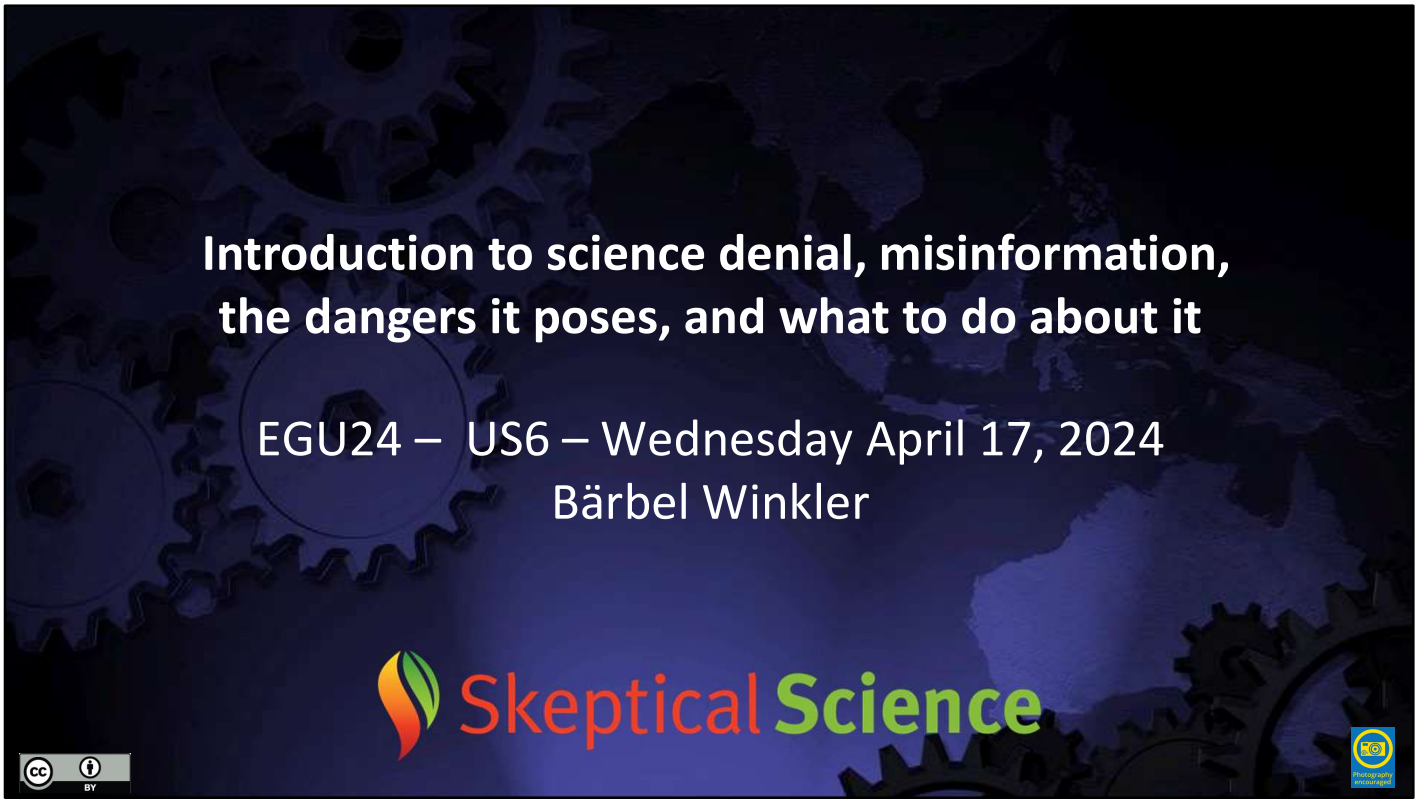
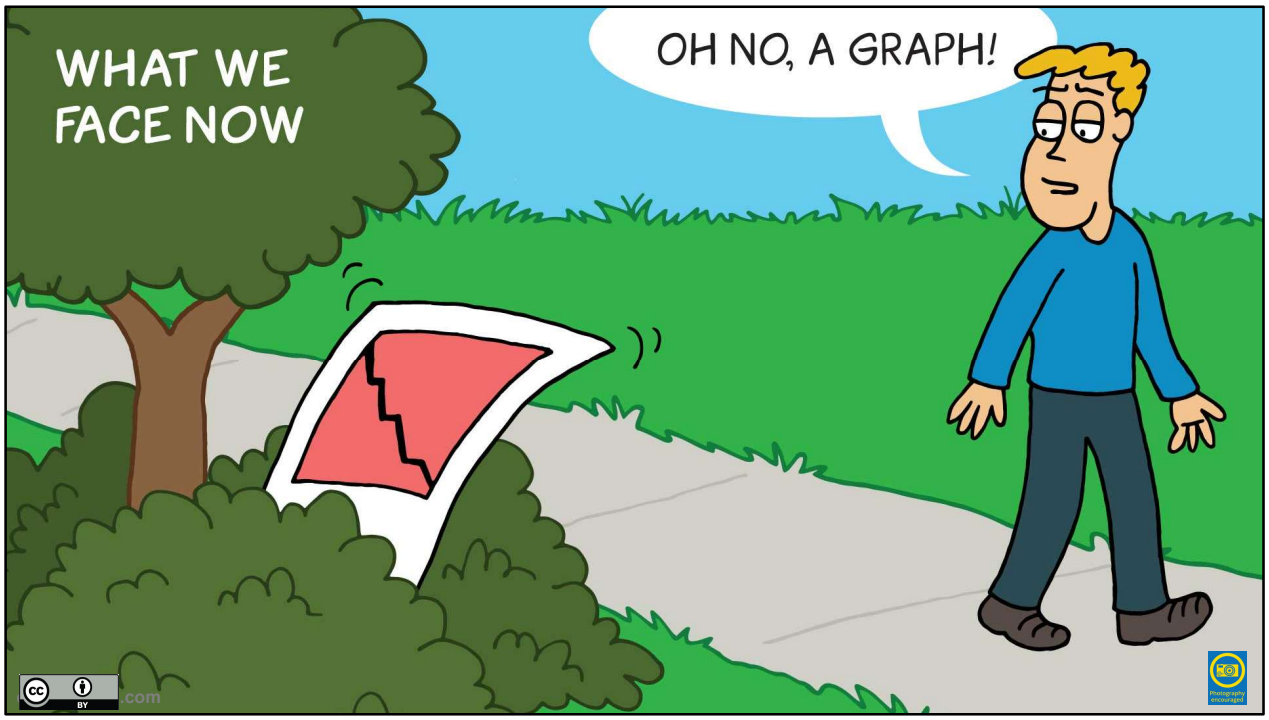


