

Logical Reasoning and Fallacies

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Snt

Master in Cybersecurity



What is Logical Reasoning?

Why we need logical reasoning in
Cybersecurity?

Argument

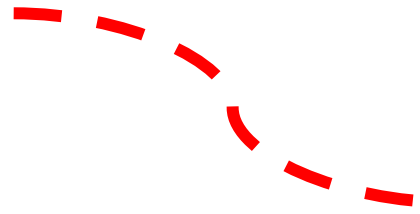
Premise

Conclusion

Step-by-Step Outline of Analysis of Competing Hypotheses

- 1. Identify the possible hypotheses to be considered. Use a group of analysts with different perspectives to brainstorm the possibilities.*
- 2. Make a list of significant evidence and arguments for and against each hypothesis.*
- 3. Prepare a matrix with hypotheses across the top and evidence down the side. Analyze the “diagnosticity” of the evidence and arguments—that is, identify which items are most helpful in judging the relative likelihood of the hypotheses.*

Arguments

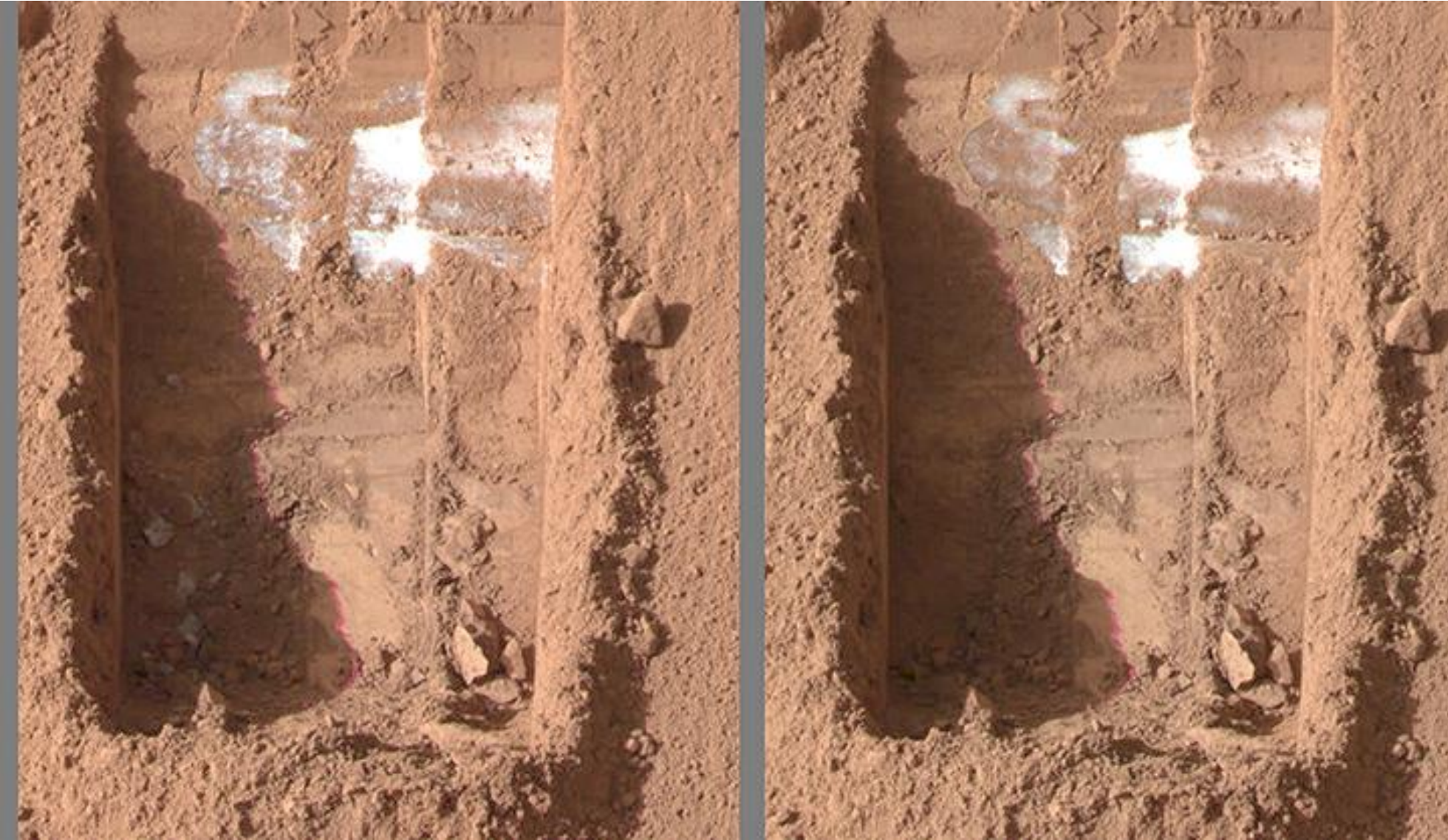


Hypotheses

Psychology — of — Intelligence Analysis

by
Richards J. Heuer, Jr.

The two photographs taken by NASA Mars rover Phoenix to show there is water in Mars



Argument from Sign

Does disappearing of crust a sign of water in Mars?

Argument from Example

How much generally phonix observation support exist of water in Mars and other planets?

Argument from Cause to Effect

Does existing crust correlated with existing water?

Argument from Expert Opinion

Is NASA a reliable source about space discoveries?

Argument From Popular Opinion

Why people thinking Mars as the second planet for humans to live?

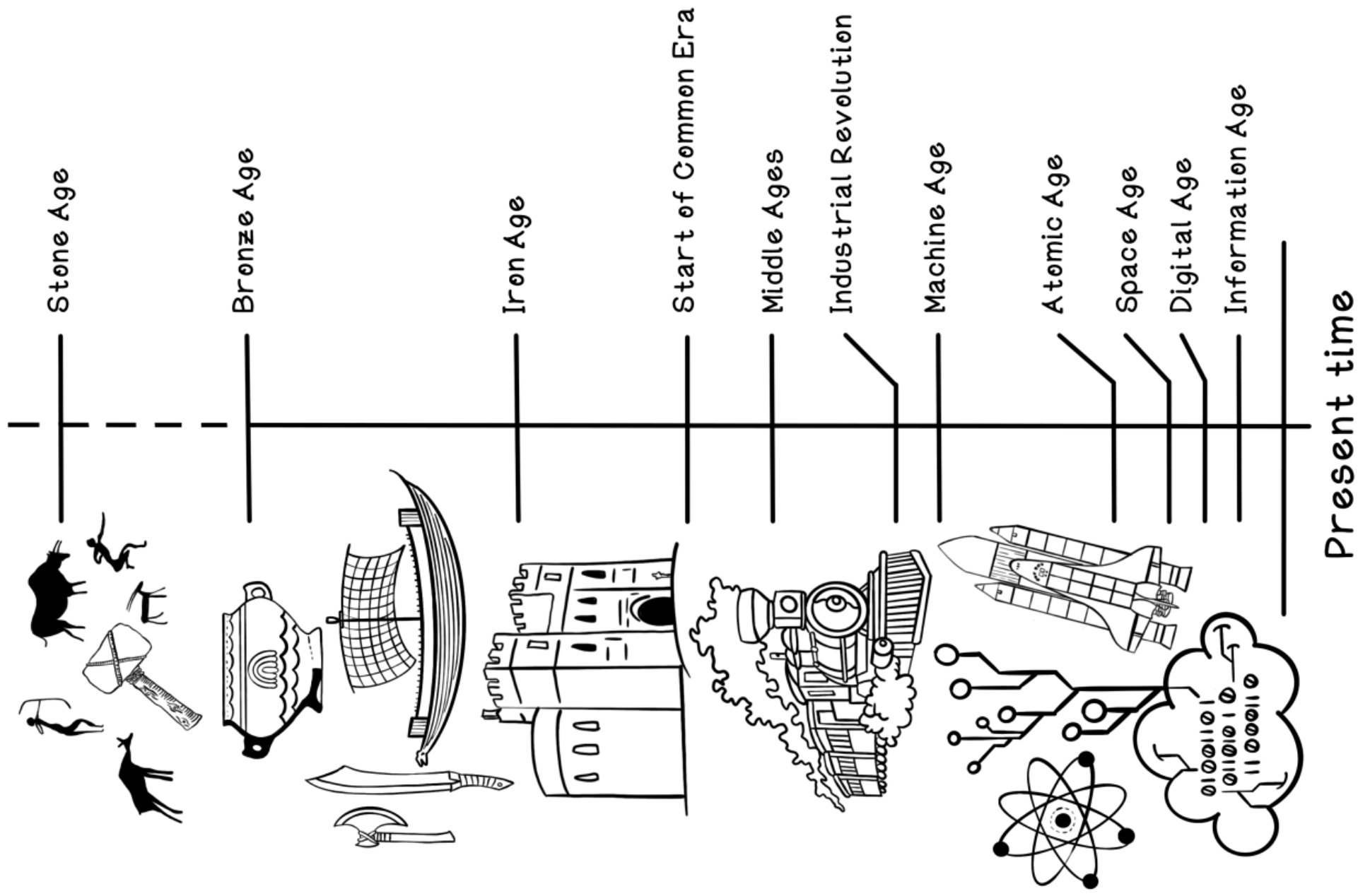
Argument from Authority

Does NASA have authority in space discovery?

Argument from Practical Reasoning

Is finding water an enough means for living in Mars?

