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

Bärbel Winkler and John Cook

vEGU21 – EOS3.2 – Monday April 26, 2021

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summary

5 Techniques of Science Denial



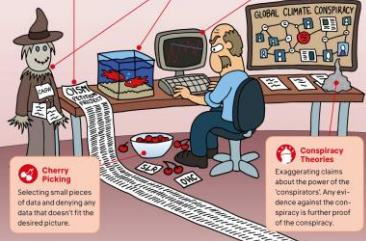
Fake Experts
Using spokespersons with no relevant expertise to cast doubt on the expert consensus.



Logical Fallacies
Arguments based on false logic, misdirection, and misrepresentation. E.g., straw men and red herrings.



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



Cherry Picking
Selecting small pieces of data and denying any data that doesn't fit the desired picture.



Conspiracy Theories
Exaggerating claims about the power of the "conspirators." Any evidence against the conspiracy is further proof of the conspiracy.

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slides

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 enrollments from over 180 countries. A number of enrolled students were secondary and tertiary educators, who adopted the course content in their own classes.

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.



Structure of an Effective Debunking

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



Check
out
FLICC

5 CHARACTERISTICS OF SCIENCE DENIAL



F
Fake Experts



L
Logical Fallacies



I
Impossible Expectations

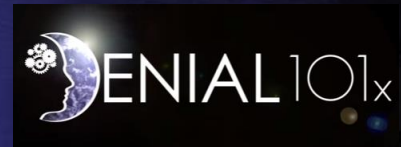


C
Cherry Picking



C
Conspiracy Theories

Content
of our
MOOC



2 minute
summary

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Two Minute Summary starts here!

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Bärbel Winkler and John Cook
vEGU21 – EOS3.2 – Monday April 26, 2021



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Denial101x – Making sense of climate science denial

Massive
Open
Online
Course



2 minute
summary

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Denial101x – Making sense of climate science denial

Massive
Open
Online
Course



40.000+
participants
from 180+
countries
since 2015



2 minute
summary

Main slides



Denial101x – Making sense of climate science denial

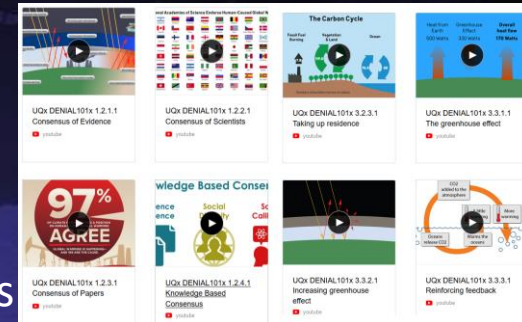
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60 lectures
about climate
science and
debunking
misconceptions



2 minute
madness

Main slides



Denial101x – Making sense of climate science denial

Massive



Open
Online
Course

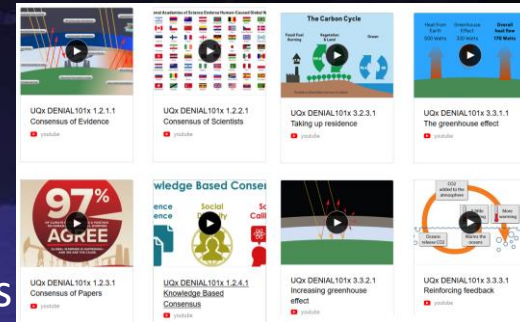


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40 expert
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debunking
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2 minute
summary

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Denial101x – Making sense of climate science denial

Massive
Open
Online
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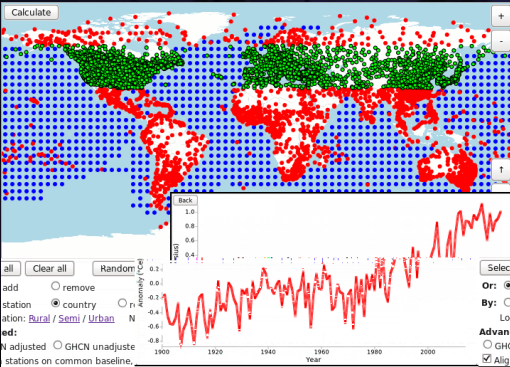
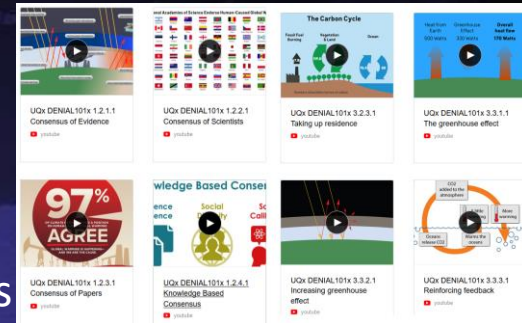
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Interactive
Exercises
which often
trigger
discussions in
the forums

40 expert
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60 lectures
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2 minute
summary

Main slides



Denial101x – Making sense of climate science denial

3 ELEMENTS TO AN EFFECTIVE DEBUNKING

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

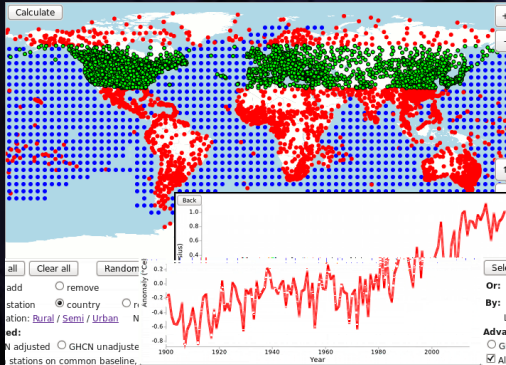
THE GOLDEN RULE OF DEBUNKING
...With Stickier Facts

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

- Emphasize 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.

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



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

Interactive Exercises which often trigger discussions in the forums

Massive Open Online Course



40.000+ participants from 180+ countries since 2015



40 expert interviews to go along with the lectures

60 lectures about climate science and debunking misconceptions



UQx DENIAL101x 1.2.1.1 Consensus of Evidence

UQx DENIAL101x 1.2.2.1 Consensus of Scientists

UQx DENIAL101x 3.3.3.1 Taking up residence

UQx DENIAL101x 3.3.1.1 The greenhouse effect

97% AGREE

UQx DENIAL101x 1.2.3.1 Consensus of Papers

wledge Based Conser

UQx DENIAL101x 1.2.4.1 Knowledge Based Consensus

UQx DENIAL101x 3.3.2.1 Increasing greenhouse effect

UQx DENIAL101x 3.3.3.1 Reinforcing feedback



2 minute summary

Main slides



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**



2 minute
summary

Main slides



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2 minute
summary

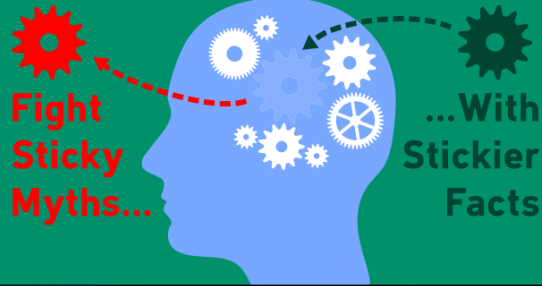
Main slides



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THE
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Fake Experts



Logical Fallacies



Impossible Expectations



Cherry Picking



Conspiracy Theories



2 minute
summary

Main slides



The 5 techniques of science denial (FLICC)



2 minute
summary

Main slides



The 5 techniques of science denial (FLICC)