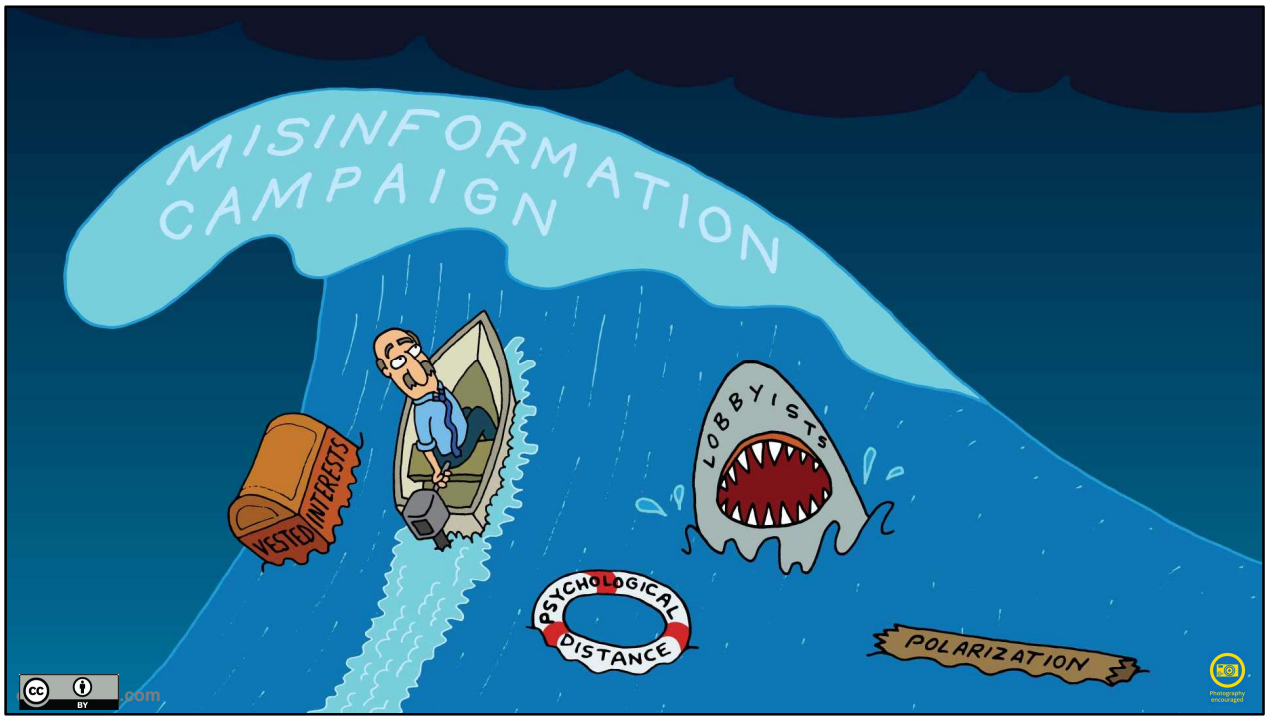

My short presentation leverages material created by John Cook, founder of Skeptical Science and cognitive scientist working at the University of Melbourne.


Let me start with a short detour to look at how people think about climate change.

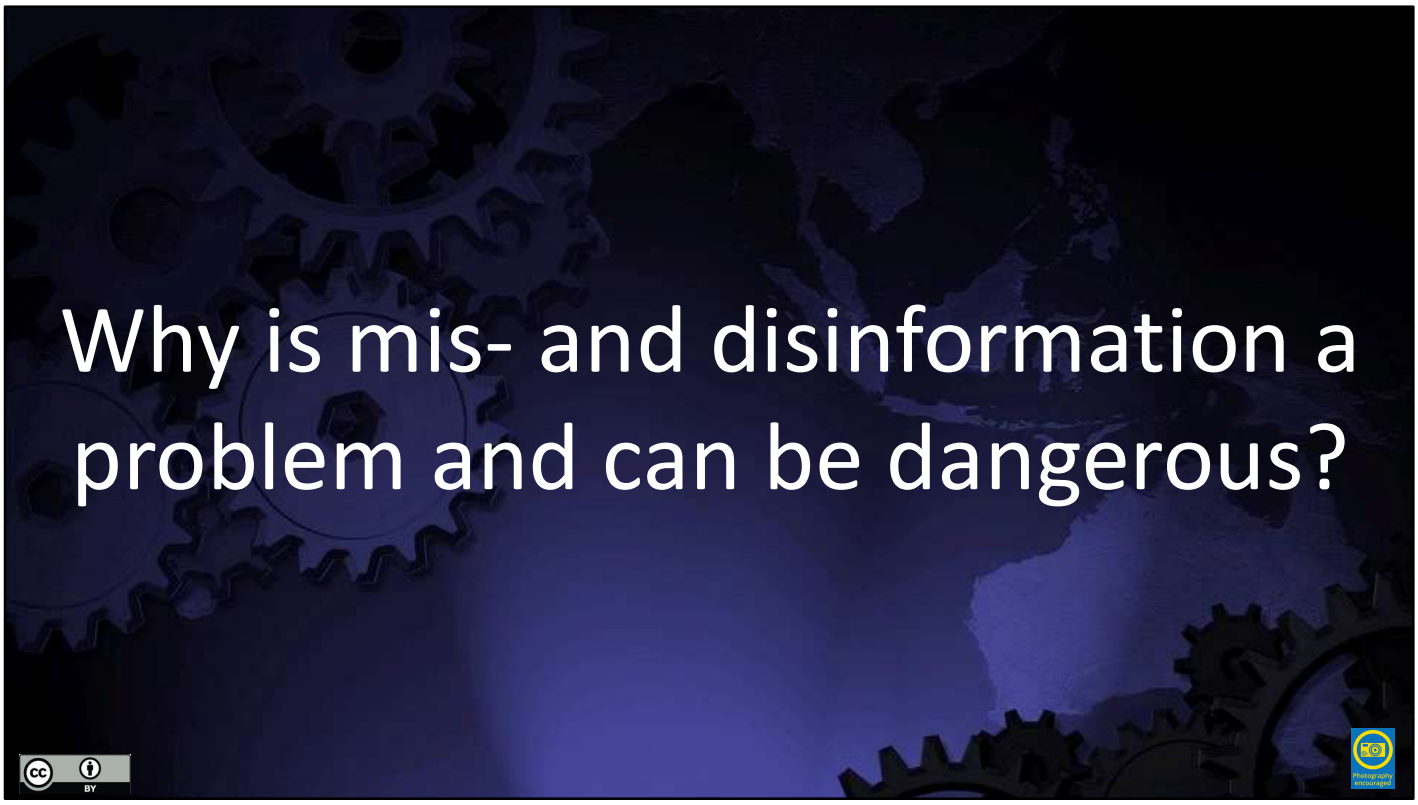

Unfortunately, we don't do this very well. Over millions of years, our brains have evolved to avoid life threatening dangers like predators jumping out of bushes. We survived by quickly detecting and avoiding immediate dangers.




In contrast, global warming is a slow-motion disaster happening on a global scale. Our brains aren't built to respond to planetary crises stretched out over decades and far removed in time and space for many of us.




This provides fertile ground for a massive wave of mis- and disinformation about climate change. Vested interests, political polarization, the global nature of climate change, as well as misinformation add up to a perfect psychological storm, preventing people from accepting the reality of climate change.