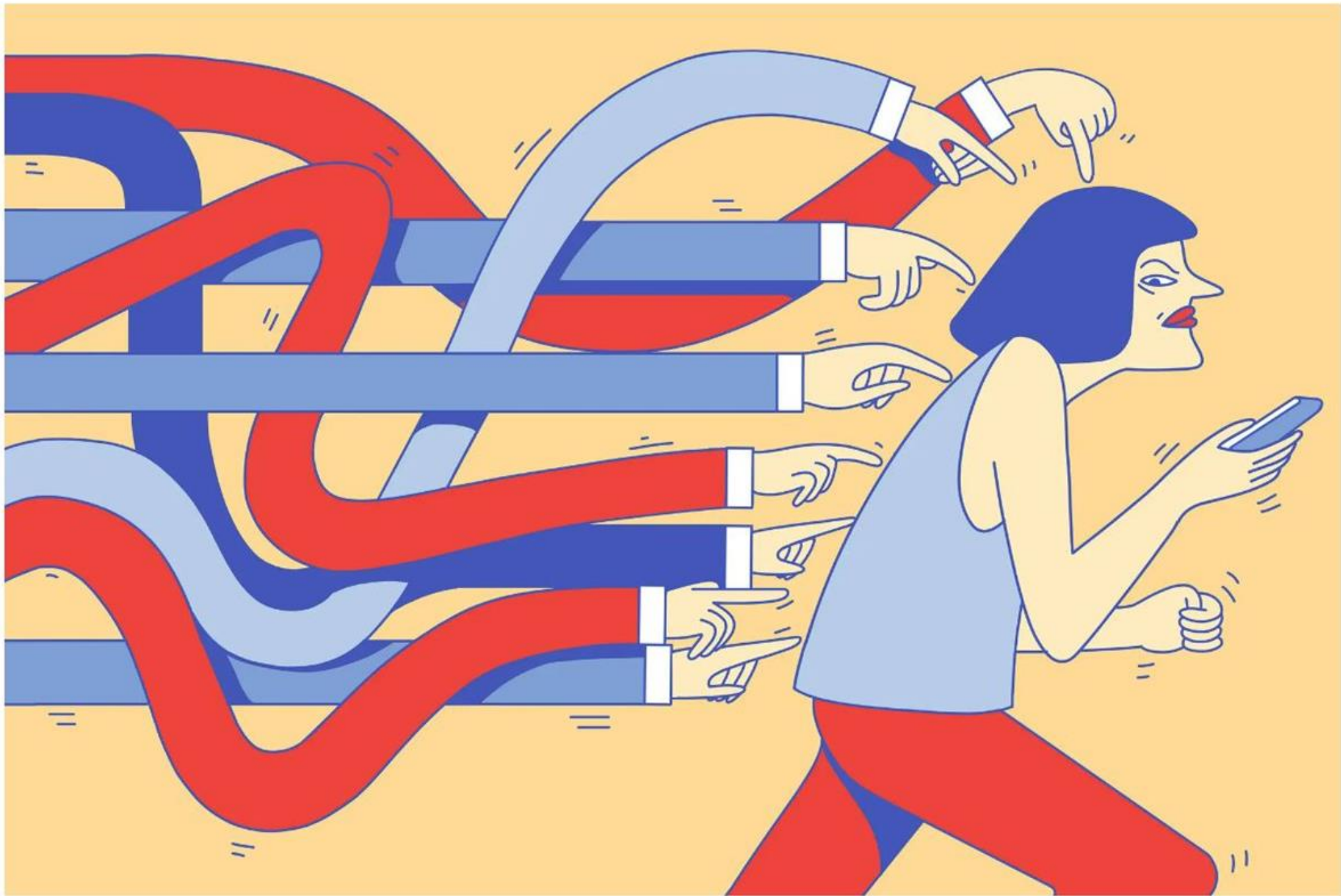
Beginning of time



Information



Argument



In argumentation theory, reasoning serves a dual purpose: it is not only a means for constructing valid arguments but also a strategic tool for launching attacks against opposing viewpoints. This perspective emphasizes that reasoning can be employed to defend one's own position while simultaneously undermining the credibility of an opponent.



Elena Xausa

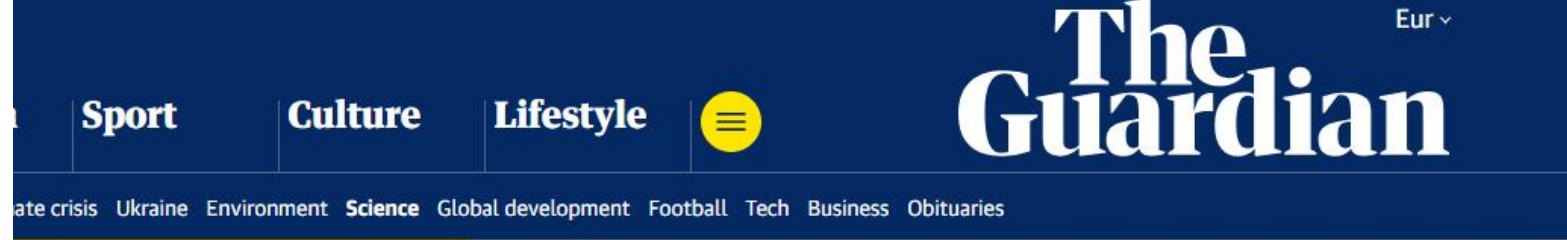
Despite the extraordinary volume of *evidence*

(including *382kg of moon rock* collected across six missions;

corroboration from Russia, Japan and China;

and *images from the Nasa* Lunar Reconnaissance Orbiter showing the tracks made by the astronauts in the moondust),

belief in the moon-hoax conspiracy has blossomed since 1969.



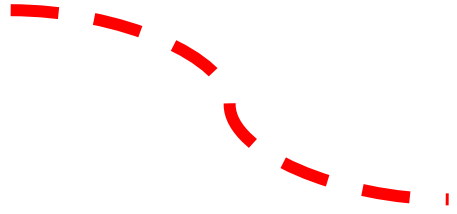
This article is more than 5 years old

One giant ... lie? Why so many people still think the moon landings were faked



Buzz Aldrin descends from the lunar module. Photograph: Allstar Picture Library

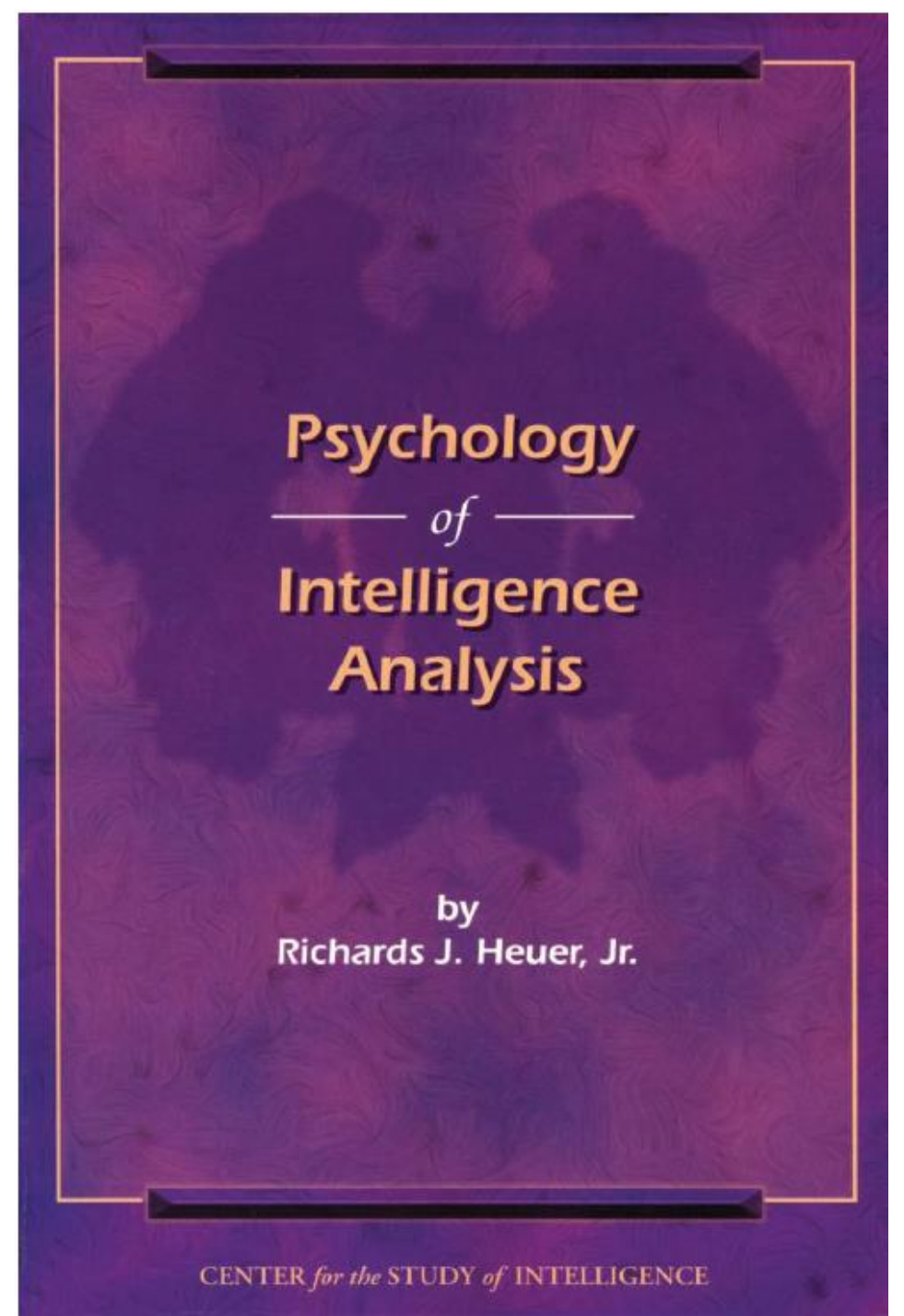
Arguments



Hypotheses

We are not "free" to make
the hypothesis (**Biases**)

We are not "free" to evaluate
our hypothesis (**Fallacies**)



Argument

Information

Logical Fallacy

Some Crucial concepts

Standpoint:

what is at issue in argumentative discourse

Argument schemes:

an abstract characterization of the way in which a reason is used to support the standpoint

Enthymemes (missing premises), e.g.