 Fake Experts

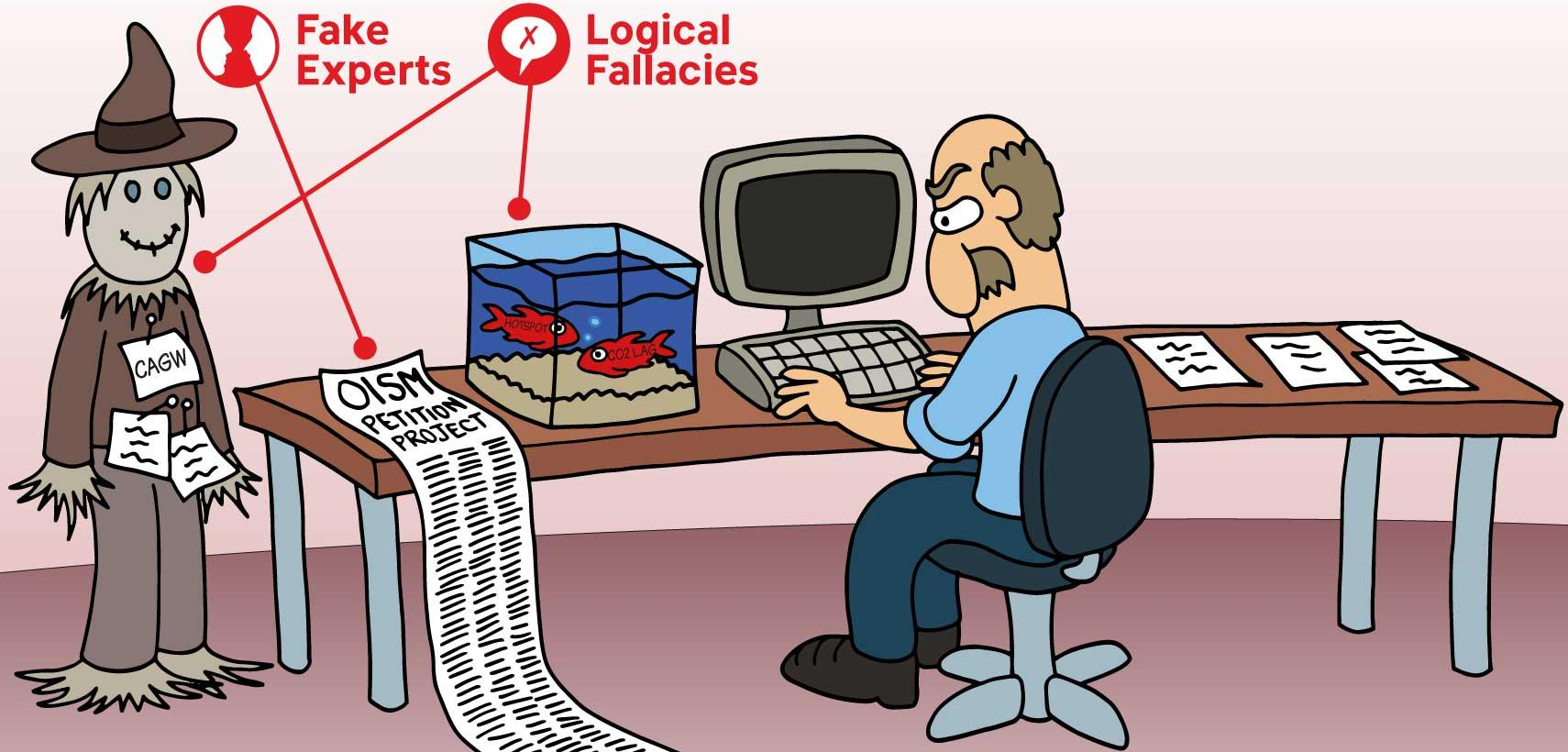


[2 minute summary](#)

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The 5 techniques of science denial (FLICC)

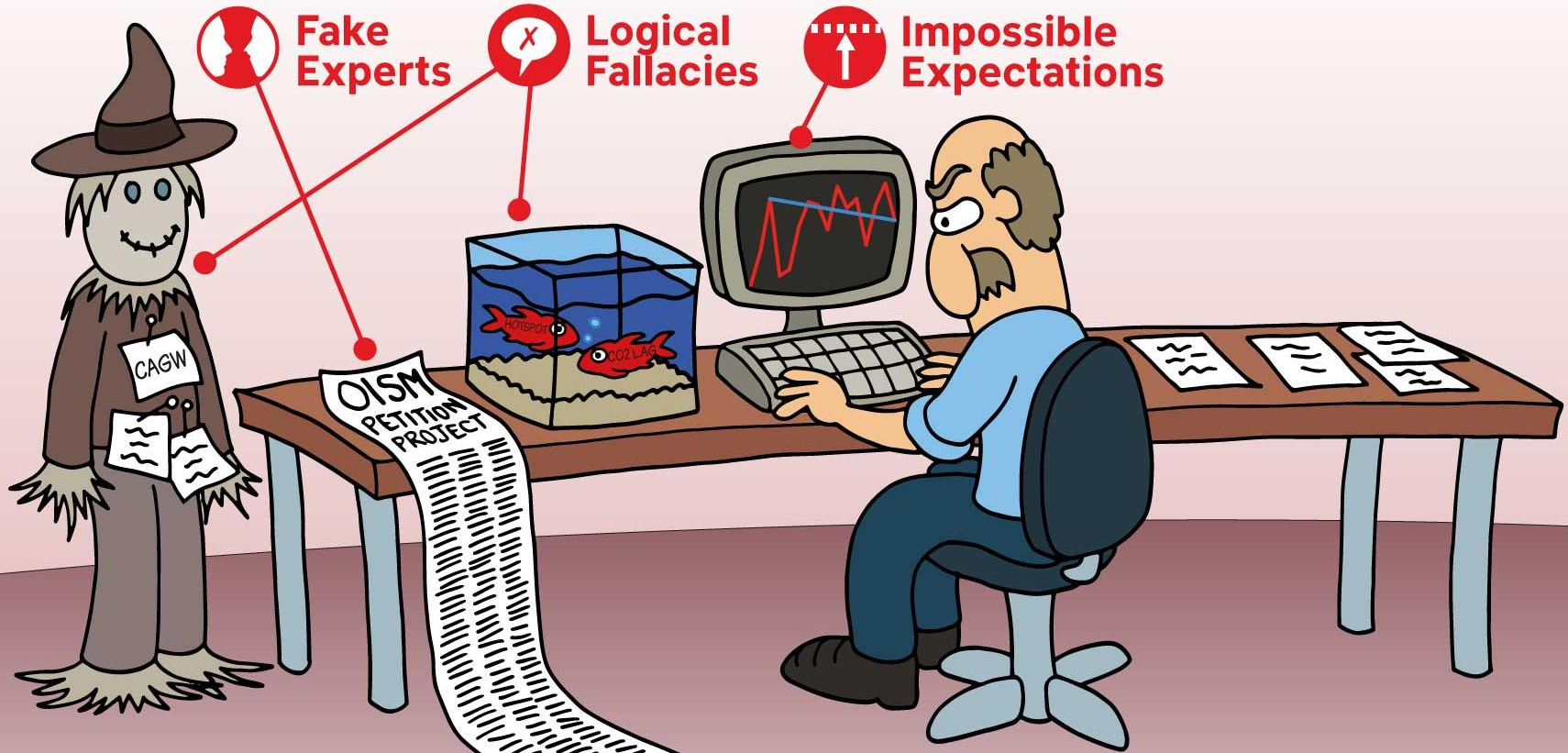


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summary

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The 5 techniques of science denial (FLICC)



