

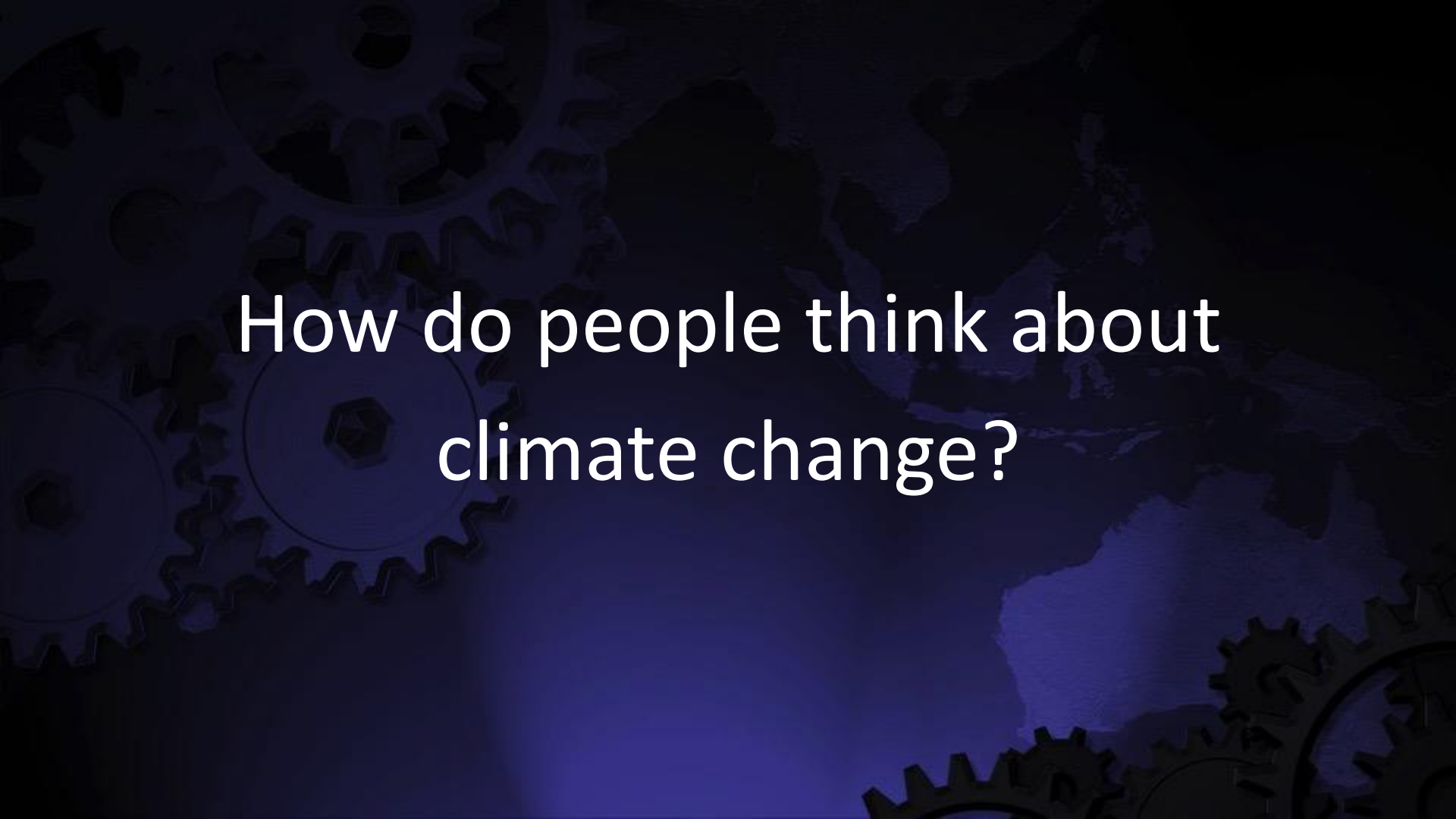
Taking on fake news about climate change

BÄRBEL WINKLER

JOHN COOK



GEORGE MASON UNIVERSITY
CENTER *for*
CLIMATE CHANGE
COMMUNICATION



How do people think about
climate change?

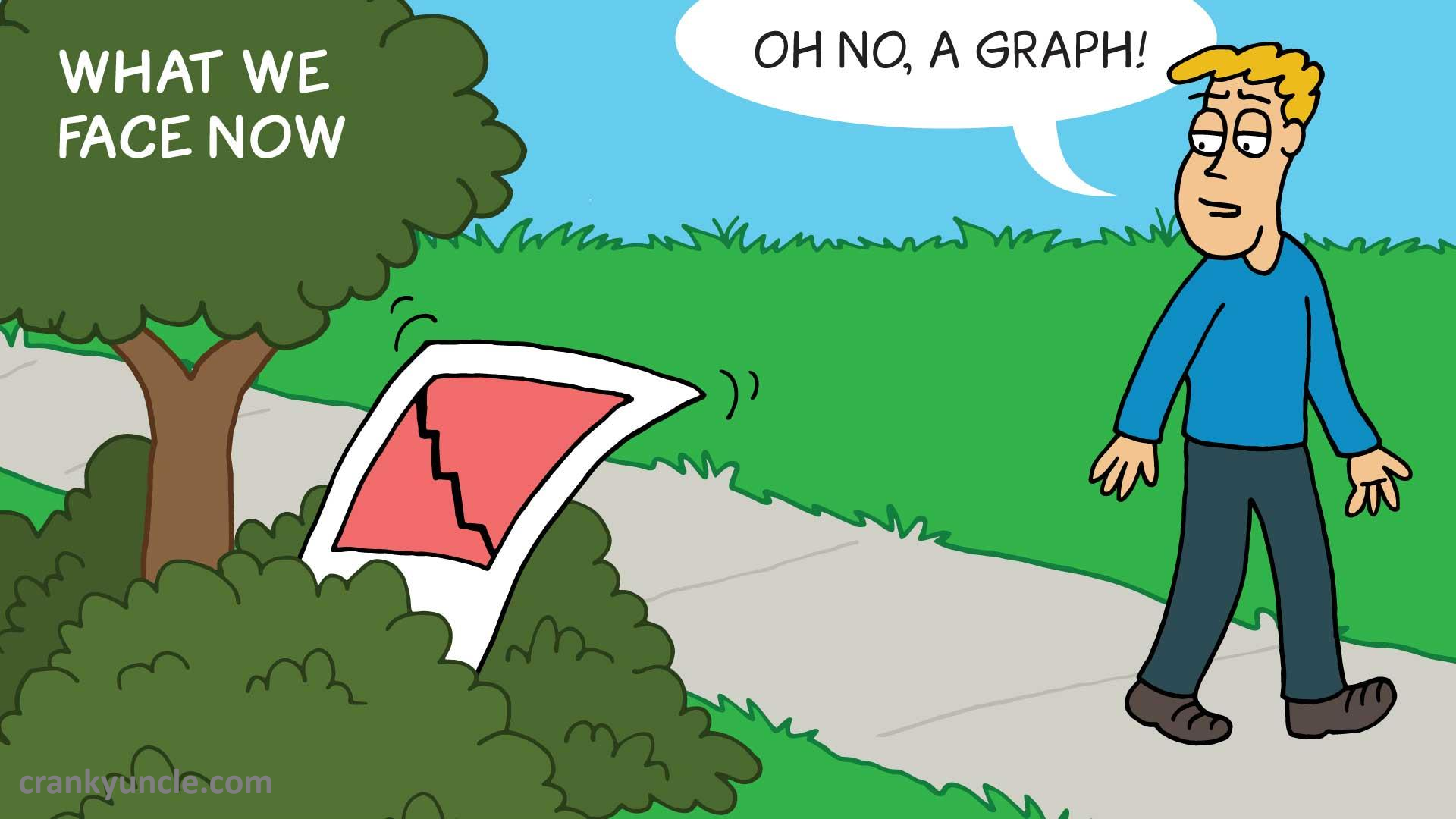
WHAT WE'RE
BUILT FOR

OH NO, A BEAR!



WHAT WE
FACE NOW

OH NO, A GRAPH!



The background of the entire image is a dark blue gradient. Overlaid on this are several interlocking gears of different sizes, some of which are semi-transparent. A faint world map is also visible in the background, centered behind the main title.