Socrates is mortal because he's human
(missing premise: all humans are mortal)

Fallacies:

contaminators of
the argumentative
discourse that can
be undetected



Argumentum ad hominem

Instead of really attacking an argument, you attack the person making (or related to) the argument



Trump on Childcare Costs:
Topic #9 of the Presidential
Debate of June 27th, 2024

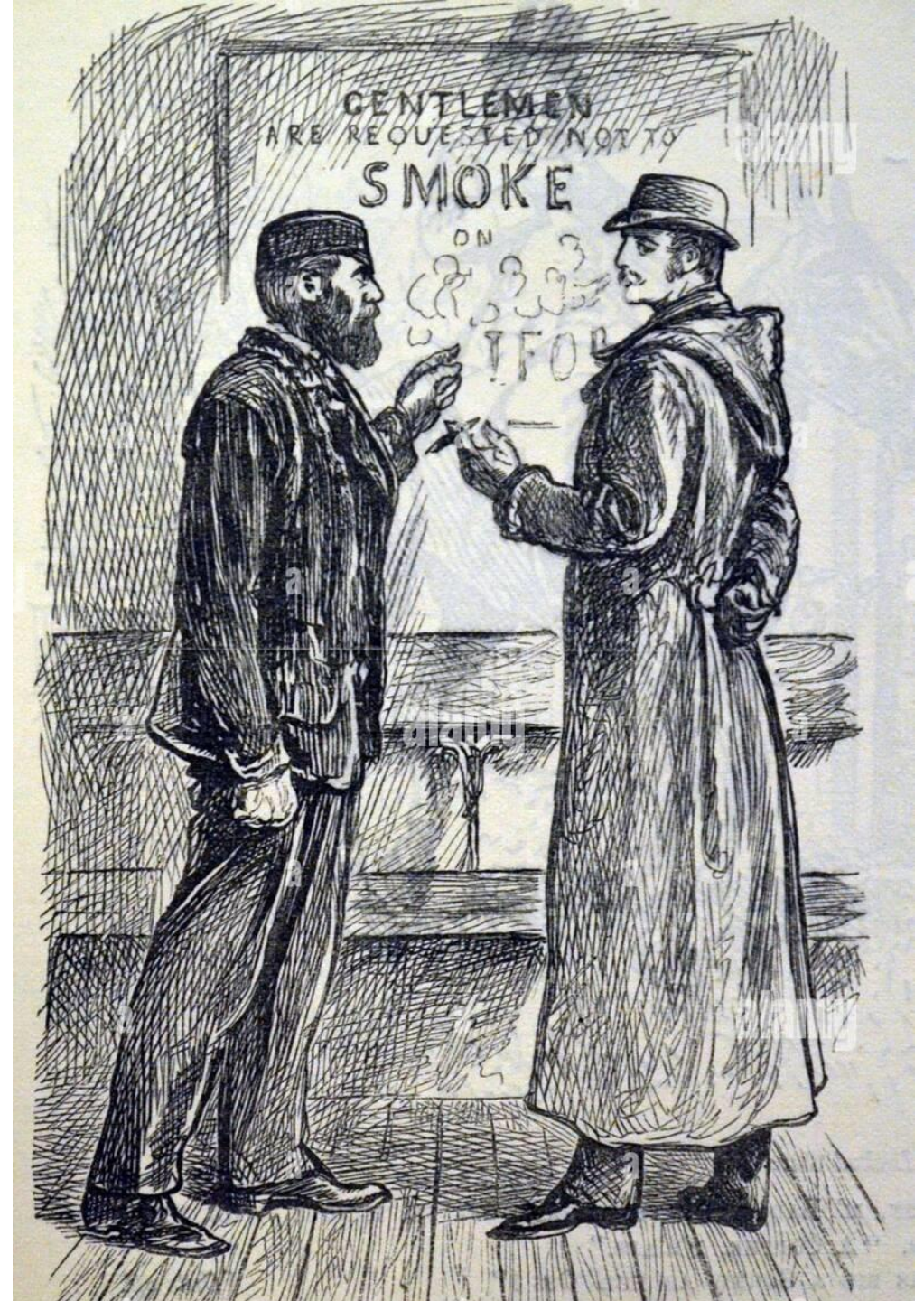


Trump:

"He is the worst president. He just said it about me because I said it. But look, he's the worst president in the history of our country."

GENTLEMEN

ARE REQUESTED
NOT TO SMOKE



Reasoning as Attacking



Implicit
Labeling:
Darcus Howe
and Joan
Rivers



Words

as

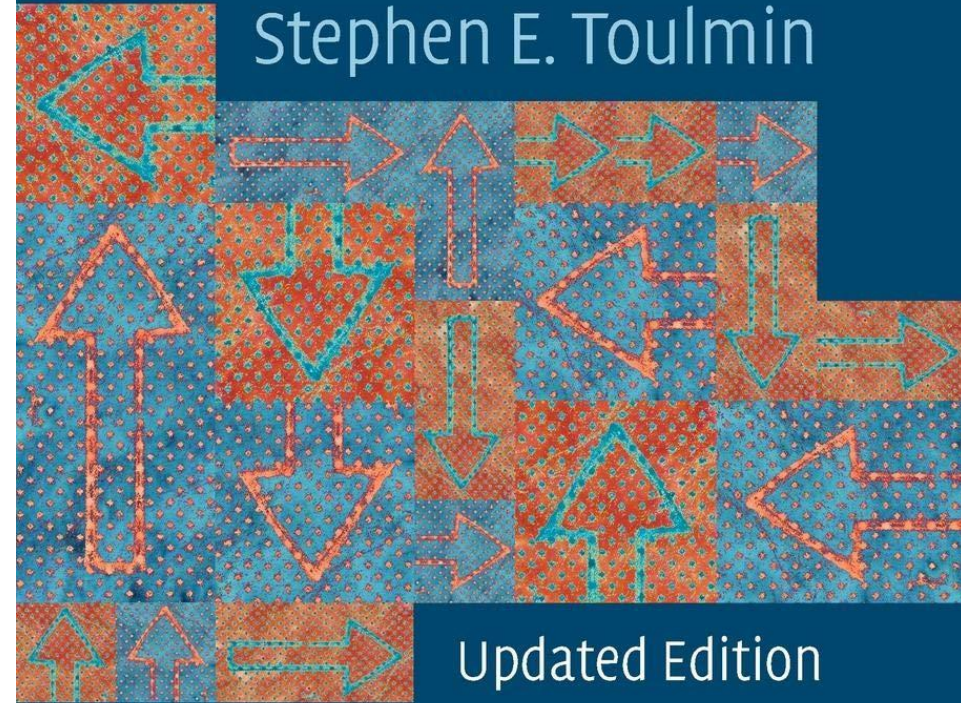
Attacks



Argument validity is **procedural**, i.e. it emerges as the capability of defending it in a dispute, where the criteria of properly conducted disputes are field-dependent

