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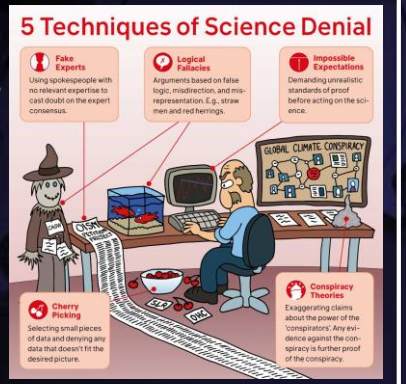
Using an interdisciplanery MOOC to teach climate science and science communication to a global classroom

Bärbel Winkler and John Cook

EGU 2019 – EOS7.1/CL3.16 – Monday April 8, 2019

Go to 2-minute-madness



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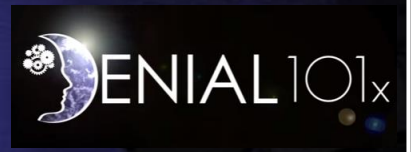
Check out FLICC

Content of our MOOC



Photography encouraged

2 minute madness

Main slides

Two Minute Madness starts here!

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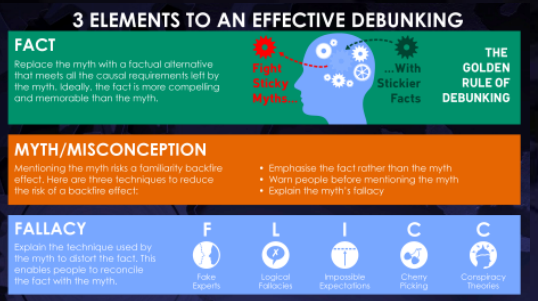
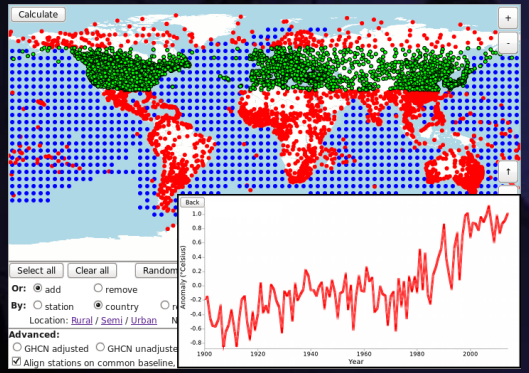
Denial101x – Making sense of climate science denial



Lectures follow the Fact-Myth-Fallacy structure of effective debunking



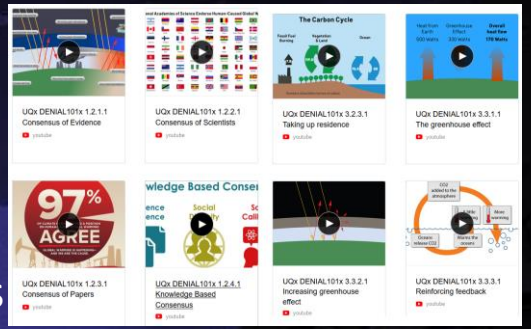
Interactive Exercises which often trigger discussions in the forums

Massive
Open
Online
Course

40 expert interviews to go along with the lectures

40.000+ participants from **180+** countries since 2015

60 lectures about climate science and debunking misconceptions



2 minute madness | Main slides

3 ELEMENTS TO AN EFFECTIVE DEBUNKING

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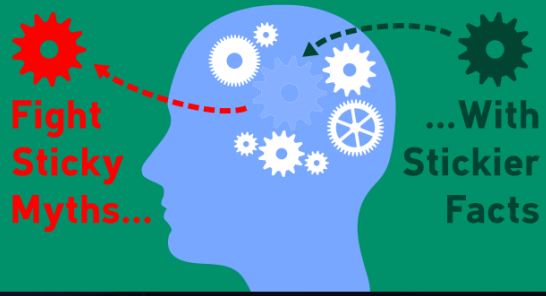
Replace the myth with a factual alternative that meets all the causal requirements left by the myth. Ideally, the fact is more compelling and memorable than the myth.



THE GOLDEN RULE OF DEBUNKING

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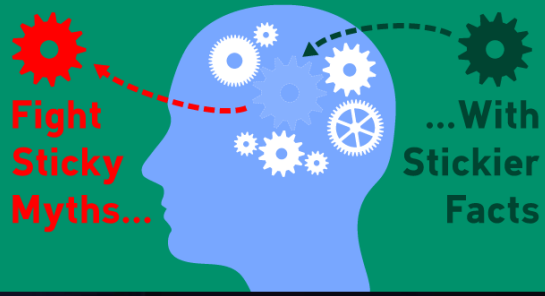

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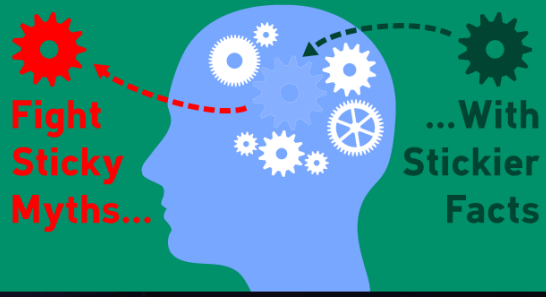

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FALLACY

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

F Fake Experts

L Logical Fallacies

I Impossible Expectations

C Cherry Picking

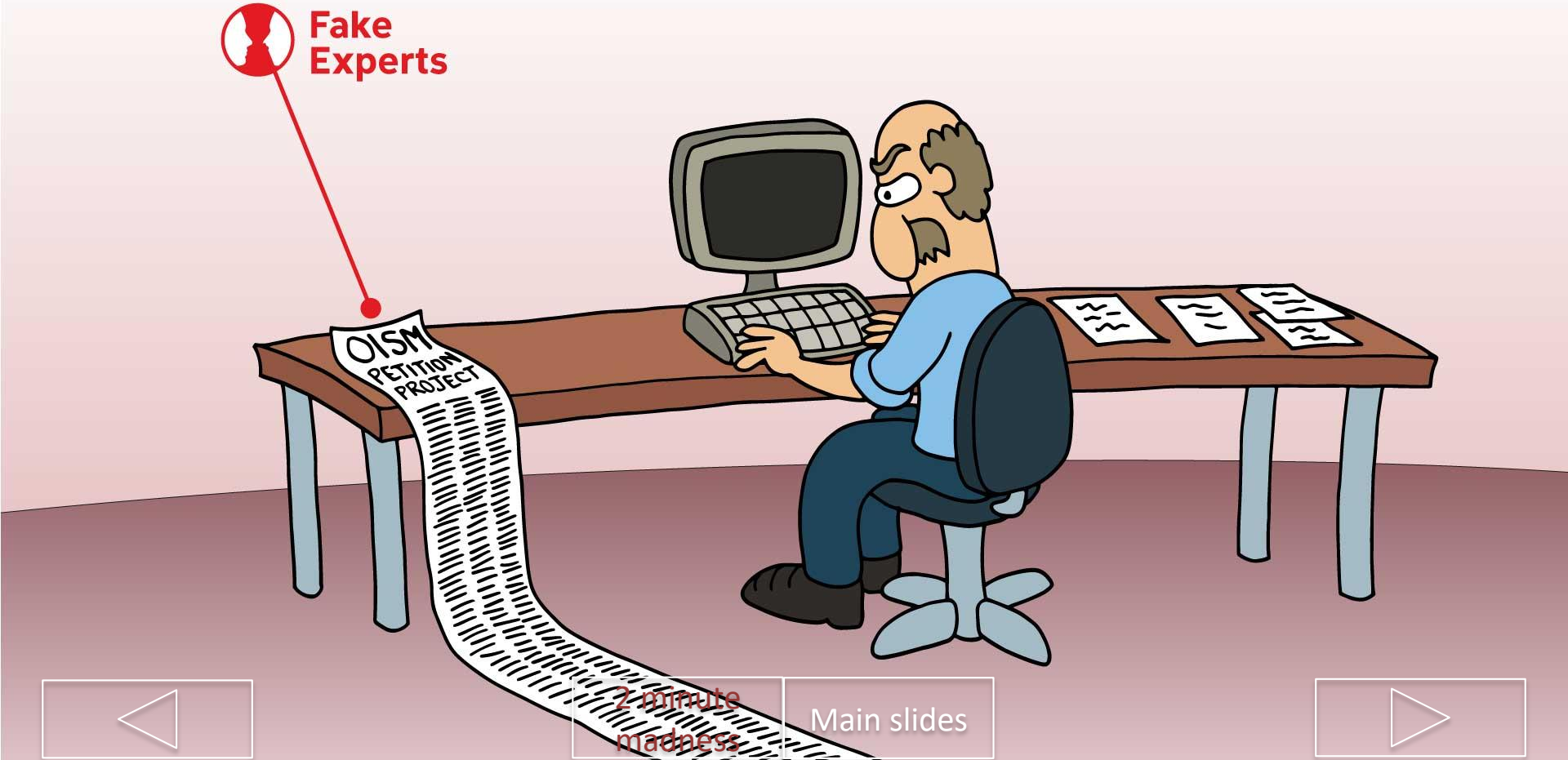
C Conspiracy Theories

The 5 techniques of science denial (FLICC)

2 minute madness

Main slides

The 5 techniques of science denial (FLICC)