It's real

It's us

Experts
agree

It's bad

There's
hope

CLIMATE CHANGE IN A FEW WORDS

It's real

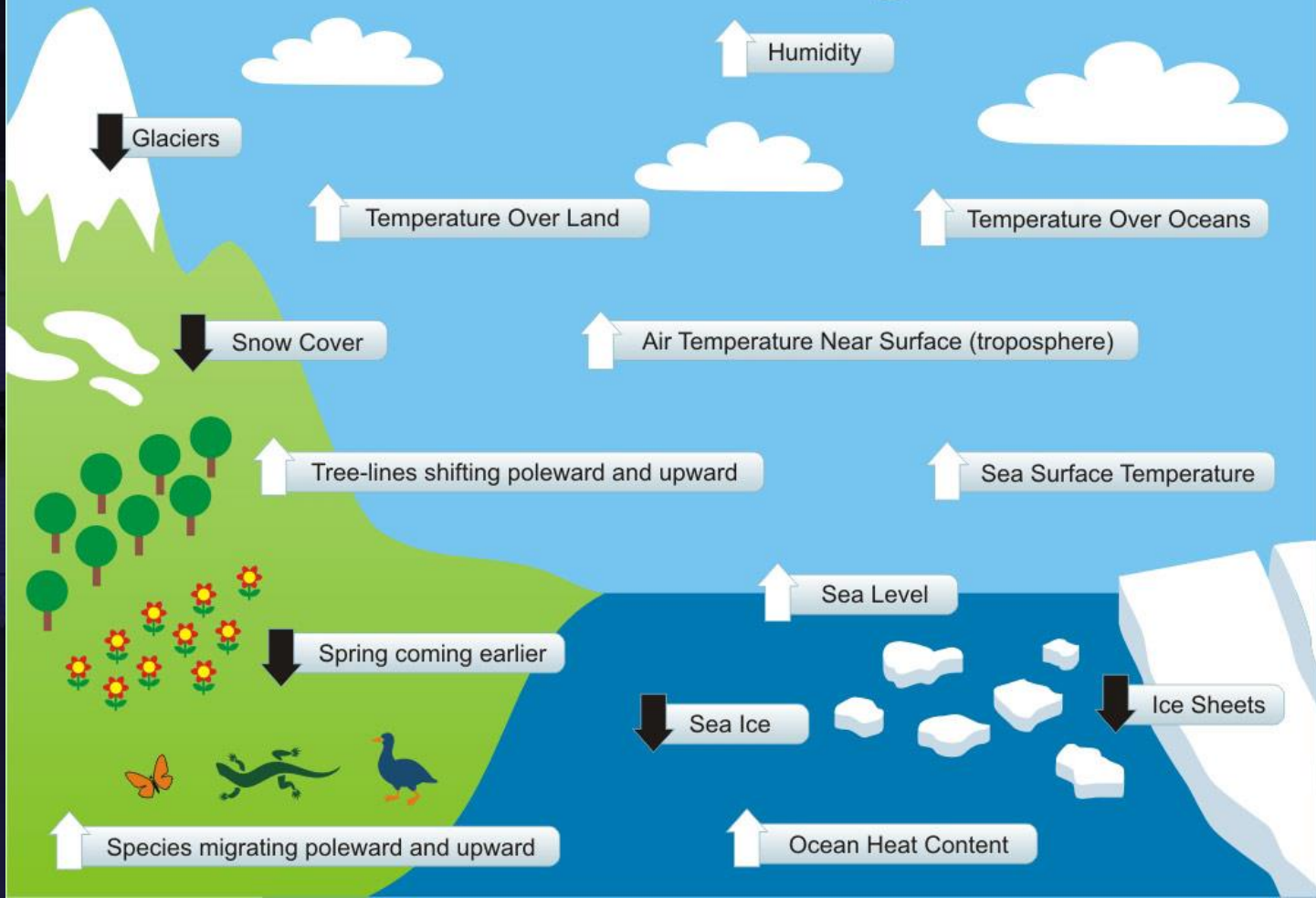
It's us

Experts
agree

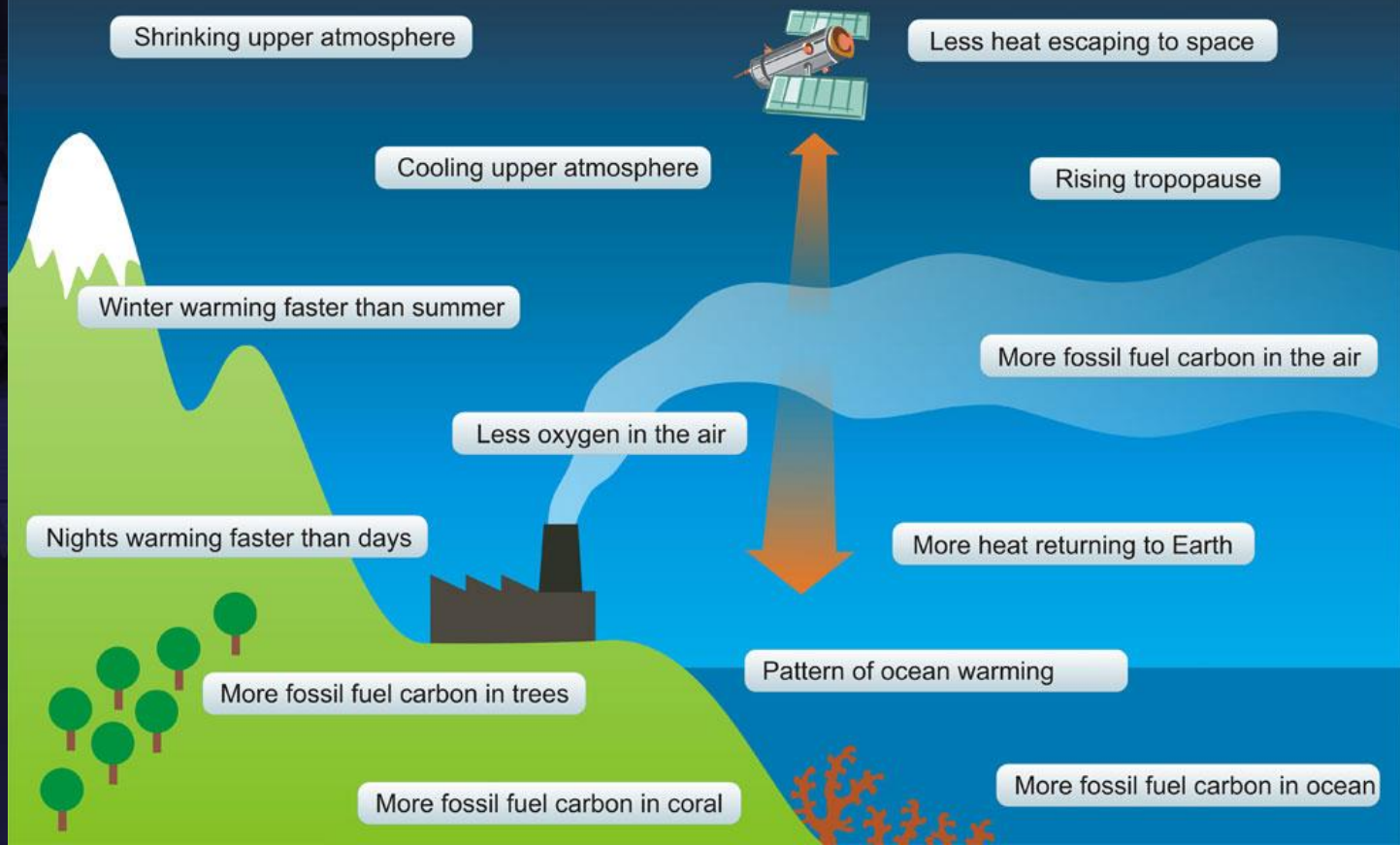
It's bad

There's
hope

Indicators of a Warming World



How we know we're causing global warming



It's real

It's us

Experts agree

It's bad

There's hope

It's real

It's us

Experts agree

It's bad

There's hope



Winter warming faster than summer

Cooling upper atmosphere

Rising tropopause

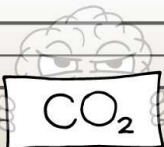



Less heat escaping to space

More heat returning back to Earth

Nights warming faster than days

Pattern of ocean warming

Land warming faster than oceans

	5'0"	4'6"	4'0"	3'6"	3'0"
					
Winter warming faster than summer	✓	✗	✗	✗	
Cooling upper atmosphere	✓	✗	✗	✗	
Rising tropopause	✓	✓	✓	✗	
Less heat escaping to space	✓	✗	✗	✗	
More heat returning back to Earth	✓	✗	✗	✗	
Nights warming faster than days	✓	✗	✗	✗	
Pattern of ocean warming	✓	✗	✗	✗	
Land warming faster than oceans	✓	✓	✗	✗	

Consensus on Consensus

Studies quantifying the scientific consensus
that humans are causing global warming

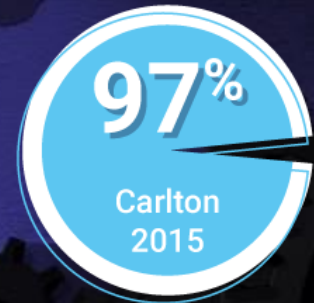
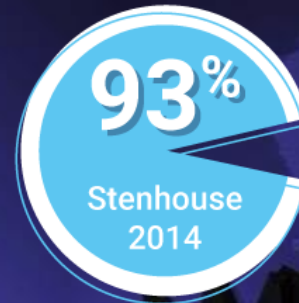
It's real