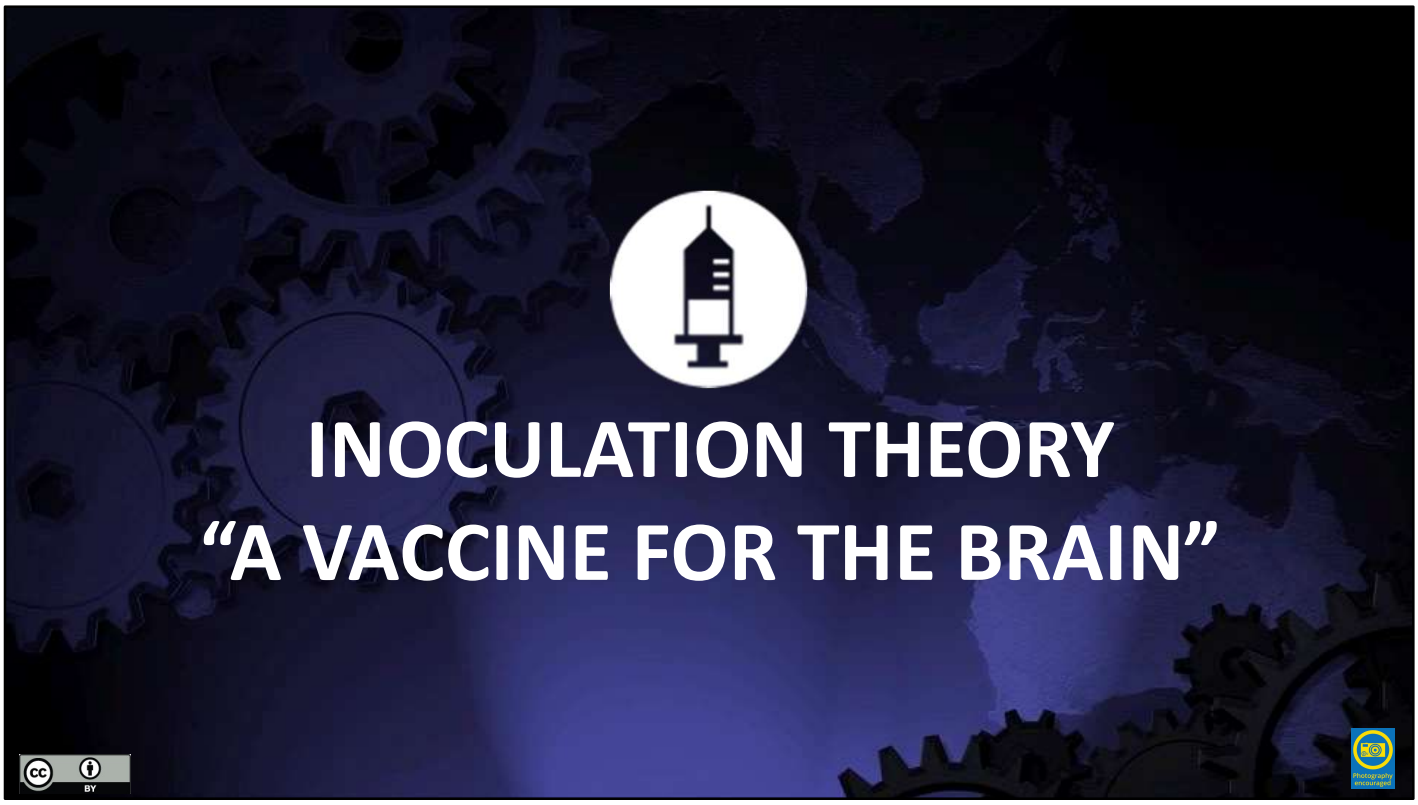

Why is mis- and disinformation a problem and can even be dangerous?


Studies have identified a big problem, namely that misinformation can cancel out facts when people are exposed to both and cannot easily reconcile this contradicting information. This can lead to them disengaging and believing neither.


The good news however is, that the antidote to fake news ....
... is a litte bit of fake news!

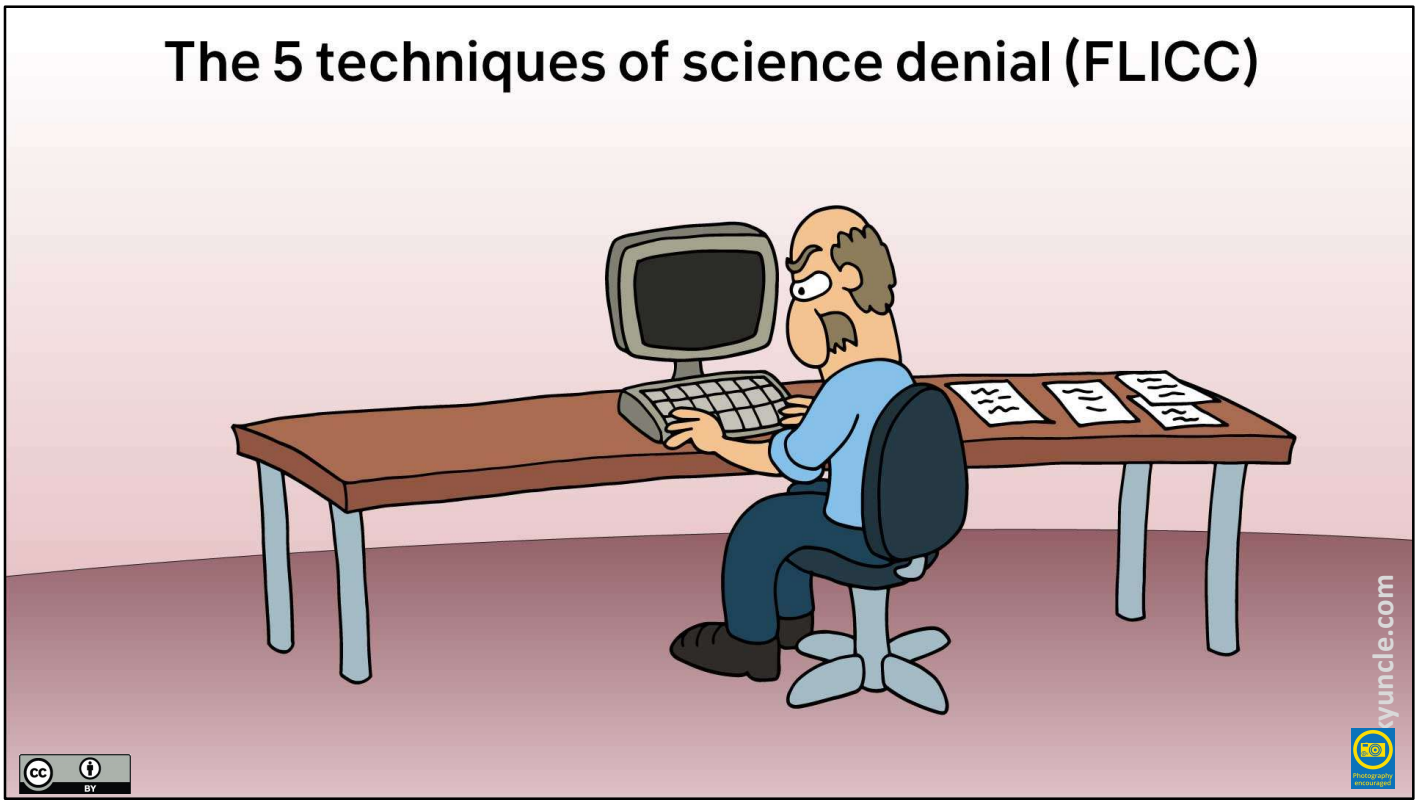
This is comparable to getting a flu shot with an inactive strain of a virus.


Recognising this problem provides the answer of how to respond to misinformation. We need to help people discern the difference between fact and fiction when faced with conflicting information. We can do this by explaining the techniques used to distort the facts. This is like exposing the sleight of hand behind a magician's trick. Once people see the technique behind a misleading argument, the misinformation loses its influence.