2 minute madness
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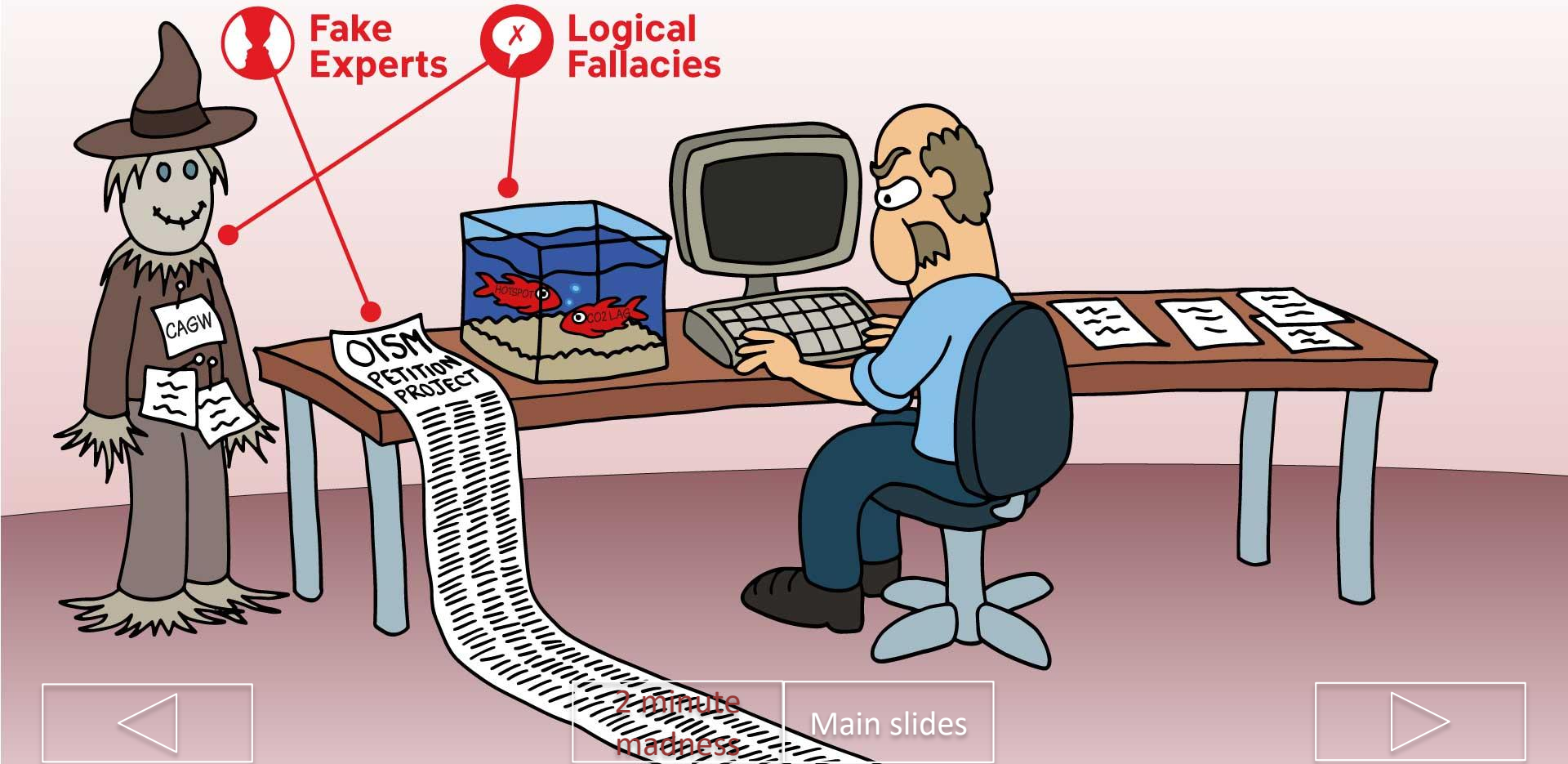
The 5 techniques of science denial (FLICC)



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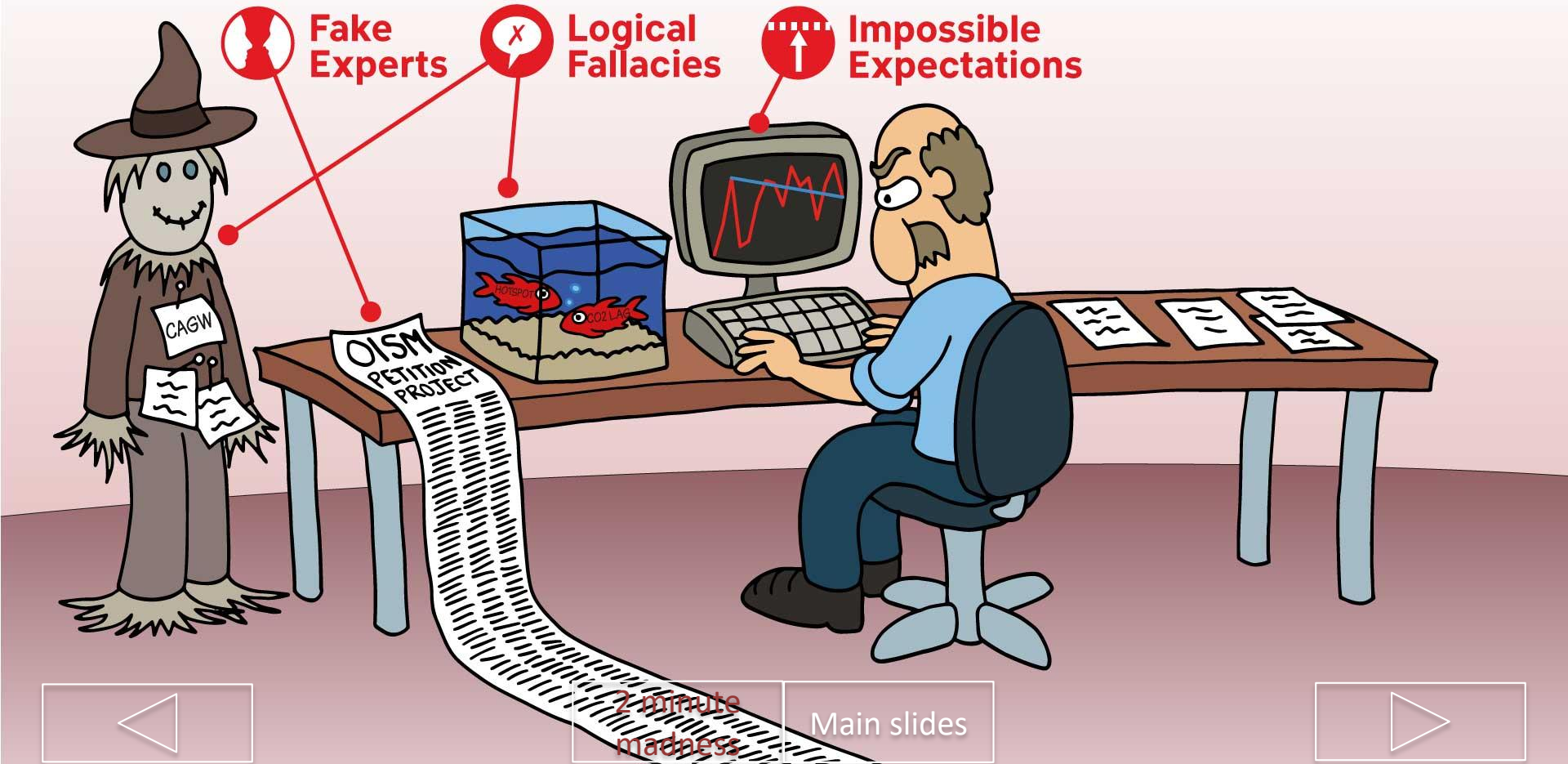