It's us

Experts
agree

It's bad

There's
hope



It's real

It's us

Experts
agree

It's bad

There's
hope

97% of climate scientists agree we're causing global warming



crankyuncle.com

<http://sks.to/97>



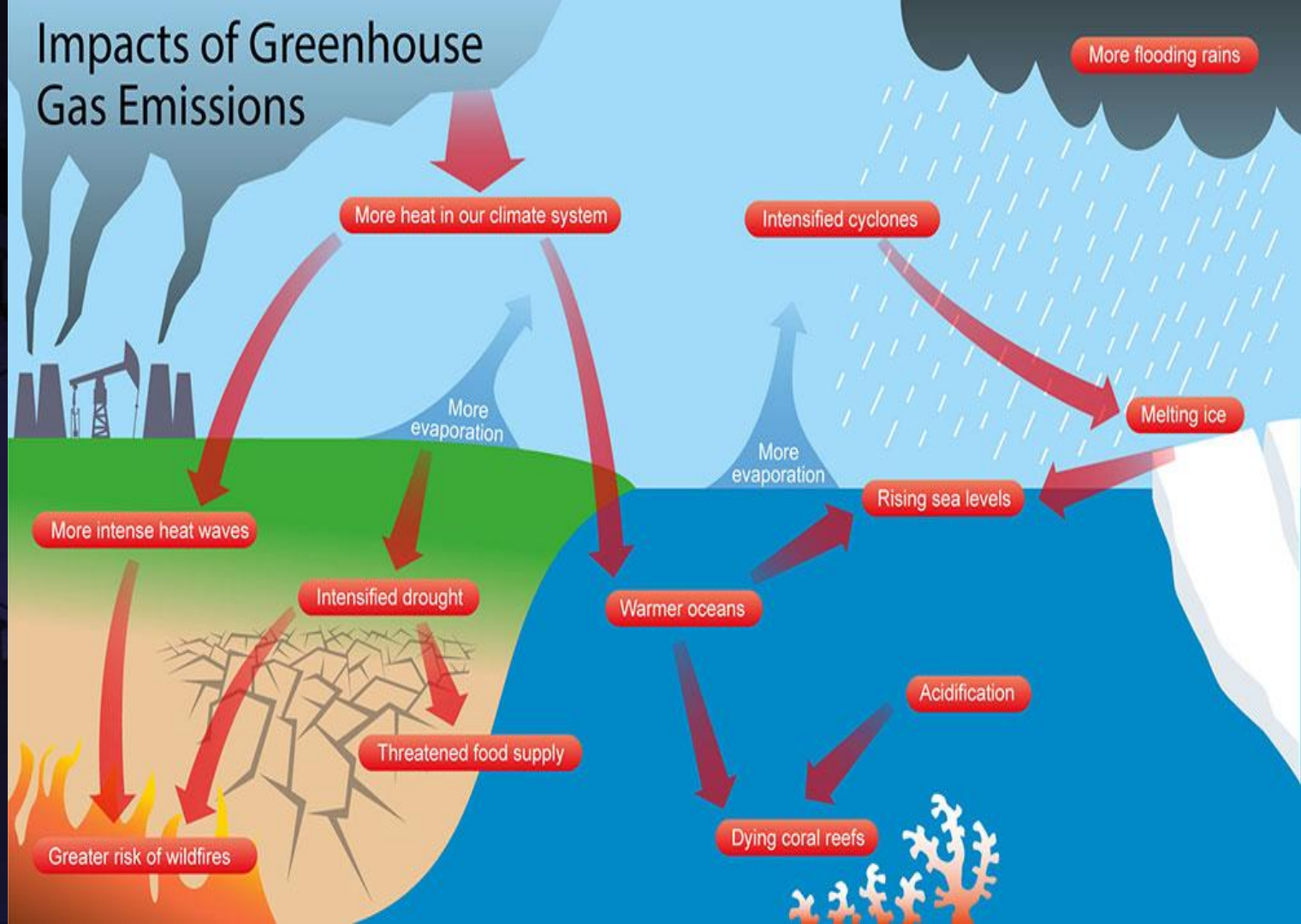
It's real

It's us

Experts
agree

It's bad

There's
hope



It's real

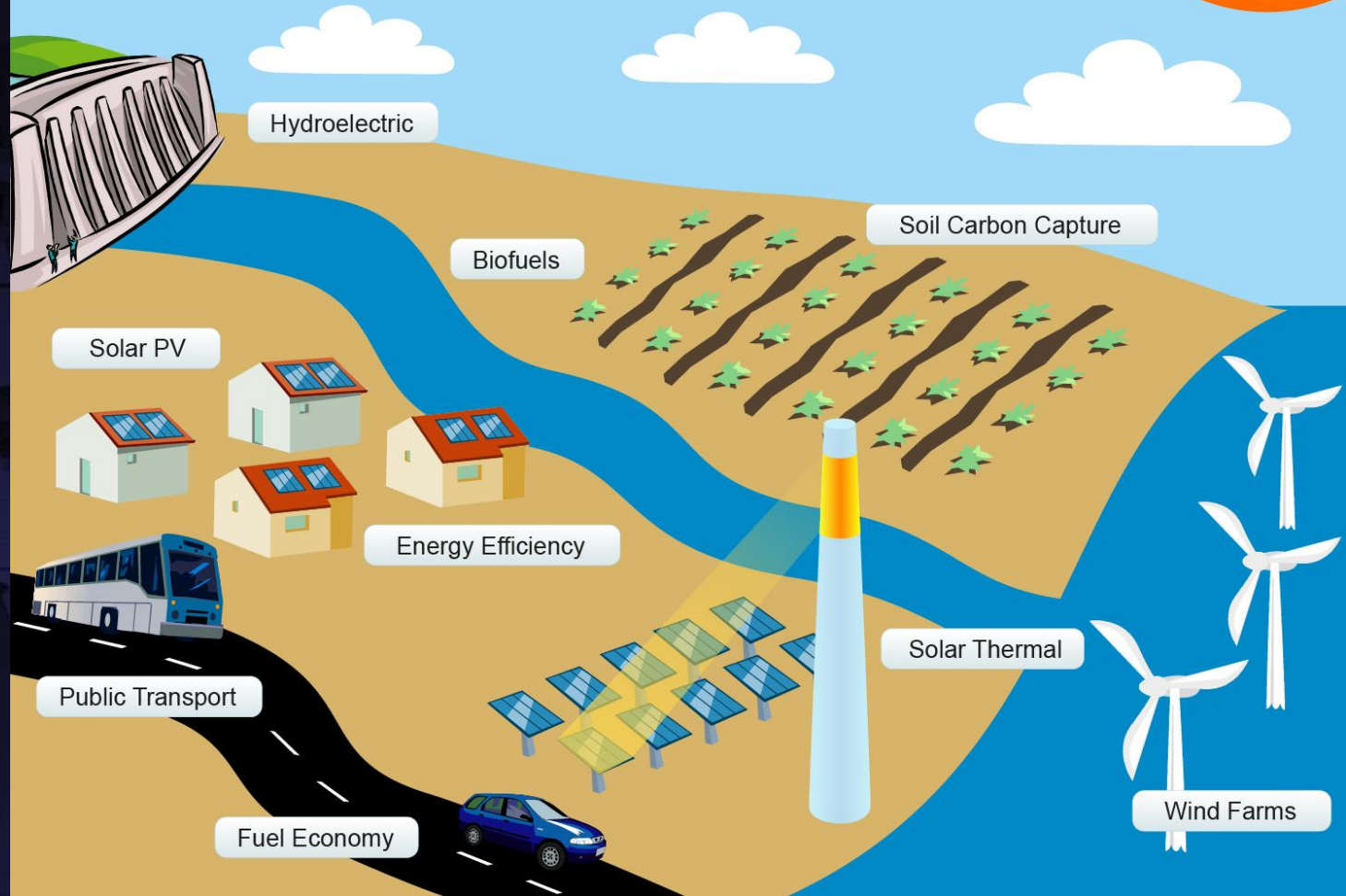
It's us

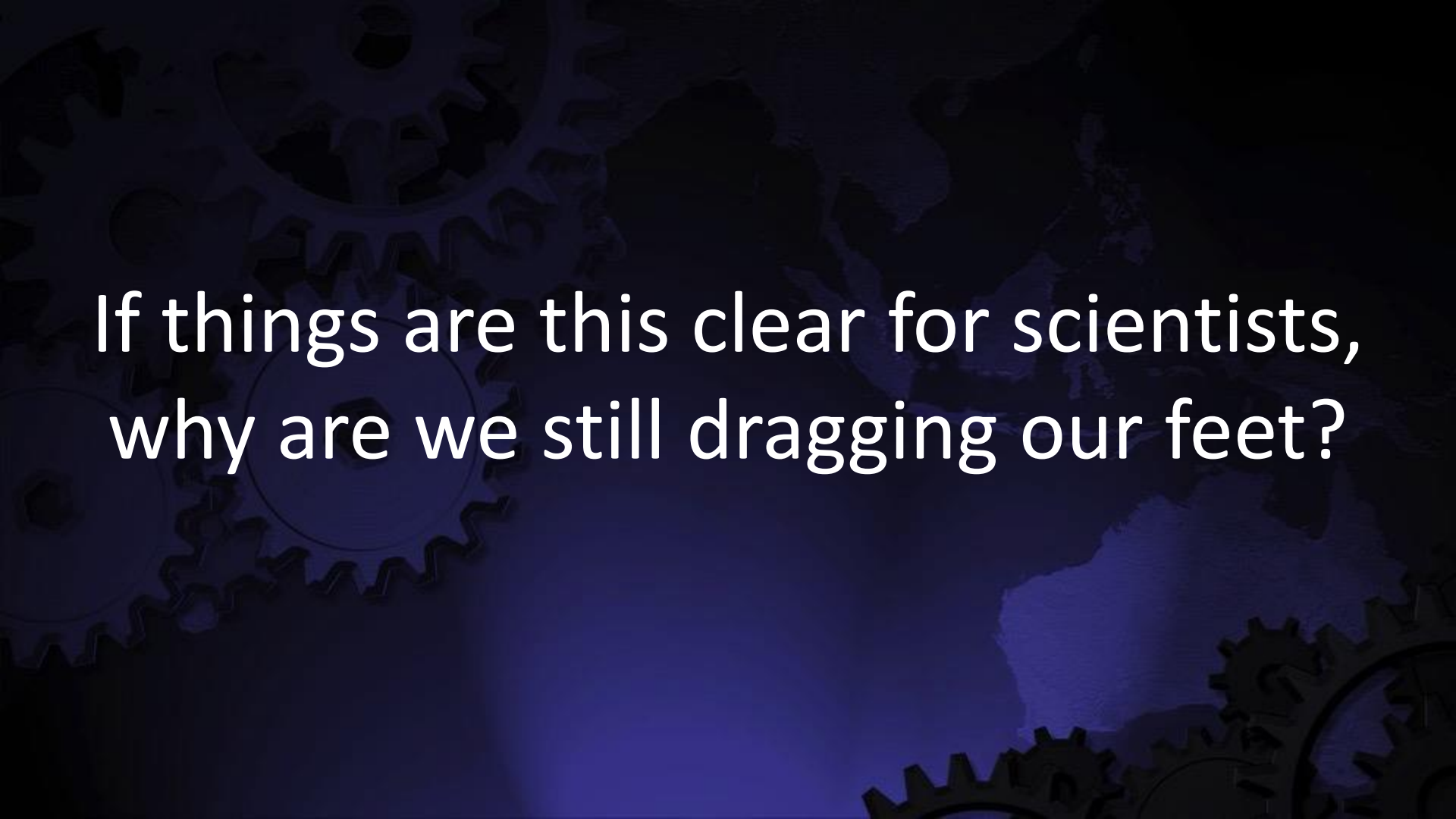
Experts
agree

It's bad

There's
hope

We have the technology to solve climate change



The background of the slide is a dark blue gradient. Overlaid on this are several large, semi-transparent gears of different sizes, some of which are interlocked. A faint, light-colored world map is also visible in the background, centered behind the text.

If things are this clear for scientists,
why are we still dragging our feet?

MISINFORMATION CAMPAIGN





It's real

It's us

Experts
agree

It's bad

There's
hope

It's *not* real

It's *not* us

Experts are
unreliable

It's *not* bad

There's
no hope

Scientific consensus



97%

OF CLIMATE SCIENTISTS
AGREE ON GLOBAL
WARMING

Global Warming Petition Project

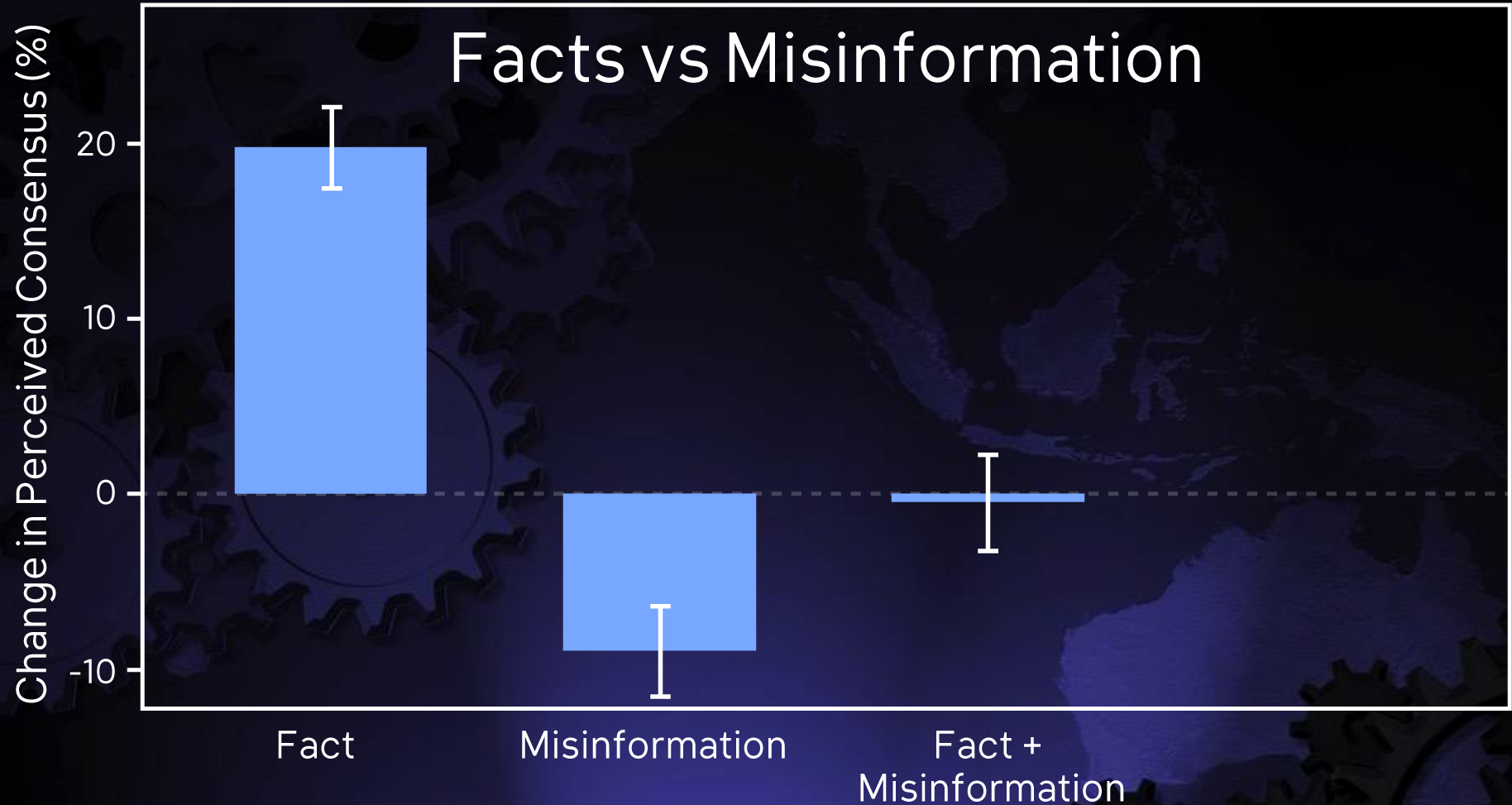
*31,487 American scientists have signed this petition,
including 9,029 with PhDs*

Petition

We urge the United States government to reject the global warming agreement that was written in Kyoto, Japan in December, 1997, and any other similar proposals. The proposed limits on greenhouse gases would harm the environment, hinder the advance of science and technology, and damage the health and welfare of mankind.

There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gases is causing or will, in the foreseeable future, cause catastrophic heating of the Earth's atmosphere and disruption of the Earth's climate. Moreover, there is substantial scientific evidence that increases in atmospheric carbon dioxide produce many beneficial effects upon the natural plant and animal environments of the Earth.

Facts vs Misinformation



Explanation

... several independent investigations have concluded that the “Petition Project” is extremely misleading. For instance, many of the signatures on the petition are fake (for example, past signatories have included the long deceased Charles Darwin, members of the Spice Girls, and fictional characters from Star Wars). Also, although 31,000 may seem like a large number, it actually represents less than 0.3% of all US science graduates (a tiny fraction). Further, nearly all of the legitimate signers have no expertise in climate science at all.

Highlighting various issues

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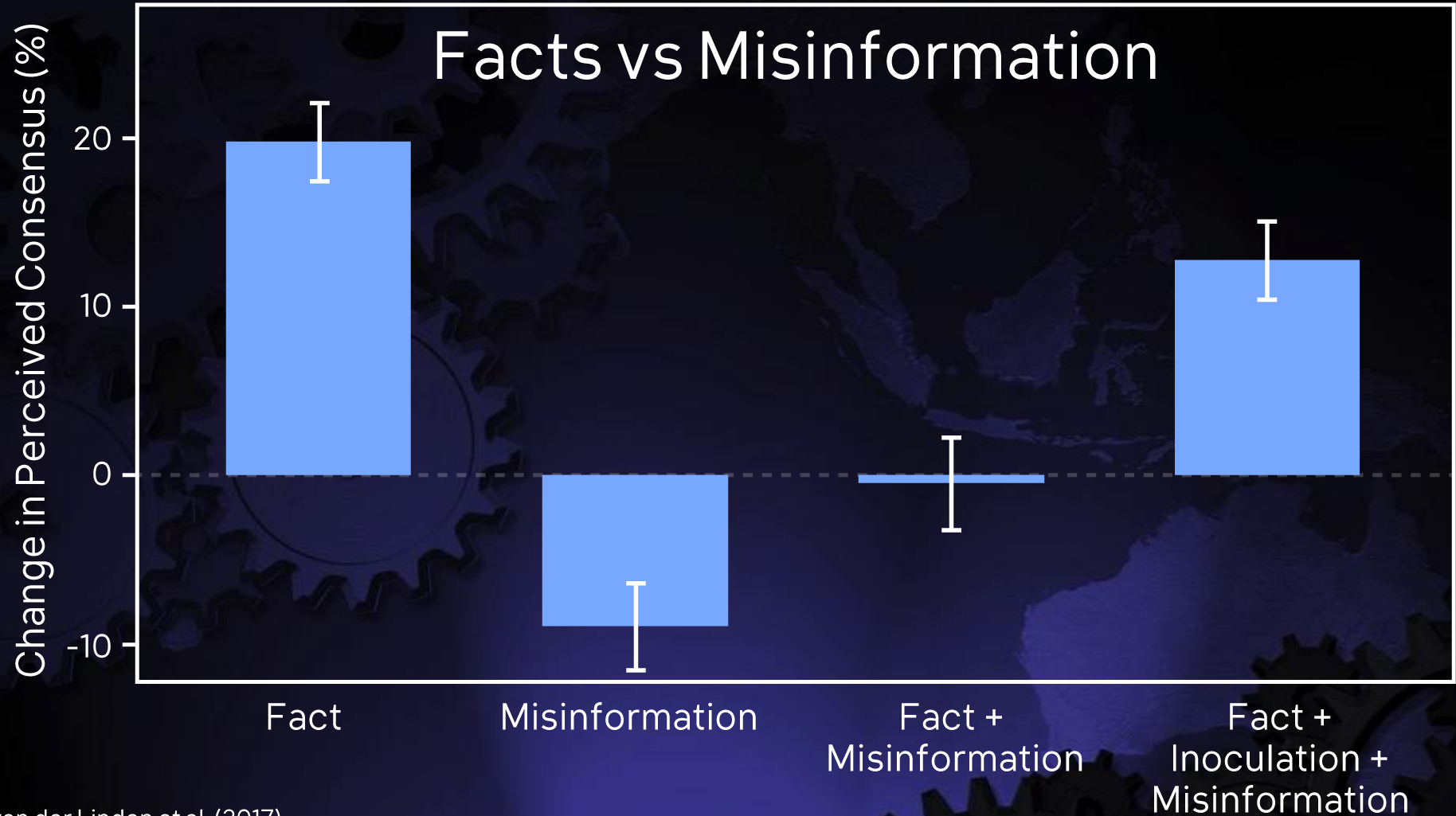
Highlighting various issues

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Highlighting various issues

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Facts vs Misinformation





The antidote to fake news...
...is a little bit of fake news.