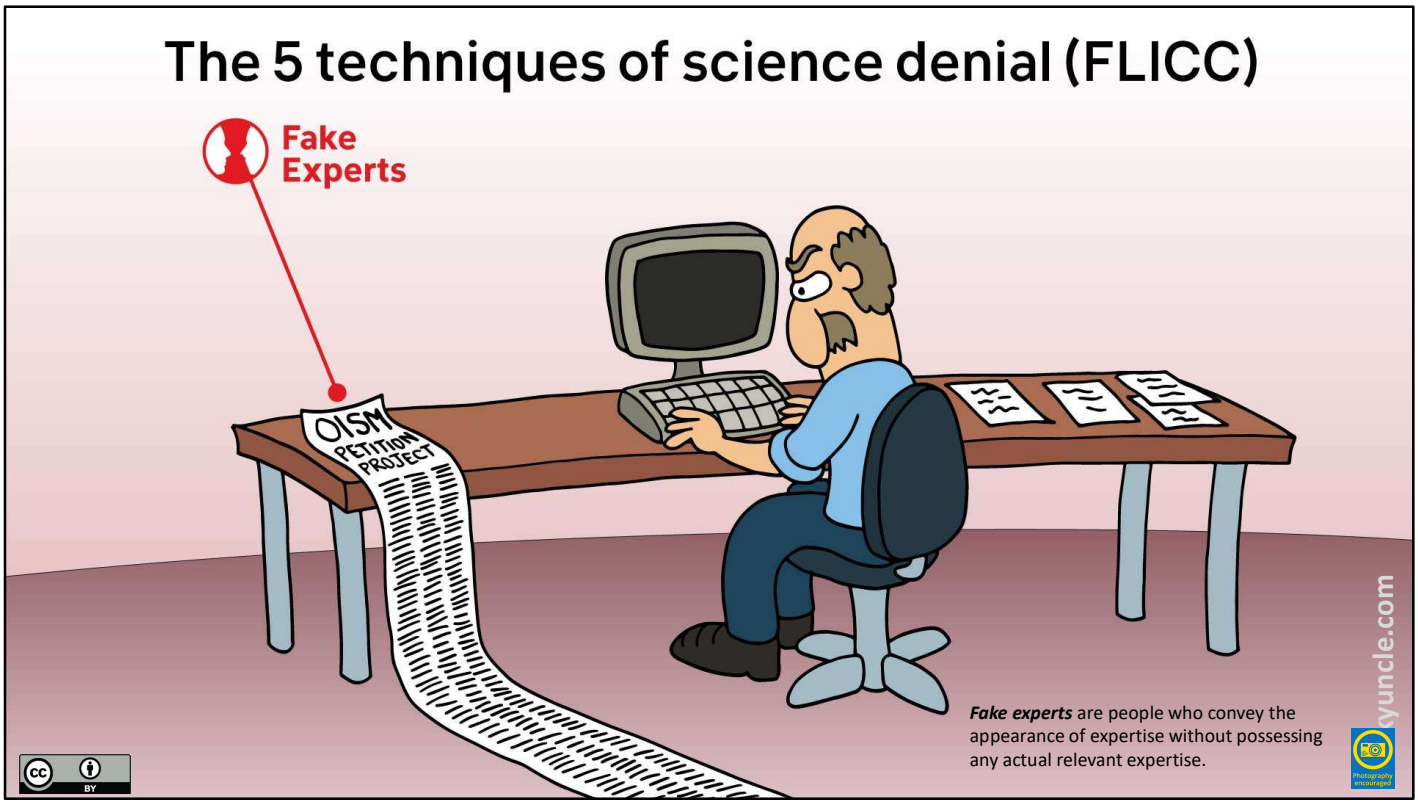



This is called Inoculation theory

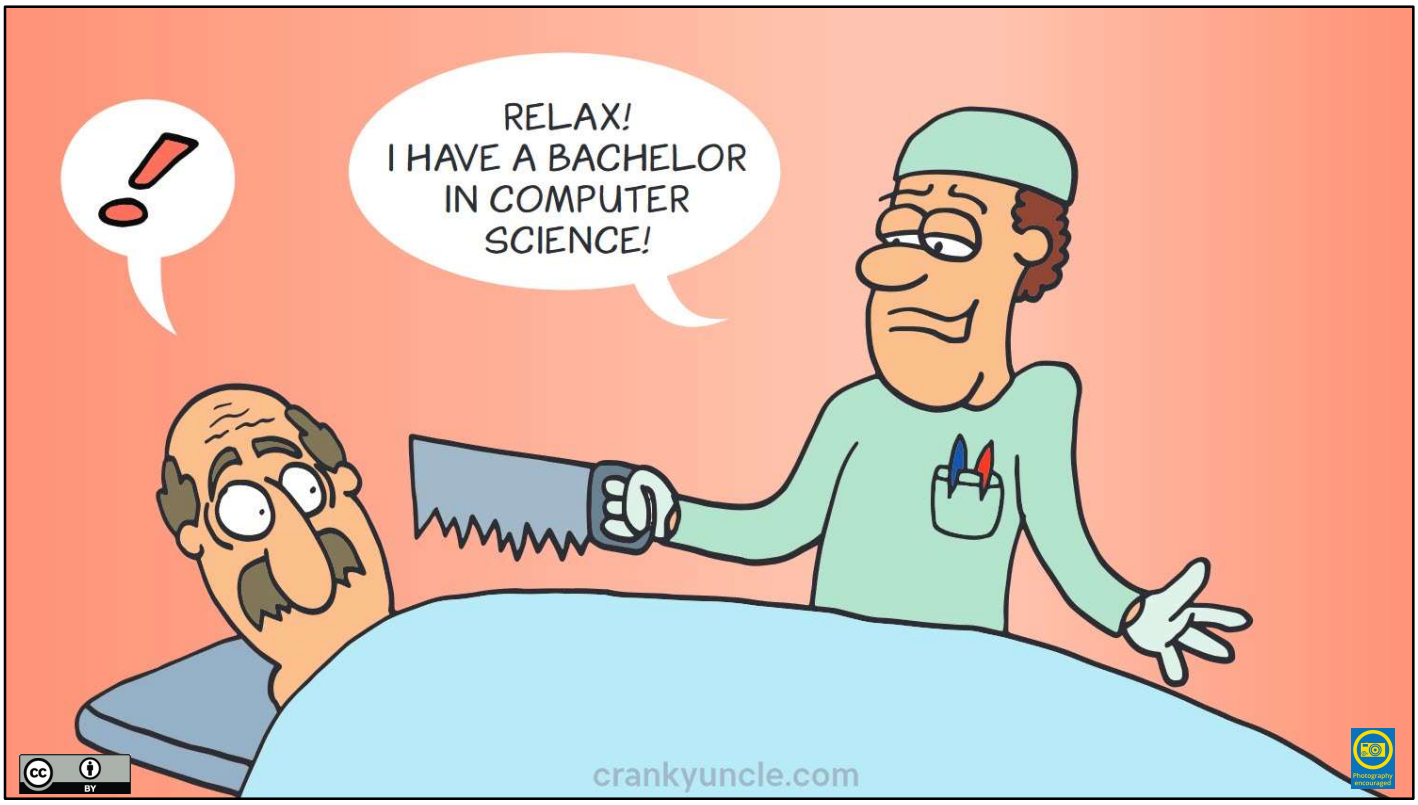
You warn people of the threat of the misinformation and you also give them countarguments and explanations of why the misinformation is wrong.




Science denial has five tell-tale techniques. They can be summarized with the acronym FLICC.