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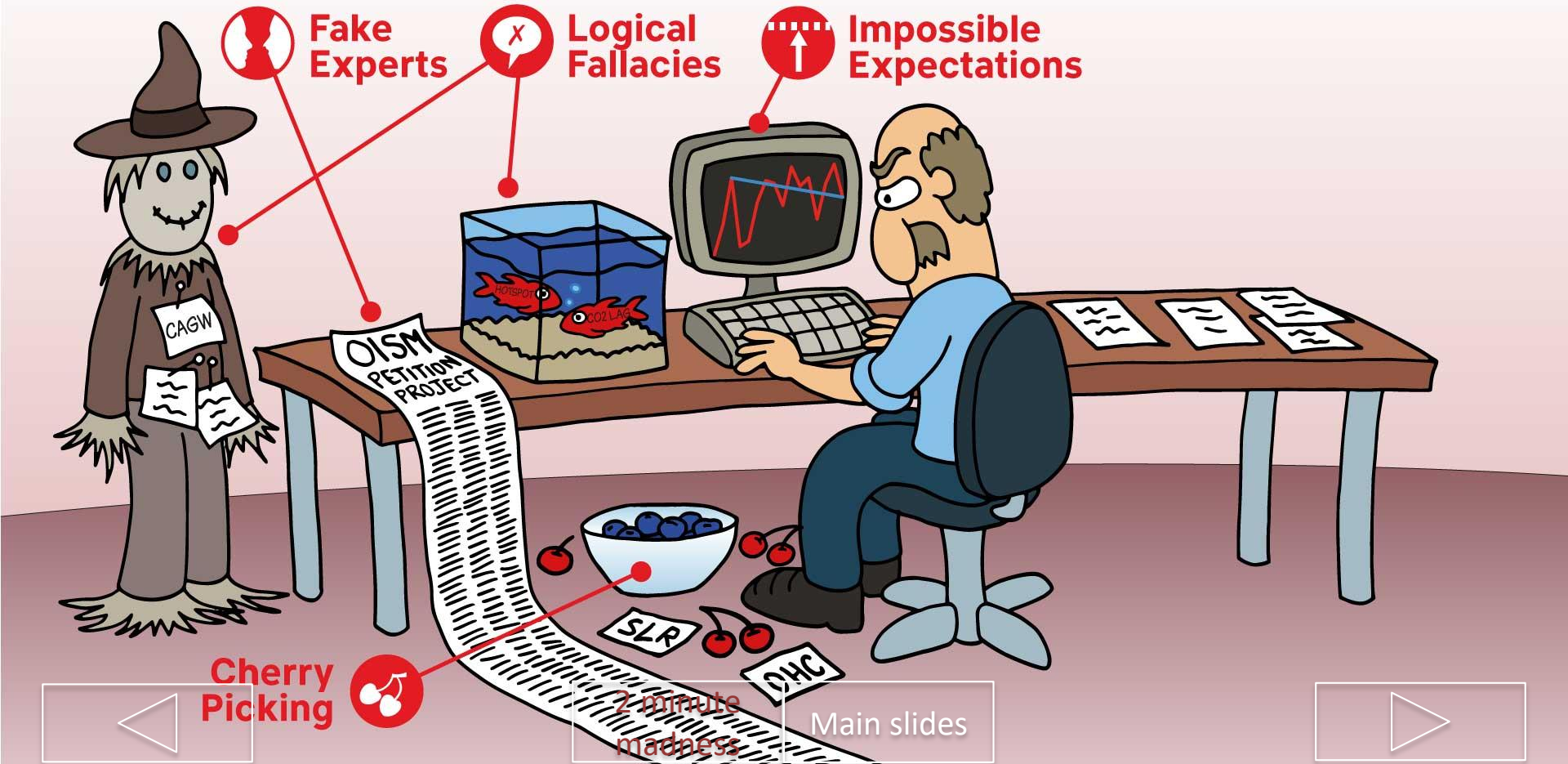

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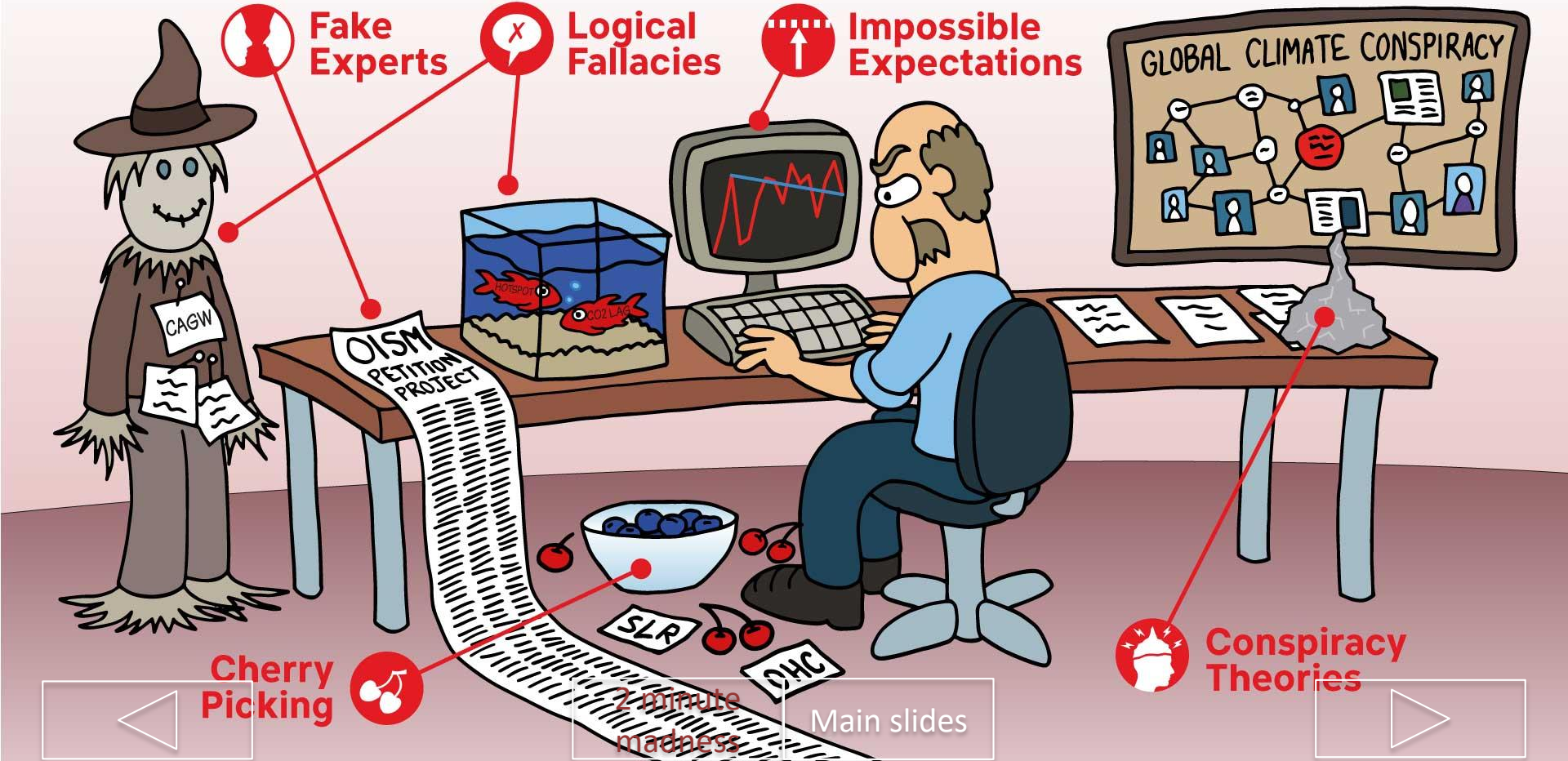

See you at PICO-spot 04.10!

Bärbel Winkler

Email: baerbelw@skepticalscience.com

Web: https://www.skepticalscience.com

Profile: http://sks.to/BaerbelW

MOOC http://sks.to/denial101x

Main presentation starts here

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Click on the elements you'd like to know more about. This will take you to other slides with more details and some examples.

Using MOOCs to Debunk Climate Misinformation in a Global Classroom

John Cook, George Mason University

Bärbel Winkler, Skeptical Science

MOOCs (Massive Open Online Courses) are a powerful way to educate a large, diverse audience. The MOOC *"Making Sense of Climate Science Denial"* applies misconception-based learning and psychological principles in videos debunking the most common myths about climate change. As well as teaching fundamental climate science, the course explains the psychology of climate science denial and the most effective techniques for responding to misinformation. This interdisciplinary online course has had over 35,000 enrolments from over 180 countries. A number of enrolled students were secondary and tertiary educators, who adopted the course content in their own classes.

Structure of an Effective Debunking

All debunking lectures (see right for examples) adopted the fact-myth-fallacy format.

FACT
Replace the myth with a factual alternative. Ideally, your fact needs to be more compelling and memorable than the myth.

Fight Sticky Myths... ...With Stickier Facts

MYTH/MISCONCEPTION
Warn people before mentioning the myth so they're cognitively on guard.

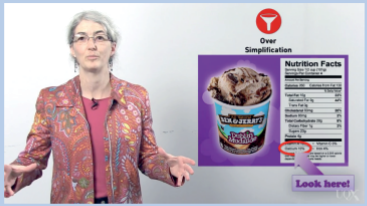
FALLACY
Explain the technique used by the myth to distort the fact using the five characteristics of science denial.

F Fake Experts · L Logical Fallacies · I Impossible Expectations · C Cherry Picking · C Conspiracy Theories

	FACT	MYTH	FALLACIES
SCIENTIFIC CONSENSUS	Many independent human fingerprints have been observed across our climate.	"There is no empirical evidence that humans are causing global warming."	Misrepresentation: ignores the full body of evidence for human-caused global warming.
	Multiple studies find that 97% of publishing climate scientists agree that humans are causing global warming.	"31,000 dissenting scientists show there's no scientific consensus on climate change."	Magnified minority: 31,000 is only 0.3% of over 10 million people with science degrees in the U.S. Fake experts: 99.9% of the 31,000 signatories are not climate scientists.
IT'S WARMING	Our planet has continued to build up heat since 1998. Global warming is still happening.	"Global warming stopped in 1998."	Cherry picking: looking at a single temperature record or a short period ignores the full picture.
	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.
WE'RE THE CAUSE	For thousands of years, our atmosphere has been in balance. Humans have upset the balance.	"Human CO_2 emissions are tiny compared to natural CO_2 emissions so our influence is negligible."	Over-simplification: considers only natural CO_2 emissions and ignores natural CO_2 sinks.
	Satellites measure the warming effect from CO_2 - the increased greenhouse effect is an observed reality.	"CO_2 is a trace gas so its warming effect is minimal."	Red herring: due to its strong warming potential, it doesn't matter that CO_2 is 'just' a trace gas.
PAST & FUTURE	Past climate change tells us climate is sensitive to the warming effect of CO_2.	"Natural climate change in the past implies current climate change is also natural."	Jumping to conclusions: past climate change actually sends the opposite message than what the myth concludes.
	The IPCC is 20 times more likely to underestimate rather than exagerate climate impacts.	"Climate models and the IPCC are alarmist."	Cherry picking: selectively looks at a few examples where the IPCC overestimated climate change, ignoring the much larger number of examples of underestimation.
CLIMATE IMPACTS	Climate change is having negative impacts on all parts of society.	"Global warming is good."	Cherry picking: this focuses on a few good impacts of global warming and ignoring the overwhelming number of bad impacts.
	Climate change impacts agriculture through extreme weather, heat stress and flooding.	"CO_2 is plant food."	Oversimplification: CO_2 fertilisation is just one factor affecting plant growth. The full picture shows that negative impacts outweigh benefits.