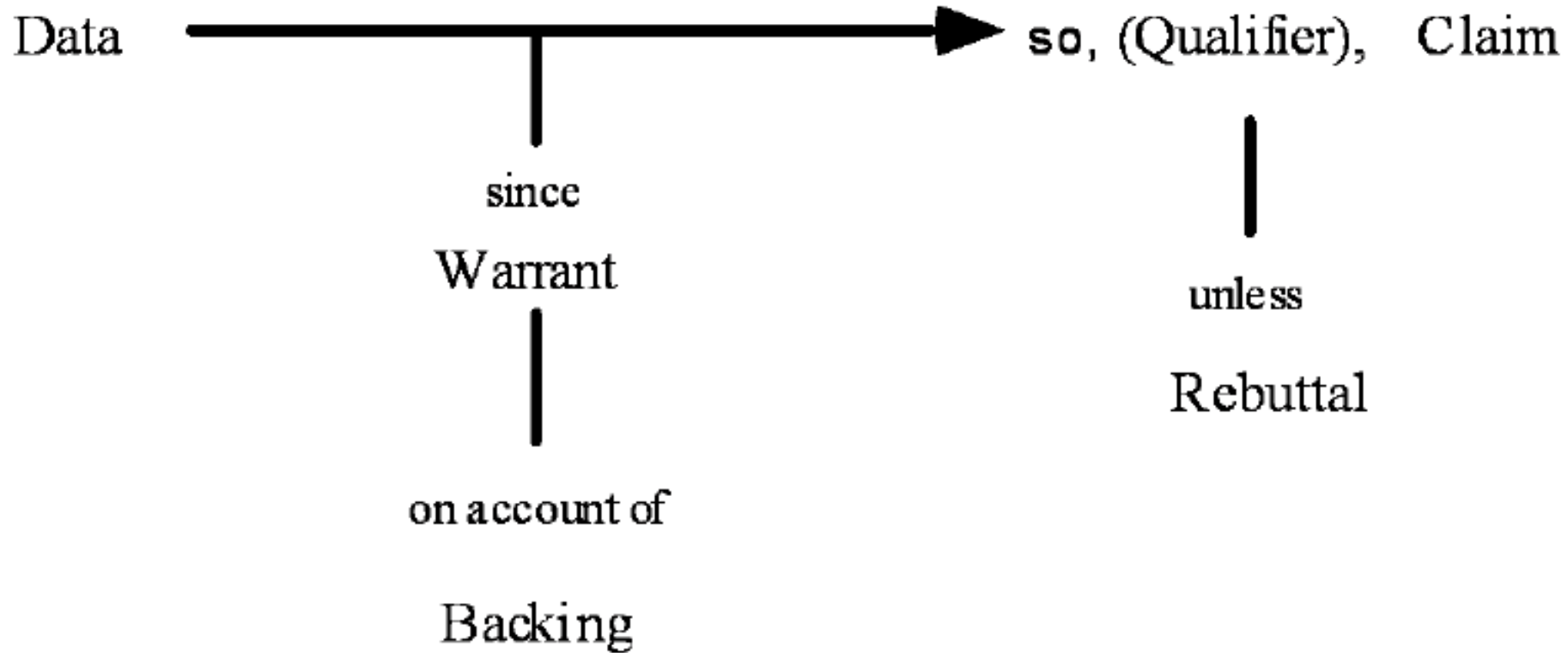
The Uses of Argument

Stephen E. Toulmin



Updated Edition

CAMBRIDGE

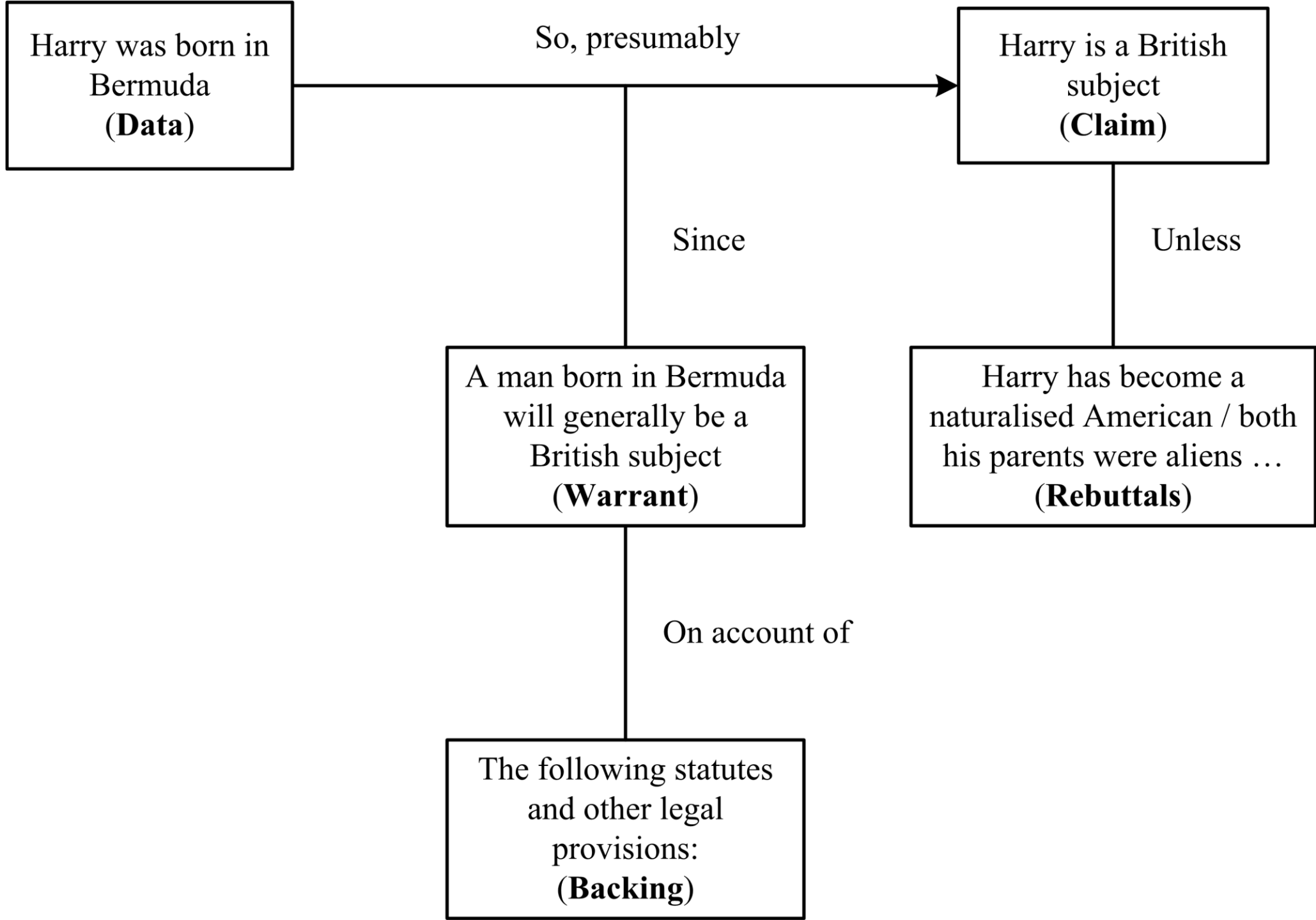


Warrant:

Background knowledge justifying the 'transfer of acceptance' from the ground (data) to the claim. Typically implicit (unstated).

Backing:

Additional justification to the statement expressed in the warrant (to be used when the warrant does not convince the reader or listener)



Fact

Rick has fair skin, red hair and freckles, and he sunbathed all day yesterday.

(probably) Conclusion

Rick will probably get seriously sunburnt.

Warrant

People with fair skin, red hair and freckles usually get sunburnt easily.

Rebuttal

Rick's parents both have fair skin, red hair and freckles, and they never seem to get sunburnt however much they sit outside.

Backing

Those people have little melanin in their skin. Melanin protects against sunburn.

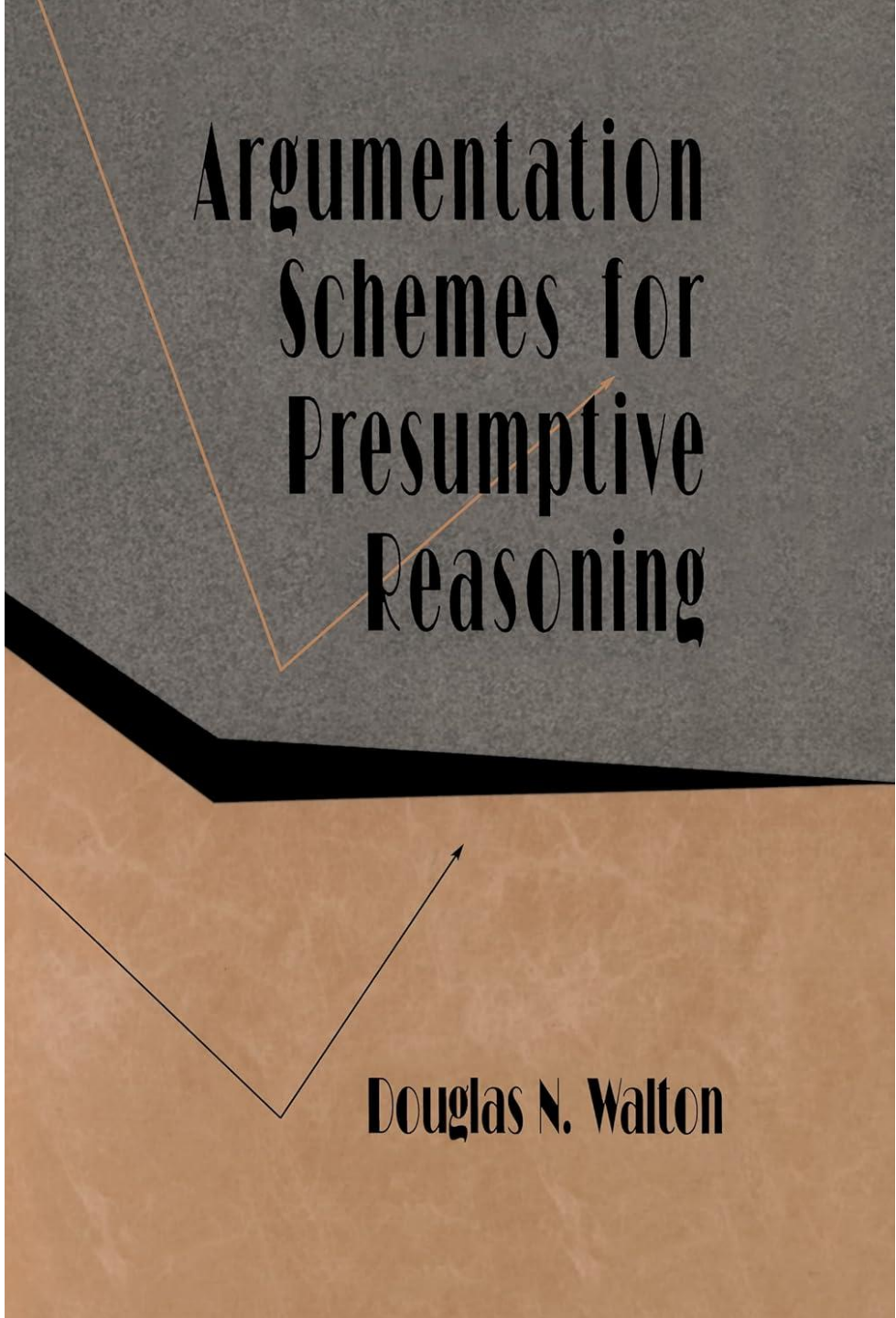
General idea

- correspond to recurring

patterns of reasoning

- have associated

"critical questions"



Argumentation
Schemes for
Presumptive
Reasoning

Douglas N. Walton

Argument
from Sign

Brown Grizzly Bear



front paw



hind paw



Argument from Sign

B is true in this situation.

A is true in this situation.

B is generally indicated as true when its sign, A, is true, in this kind of situation.

support



1. What is the strength of the correlation of the sign with the event signified?



2. Are there other events that would more reliably account for the sign?

Argument
from Example

Claim:
Implementing a
four-day
workweek
increases
employee
productivity.

Four-day week: trial finds lower stress and increased productivity

Study of pilot at New Zealand firm finds staff were happier
and 20% more productive



📷 Employees taking part in the trial reported significantly lower job stress and burnout.
Photograph: Alamy

Argument from Example

Generally, if x has property F , then x also has property G .



How strong is the generalization?



Is the proposition presented by the example in fact true?

In this particular case, the individual a has property F and also property G .

a is typical of things that have F and may or may not also have G .

support



Does the example support the general claim it is supposed to be an instance of?



Were there special circumstances present in the example that would impair its generalizability?



Is the example typical of the kinds of cases that the generalization ranges over?

Daylight saving time

Iran Considers Abolishing DST

By Anne Buckle and Mathew Gundersen. Published 17-Mar-2022. Changed 11-May-2022 

Iran is considering removing [Daylight Saving Time \(DST\)](#).

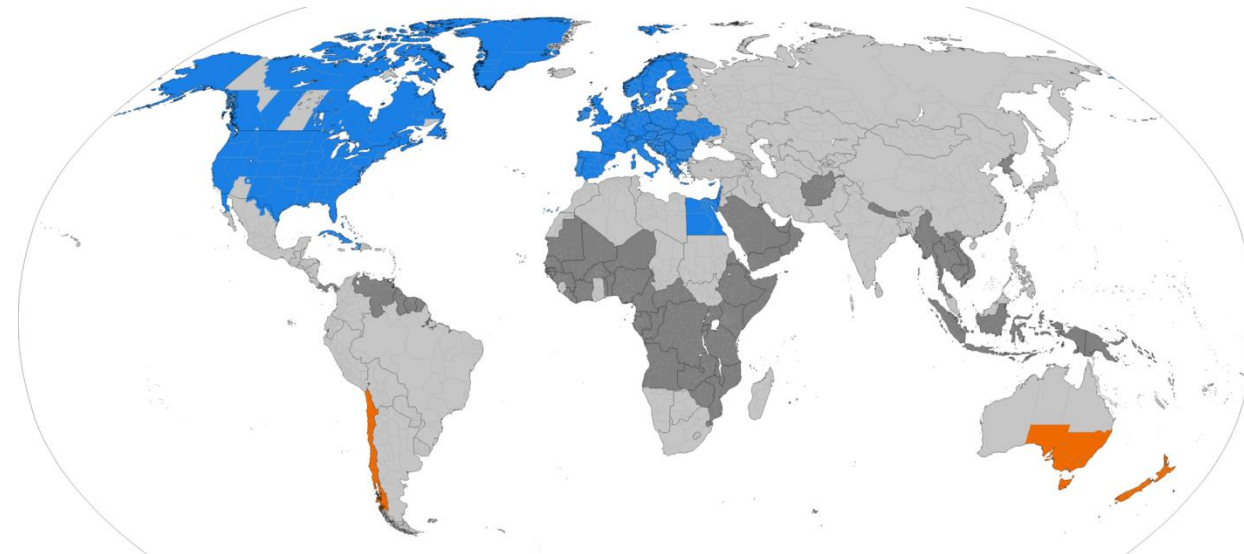
Confirmed: Iran Removes DST

From 2023, Iran will not set their clocks forward for Daylight Saving Time (DST) but remain on standard time permanently.