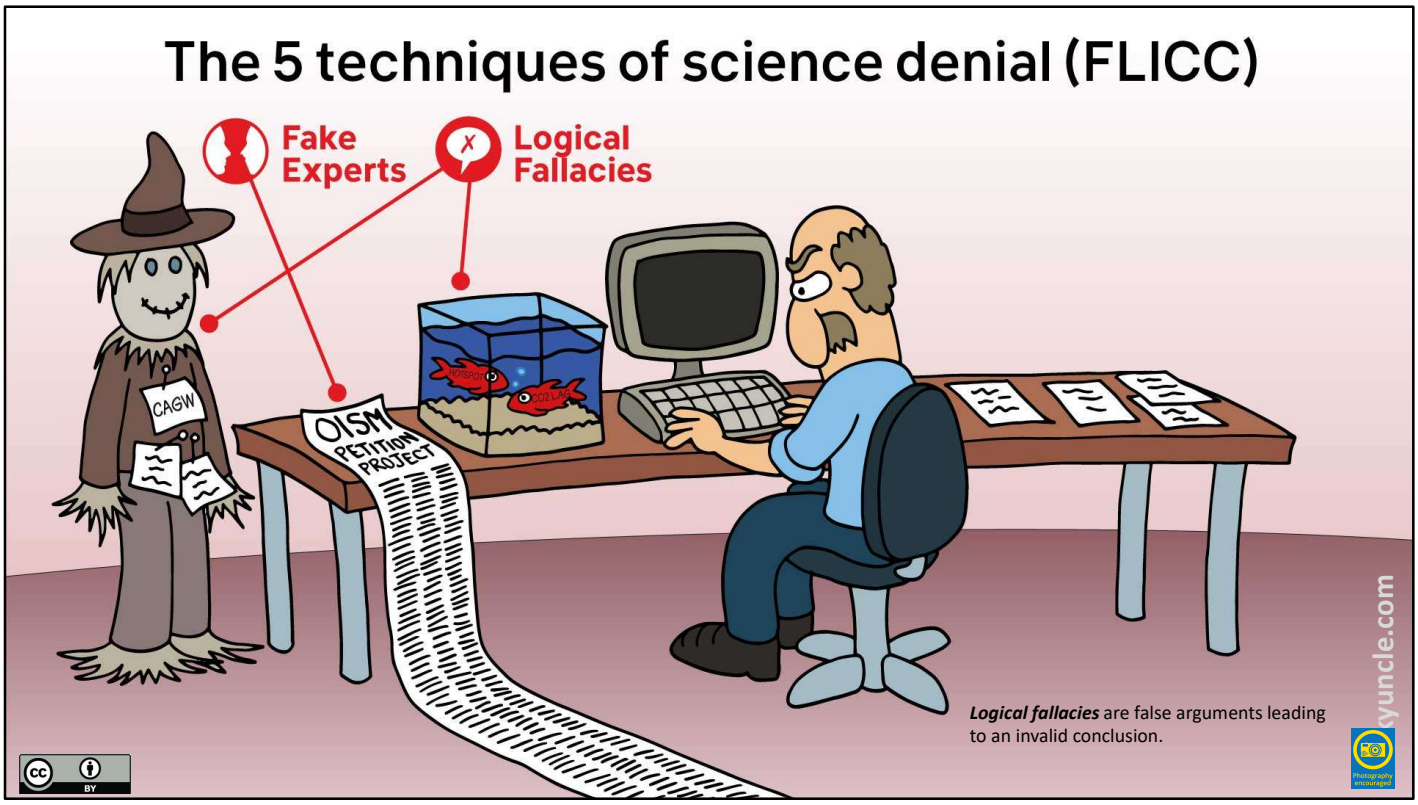



***Fake experts*** are people who convey the appearance of expertise without possessing any actual relevant expertise.

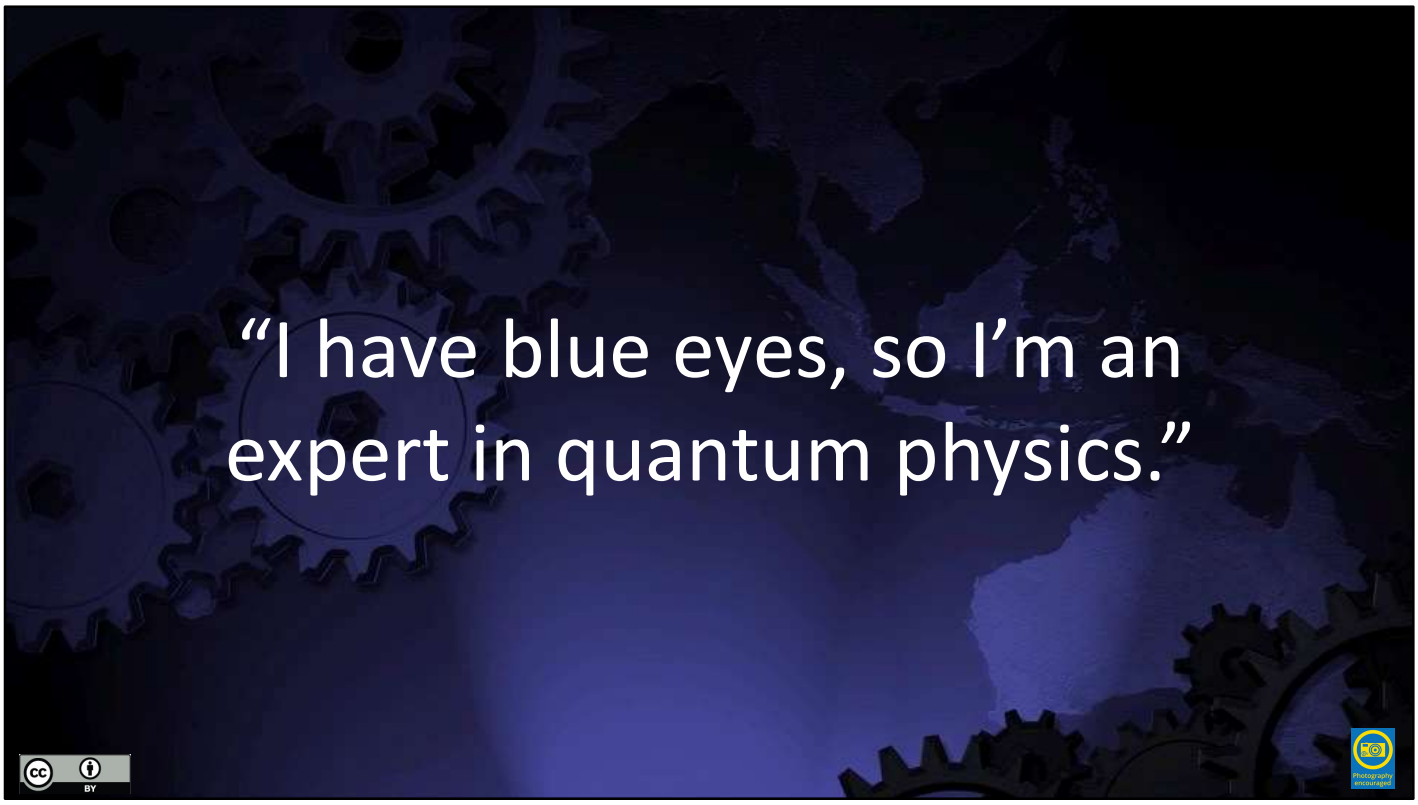



They can make an appearance individually when mentioned in articles or as talk show guests with impressive sounding titles …


… or in bulk form as signatories to online petitions disputing the consensus on human-caused global warming.




***Logical fallacies*** are false arguments leading to an invalid conclusion. There are a number of different fallacies— strawman and red herrings shown here are just two of commonly found denier arguments.