Video Lectures

Youtube videos (around 7 minutes long) explain the basics of climate science while debunking common myths about climate change.

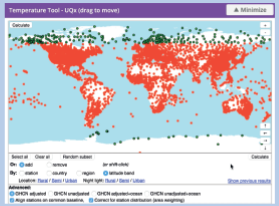


Expert Interviews

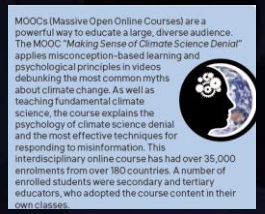
Interviews with leading scientists & communicators complement video lectures with more in-depth details.

Interactive Exercises

Online activities allow students to interact directly with climate and psychological data.



sks.to/denial101x · facebook.com/denial101x · twitter.com/denial101x · john@skepticalscience.com · Skeptical Science · The University Of Queensland · creative commons



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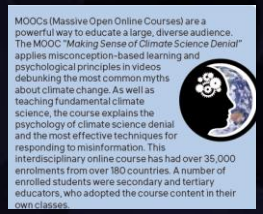


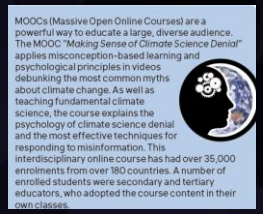
About our MOOC

In public discussions, climate change is a highly controversial topic. However, in the scientific community, there is little controversy with 97% of climate scientists concluding 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.

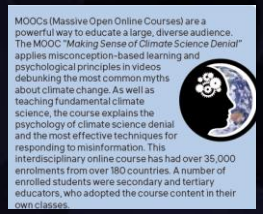


What Students learn

We 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”.

Students learn both the science of climate change and the techniques used to distort the science. Finally, armed with all this knowledge, they learn the psychology of misinformation which will equip them to effectively respond to it.

With every myth debunked, students learn the critical thinking needed to identify the fallacies associated with the myth.



Students learn:

- How to recognise the social and psychological drivers of climate science denial
- How to better understand climate change: the evidence that it is happening, that humans are causing it and the potential impacts
- How to identify the techniques and fallacies that climate myths employ to distort climate science
- How to effectively debunk climate misinformation

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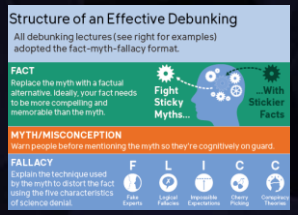

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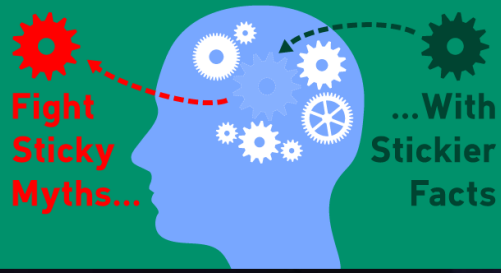

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F	L	I	C	C
Fake Experts	Logical Fallacies	Impossible Expectations	Cherry Picking	Conspiracy Theories

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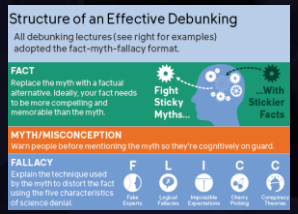

5 CHARACTERISTICS OF SCIENCE DENIAL

F — Fake Experts
- Magnified Minority

L — Logical Fallacies
- Red Herring

I — Impossible Expectations
- Misrepresentation

C — Cherry Picking
- Jumping to Conclusions

C — Conspiracy Theories
- False Dichotomy

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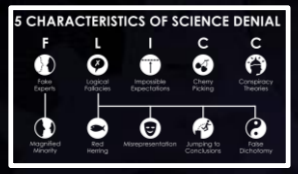
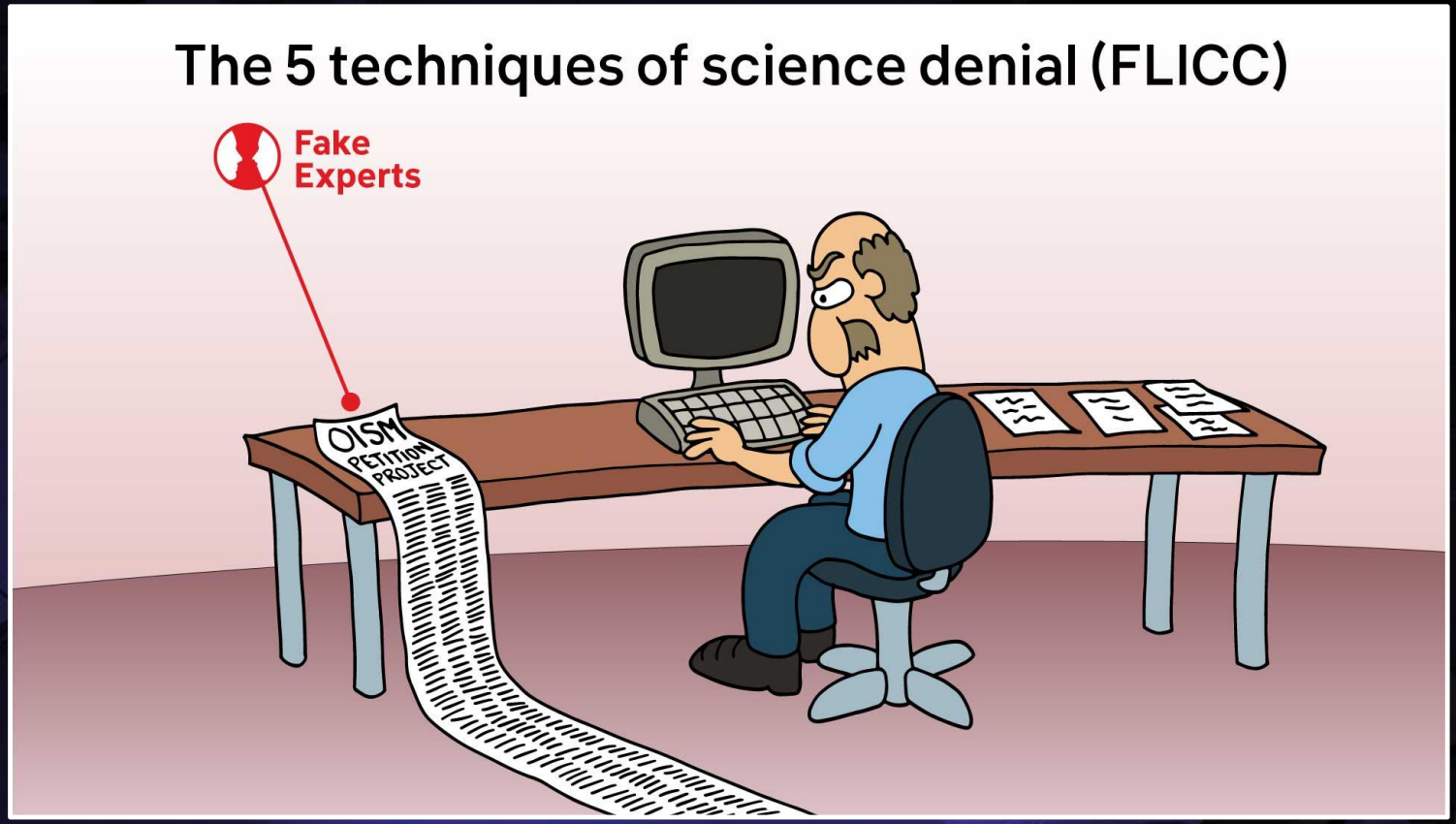


Fake experts are people who convey the appearance of expertise without possessing any actual relevant expertise.