Iran is considering a permanent move to standard time. The skyline of Tehran, Iran.

©iStockphoto.com/jacquessvandinteren



Argument from
Cause to Effect

National living wage increase of 6.7% confirmed

by Rob Moss | 29 Oct 2024

In economics, the implementation of a minimum wage is often argued to increase workers' income. This observation leads to the inference that raising the minimum wage will improve the standard of living for low-income workers.




The national living wage in 2025 will be £12.21 per hour. Image: Stopped Clock/Shutterstock


The national living wage rate from 1 April 2025 will be £12.21, a 6.7% rise, while the national minimum wage for 18 to 20-year-olds increases by a record 16.3% to £10.00 per hour, the government has announced ahead of the Budget.


Chancellor Rachel Reeves said: "This government promised a genuine living wage for working people. This pay boost for millions of workers is a significant step towards delivering on that promise."

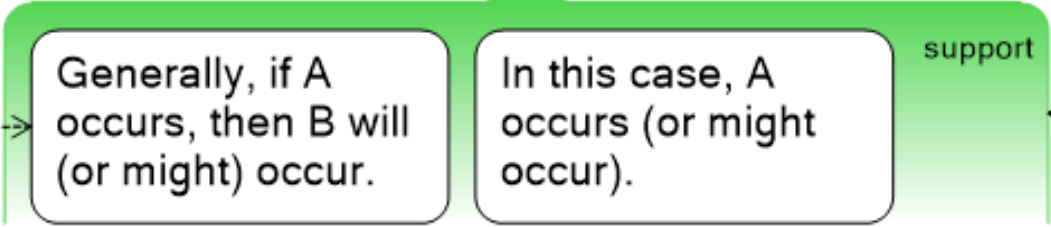
Argument from Cause to Effect

In this case, B will occur (or might occur).


2. Is the evidence cited (if there is any) strong enough to warrant the generalization as stated?


3. Are there other factors that would or will interfere with or counteract the production of the effect in this case?


1. How strong is the causal generalization (if it is true at all)?



Does increasing the minimum wage lead to higher prices?

Many business leaders fear that any increase in the minimum wage will be passed on to consumers through price increases thereby slowing spending and economic growth, but that may not be the case. New research shows that the pass-through effect on prices is fleeting and much smaller than previously thought.

In a new Upjohn Institute working paper, Daniel MacDonald and Eric Nilsson, of California State University, Bernardino, advance the literature on price effects of minimum wage increases.

Historically, minimum wage increases were large, one-shot changes imposed with little advance notice for businesses. But many recent state and city-level minimum wage increases have been scheduled to be implemented over time and often are indexed to some measure of price inflation. These small, scheduled minimum wage hikes seem to have smaller effects on prices than large, one-time increases.

Related Information


[The Effects of Increasing the Minimum Wage on Prices](#), by Daniel MacDonald and E...

[What Does the Minimum Wage Do?](#) by Dale Belman and Paul Wolfson

More research and experts on wages, health insurance, and other benefits

[View All Highlights](#)

Contact Information

 [Justin Carinci](#)

General form

Premise 1

Premise 2

...

Therefore (presumably) Claim

Critical questions:

...

Argument from
Expert Opinion

Expert Testimony

E is **expert** on D

E **says** P

P is in D

Therefore, P is the case

Critical questions:

Is E **really expert** on E?

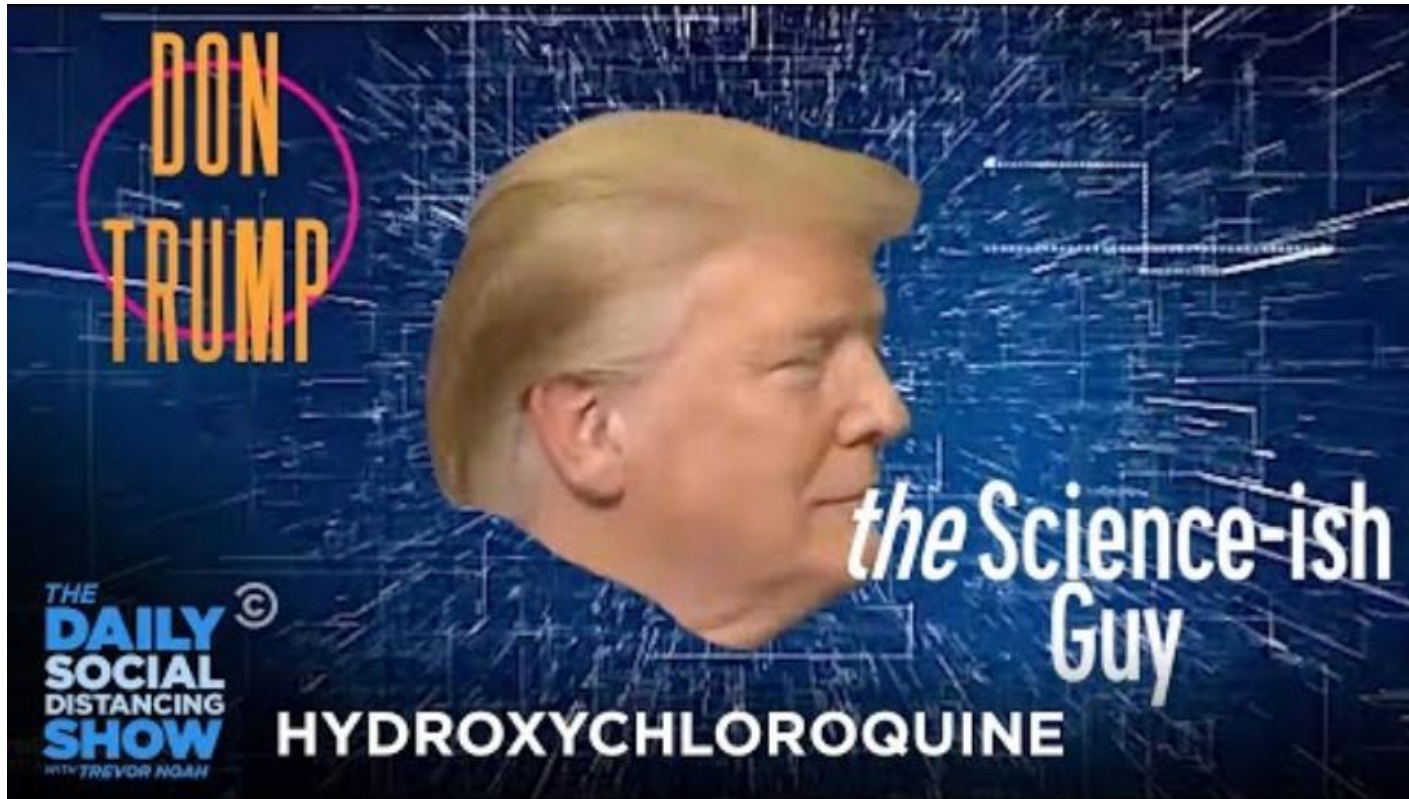
Did E really say P?

Is P really within D?

Is E biased?

Is P consistent with what other experts say?

Is P consistent with known evidence?



 **NBC NEWS**

CORONAVIRUS

Trump says he's taking hydroxychloroquine to prevent COVID-19

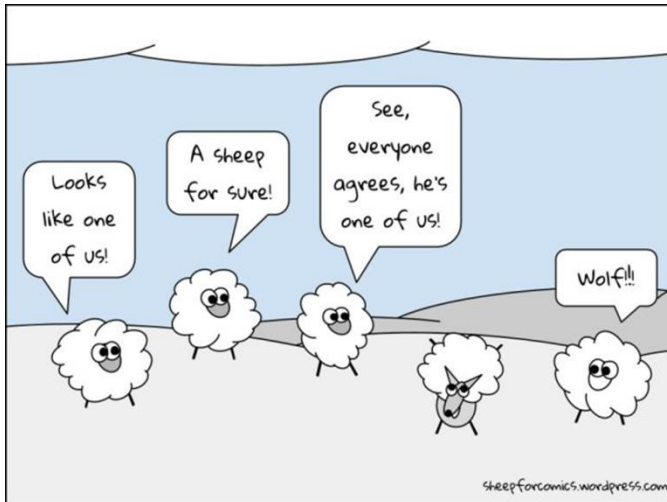
The antimalarial drug is unproven as a treatment for the coronavirus, and the FDA has warned against its use outside hospital settings.

Argument From
Popular Opinion

Argument From Popular Opinion

S1: Everybody (in a particular reference group) **accepts** that A
Therefore, A is **true** (or you should **accept** A).

S2: Everybody (in a particular reference group) **reject** A.
Therefore, A is **false** (or you should **reject** A).



CQ1: Does a large majority of the cited reference group accept A as true?

CQ2: Is there other relevant evidence available that would support the assumption that A is not true?

CQ3: What reason is there for thinking that the view of this large majority is likely to be right?

What is
wrong
here?

50,000,000 ELVIS FANS CAN'T BE WRONG

ELVIS' GOLD RECORDS - Volume 2

A FOOL SUCH AS I
I NEED YOUR LOVE TONIGHT
WEAR MY RING AROUND YOUR NECK
DONCHA THINK IT'S TIME
I BEG OF YOU
A BIG HUNK O' LOVE
DON'T
MY WISH CAME TRUE
ONE NIGHT
I GOT STUNG



Donald Trump claims he has 'overwhelming support' from Muslims in Michigan



Best Hashtags



#Trendvideo

#Attention_Seeker



Argument
from Authority

Argument from Authority

Major Premise:  is an administrative authority in institution .


Minor Premise: According to , I should (or I should not) do *A*.

Conclusion: I should (or I should not) do *A*.

CQ1: Do I come under the authority of institution ?

CQ2: Does what  says apply to my present circumstances *C*?

