressive
- We need evidence to decide!
- Possibilities
  - Compare sales/satisfaction rates of many-bug vs. few-bug products
- Evidence, not preconceptions or pecking order, guides decisions



# What Critical Thinking is NOT

- Not (necessarily) criticizing anything
- It's weighing, not “winning”(sophistry)
  - I am my mind in action, not my current views
- Not “perfect” thinking
- Not that hard, as you just saw!
- Many fine activities are not critical thinking
  - Reading stories
  - Games, puzzles
  - Goofing off
  - Any habitual activity
  - Coding





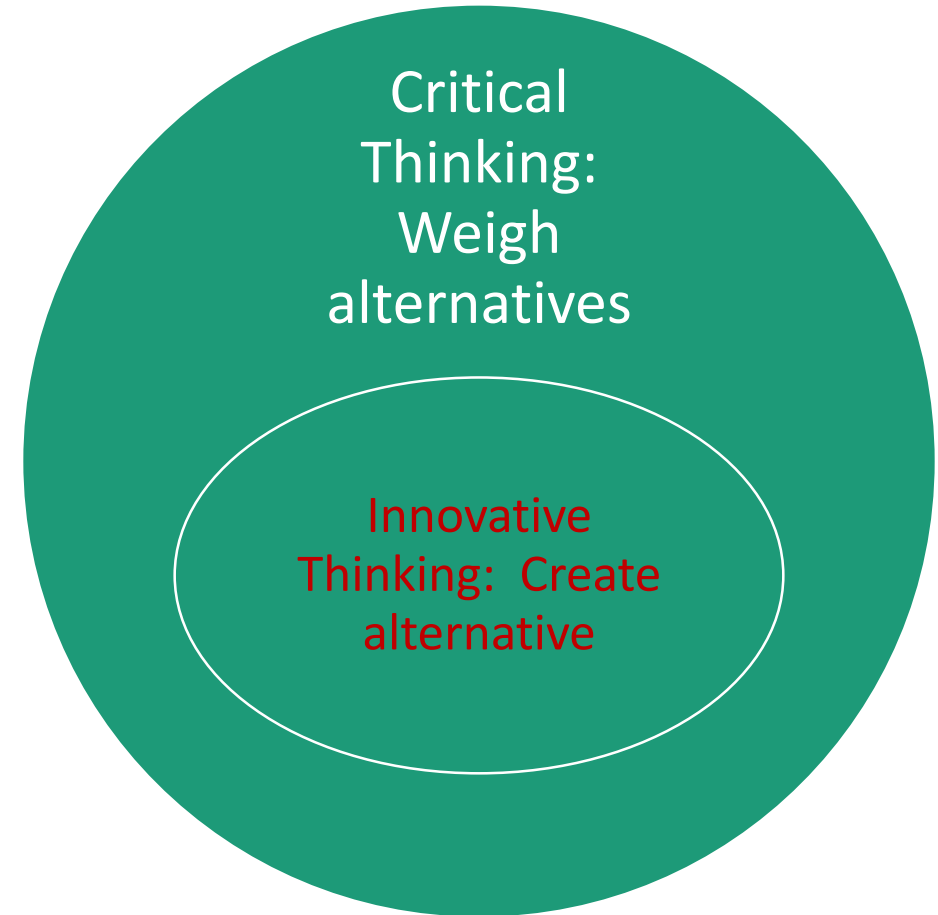
# Lies- Kryptonite killing the ability to weigh

- We trust others to tell us the *truth as best they know it*
- Weighing alternatives requires that supporting reasons are as true and complete as possible
- Truthful: “I don’t know, I’m not sure, it’s unclear”
- Fallacy: *Ad hominem* attack
- We can’t keep our thumb on the scale when weighing.



# Innovation is a special type of critical thinking

- Critical thinking = weigh alternatives in light of their evidence
- **Innovation** = “**deviant**” creation of a new theory/alternative
  - If (more) evidence can't be found, theory disappears
  - If more evidence is found, over time this can become the dominant view...
  - Unless and until a new deviant theory comes along, and people weigh it



# Think about de-stressing *the work itself*

- We assume we need to de-stress outside of work so
- We do (say) yoga
- Then work and stress out again
- Wouldn't it be better to fix the conditions creating the stress?



What were the two images you were supposed to remember?