Click for an example



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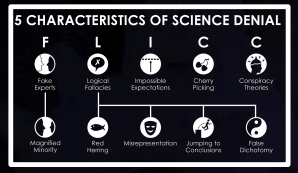
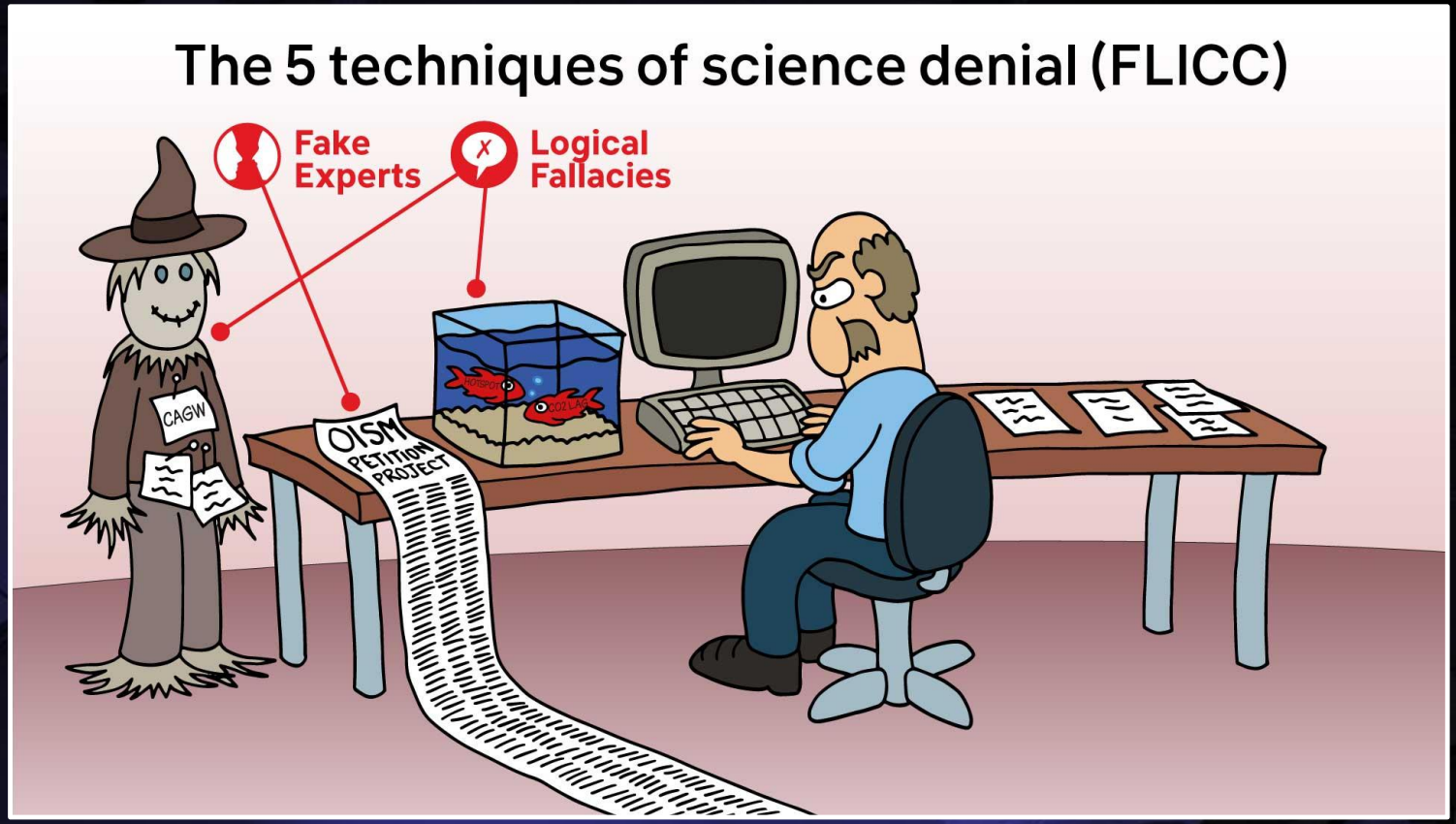


Logical fallacies are false arguments leading to an invalid conclusion. There are a number of different fallacies commonly found in deniers' arguments.

Click for an example



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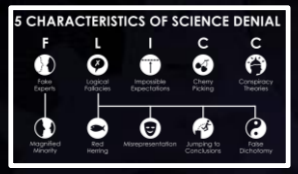
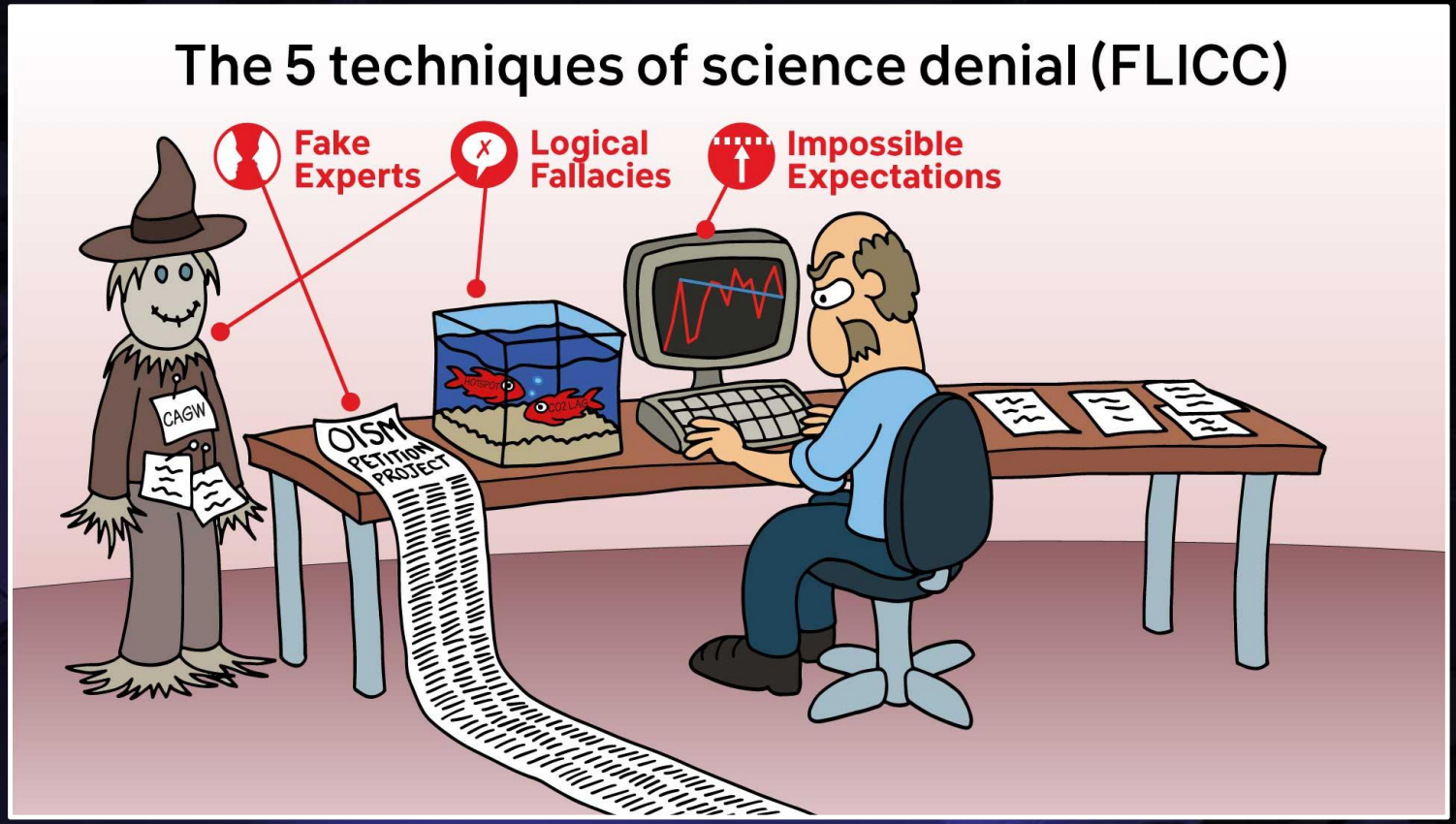


Impossible expectations demand unrealistic standards of proof before acting on the science.

Click for an example



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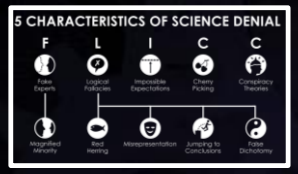
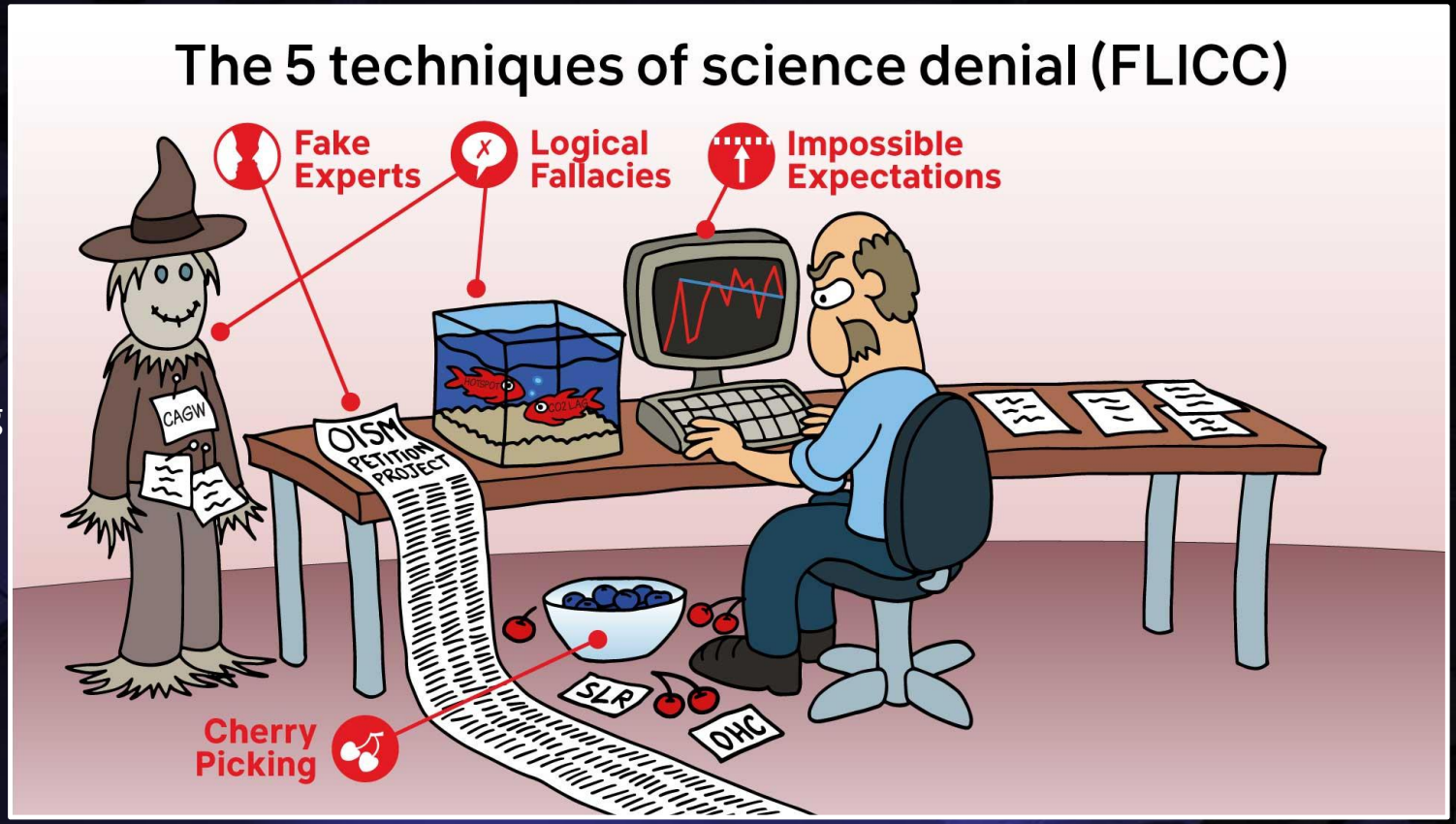