INOCULATION THEORY

**Warning
of threat**

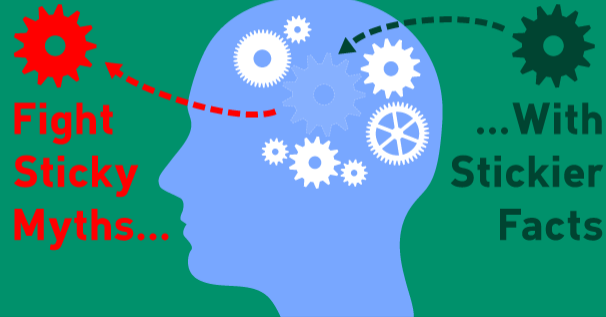
+

**Counter-
arguments**

3 ELEMENTS TO AN EFFECTIVE DEBUNKING

FACT

Replace the myth with a factual alternative that meets all the causal requirements left by the myth. Ideally, the fact is more compelling and memorable than the myth.



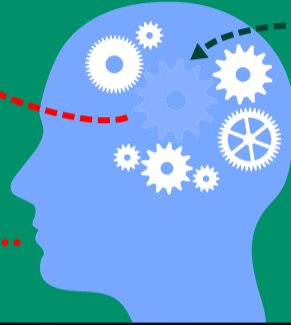
THE
GOLDEN
RULE OF
DEBUNKING

3 ELEMENTS TO AN EFFECTIVE DEBUNKING

FACT

Replace the myth with a factual alternative that meets all the causal requirements left by the myth. Ideally, the fact is more compelling and memorable than the myth.

**Fight
Sticky
Myths...**



**...With
Stickier
Facts**

**THE
GOLDEN
RULE OF
DEBUNKING**

MYTH/MISCONCEPTION

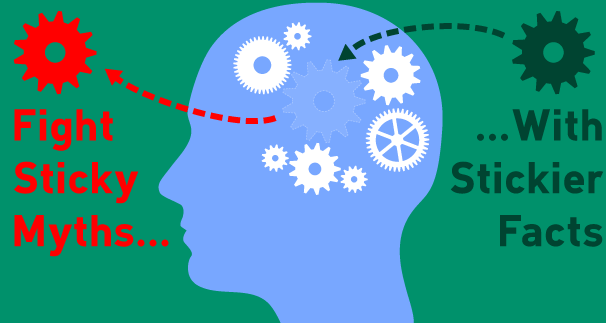
Mentioning the myth risks a familiarity backfire effect. Here are three techniques to reduce the risk of a backfire effect:

- Emphasise the fact rather than the myth
- Warn people before mentioning the myth
- Explain the myth's fallacy

3 ELEMENTS TO AN EFFECTIVE DEBUNKING

FACT

Replace the myth with a factual alternative that meets all the causal requirements left by the myth. Ideally, the fact is more compelling and memorable than the myth.



**THE
GOLDEN
RULE OF
DEBUNKING**

MYTH/MISCONCEPTION

Mentioning the myth risks a familiarity backfire effect. Here are three techniques to reduce the risk of a backfire effect:

- Emphasise the fact rather than the myth
- Warn people before mentioning the myth
- Explain the myth's fallacy

FALLACY

Explain the technique used by the myth to distort the fact. This enables people to reconcile the fact with the myth.



Fake Experts



Logical Fallacies



Impossible Expectations



Cherry Picking



Conspiracy Theories

The 5 techniques of science denial (FLICC)



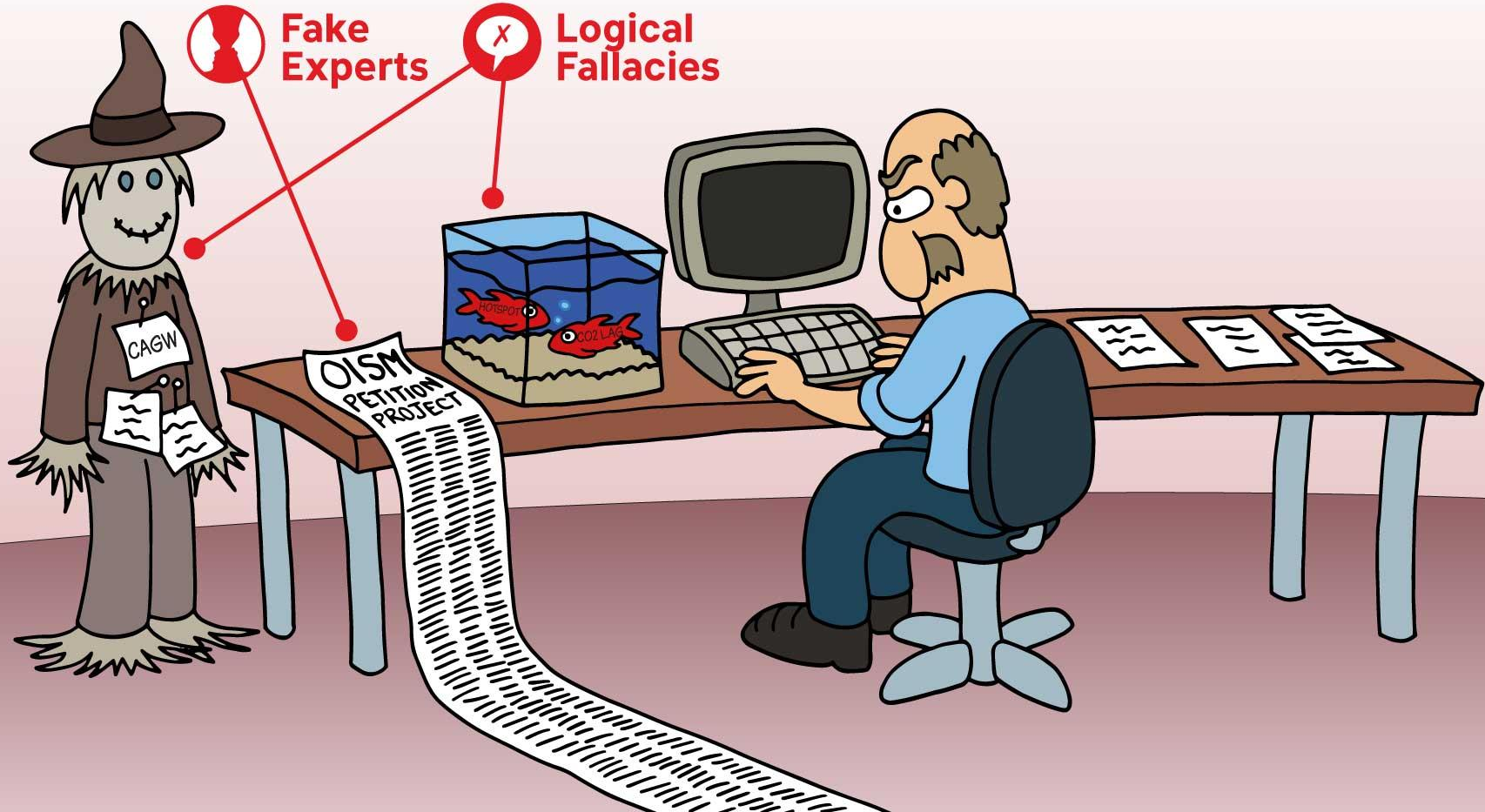
The 5 techniques of science denial (FLICC)