- a) The hedgehog and the fox
- b) The Lexus and the olive tree
- c) The lightsaber and the scale
- d) The innovator and the slug
- e) None of these

# What is Critical Thinking?

- a) Comparison of alternatives in light of evidence for each
- b) Perfect thinking
- c) Thinking that must be critical of someone else's idea
- d) All of the above
- e) None of the above



# Critical thinking about your workplace overall

- Are alternative ideas encouraged, rewarded?
- Critical thinking takes time away from habitual behaviors. Is this acceptable/ encouraged?
- If not, you could encourage your company to engage in critical thinking and use evidence from this training.

# Finally, if the coast is clear, go meta!



- What assumptions/habits could you examine?”
- What alternative(s) could there be? What evidence can be had, for and against?
- How can you try a pilot test?
- Is there research supporting your idea?
- Critical thinking drives better products, more revenue, and happier employees.



A night sky photograph featuring the Milky Way galaxy stretching across the upper half of the frame. In the lower center, a dark, jagged rock formation rises, its shape reminiscent of a hand with two fingers pointing upwards towards the galaxy. The sky is filled with numerous stars, and the galaxy's core is visible as a bright, hazy band of light.

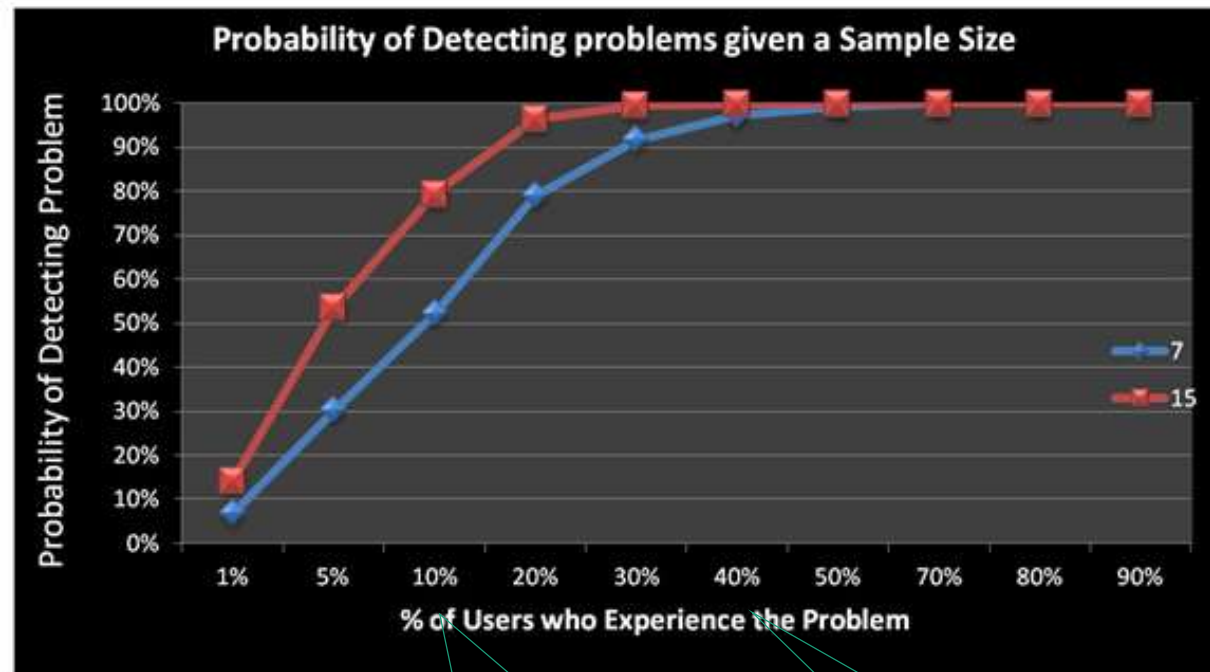
Thanks for thinking with me!

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# Why is 5+ enough? (courtesy Erin Schultz, [LaunchBox](#))



A study with  $n=15$  will be almost twice as expensive as a study with  $n=7$  (recruit, incentive, lab time, moderation and analysis increases)

If 10% of the population experiences the problem, you have a 50% chance of seeing that problem with  $n=7$  (and 80% with  $n=15$ ). **How important are problems experienced by 10% of the population?**

If 40% of the population experiences the problem, you have a 90% chance of seeing that problem with  $n=7$