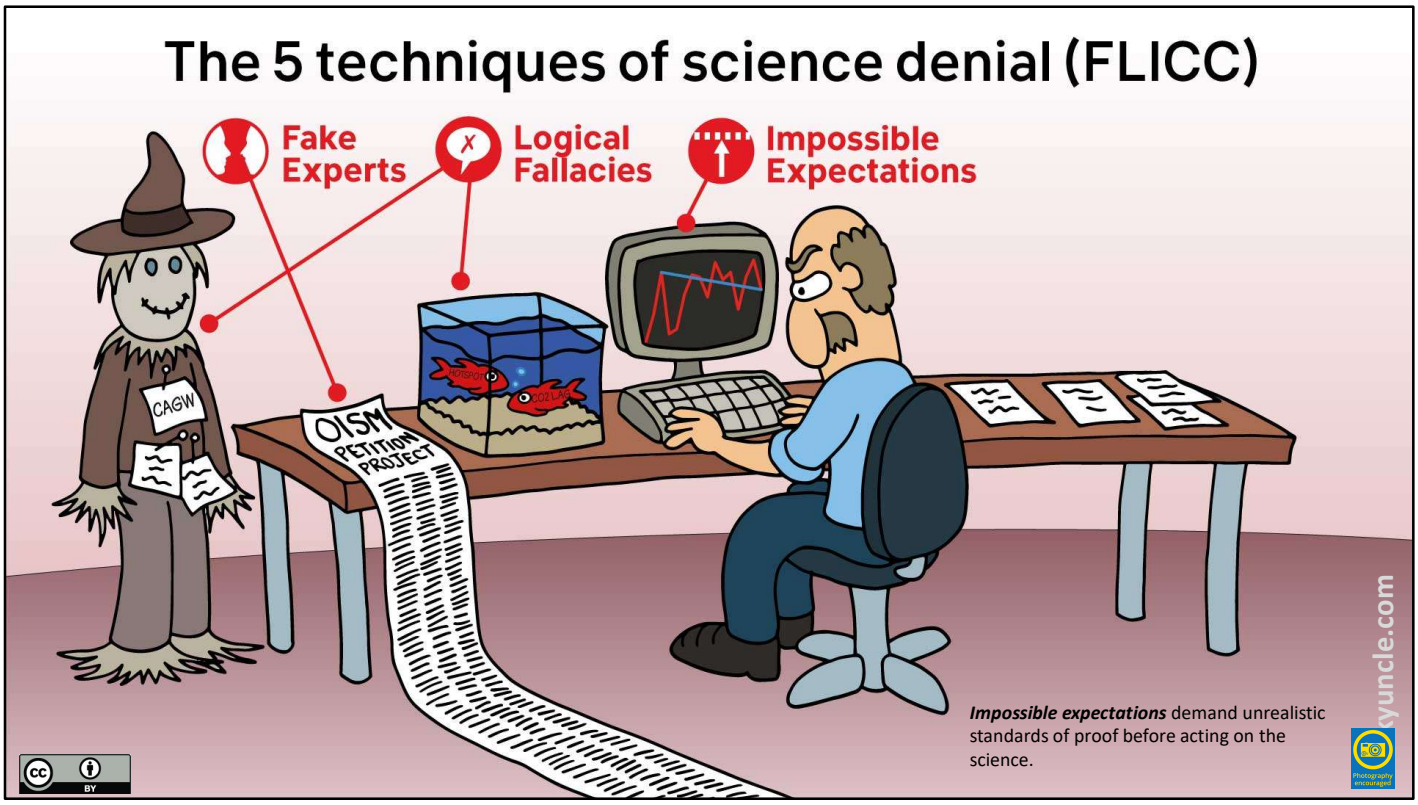



Some are obvious and easy to spot …

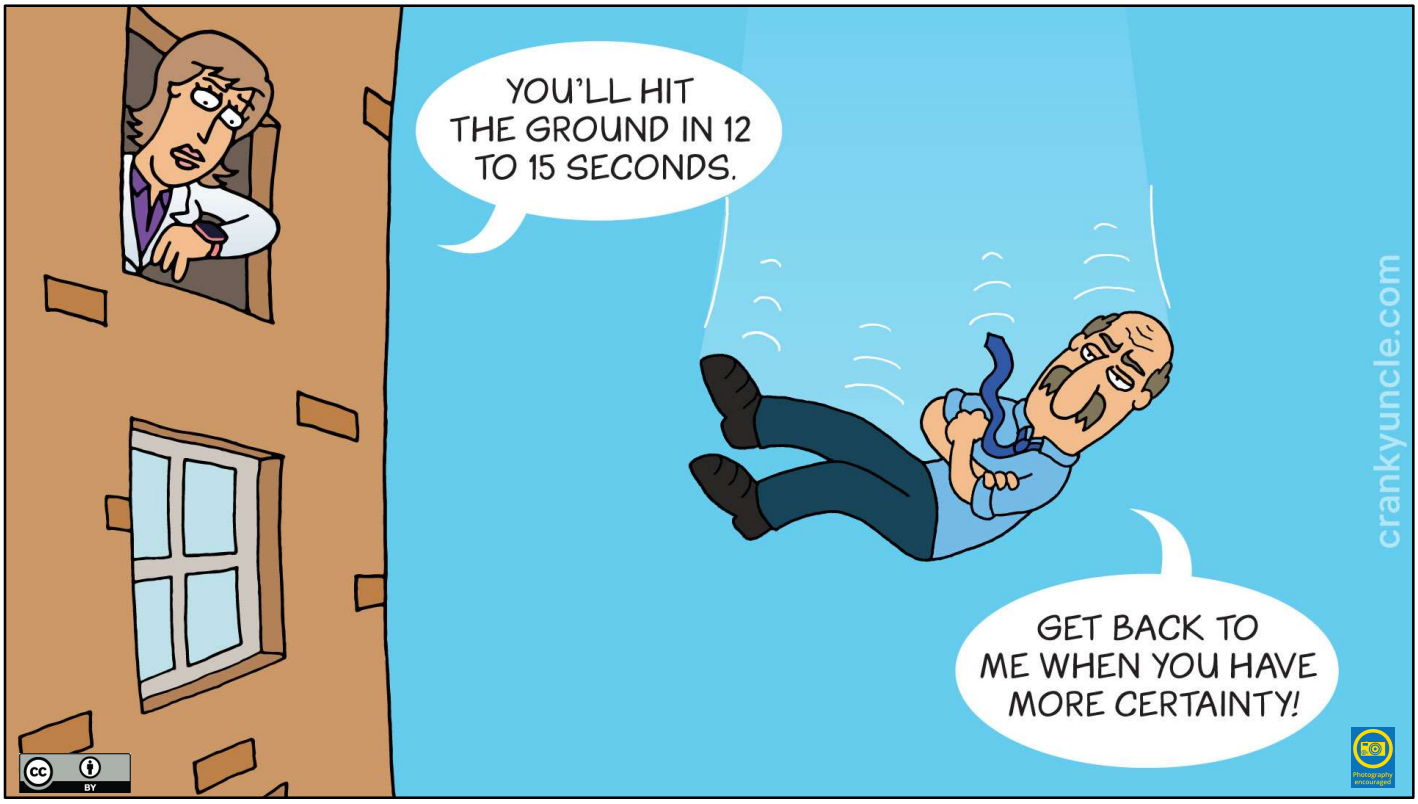

… while others need a bit more unpacking:

The argument that **the reason why climate is changing now, is because climate has always changed throughout the earth's past** commits the single cause fallacy. This is assuming that whatever caused something in the past, must also be the cause now.

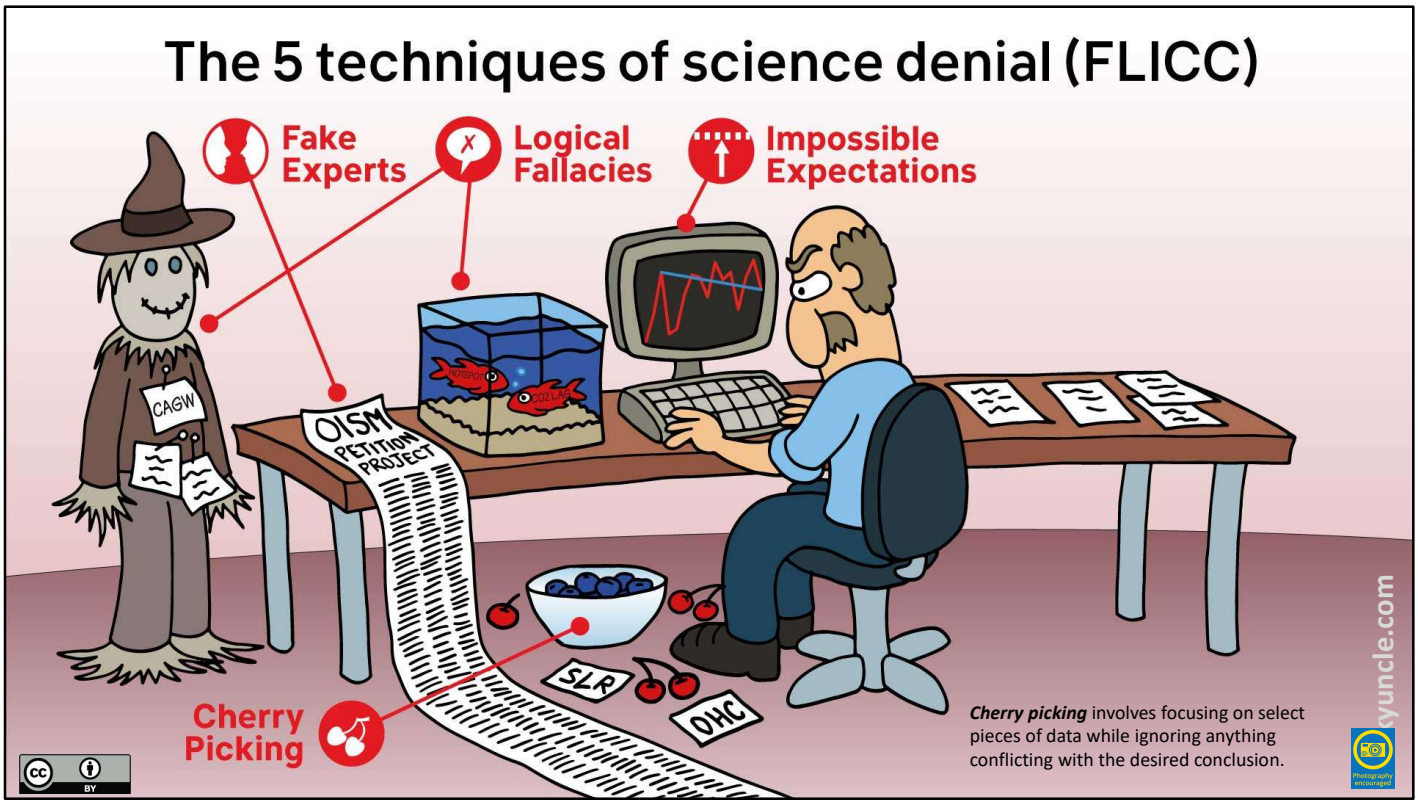
It's exactly the same logic as arguing in front of a body that was obviously murdered, that people have died of natural causes in the past so this person must have died of natural causes as well.