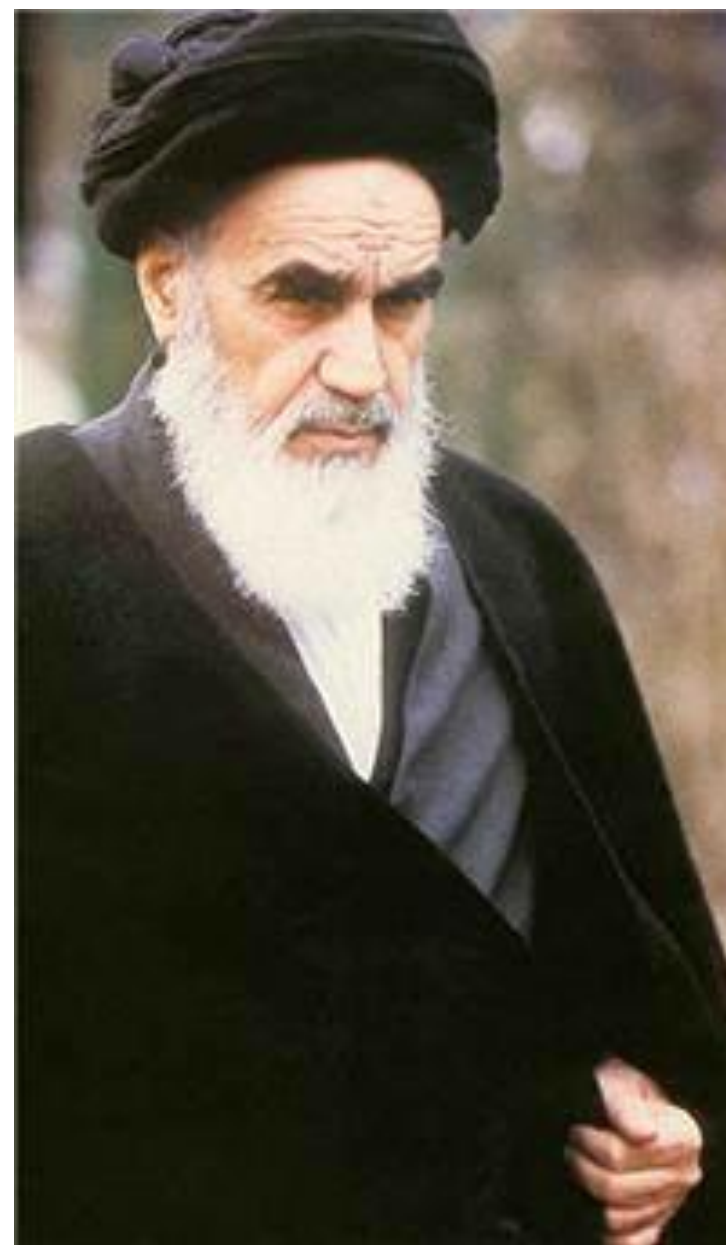
CQ3: Has what  says been interpreted correctly?

CQ4: Is  genuinely in a position of authority?

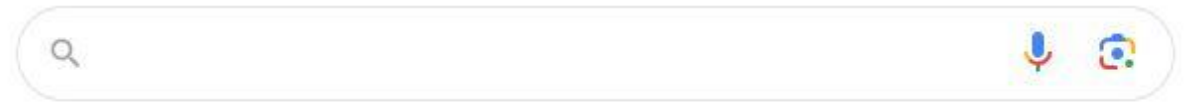
Code of Hammurabi

If a man breaks into a house, they shall kill him and hang him(?) in front of that very breach.





Does Google Search, as an information search engine, have authority about accessing information?

The Google logo, consisting of the word "Google" in its signature multi-colored font (blue, red, yellow, blue, green, red).A white search bar with rounded corners. On the left side, there is a magnifying glass icon. On the right side, there are two icons: a microphone and a camera.

Google Search

I'm Feeling Lucky

Google offered in: [Deutsch](#) [Français](#)

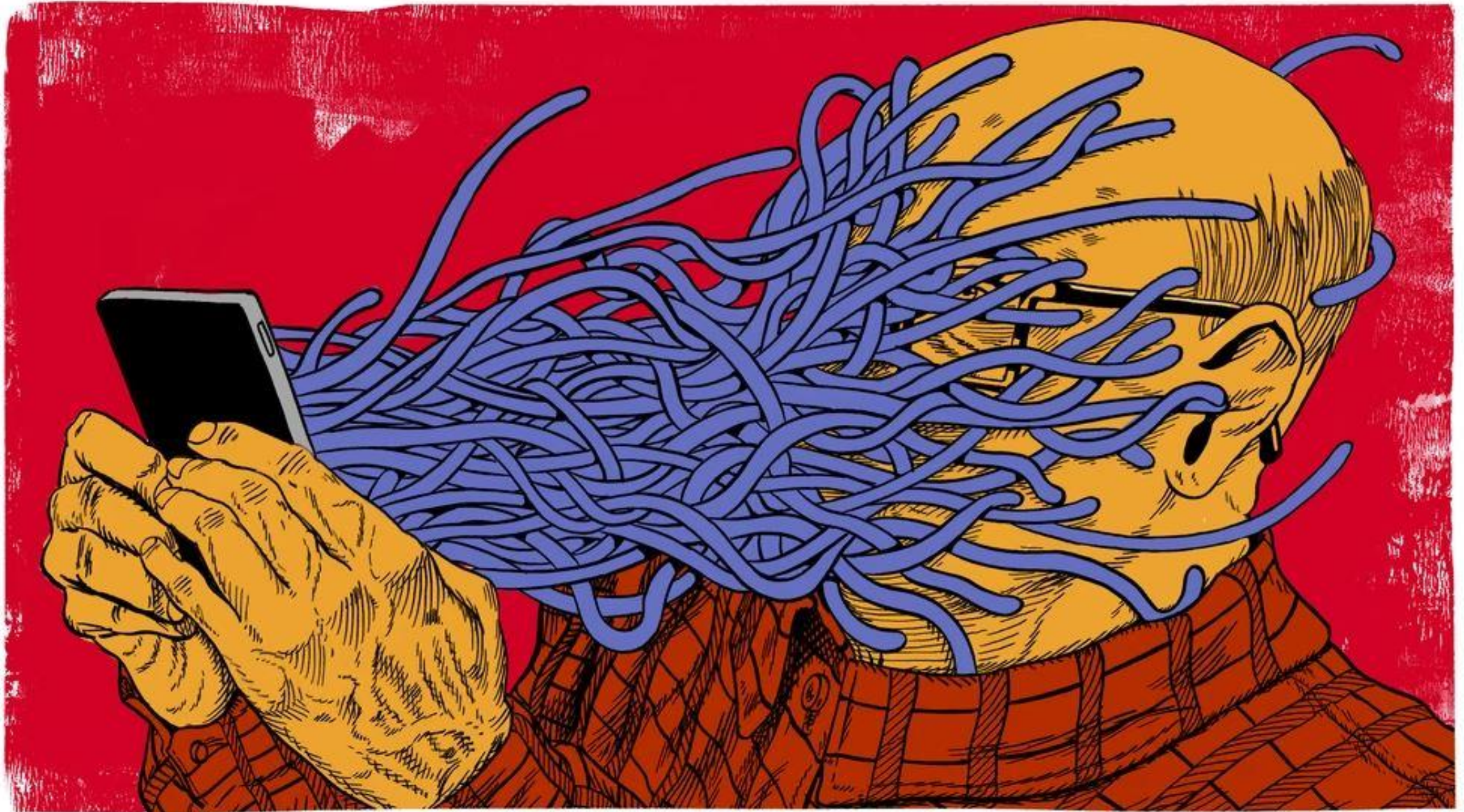
"[T]he argumentum ad verecundiam ... consists in making an appeal to authority rather than reason, and in using such an authority as may suit the degree of knowledge possessed by your opponent. ... The more **limited** his capacity and **knowledge**, the **greater** is the number of the **authorities** who weigh with him."



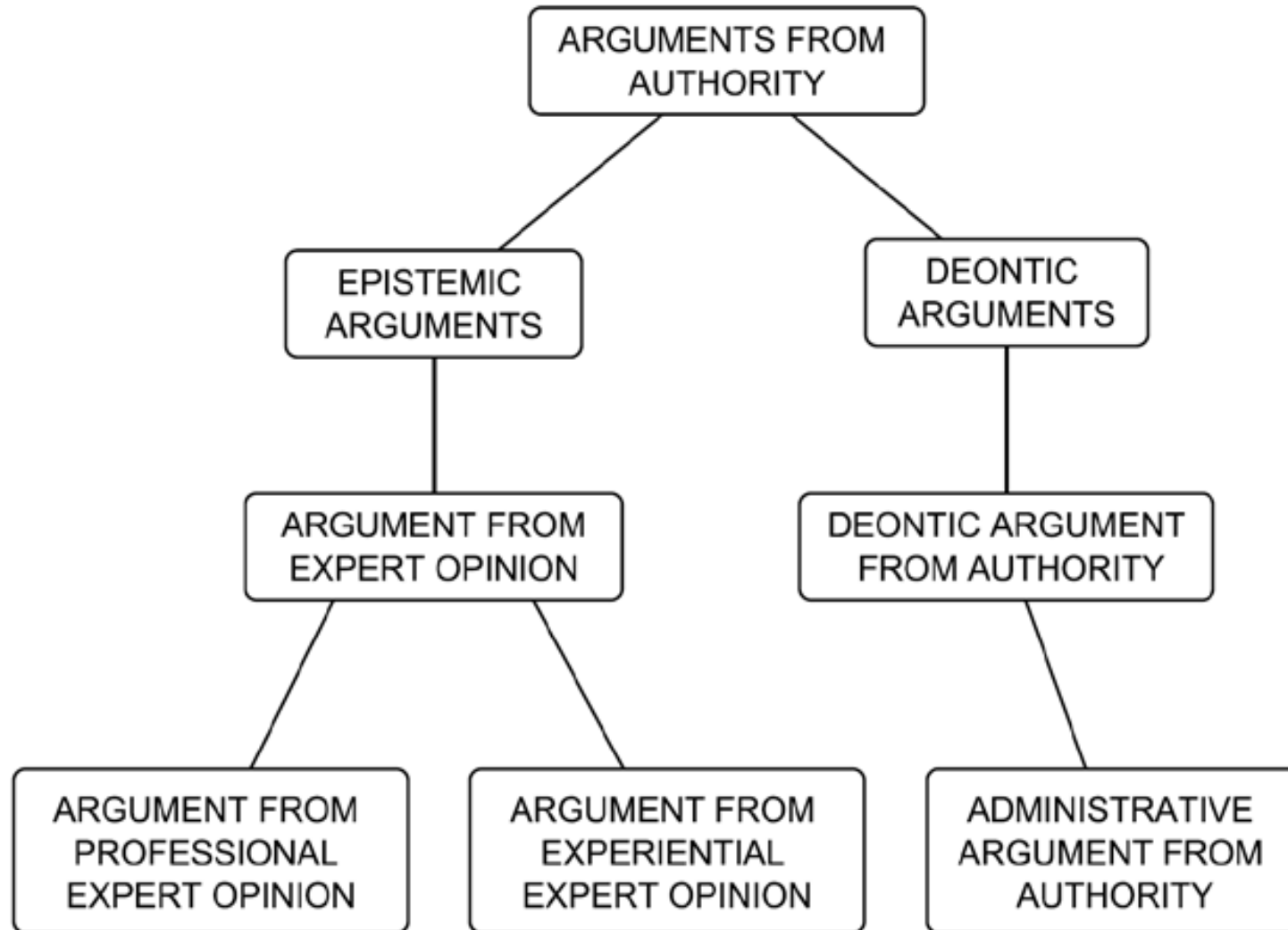
The Art of Controversy and Other Posthumous Papers trans.