Fake Experts



Logical Fallacies



Impossible Expectations

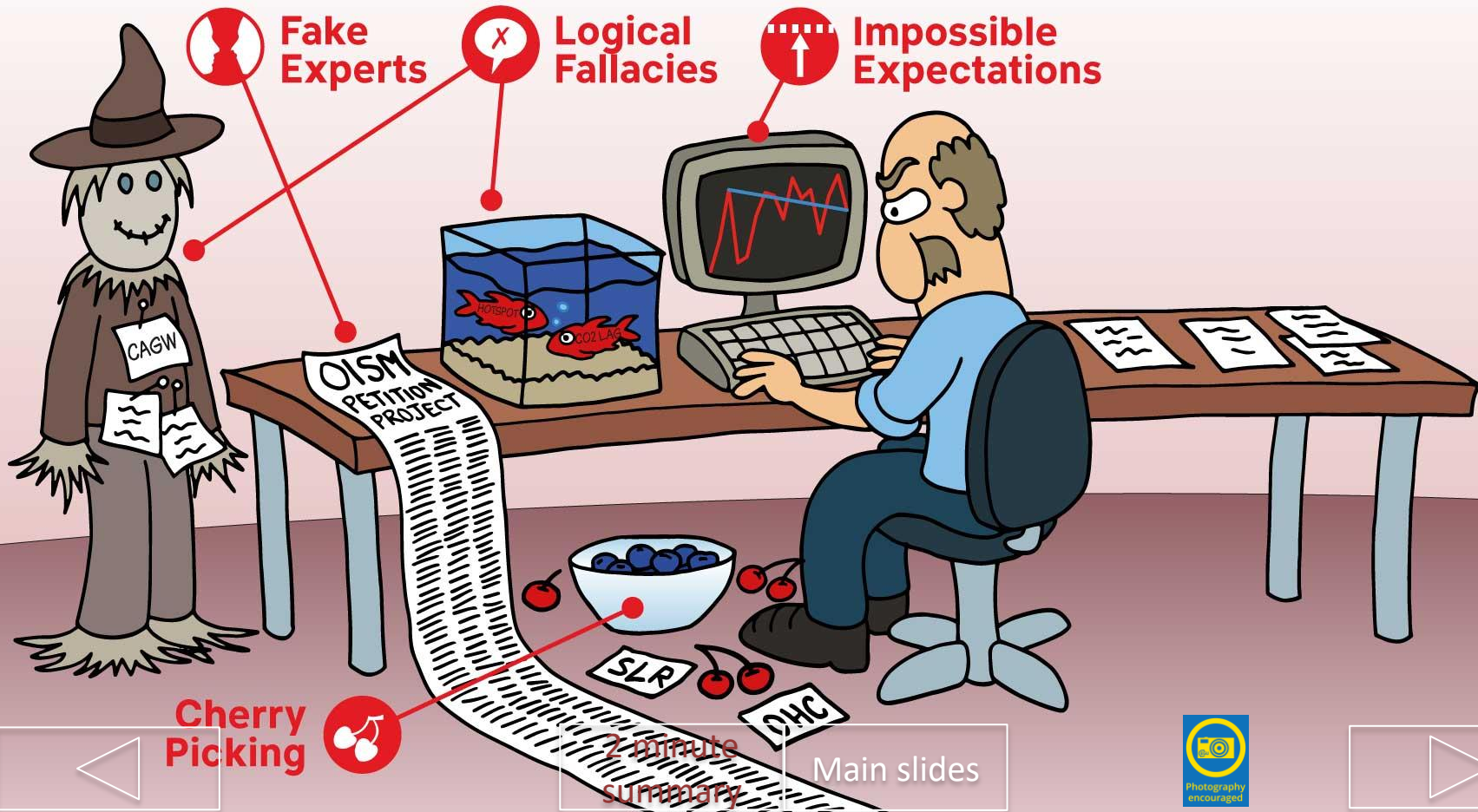
**OISM
PETITION
PROJECT**

2 minute
summary

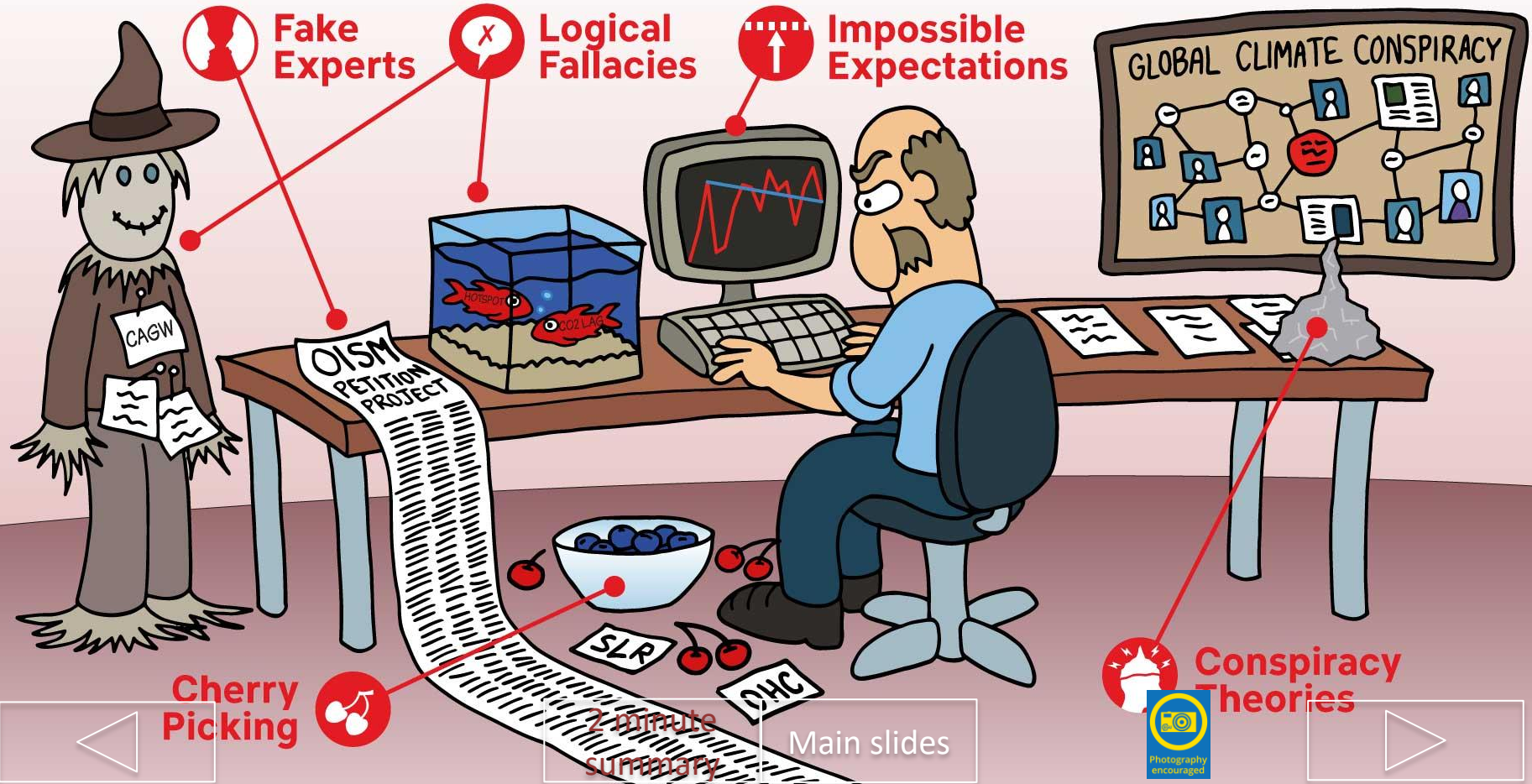
Main slides



The 5 techniques of science denial (FLICC)



The 5 techniques of science denial (FLICC)



Bärbel Winkler

Email: baerbelw@skepticalscience.com

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

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

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



2 minute
summary

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Main presentation starts here

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

Bärbel Winkler and John Cook
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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.



MYTH/MISCONCEPTION

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

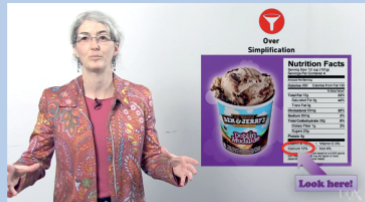
FALLACY

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



Video Lectures

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



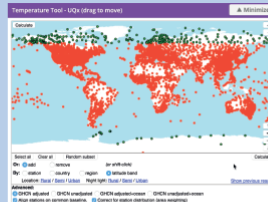
Expert Interviews

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.