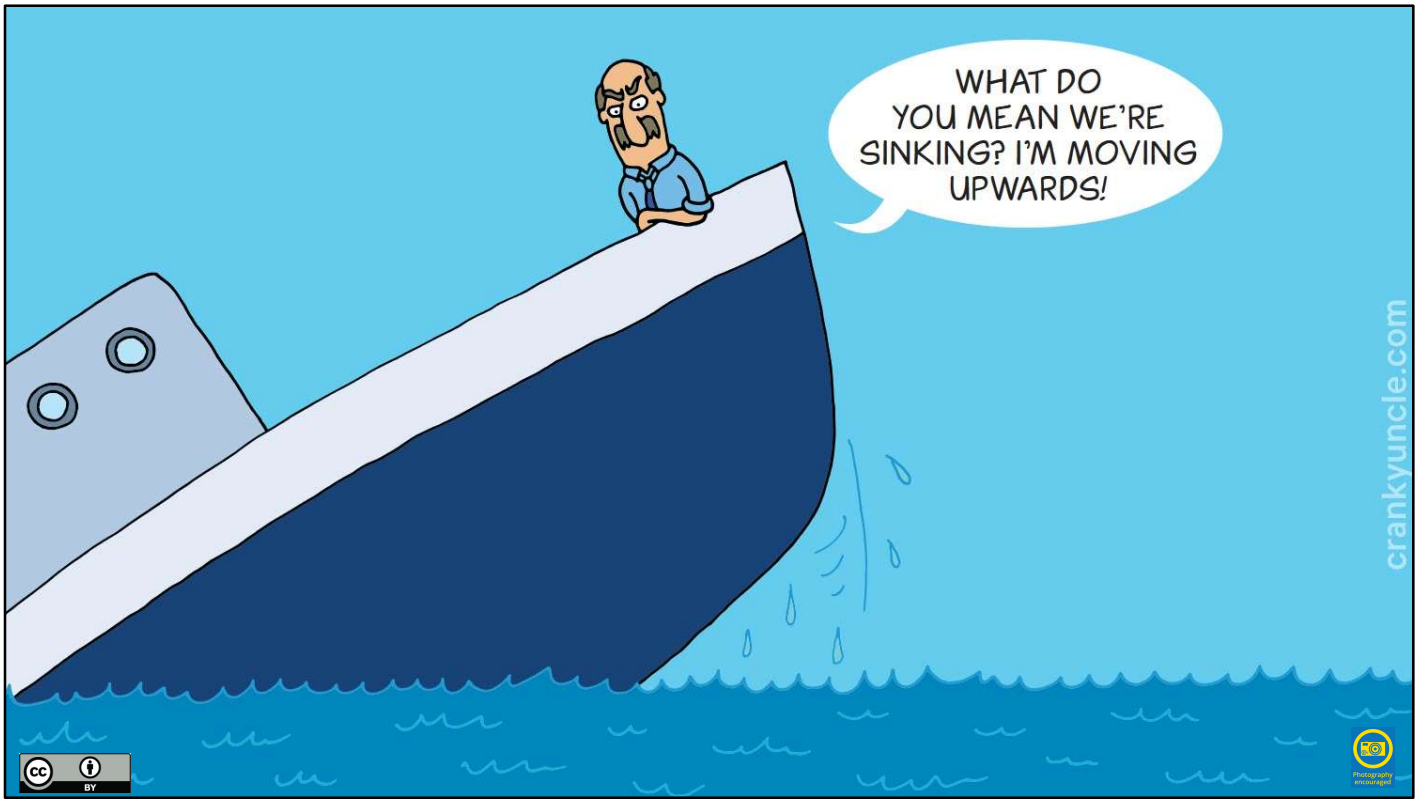

***Impossible expectations*** demand unrealistic standards of proof before acting on the science.




The problem with this - or why this is so challenging - is because science by nature is not definitive. It doesn't give exact values. It gives estimated ranges of values. This confusion about science is exploited by climate science deniers.

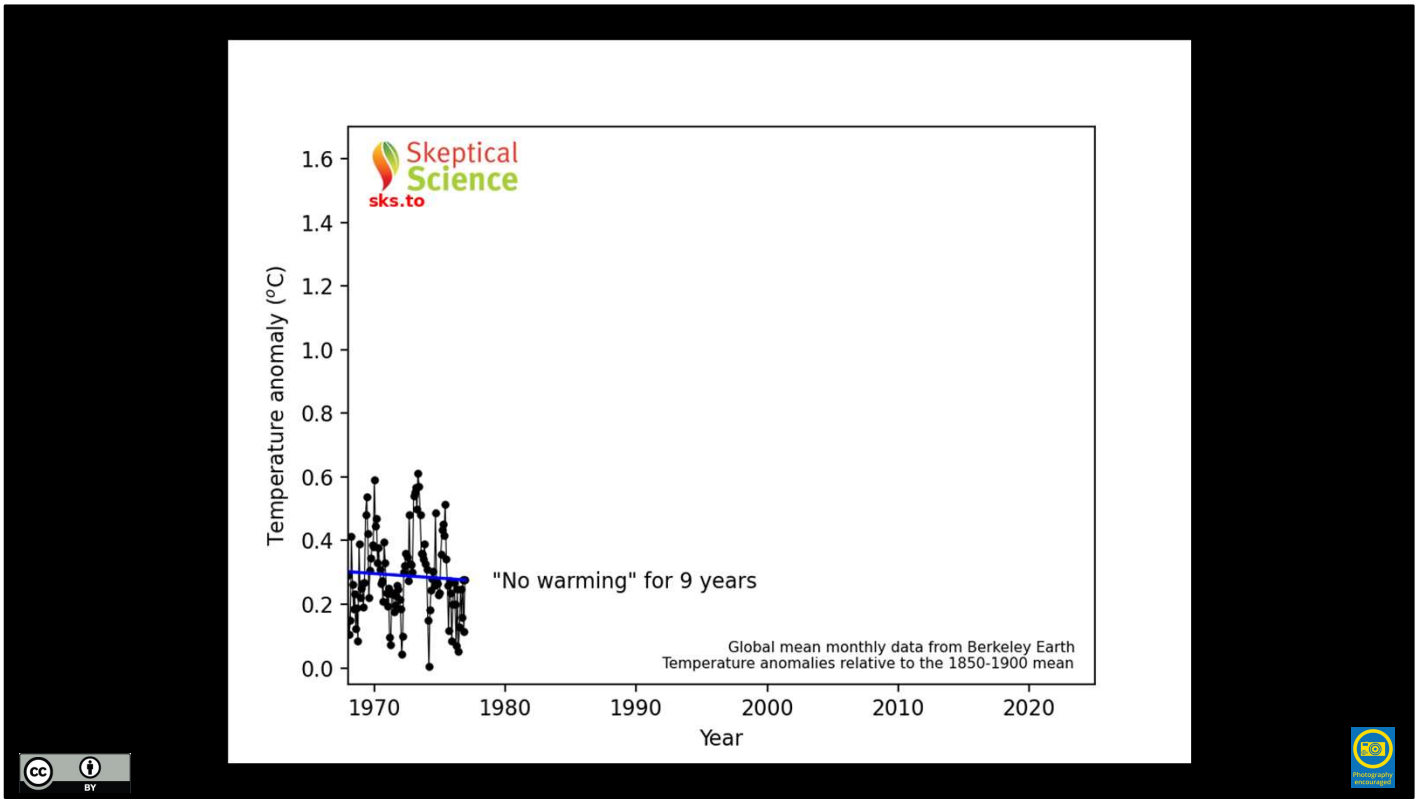



***Cherry picking*** involves focusing on select pieces of data while ignoring anything conflicting with the desired conclusion.