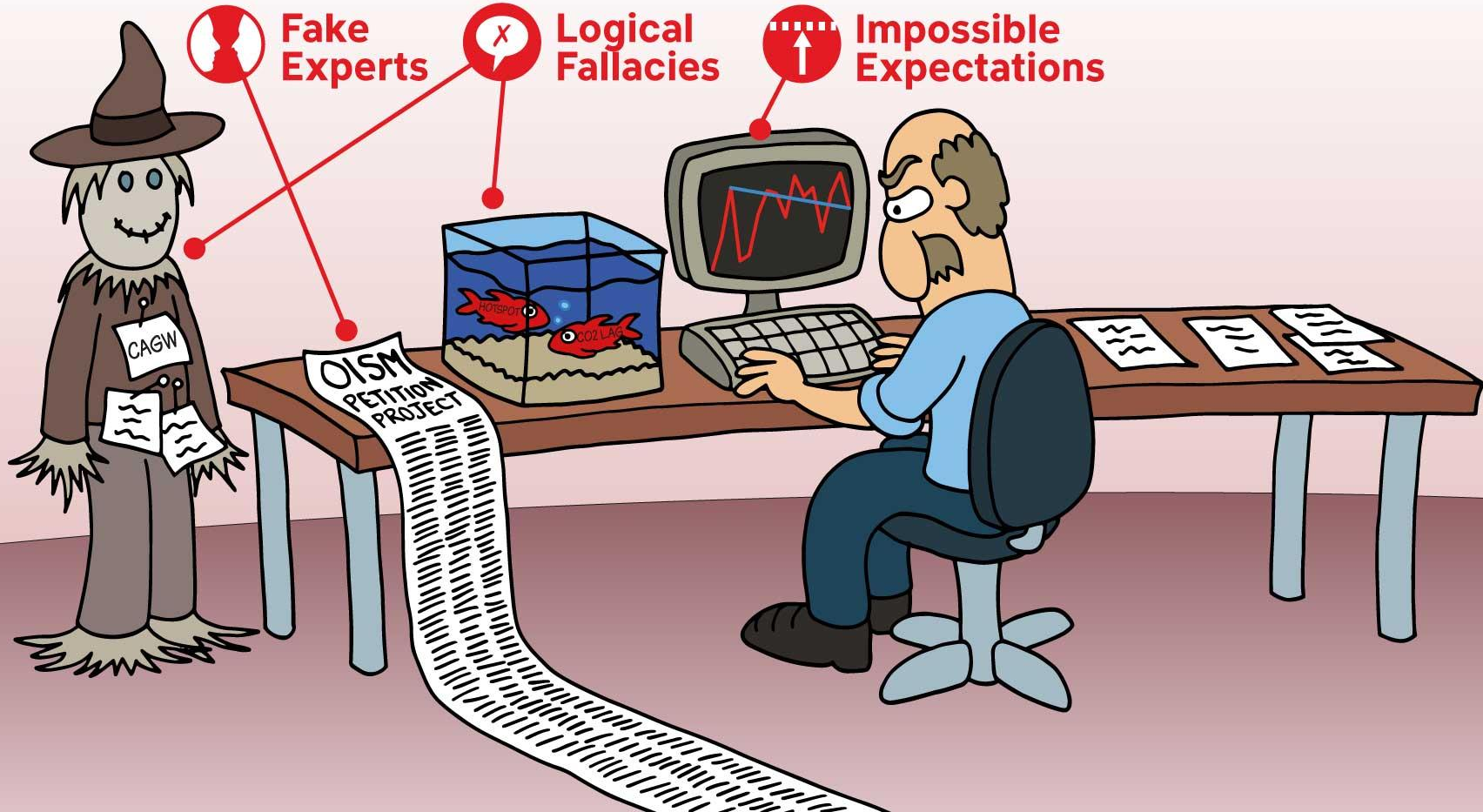
**Fake
Experts**



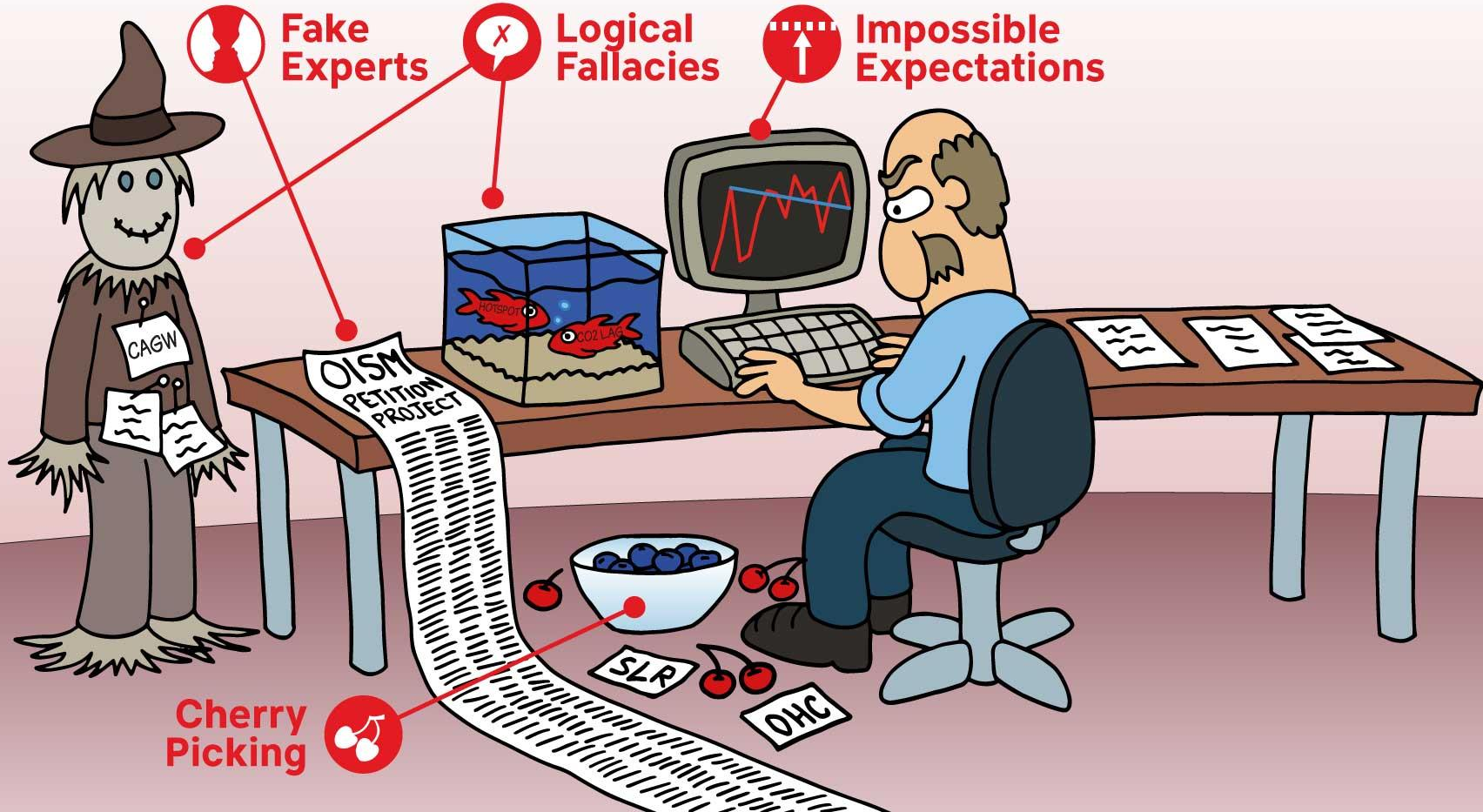
The 5 techniques of science denial (FLICC)



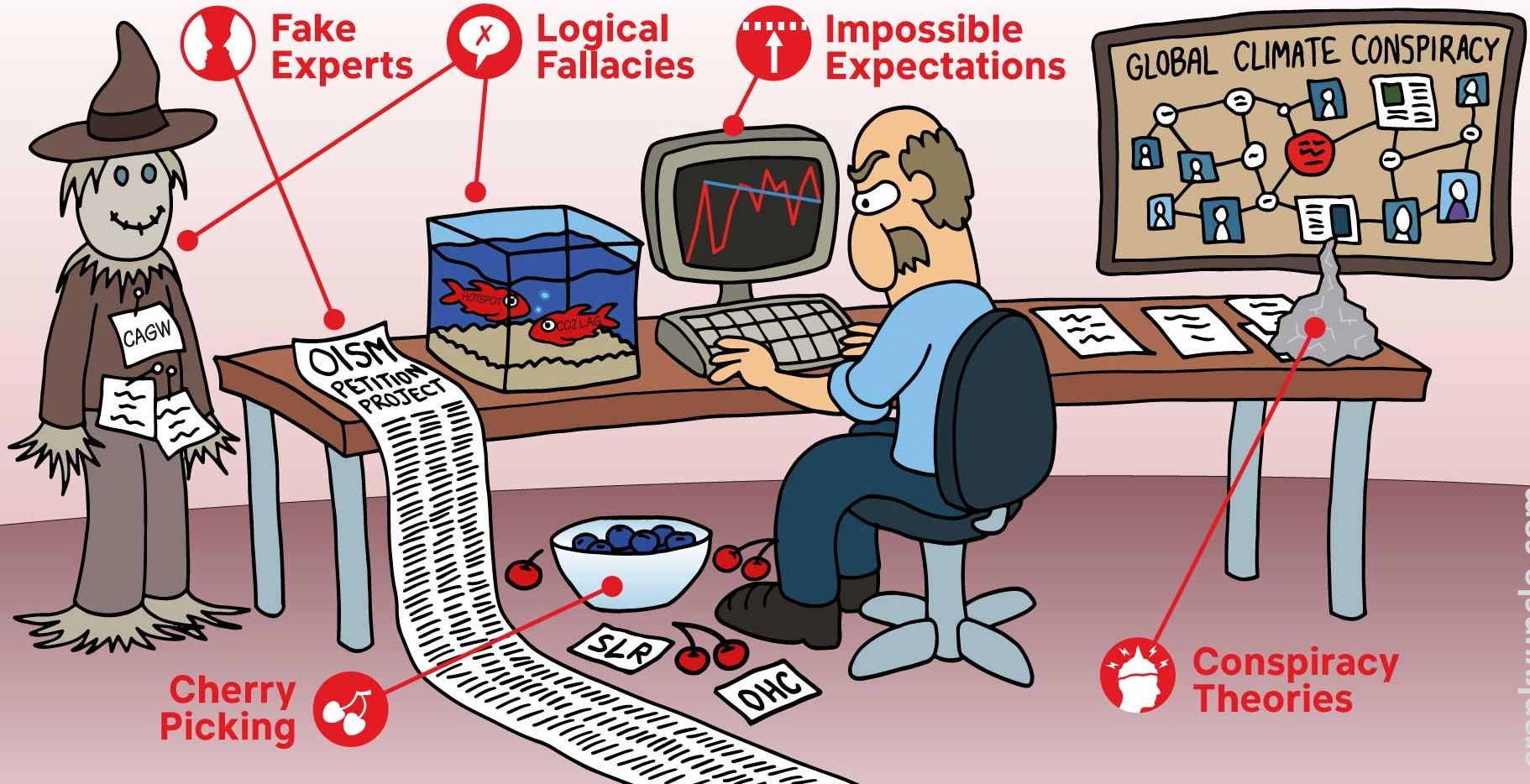
The 5 techniques of science denial (FLICC)



The 5 techniques of science denial (FLICC)



The 5 techniques of science denial (FLICC)



5 CHARACTERISTICS OF SCIENCE DENIAL

F



**Fake
Experts**

L



**Logical
Fallacies**

I



**Impossible
Expectations**

C



**Cherry
Picking**

C



**Conspiracy
Theories**

5 CHARACTERISTICS OF SCIENCE DENIAL





Fake Experts

Consensus

FACT

Between 90 and 100 % of climate experts agree that we are mostly responsible for current global warming.

MYTH

More than 31,000 scientists disagree with the consensus.

FALLACY

The myth relies on fake experts and a magnified minority. Just about 0.1 % of signees are actively publishing climate scientists while most of them work in other areas.

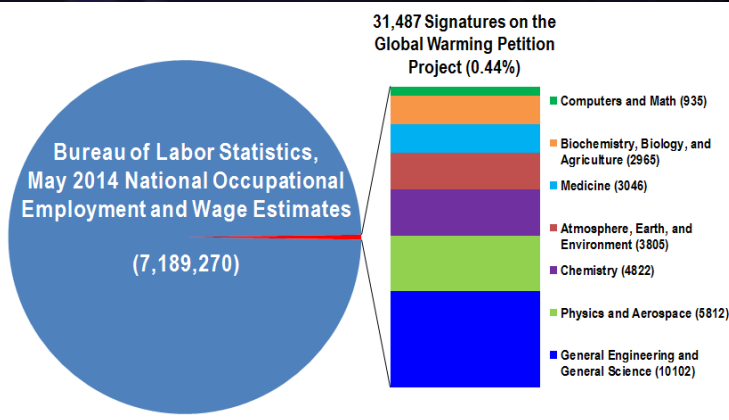
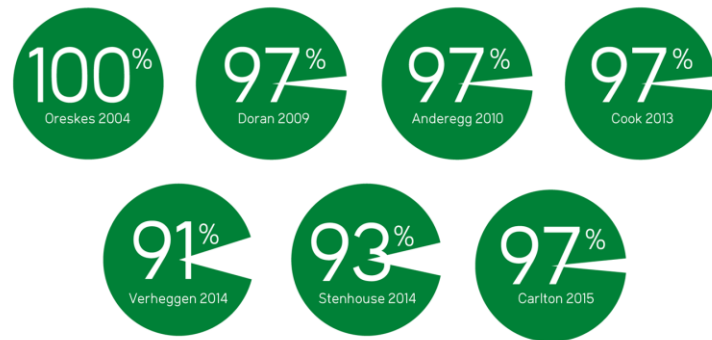


Fake
Experts



Magnified
Minority

Studies into scientific agreement on human-caused global warming



Brian Angliss – Scholars & Rogues (2015)

<http://sks.to/consensus>





Logical Fallacies



Jumping to
Conclusions



False
Choice



Red
Herring



Straw
Man



Past and future climate change

FACT

Past climate change tells us climate is sensitive to the warming effect of CO₂.

MYTH

Natural climate change in the past implies current climate change is also natural.

FALLACY

Past climate change actually sends the opposite message than what the myth concludes.

Humans have died naturally in the past...

...so this death must be natural!



Jumping to
conclusions



<http://sks.to/past>





Impossible Expectations

Past and future climate change

FACT

Models are based on fundamental physical principles.

MYTH

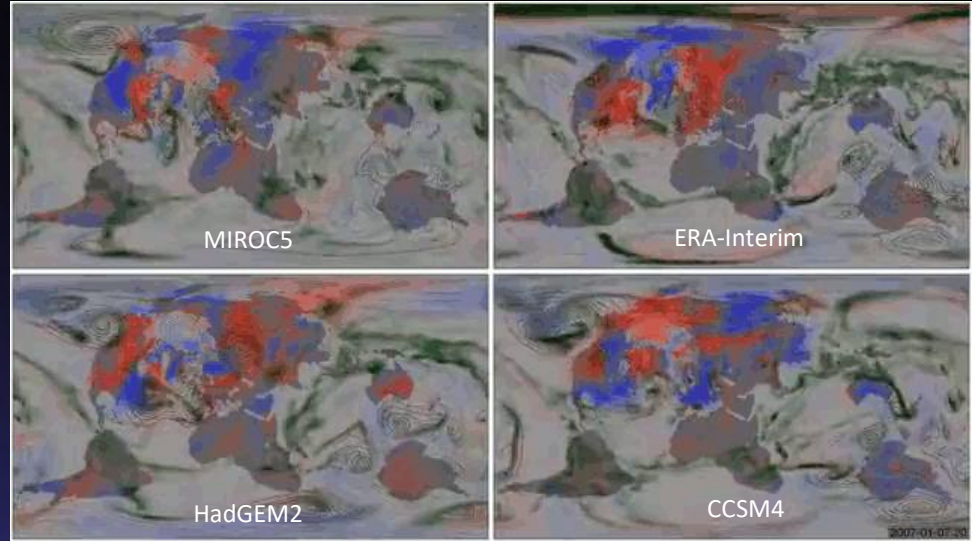
Models are unreliable.

FALLACY

No model is perfect but they are useful tools that can reproduce the past and provide insights into the future.