	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 0.5% of over 10 million people with consensus on climate science in the U.S. Fake experts: 99.9% of the 31,000 signatures 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.	"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 effects 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 is 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 exaggerate 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.

sks.to/denial101x

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john@skepticalscience.com

Skeptical Science

THE UNIVERSITY OF QUEENSLAND

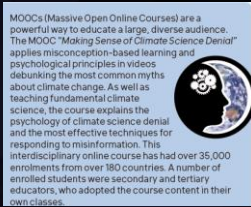
creative commons



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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 40,000 enrolments from over 180 countries since April 2015. A number of enrolled students were secondary and tertiary educators, who adopted the course content in their own classes.



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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.




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MOCs (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.



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.



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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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Structure of an Effective Debunking
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MYTH/MISCONCEPTION
 Warn people before mentioning the myth so they're cognitively on guard.

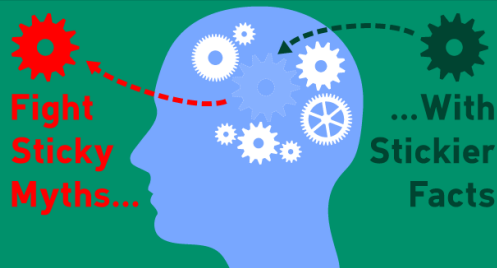
FALLACY
 Explain the technique used by the myth to distort the fact using the five characteristics of Evidence-based.

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

3 ELEMENTS TO AN EFFECTIVE DEBUNKING

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THE GOLDEN RULE OF DEBUNKING

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Fake Experts



Logical Fallacies



Impossible Expectations



Cherry Picking



Conspiracy Theories



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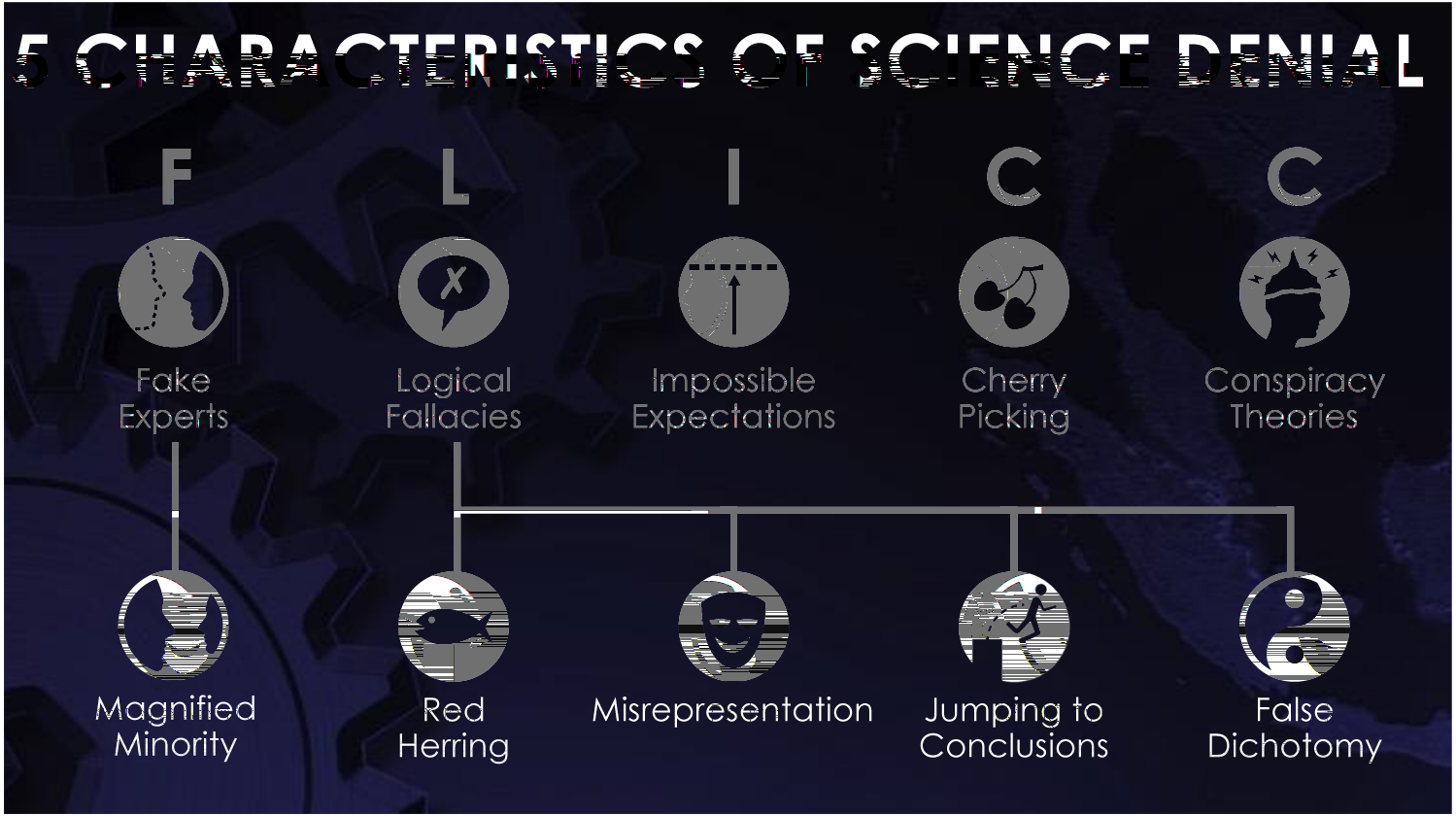
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F **L** **I** **C** **C**
 Fake Experts Logical Fallacies Impossible Expectations Cherry Picking Conspiracy Theories



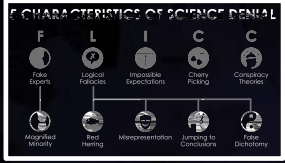
Click on the icons you'd like to know more about. This will take you to other slides with more details and some examples.



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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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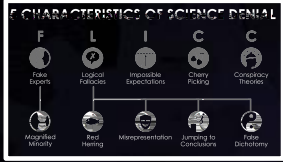


The 5 techniques of science denial (FLICC)