Do AI
Agents
have
authority?





Ben Clarkson

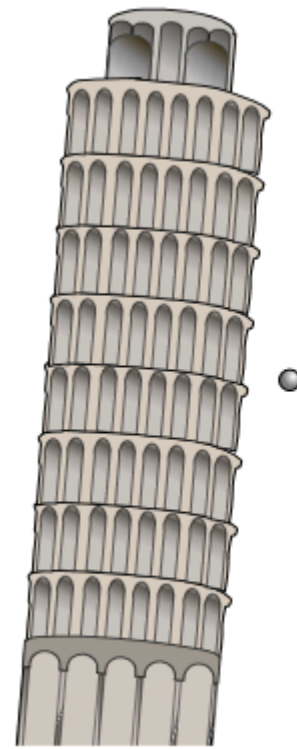


Expert Opinion Ad Populum Argument

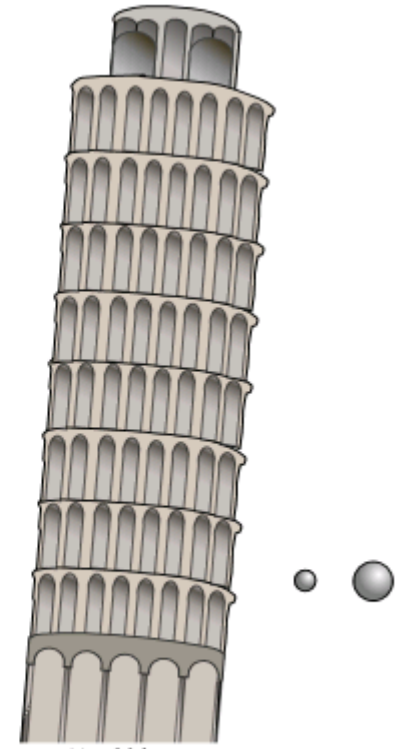
Everybody in this group G accepts A .
 G is a group of expert in a domain of knowledge.

Therefore, A is true.

So many people accept that heavier things fall faster to the ground
[therefore it is plausible that]
heavier things fall faster to the ground.



Old idea



Galileo

According to repeated nationwide surveys,

More Doctors Smoke **CAMELS** than any other cigarette!

Doctors in every
branch of medicine
were asked, "What
cigarette do you smoke?"

You'll enjoy Camels for the same reasons
so many doctors enjoy them. Camels have
real, mild nicotine, pack after pack, and
a flavor unmatched by any other cigarette.

Makes this simple too: Smoke only
Camels for 30 days and see how well Camels



Debate: Will AI replace clinicians?



17 June 2024



As part of the ongoing conversation of artificial intelligence in healthcare, two GPs debate whether or not AI is a threat to the workforce

YES: 'AI will replace clinicians and reduce the workforce to 10% of what it currently is'

Argument from
Practical Reasoning

Practical reasoning

I have a **goal** G .

Carrying out this action A is a **means** to achieve G .

Therefore, I ought to **carry out** A .

Critical questions:

What other goals do I have that might conflict with G ?

Does A also have bad consequences?

Are there other (possibly more efficient) actions to bring about G ?

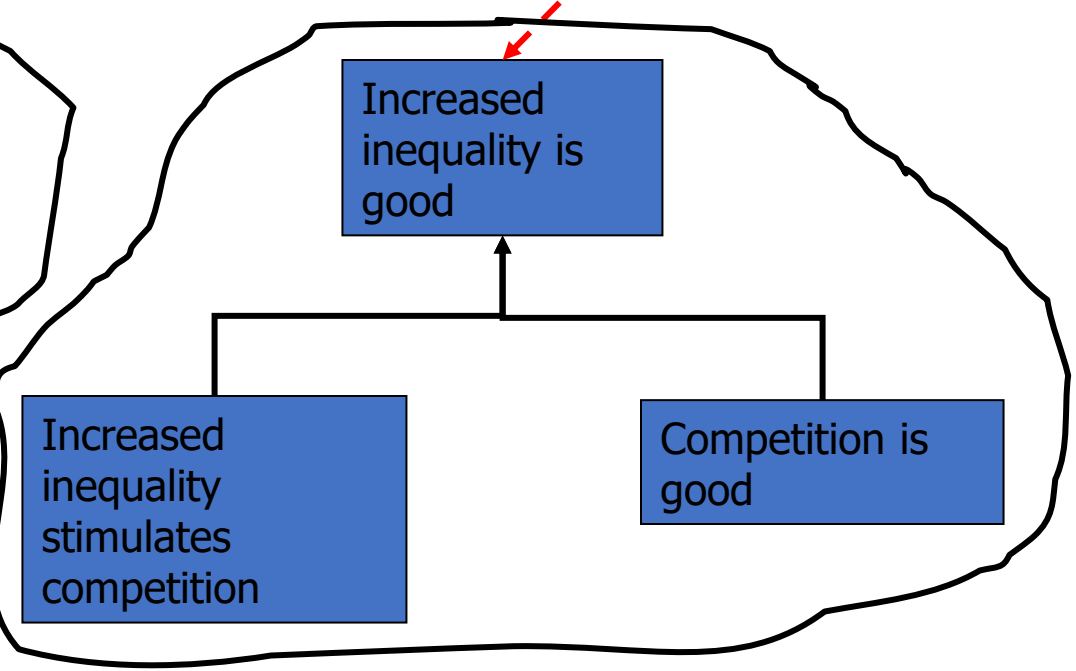
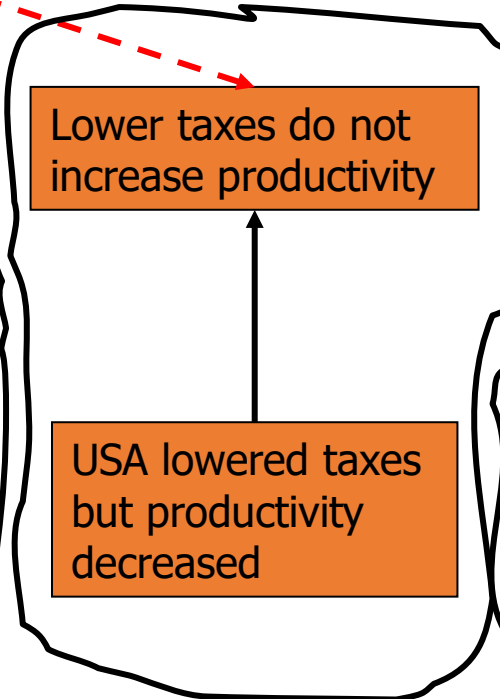
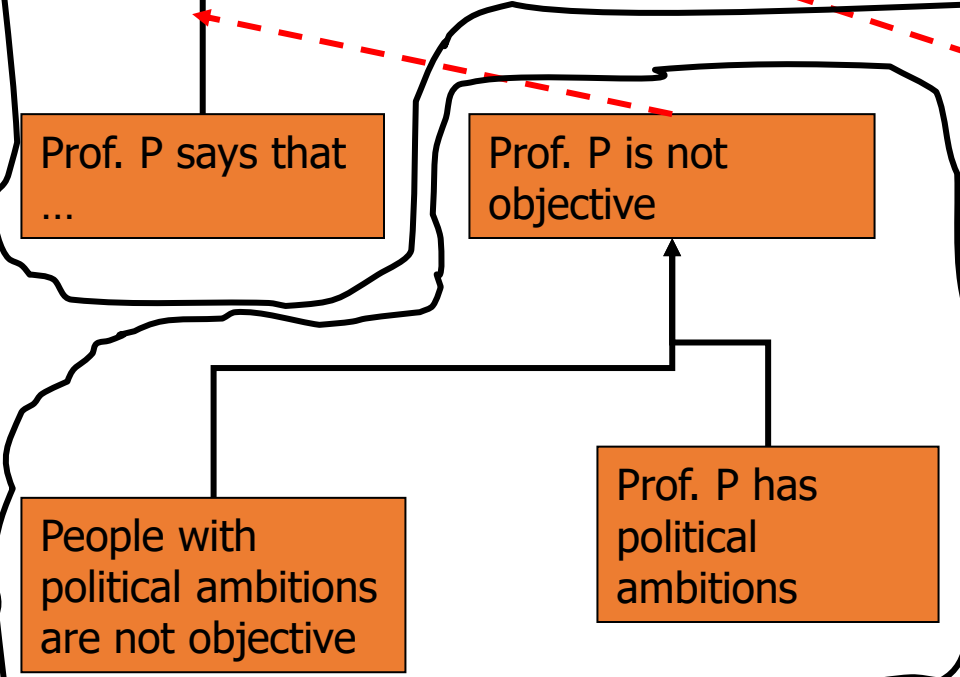
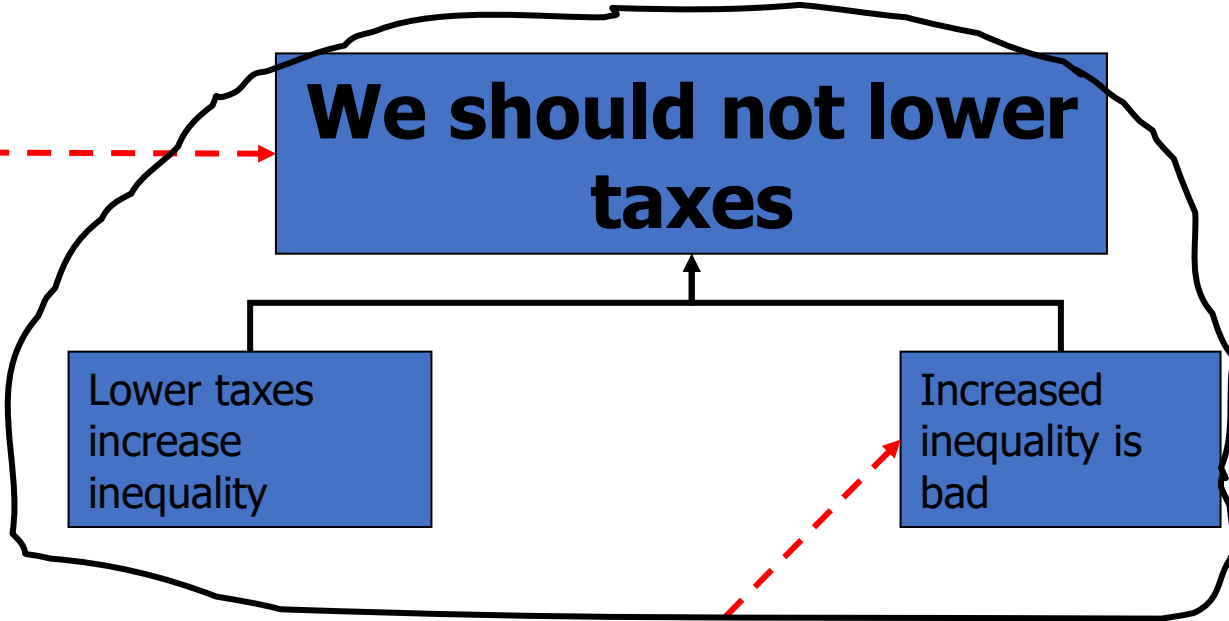
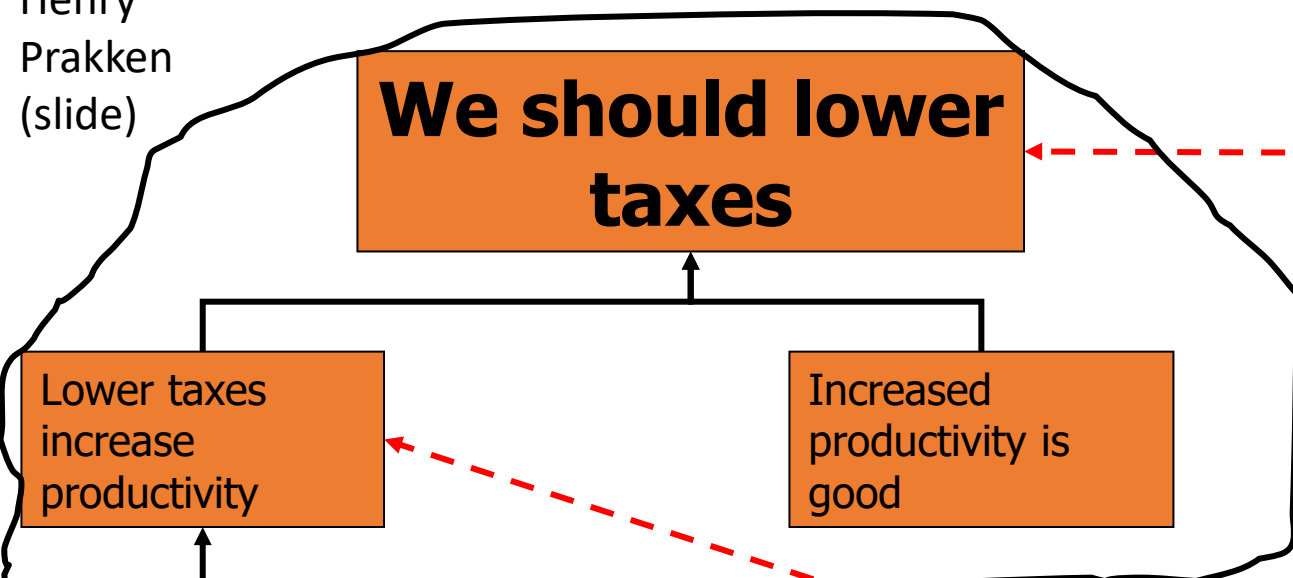
Is A practically possible?