Impossible
Expectations



One of these panels shows observed weather (as estimated by Era-Interim); the other three weather simulated by three different climate models (HadGEM2, CCSM4, and MIROC5) - which is which? Click to find out!
Video from Philip Brohan - <https://vimeo.com/213117747>





Cherry Picking

We are causing global warming

FACT

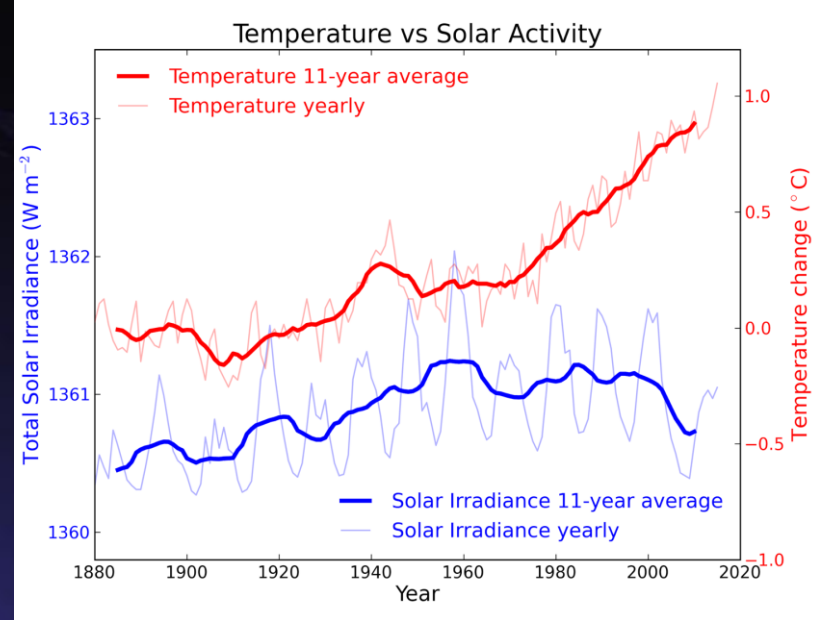
The Sun has been getting colder for the last 30 years as the Earth has been warming. Sun and climate are moving in opposite directions.

MYTH

The sun is causing global warming.

FALLACY

Ignores human fingerprints and recent period where sun and climate move in opposite directions.



Skeptical Science - <https://skepticalscience.com/graphics.php?g=5>



Cherry-
picking



<http://sks.to/sun>





Conspiracy Theories



Donald J. Trump 

@realDonaldTrump



The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive.

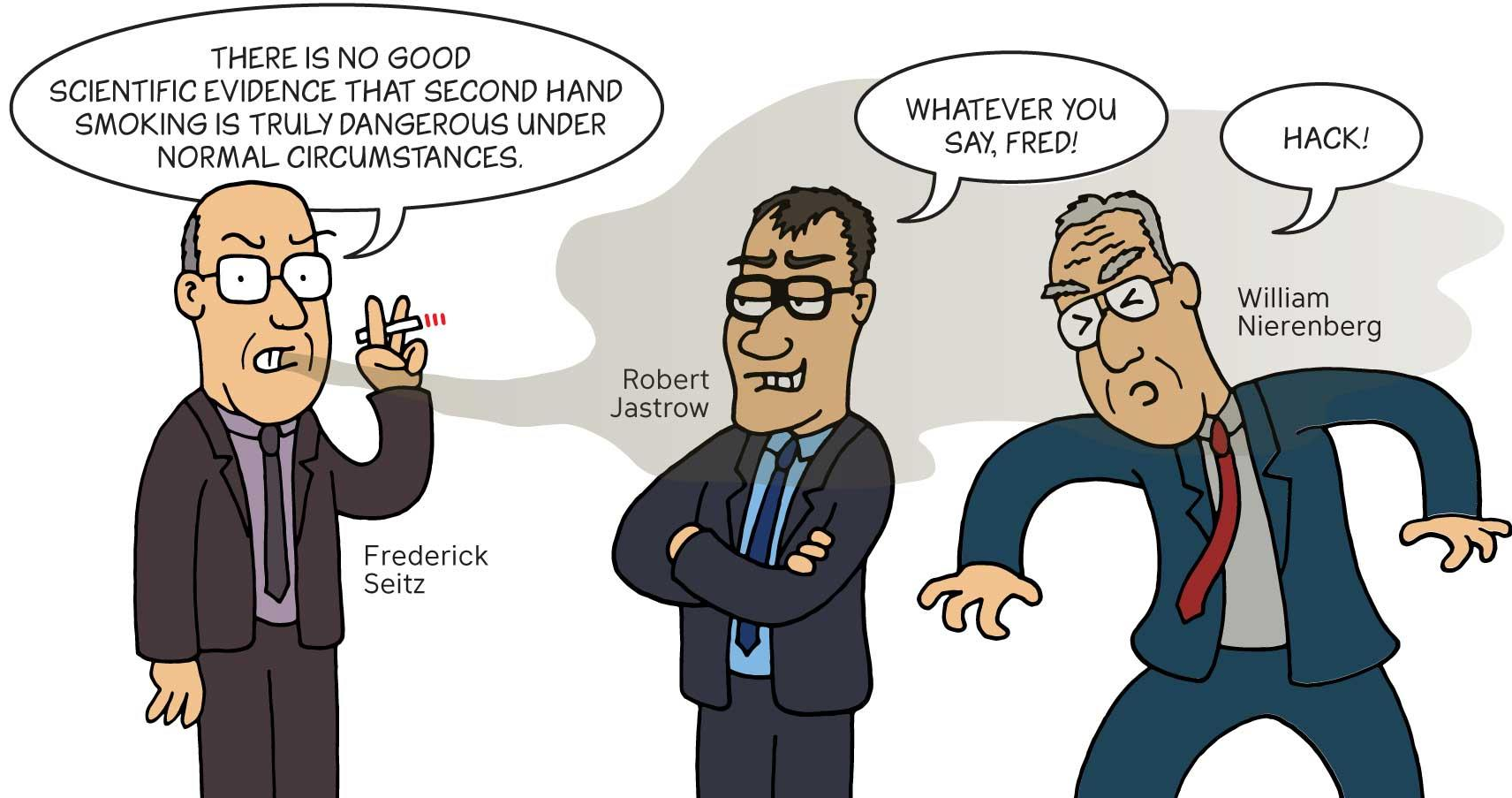
2:15 PM · Nov 6, 2012 · [Twitter Web Client](#)

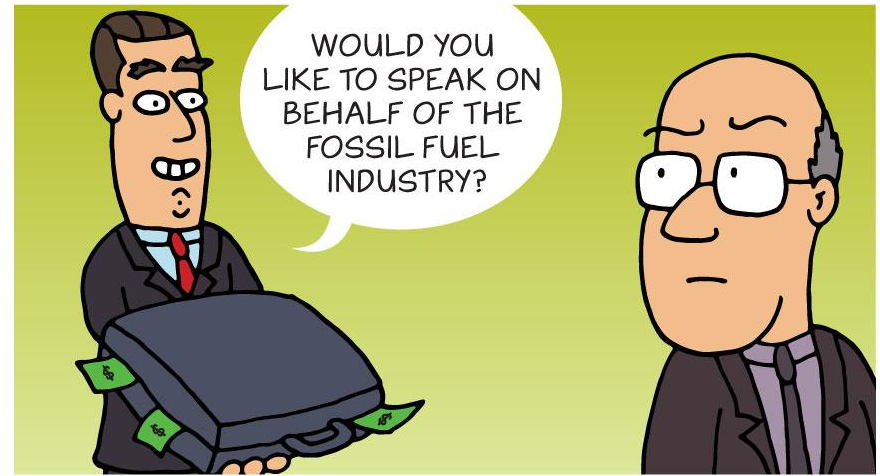
96.7K Retweets **64.7K** Likes



What is behind science denial?