Cherry picking involves focusing on select pieces of data while ignoring anything conflicting with the desired conclusion.

Click for an example



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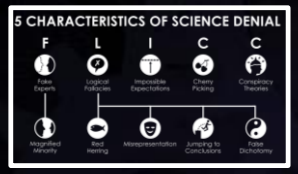
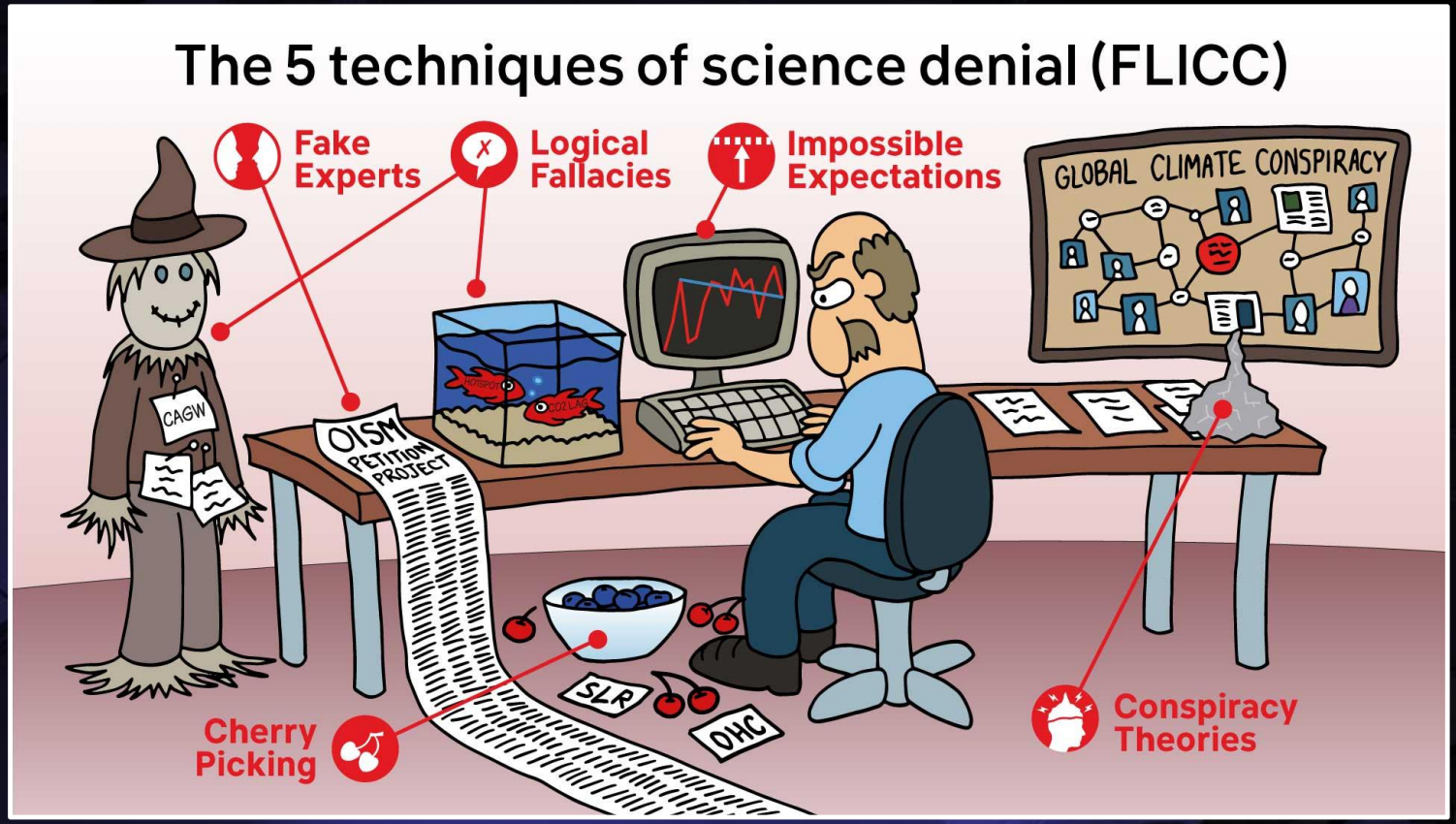


Conspiracy theories are created when science deniers accuse the world's scientists of a massive, global conspiracy.

Click for an example



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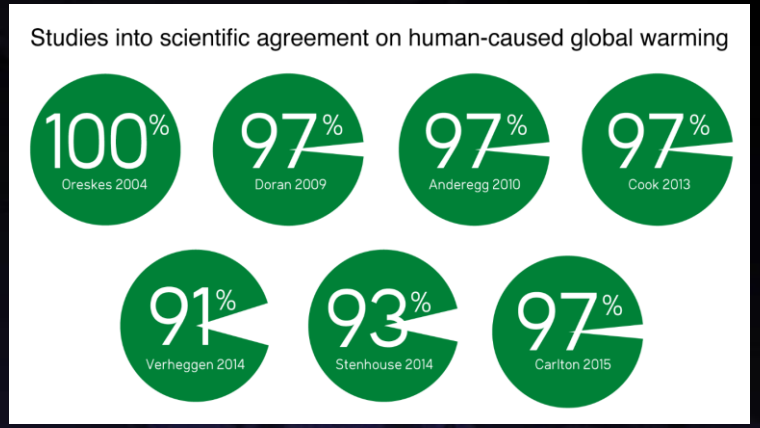
FACT

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



Fake Experts

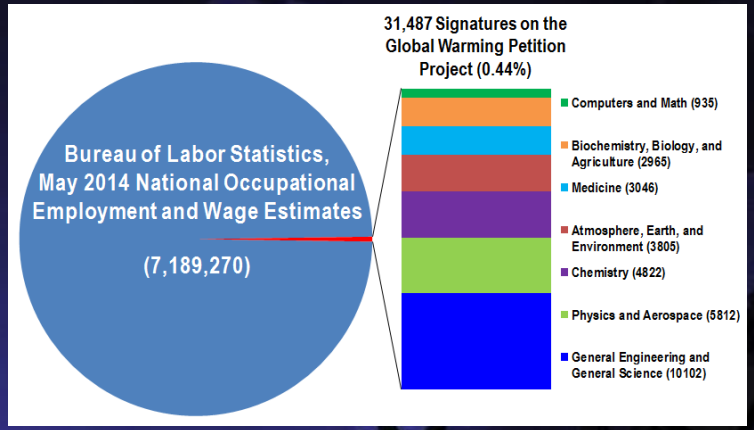
MYTH

More than 31,000 scientists disagree with the consensus.

Magnified Minority

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.



Brian Angliss – Scholars & Rogues (2015)

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http://sks.to/consensus

We are causing global warming

FACT

Satellites measure the warming effect from CO2. The increased greenhouse effect is an observed reality. It was predicted before it could be measured.

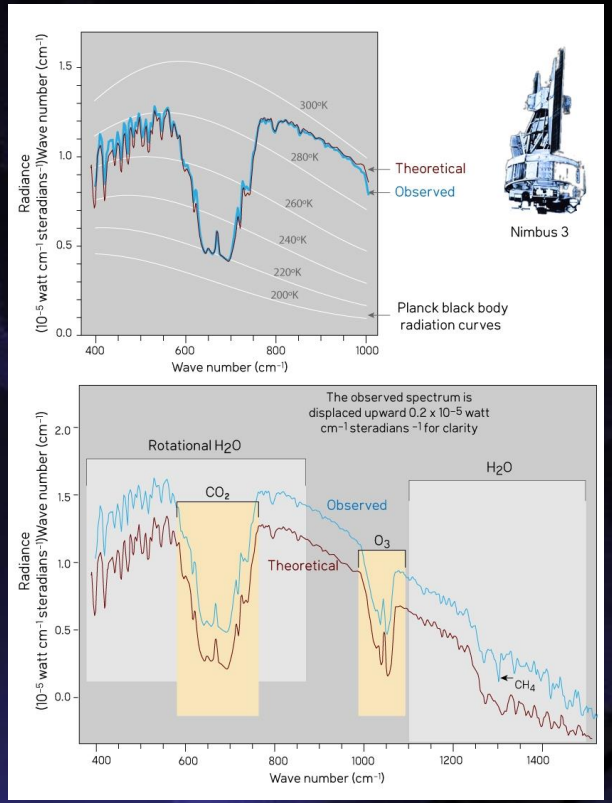
MYTH

CO_2 is a trace gas so it's warming effect is minimal.