Fake Experts

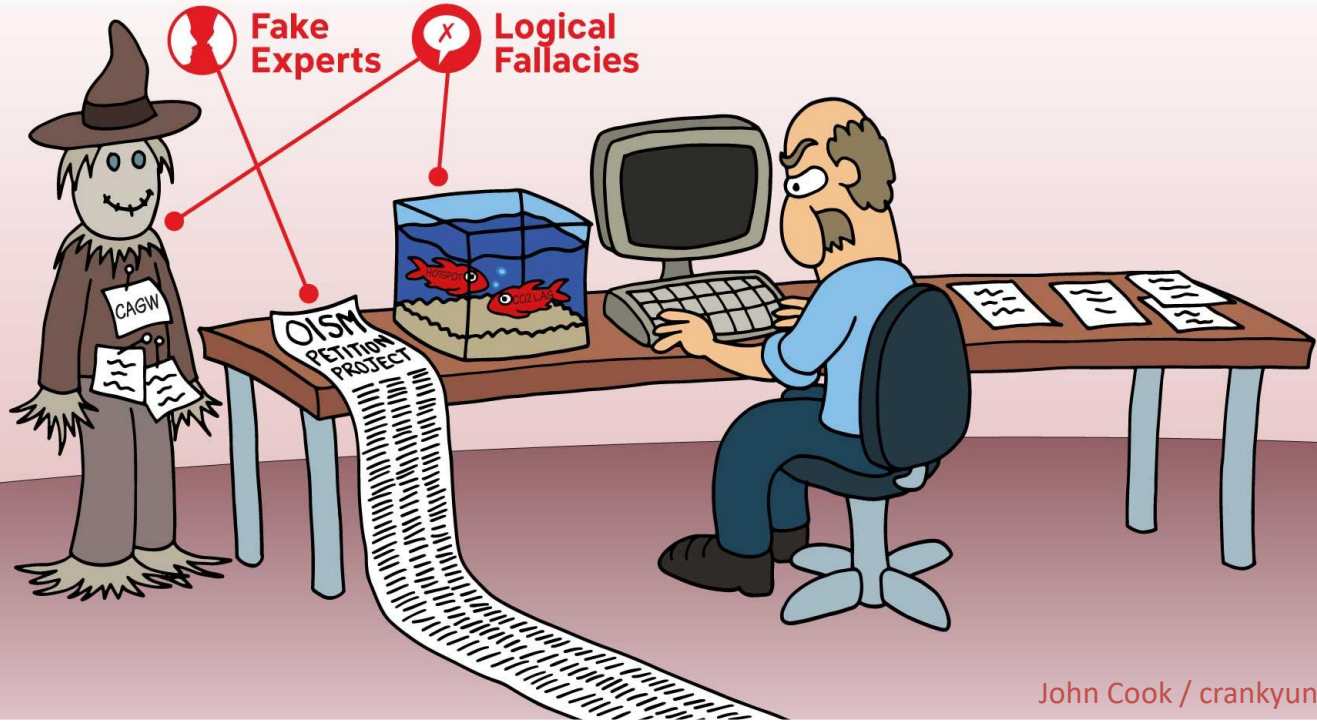


John Cook / crankyuncle.com



The 5 techniques of science denial (FLICC)

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



John Cook / crankyuncle.com

Click for an example



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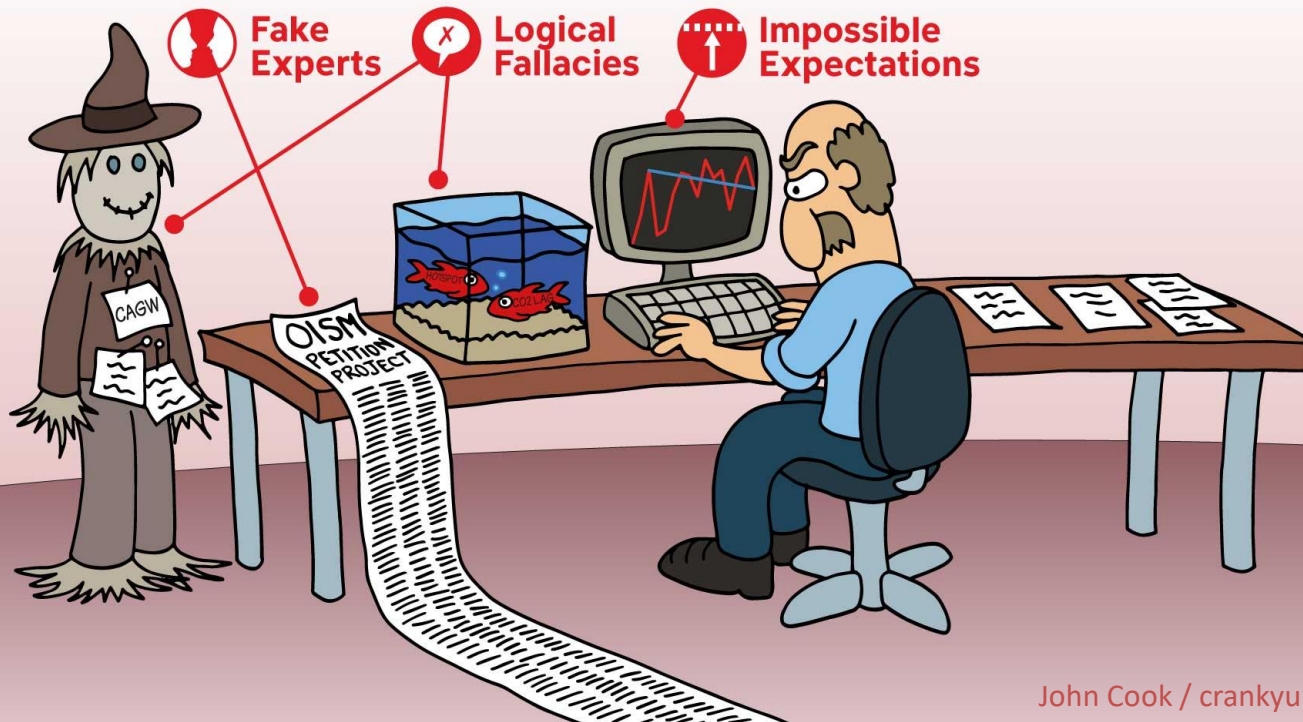




Impossible expectations

demand unrealistic standards of proof before acting on the science.

The 5 techniques of science denial (FLICC)



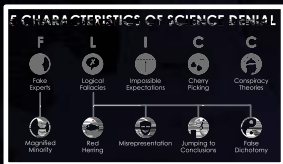
John Cook / crankyuncle.com

Click for an example

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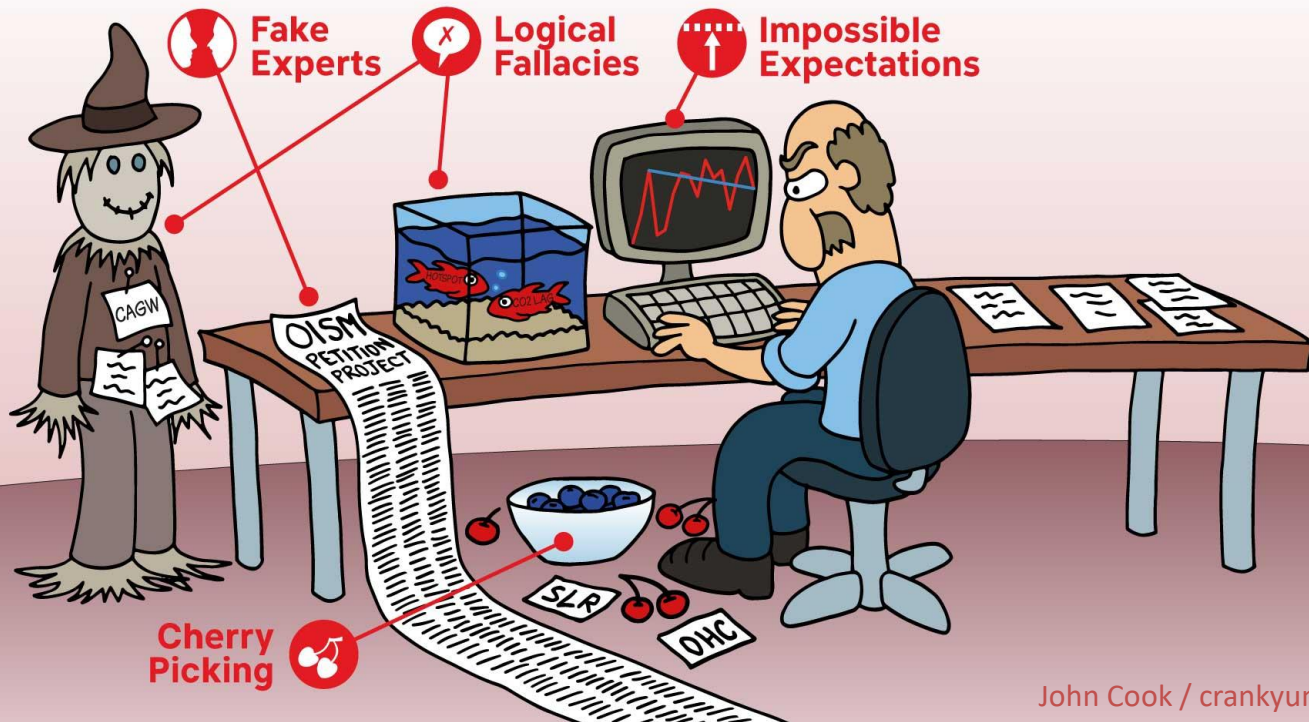




Cherry picking involves focusing on select pieces of data while ignoring anything conflicting with the desired conclusion.