Merchants of Doubt

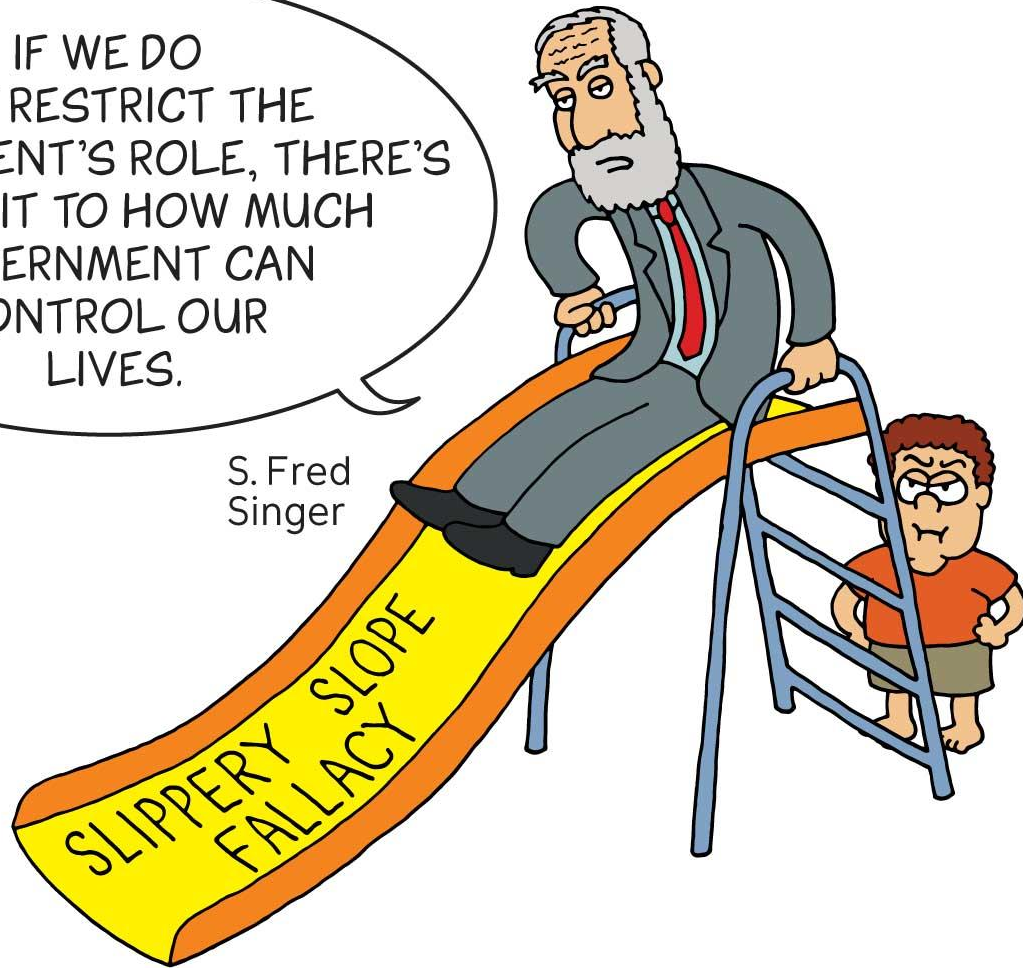


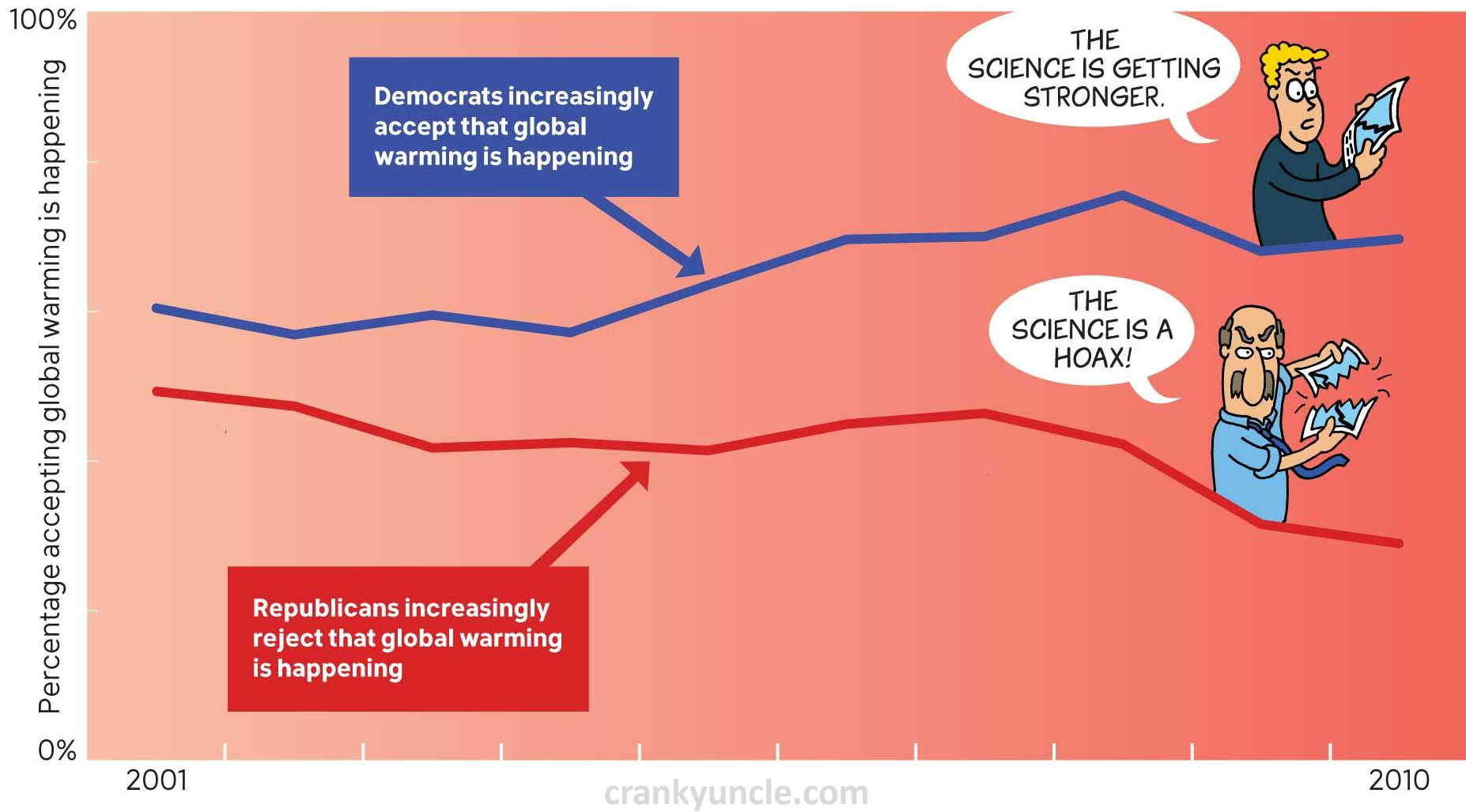


IF WE DO
NOT RESTRICT THE
GOVERNMENT'S ROLE, THERE'S
NO LIMIT TO HOW MUCH
GOVERNMENT CAN
CONTROL OUR
LIVES.

S. Fred
Singer

SLIPPERY SLOPE
FALLACY







How to tell skepticism from denial?

A **GENUINE SKEPTIC**
considers the evidence...



THEN

...comes to a conclusion.



THE
EVIDENCE
INDICATES...

A **GENUINE SKEPTIC**
considers the evidence...



THEN

...comes to a conclusion.



THE
EVIDENCE
INDICATES...

A **SCIENCE DENIER**
makes up his mind...



I DON'T
BELIEVE
IT!

THEN

...denies inconvenient
evidence.



The background of the slide features a dark blue, almost black, color scheme. Overlaid on this are several interlocking gears of different sizes, some of which are semi-transparent, revealing a faint world map underneath. The gears are positioned in the corners and along the sides, creating a mechanical, interconnected feel. The text is centered in the middle of the slide in a clean, white, sans-serif font.

How can we communicate
logical fallacies?

**"One of the reasons
why the climate is
changing is climate
has always been
changing."**

MARCO RUBIO



**P1: The climate can change
through natural processes.**

**P2: The climate is currently
changing.**



**C: The climate is currently
changing through natural
processes**



P1: The climate can change through natural processes.

P2: The climate is currently changing.



C: The climate is currently changing through natural processes

**Non
sequitur**



**(jumping to
conclusions)**

One of the
reasons why
the climate is
changing...



...is climate
has always
been
changing.

This person
died of
natural
causes...



...because
people have
always died of
natural causes.



Examples

**"It's a snowball...
It's very, very cold out."**

JAMES INHOFE



We keep hearing
that 2014 has been
the warmest year
on record...



You know what this is?
It's a snowball... It's
very, very cold out.

JAMES INHOFE

We keep hearing
that 2014 has been
the warmest year
on record...



You know what this is?
It's a snowball... It's
very, very cold out.

JAMES INHOFE

It's very
very
dark
out...



...that means
the sun
doesn't
exist!



They say that we had hurricanes
that were far worse than what we
just had with Michael.

DONALD TRUMP



They say that we had hurricanes
that were far worse than what we
just had with Michael.

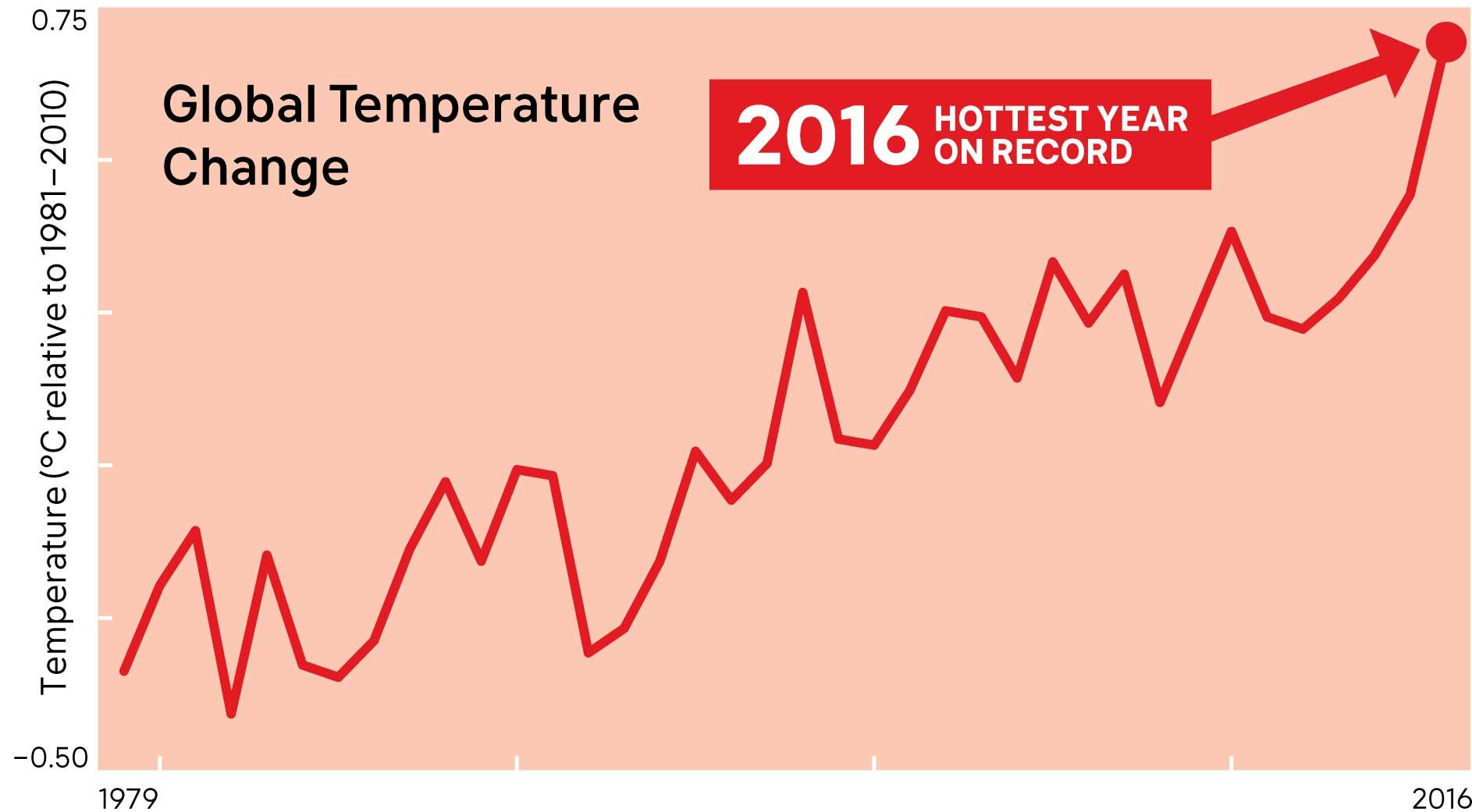
DONALD TRUMP

They say we had
cancer far worse
before cigarettes
were invented.



Global Temperature Change

2016 HOTTEST YEAR ON RECORD

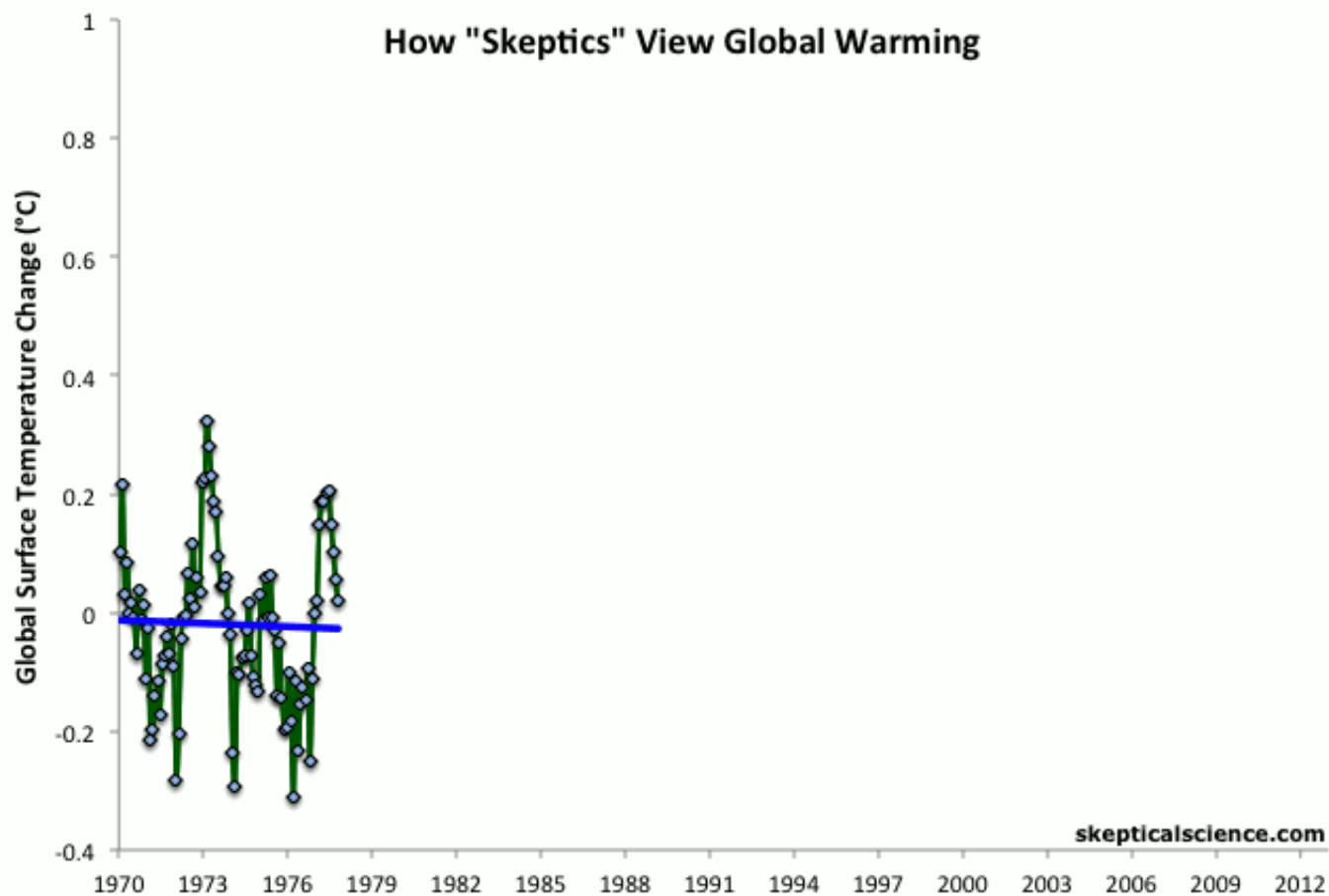




We've actually been in a
hiatus since the late 1990s.