FALLACY

The fact that CO2 is a trace gas is irrelevant to whether it can impact climate. Trace amounts of substances can have a strong effect.

Red Herring



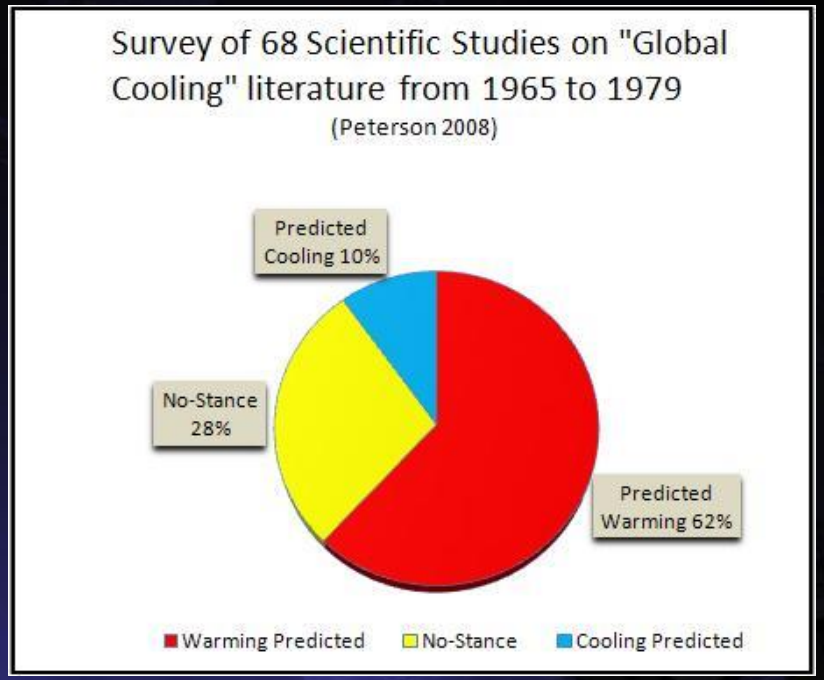
Skeptical Science - https://skepticalscience.com/graphics.php?g307

Past and future climate change

FACT
In the 1970s, the majority of climate papers were predicting warming.

MYTH
In the 1970s, climate scientists were predicting an ice age.

FALLACY
Confuses mainstream media reports with scientific papers which overwhelmingly pointed towards warming.



Misrepre-sentation

Past and future climate change

FACT

Past climate change tells us climate is sensitive to the warming effect of CO_2.

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.

Jumping to conclusions

We are causing global warming

FACT

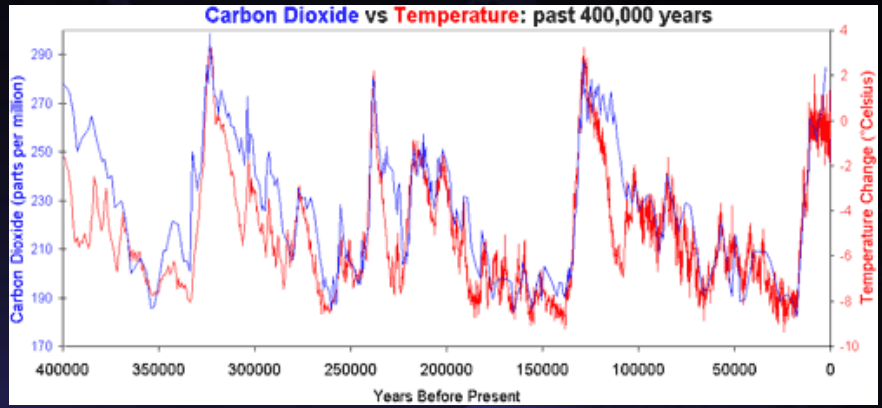
Ice cores tell us warming causes the ocean to emit more CO_2. Combined with greenhouse effect, this is a reinforcing feedback.

MYTH

CO_2 lagging temperature means greenhouse effect is minimal.

FALLACY

It's not one or the other but both. CO_2 causes warming and warming causes CO_2 to rise.



Vostok Antarctic ice core records for carbon dioxide concentration (Petit 2000) and temperature change (Barnola 2003)

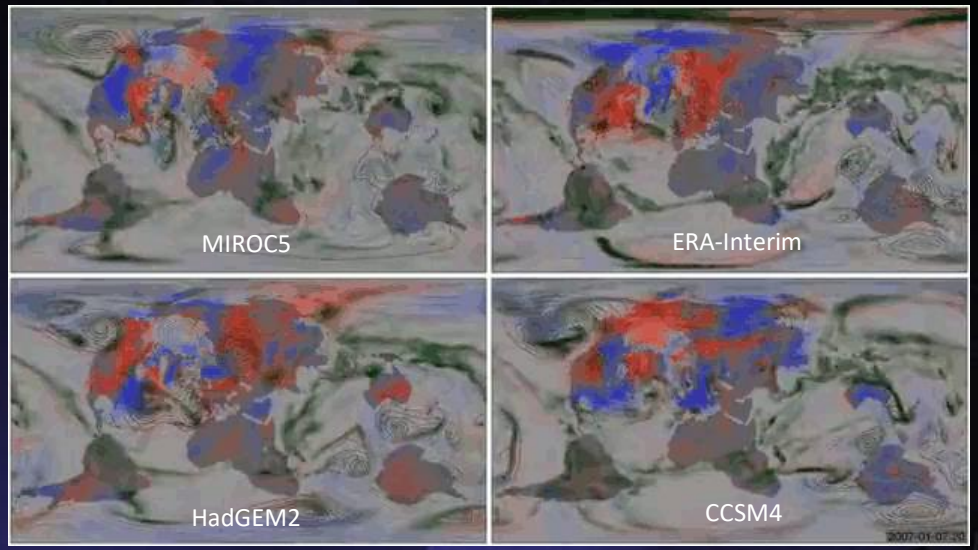
False Dichotomy

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.



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

Impossible Expectations

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.

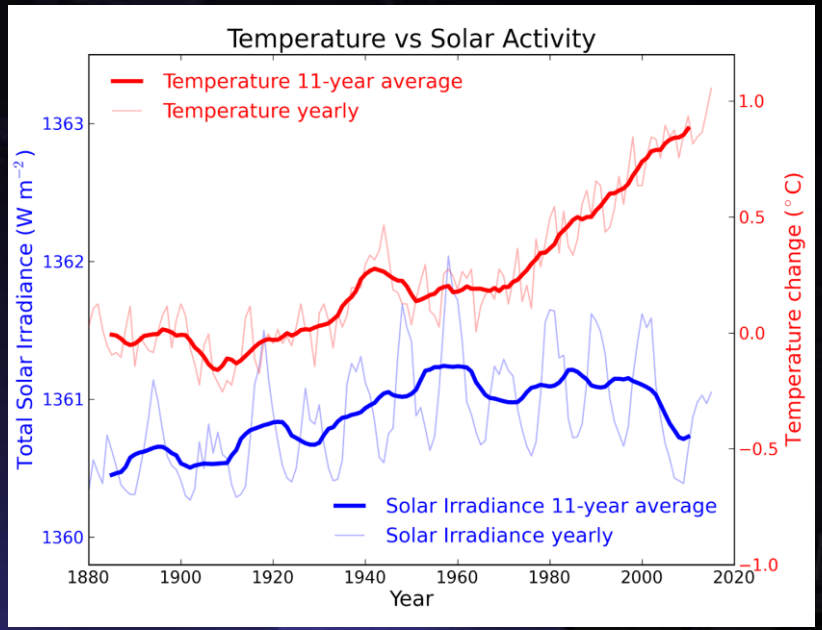
MYTH

The sun is causing global warming.

FALLACY

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

Cherry-picking



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

“A paper came out in a journal which I suspect was created just so that they could publish this paper because no proper peer reviewed journal would have published it.”

CHRISTOPHER MONCKTON

- ERL has published more than 1,000 research papers since **2006**
- Skeptical Science exists since **2007** and our consensus study (Cook et al.) was published in May **2013**.

Conspiracy Theory

“So they've said there's a consensus and of course they fiddled the consensus as well. A paper came out in a journal which I suspect was created just so that they could publish this paper because no proper peer-reviewed journal would ever have published it. And the paper claimed that 97% of nearly 12-thousand extracts from scientific papers supported the consensus that more than half the warming of the last sort of 50 years was caused by us. But in fact, a closer analysis of the paper shows, it wasn't 97 percent it was naught point 3 percent of the abstracts that actually agreed with their consensus.”

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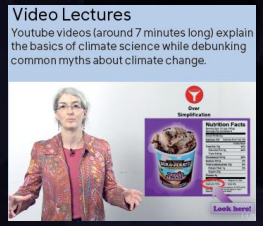
Video lectures

60 Youtube videos explain the basics of climate science while debunking common myths about climate change.

Course Syllabus

WEEK 1: Understanding The Climate Controversy

We introduce the course content, interact with each other and complete an introductory survey. The week continues with an exploration of scientific consensus, the drivers and psychology of climate science denial and an overview of the controversy surrounding this topic.