Click for an example

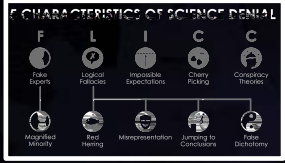
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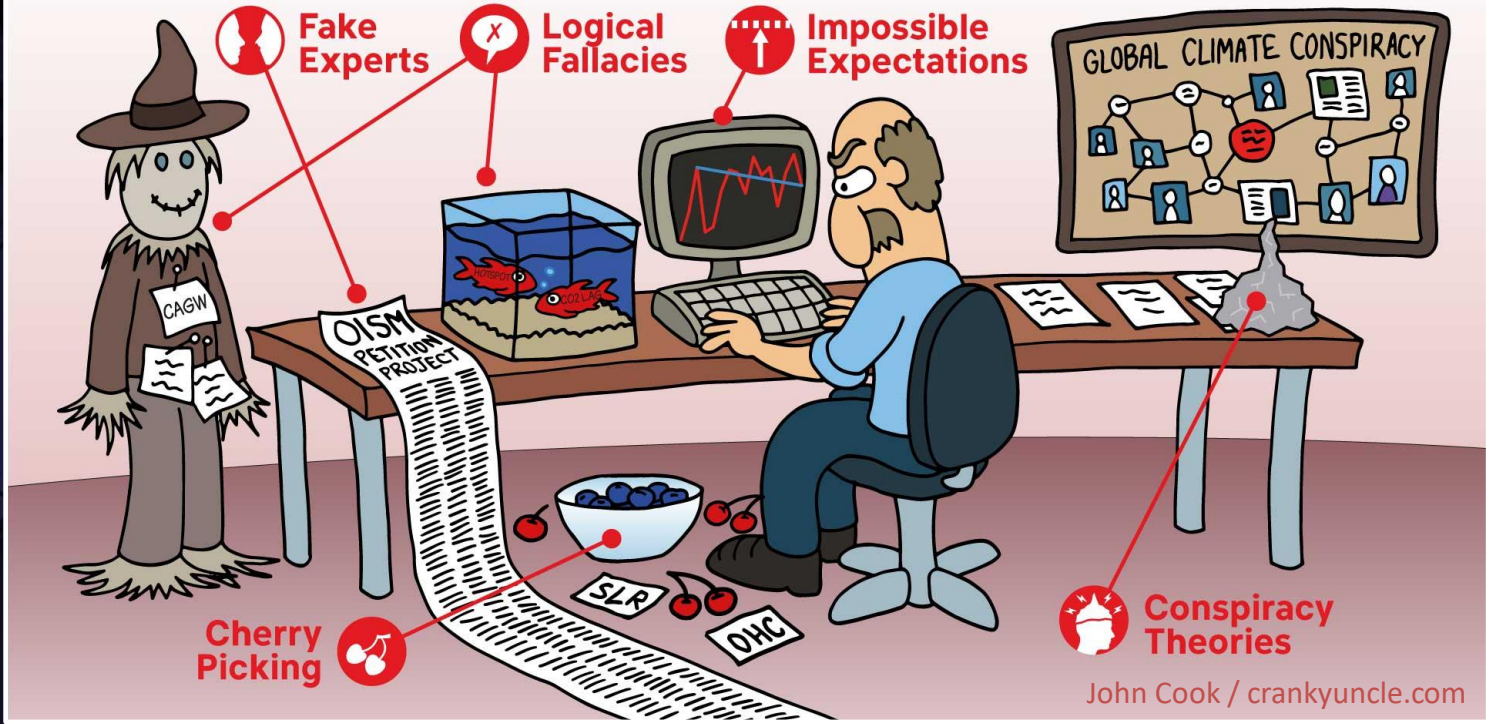




Conspiracy theories are created when science deniers accuse the world's scientists of a massive, global conspiracy.

Click for an example

The 5 techniques of science denial (FLICC)



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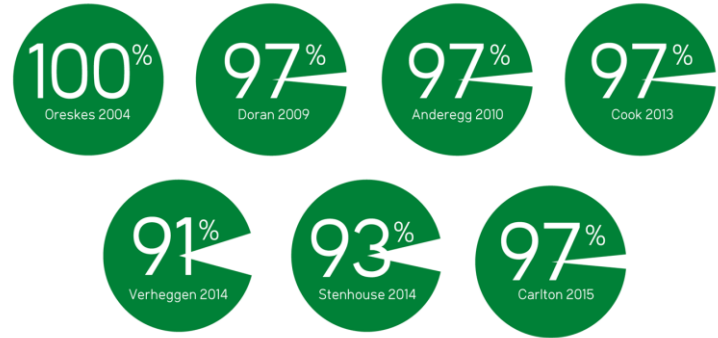
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FACT

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

Studies into scientific agreement on human-caused global warming



Fake Experts

MYTH

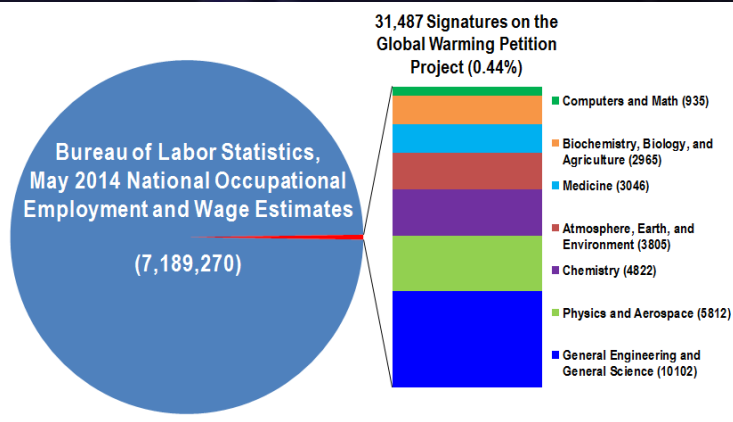
More than 31,000 scientists disagree with the consensus.



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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<https://sks.to/consensus>



We are causing global warming

FACT

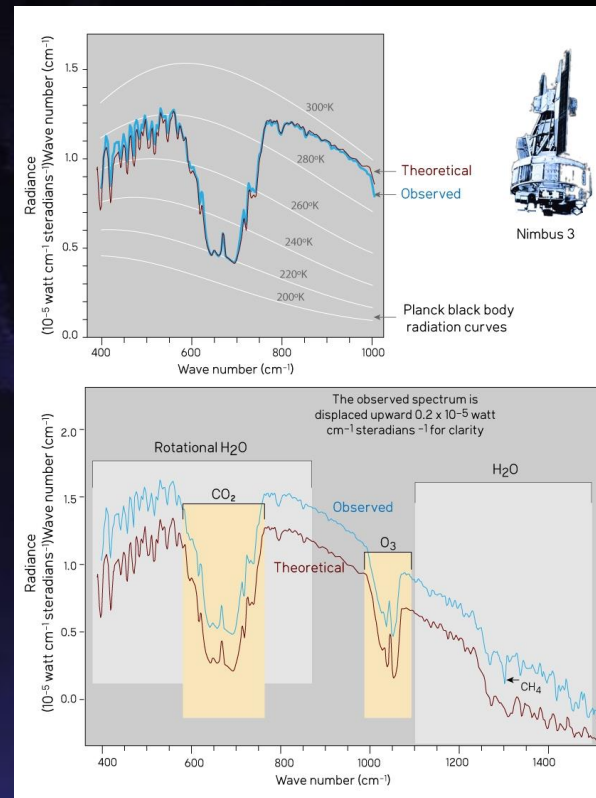
Satellites measure the warming effect from CO₂. The increased greenhouse effect is an observed reality. It was predicted before it could be measured.

MYTH

CO₂ 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.