SCOTT PRUITT

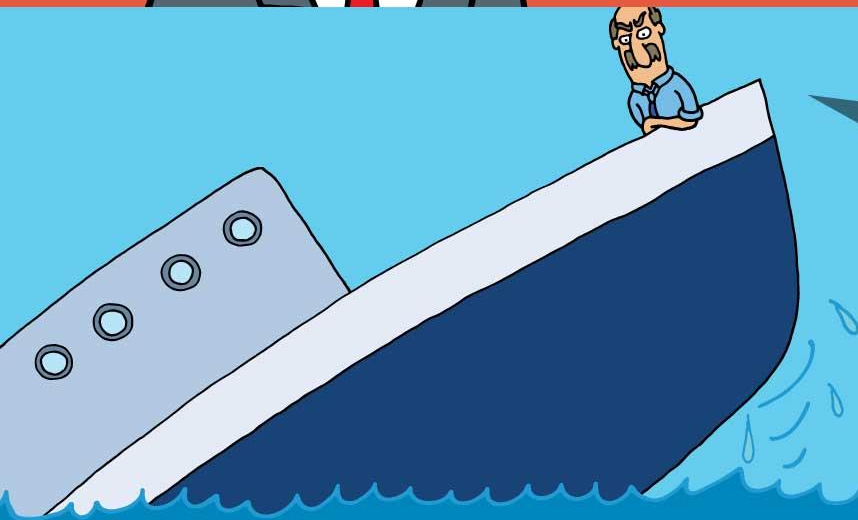
How "Skeptics" View Global Warming






We've actually been in a
hiatus since the late 1990s.

SCOTT PRUITT



I've actually been
moving upwards since
we started "sinking."


Massive open online course (MOOC) Denial101x

[Courses](#) ▾ [Programs](#) ▾ [Schools & Partners](#) [About](#) ▾

Search:


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[Home](#) > [All Subjects](#) > [Communication](#) > [Making Sense of Climate Science Denial](#)



Making Sense of Climate Science Denial

Climate change is real, so why the controversy and debate? Learn to make sense of the science and to respond to climate change denial.



Self-Paced

[Enroll Now](#)

☒ I would like to receive email from The University of Queensland and learn about other offerings related to Making Sense of Climate Science Denial.

About this course

In public discussions, climate change is a highly controversial topic. However, in the scientific community, there is little controversy. Why do climate scientists considering humans are causing global warming.

- Why the gap between the public and scientists?
- What are the psychological and social drivers of the rejection of the scientific consensus?
- How has climate denial influenced public perceptions and attitudes towards climate change?

This course examines the science of climate science denial.

We will look at the most common climate myths from “global warming stopped in 1998” to “global warming is caused by the sun” to “climate impacts are nothing to worry about.”

We'll find out what lessons are to be learnt from past climate change as well as better understand how climate models predict future climate impacts. You'll learn both the science of climate change and the techniques used to distort the science.

🕒 Length:	7 weeks
👤 Effort:	2 to 4 hours per week
💰 Price:	FREE Add a Verified Certificate for \$49 USD
🏛️ Institution:	UQx
🎓 Subject:	Communication
⚙️ Level:	Introductory
🗨️ Language:	English
📺 Video Transcripts:	English

Next self-paced run starts February 4, 2020!

<http://sks.to/denial101x>

Global warming is happening

FACT

Our planet has continued to build up heat since 1998 - global warming is still happening.

MYTH

"Global warming stopped in 1998."

FALLACY

Cherry picking

Looking at one region or a short period ignores the full picture.



VIDEO

UQx DENIAL101x 2.2.1.1 Heat Bul...



Global warming is like rigging the weather dice, making it more likely to get hot days.

"It's cold outside, so global warming must have stopped."

Impossible Expectations

Global warming doesn't mean no more cold weather, just fewer cold days compared to hot days.



UQx DENIAL101x 2.2.2.1 Hot recor...



Overall, glaciers across the globe are shrinking at an accelerating rate, threatening water supplies for millions of people.

"Glaciers around the world are increasing, disproving global warming."

Cherry picking

Picking a handful of growing glaciers ignores the vast majority of glaciers that are shrinking.



UQx DENIAL101x 2.3.1.1 Shrinking...



Fact - Myth - Fallacy Compilation of Slides

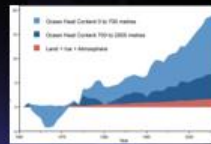


5 CHARACTERISTICS OF SCIENCE DENIAL



1998	Cold	Glacier	Greenland	Antarctica
Temp	LHF	Winter	Name	
CO ₂	Volcano	Residence	Thermo	Salinity
LAG	Holotap	Trace	Suit	
Heat	LIA	Post CO ₂	MMW	Model
Hansen 1998	Weather	10/10s	Rings	Underscore
Vapor	Cloud	Species	Clear	Acid
Impacts	Pollution	Plant	Zebra	Consensus

FACT
Our planet has continued to build up heat since 1958 - global warming is still happening.



MYTH
Global warming stopped in 1998.

FALLACY
Looking at one region or a short period ignores the full picture.



<http://sks.to/fit-folien>

FACT
Overall, glaciers across the globe are shrinking at an accelerating rate, threatening water supplies for millions of people.



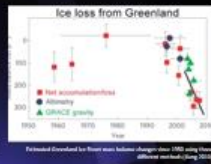
MYTH
Glaciers around the world are increasing, disproving global warming.

FALLACY
Looking at a handful of growing glaciers ignores the vast majority of glaciers that are shrinking.



<http://sks.to/fit-folien>

FACT
Greenland on the whole is losing ice, at a rate of over 2 Mount Everests worth of ice every year.



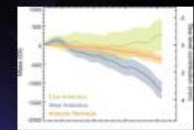
MYTH
Greenland ice sheet is thickening in the middle so it must be gaining mass.

FALLACY
Looking at the whole ice sheet shows it's thickening in the middle but ice loss at the edges is accelerating.



<http://sks.to/fit-folien>

FACT
The West Antarctic ice sheet is losing hundreds of billions of tonnes of ice every year, making it a major contributor to global sea level rise.



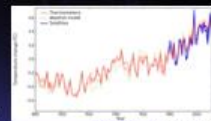
MYTH
Antarctic sea ice is on the increase and casts doubt on global warming.

FALLACY
A number of factors may contribute to the increase in sea ice - but in no way does it change the fact that climate change is happening.



<http://sks.to/fit-folien>

FACT
We can measure temperature in many ways and they all say the same thing - our planet is warming.



MYTH
The thermometer record is unreliable.

FALLACY
Just because measurements have uncertainty doesn't mean it's unknowable. The uncertainty is smaller than measured global warming.



<http://sks.to/fit-folien>

FACT
Slowing jet stream is causing Arctic cold air to leak down into Europe and North America, like an open fridge leaking cold air into the kitchen.



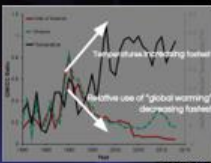
MYTH
Record cold winters disprove global warming.

FALLACY
A cold winter doesn't disprove global warming, you need to look at the big picture.



<http://sks.to/fit-folien>

FACT
Climate change and global warming have both been used for decades.



MYTH
They changed name from 'global warming' to 'climate change'.

FALLACY
They didn't change the name (let alone in connection with temperature changes).



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FACT
For thousands of years, our atmosphere has been in balance. Humans have upset the balance.



MYTH
Human CO₂ emissions are tiny compared to natural CO₂ emissions so our influence is negligible.

FALLACY
Considers only natural CO₂ emissions and ignores natural CO₂ sinks.



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FACT
Human emissions are responsible for all of the increase in CO₂ in the air over the past two centuries.



MYTH
Volcanoes produce more CO₂ than humans.










FALLACY
Volcanoes do produce CO₂, but over recent centuries the amounts are too small to account for the observed changes in the air.

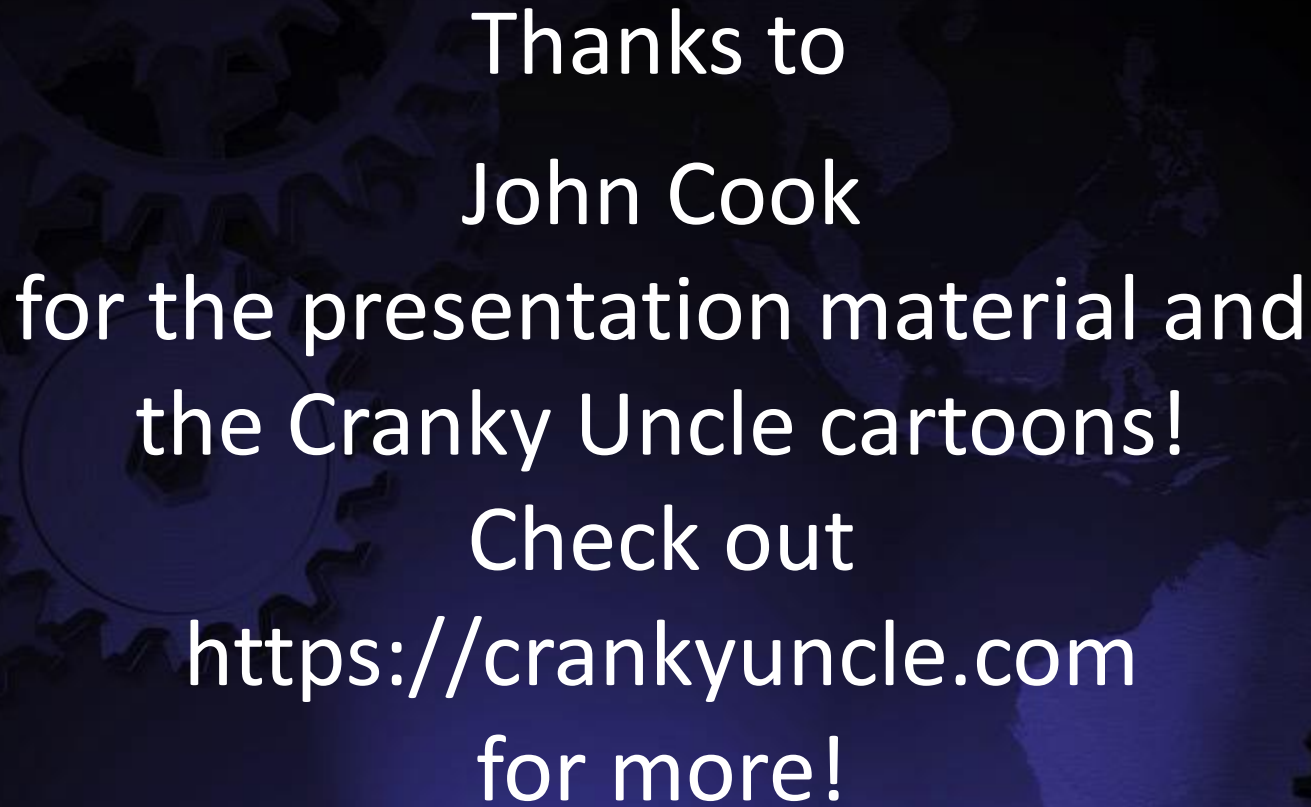


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Quiz to match fallacies to cartoons

<http://sks.to/comm-call-quiz>

			 False Choice	 Single Cause
			 Impossible Expectation	 Fake Experts
			 Cherry-picking	 Fake Debate
			 Moving the Goalposts	 Slothful Induction
			 Ambiguity	

The background of the slide features a dark blue to black gradient with several interlocking gears of various sizes. The gears are rendered in a lighter blue-grey color, creating a mechanical or industrial aesthetic. The text is centered and written in a clean, white, sans-serif font.

Thanks to
John Cook
for the presentation material and
the Cranky Uncle cartoons!
Check out
<https://crankyuncle.com>
for more!

The background of the slide features a dark, blue-toned image of several interlocking gears of different sizes, creating a mechanical or scientific aesthetic.

Thank you!

Bärbel Winkler

Email: baerbelw@skepticalscience.com

Web: <https://www.skepticalscience.com>

Profile: <http://sks.to/BaerbelW>

Fact-Myth-Fallacy page - <http://sks.to/fmf>

MOOC <http://sks.to/denial101x>

Resources & References

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References for many of the rebuttals mentioned in the presentation can be found via the reference list for our MOOC Denial101x: <http://sks.to/denial101xrefs>

Quiz to match fallacies to cartoons

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Definitions of Logical Fallacies used in the Quiz



Fake Experts: Presenting an unqualified person or institution as a source of credible information.



Fake Debate: Presenting science and pseudoscience in an adversarial format to give the false impression of an ongoing scientific debate.



Ambiguity: Using ambiguous language in order to lead to a misleading conclusion.



False Choice: Presenting two options as the only possibilities, when other possibilities exist.



Single Cause: Assuming a single cause or reason when there might be multiple causes or reasons.



Impossible Expectations: Demanding unrealistic standards of certainty before acting on the science.



Moving the Goalposts: Demanding higher levels of evidence after receiving requested levels of evidence.



Cherry Picking: Carefully selecting data that appear to confirm one position while ignoring other data that contradicts that position.



Slothful Induction: Ignoring relevant evidence when coming to a conclusion. Similar to cherry picking but with an emphasis on neglecting inconvenient information rather than highlighting convenient information.