Course Syllabus - continued

WEEK 2: Global Warming Is Happening

We look at the indicators of global warming and myths related to temperature and glaciers.

WEEK 3: We Are Causing Gobal Warming

Week three focuses on the ways in which humans cause climate change and the myths associated with the greenhouse effect and the rise in carbon dioxide.

Course Syllabus - continued

WEEK 4: The Past Tells Us About The Future

We look at the history of climate change in order to model future climate change. We also address myths related to models.

WEEK 5: We Are Feeling The Impacts Of Climate Change

Week five covers climate feedbacks and the impacts of climate change on the environment, society and the weather.

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Course Syllabus - continued

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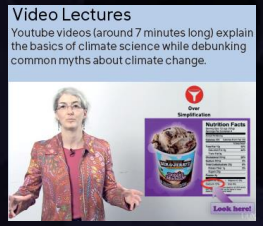

Course Syllabus - continued

WEEK 6 and 7: Responding to Denial

The final weeks of the course look more closely at the psychology of science denial and debunking techniques. We also complete a peer assessment that asks students to practice debunking strategies on real myths that can be found in today's media.

Bottom line

This isn't just a climate MOOC; it's a MOOC about how people think about climate change.

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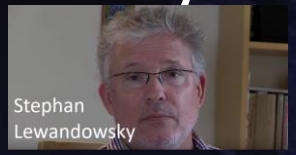
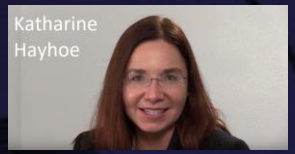
Expert Interviews

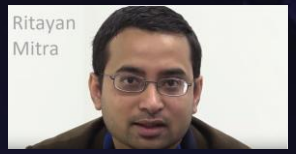
40 interviews with leading scientists and communicators complement video lectures with more in-depth details.

All videos are available on Wakelet http://sks.to/denial101xexperts

WEEK 1 - Understanding The Climate Controversy







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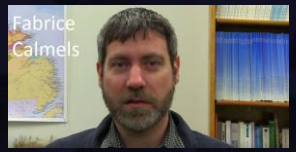
Expert Interviews

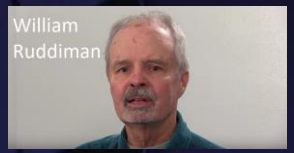
Interviews with leading scientists & communicators complement video lectures with more in-depth details.

Expert Interviews - continued

WEEK 2 – Global warming is happening



WEEK 3 – We are causing global warming



Expert Interviews

Interviews with leading scientists & communicators complement video lectures with more in-depth details.

Expert Interviews - continued

WEEK 4 – The past tells us about the future

WEEK 5 – We are feeling the impacts of climate change

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Expert Interviews

Interviews with leading scientists & communicators complement video lectures with more in-depth details.

Expert Interviews - continued

WEEK 6 – Responding to Denial

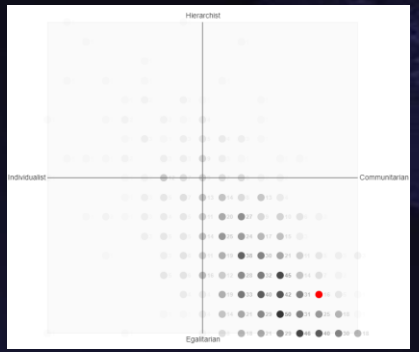
All expert interviews are available as a collection on Wakelet
http://sks.to/denial101xexperts

Interactive Exercises

Online activities allow students to interact directly with climate and psychological data.

“Where do you fit?”

Students are asked to fill out a short 8-question survey and can then discuss where they fall in a simple worldview grid.



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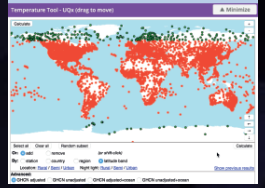
Interactive Exercises

“Why is climate change so controversial?”

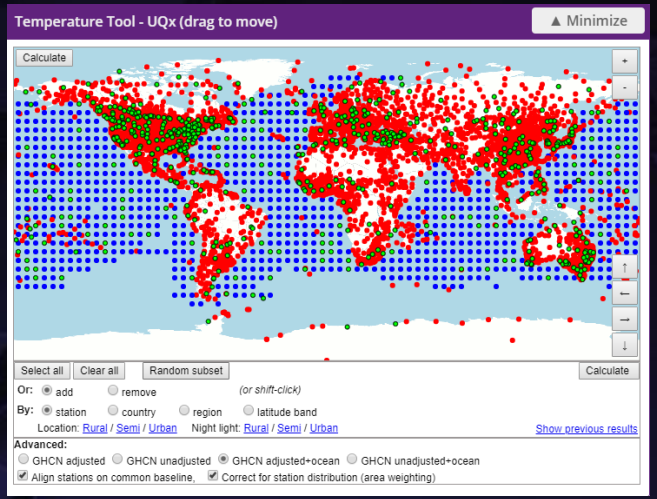
Students are asked to provide the first word which comes to mind and a wordcloud is generated from their responses.



Interactive Exercises - continued

"Check your understanding: Temperature record"

Students are asked to work with temperature data and do some calculations. The tool is also available at http://sks.to/temptool



Global warming is happening

FACT	MYTH	FALLACY	VIDEO
Our planet has continued to build up heat since 1998 - global warming is still happening.	"Global warming stopped in 1998."	**Cherry picking** Looking at one region or a short period ignores the full picture.	
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.	
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.	

http://sks.to/fmf-slides

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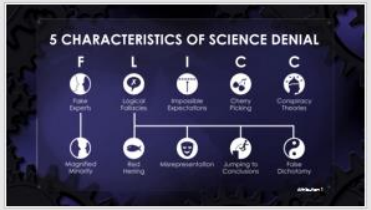

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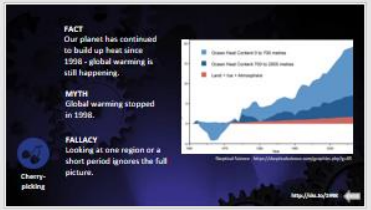

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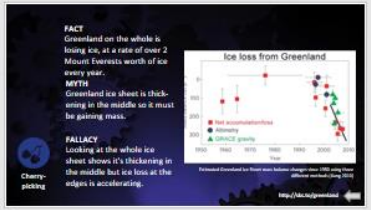

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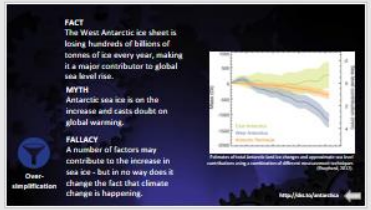

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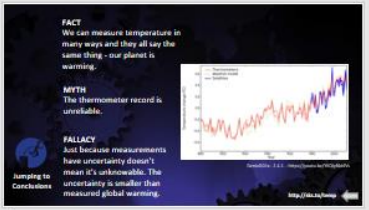

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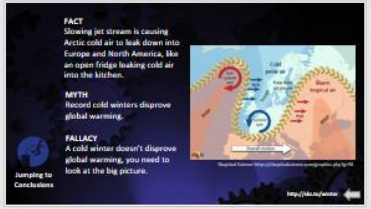

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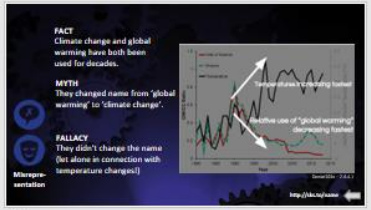

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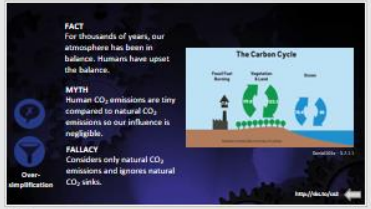

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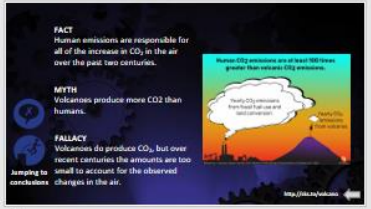

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Massive open online course (MOOC) Denial101x

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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.

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

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.

Current self-paced run will be open until December 17, 2019

http://bit.ly/Denial101x

About this course

In public discussions, climate change is a highly controversial topic. However, in the scientific community, there is little controversy: 97% of climate scientists [illegible] 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

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MOOC http://bit.ly/Denial101x

Resources & References

The Debunking Handbook: http://sks.to/debunk

Cook, J., Lewandowsky, S., & Ecker, U. (2017). Neutralizing misinformation through inoculation: Exposing misleading argumentation techniques reduces their influence. PLoS ONE, 12(5): e0175799. https://doi.org/10.1371/journal.pone.0175799

Cook, J., Oreskes, N., Doran, P. T., Anderegg, W. R., Verheggen, B., Maibach, E. W., Carlton, J. S., Lewandowsky, S., Skuce, A. G., Green, S. A., & Nuccitelli, D. (2016). Consensus on consensus: a synthesis of consensus estimates on human-caused global warming. Environmental Research Letters, 11(4), 048002.

Cook, J., Schuennemann, K., Nuccitelli, D., Jacobs, P., Cowtan, K., Green, S., Way, R., Richardson, M., Cawley, G., Mandia, S., Skuce, A., & Bedford, D. (April 2015). Denial101x: Making Sense of Climate Science Denial. edX. https://www.edx.org/course/making-sense-of-climate-science-denial-2

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