Skeptical Science - <https://skepticalscience.com/graphics.php#g307>

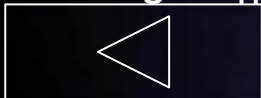
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<https://sks.to/trace>



Red
Herring



Past and future climate change

FACT

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

MYTH

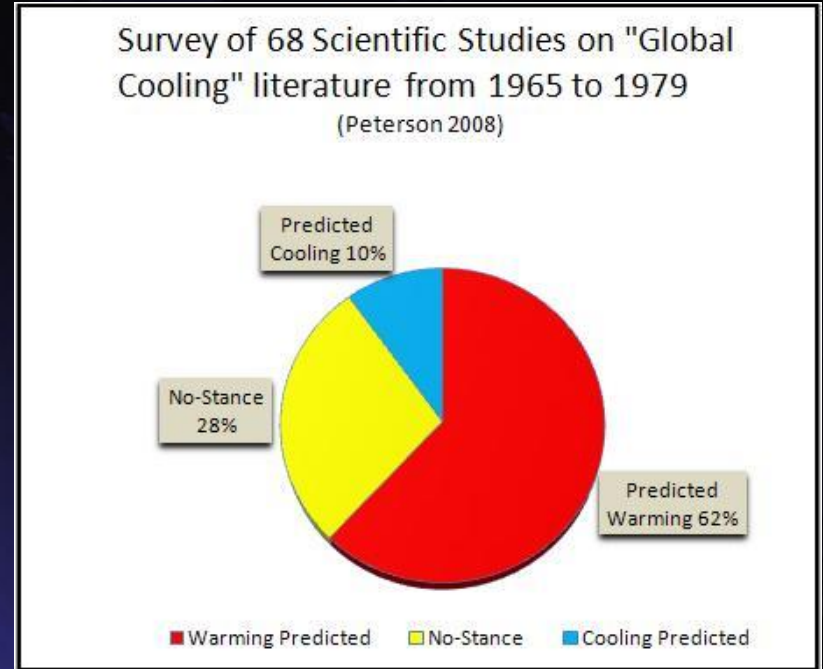
In the 1970s, climate scientists were predicting an ice age.

FALLACY

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



Misrepresentation



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<https://sks.to/1970s>



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



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<https://sks.to/past>



We are causing global warming

FACT

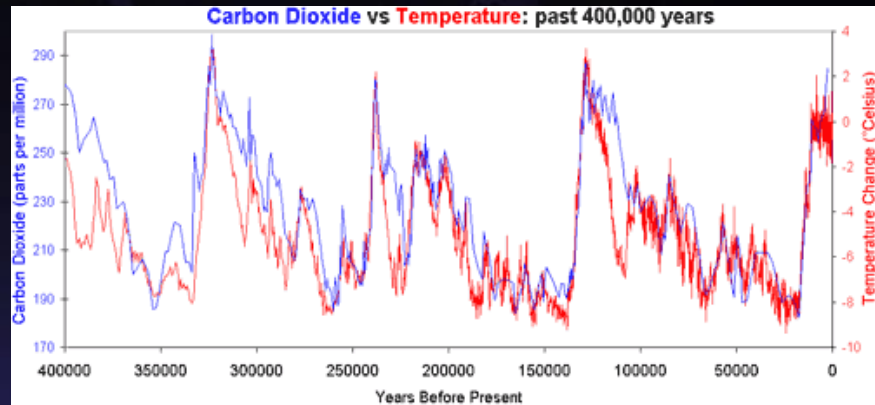
Ice cores tell us warming causes the ocean to emit more CO₂. Combined with greenhouse effect, this is a reinforcing feedback.

MYTH

CO₂ lagging temperature means greenhouse effect is minimal.

FALLACY

It's not one or the other but both. CO₂ causes warming and warming causes CO₂ to rise.



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



False
Dichotomy



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<https://sks.to/lag>



Past and future climate change

FACT

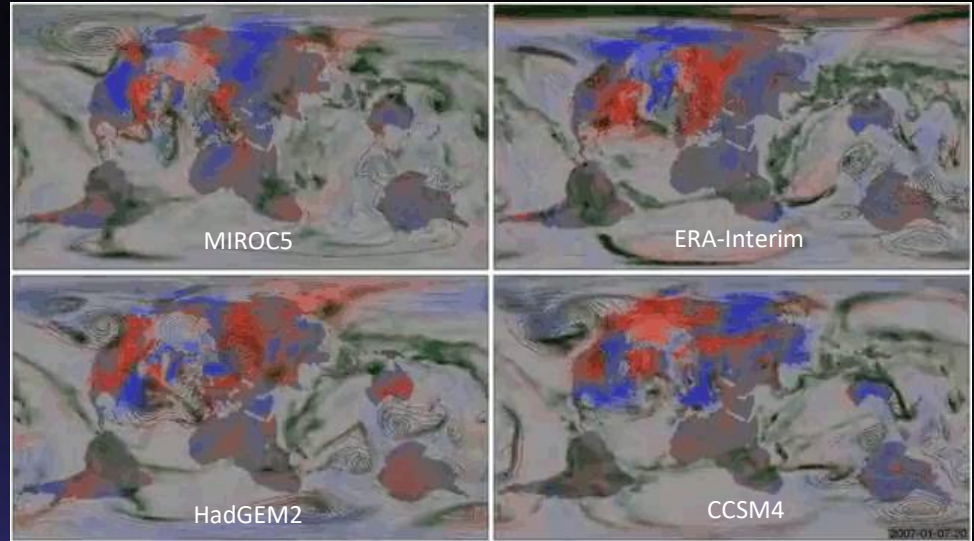
Models are based on fundamental physical principles.

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



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<https://sks.to/model>



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

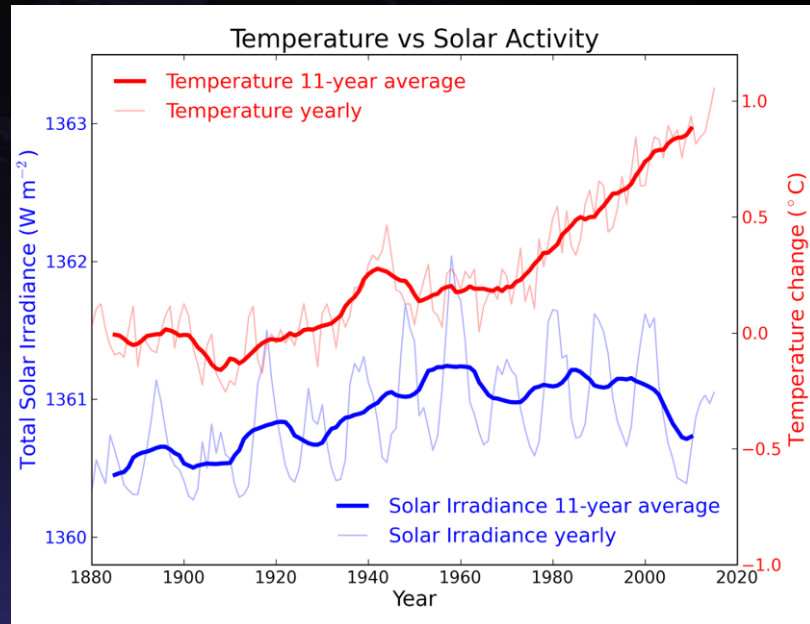
The sun is causing global warming.

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>



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<https://sks.to/sun>





“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



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“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

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



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.



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Video Lectures

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



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 Global 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.



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Video Lectures

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



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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Video Lectures

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



Course Syllabus - continued

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Video Lectures

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



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

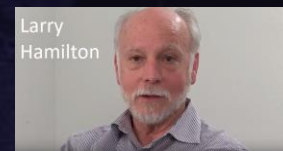
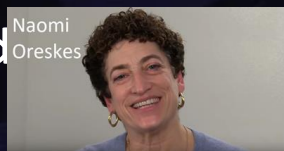
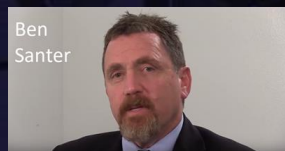
Interviews with leading scientists & communicators complement video lectures with more in-depth details.