Suppose I am deliberating with my spouse on what to do with our pension investment fund - whether to buy stocks, bonds, or some other type of investment. We consult with a financial adviser, an expert source of information who will tell us what is happening in the stock market, and so forth, at the present time. (Walton, 1997, p. 113)



"According to the latest statistics, an early retirement is any time before death."

Henry
Prakken
(slide)



Walton's Argumentation Schemes

› Classic Patterns of Argument

› Syllogisms – Categorical

› Simple Deductive Schemas

› Simple Inductive Schemas

› Classic arguments

› Classic Fallacies

› **Argumentation Schemes**

› Katzav and Reed's Argumentation Schemes

› Pollock's Argumentation Schemes

› **Walton's Argumentation Schemes**

Walton's Argumentation Schemes

The Argumentation Schemes below are taken from [Douglas Walton's](#) book [Argumentation Schemes for Presumptive Reasoning](#). If you are interested in using these schemes I would suggest that you read Walton's book, as their utility may not be apparent without the background theory concerning presumptive reasoning.

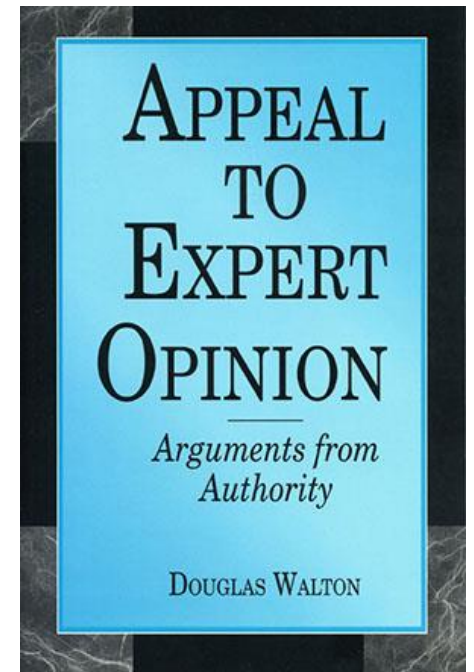
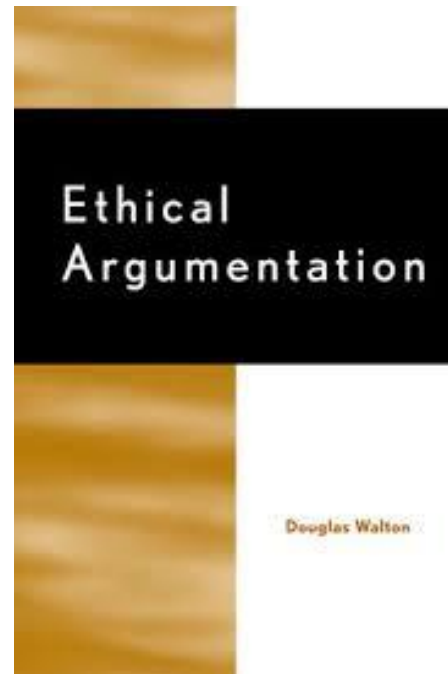
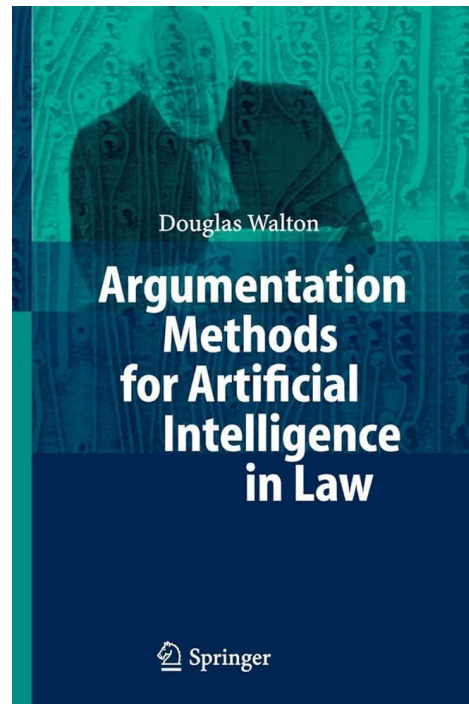
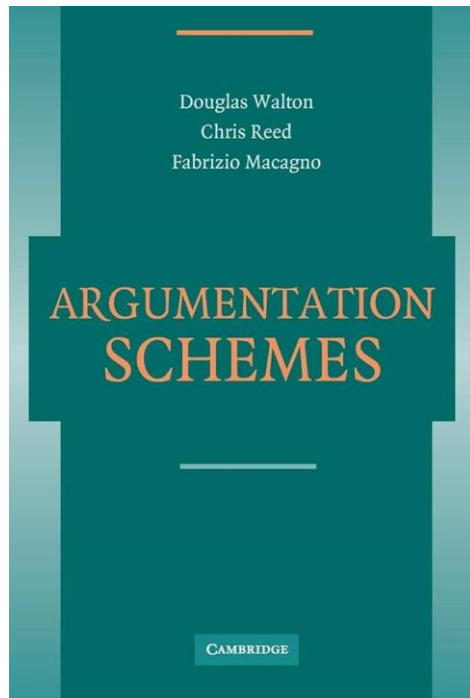
Critical Questions appear in note boxes, and are labeled with the question mark icon pictured below.

The critical questions are numbered as they appear in *Argumentation Schemes for Presumptive Reasoning*, for easy reference.

Argumentation Schemes

- [Argument from Sign](#)
- [Argument from an Exceptional Case](#)
- [Argument from Analogy](#)
- [Argument from Bias](#)

argument from commitment, argument from precedent, argument from position to know, argument from (positive or negative) consequences, argument from lack of knowledge, practical reasoning (argument from goal to action), argument from cause to effect, inference to the best explanation, argument from analogy, several types of *ad hominem* argument, the slippery slope argument, ...



Logic \neq
Formal
Method

Logic \neq
Psychology

Logic have its own faculty

References and More to Read:

Sinnott-Armstrong, Walter. "Understanding arguments: An introduction to informal logic." (2015).

Douglas Walton, Chris Reed & Fabrizio Macagno.
Argumentation schemes. Cambridge University Press. (2008)

Walton's Argumentation Schemes : www.reasoninglab.com

Informal Fallacies: Lecture Notes and Fallacy Examples :
www.philosophy.lander.edu