Expert Interviews

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

All videos are available on Wakelet
<https://sks.to/denial101xexperts>



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Expert Interviews

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

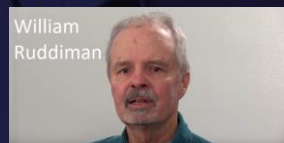
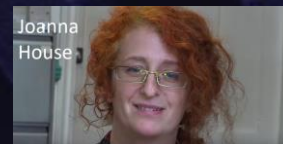


Expert Interviews - continued

WEEK 2 – Global warming is happening



WEEK 3 – We are causing global warming



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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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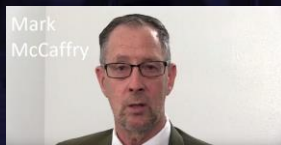
Expert Interviews

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



Expert Interviews - continued

WEEK 6 – Responding to Denial



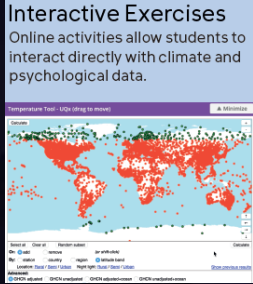
All expert interviews are available as a collection on Wakelet
<https://sks.to/denial101xexperts>



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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.

Questions

Question 1: We need to dramatically reduce inequalities between the rich and the poor, whites and people of colour, and men and women.

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

Question 2: It's society's responsibility to make sure everyone's basic needs are met.

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

Question 3: Free markets—not government programs—are the best way to supply people with the things they need.

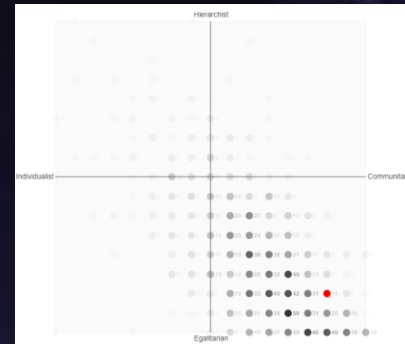
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

Question 4: We have gone too far in pushing equal rights.

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

Question 5: Our society would be better off if the distribution of wealth was more equal.

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree



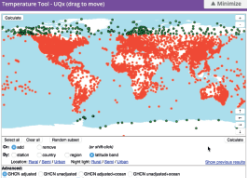
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Interactive Exercises

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



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.



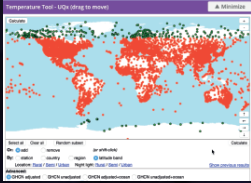
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Interactive Exercises

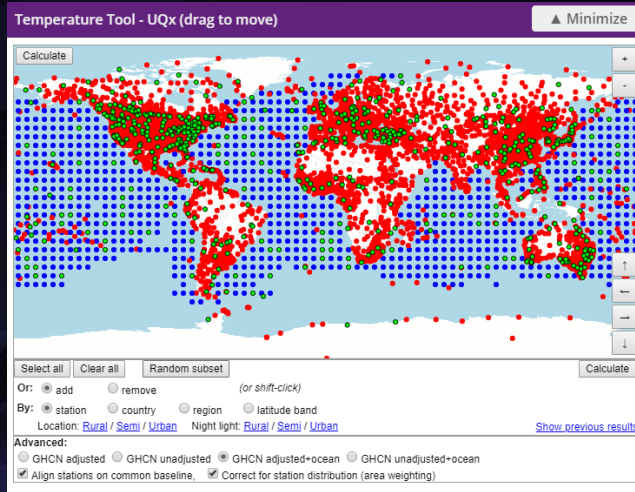
Online activities allow students to interact directly with climate and psychological data.



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 <https://sks.to/temptool>



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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...  



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1 **Fact - Myth - Fallacy**
Compilation of Slides

2 **5 CHARACTERISTICS OF SCIENCE DENIAL**

F False Equivocality	L Lack of Evidence	I Intimidation Expectations	C Cynical Fencing	C Cynical Theories
Misleading Vagueness	Red Herring	Misrepresentation	Appealing to Conclusions	Ad Hominem

3

1988	Cold	Glacier	Greenland	Antarctica
Temp	LFE	Water	Name	
CO ₂	Volcano	Resistance	Thermo	Definite
LAP	Holopt	Trace	Sun	
Fast	LJA	Peak CO ₂	MSRP	Model
Hansen 1988	Weather	1970s	Image	Unawareness
Vapor	Cloud	Species	Sea	Acid
Impacts	Robbery	Flare	Diurnal	Consequence

4

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.

Cherry-picking

6

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

Cherry-picking

7

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.

Cherry-picking

8

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.

Over-interpretation

9

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.

Jumping to Conclusions

11

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
Recent cold winters disprove global warming.

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

Jumping to Conclusions

12

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).

Misrepresentation

13

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.

Over-interpretation

The Carbon Cycle

14

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 increases in the air.

Jumping to Conclusions

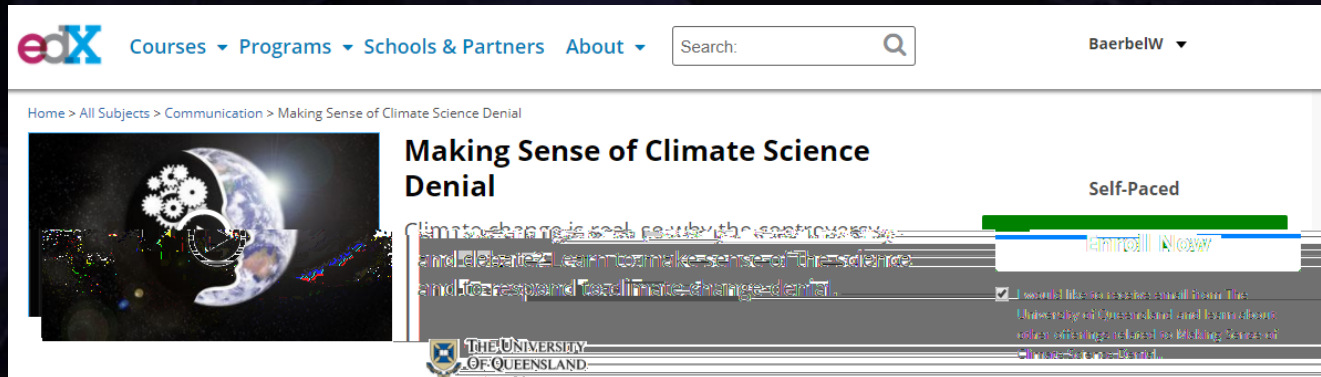


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Massive open online course (MOOC) Denial101x



The screenshot shows the edX website interface. At the top, there is a navigation bar with 'edX' logo, 'Courses', 'Programs', 'Schools & Partners', and 'About' menus. A search bar and a user profile 'BaerbelW' are also visible. Below the navigation, the breadcrumb trail reads 'Home > All Subjects > Communication > Making Sense of Climate Science Denial'. The main content area features a large image of a globe with gears and a magnifying glass, with the text 'Making Sense of Climate Science Denial' and 'Self-Paced' prominently displayed. A green banner at the top right of the course page says 'Enroll Now'. Below the banner, there is a list of course features and a 'Join this course' button.

Current self-paced run will be open until

December 14, 2021

<https://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. For climate scientists, understanding the drivers of rising 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.”

Best lessons are to be learnt from past climate change as well as better understand how predict future climate impacts. You will learn both the science of climate change and the techniques used to distort the science.

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🕒 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:	



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<https://sks.to/JohnCook>

MOOC <https://bit.ly/Denial101x>



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Main slides



Resources & References

The Debunking Handbook: <https://sks.to/debunk2020>

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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Main slides