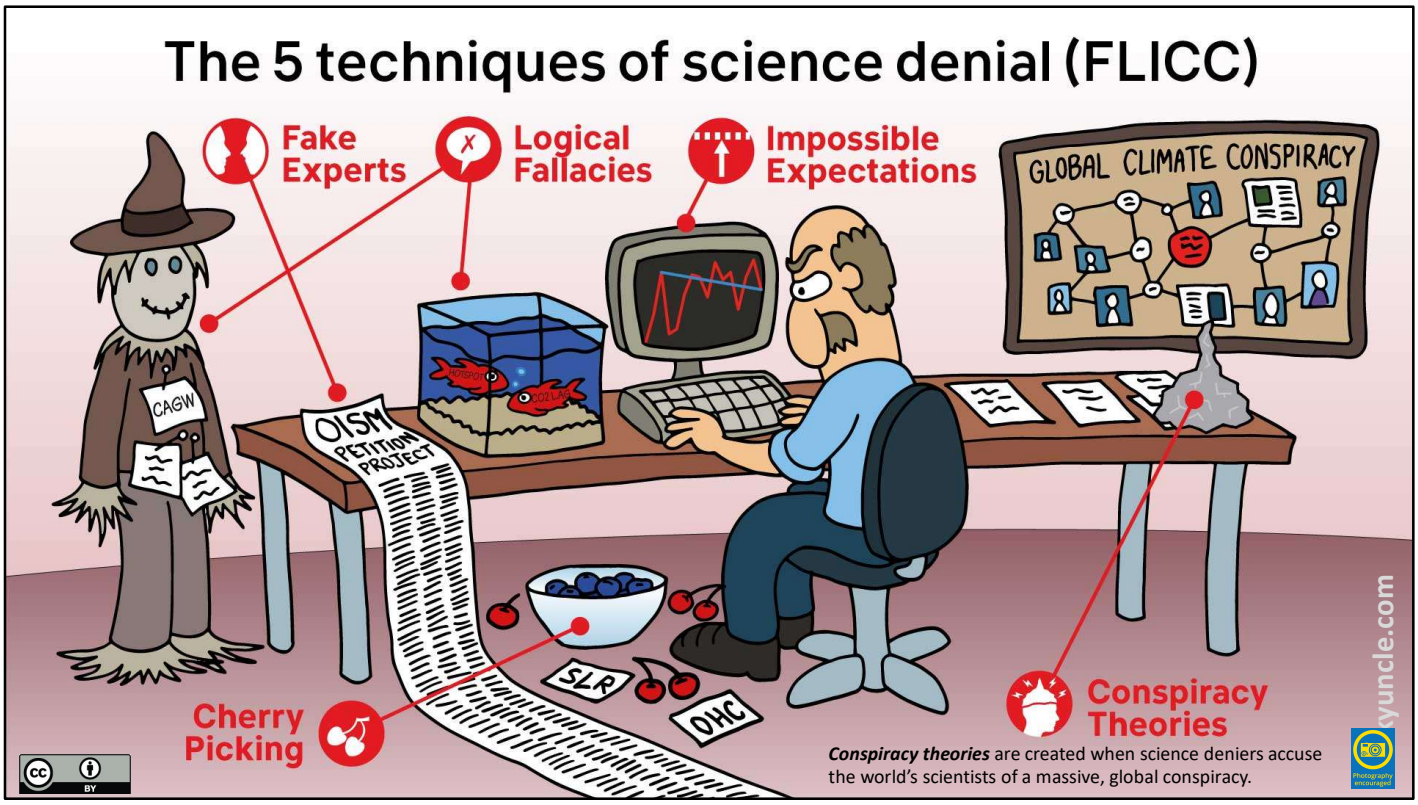



It's like being on the bow of a ship that's sinking and arguing "well I'm moving upwards so there's no problem!"

What this is doing, is ignoring what the bigger picture is and the way you can tell if someone is cherry picking, is if the conclusion that they come to from just a small part of the data, is different to the conclusion that you come to when you look at all the data, then that's cherry-picking.



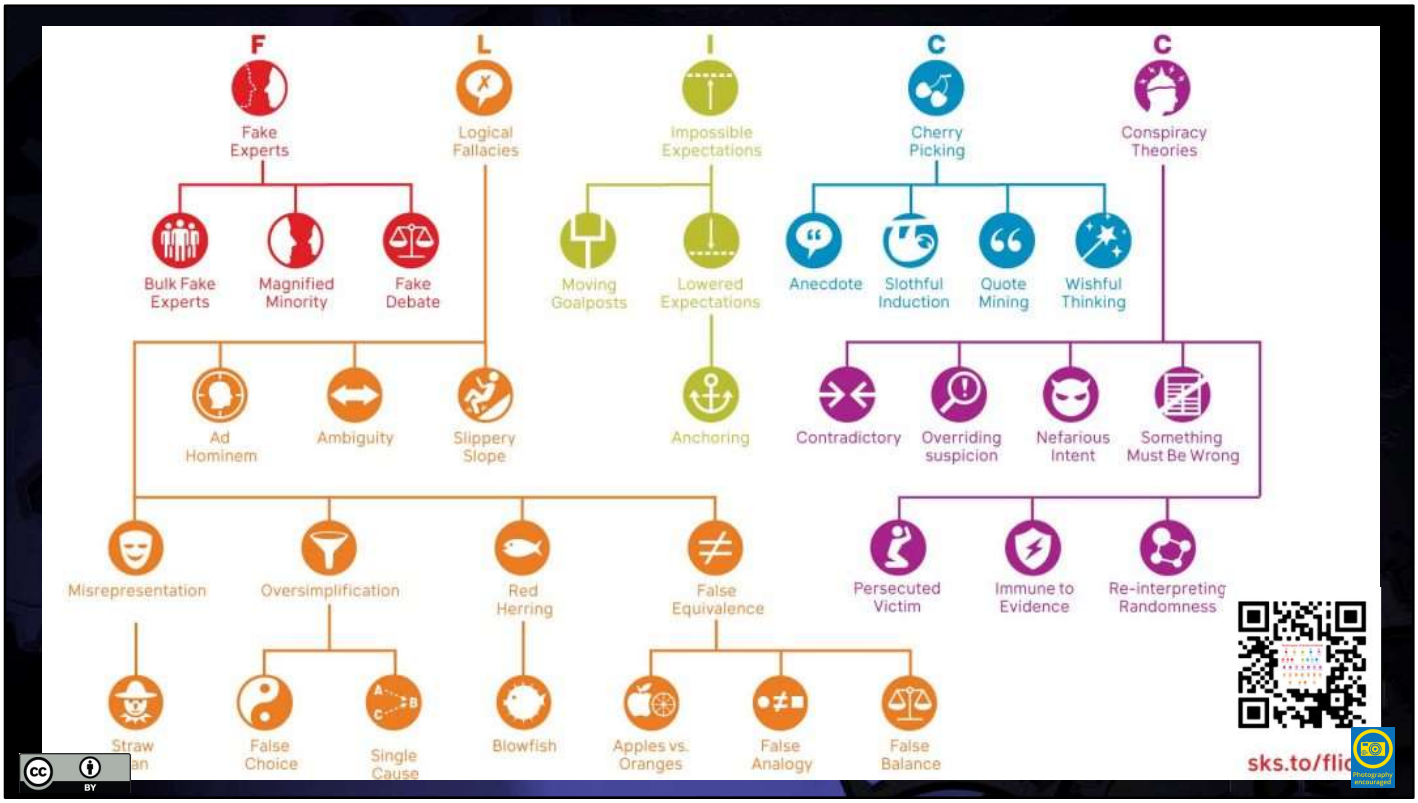

You might have seen mentions of “The Escalator” recently which is an illustration for the cherry picking going into the claim that it hasn’t warmed for “x” number of years. We see that temperature goes up and down from year to year, mostly due to ocean cycles. That means that even during a period of long-term warming, you can cherry pick short periods when it looks like global temperature is not rising.




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

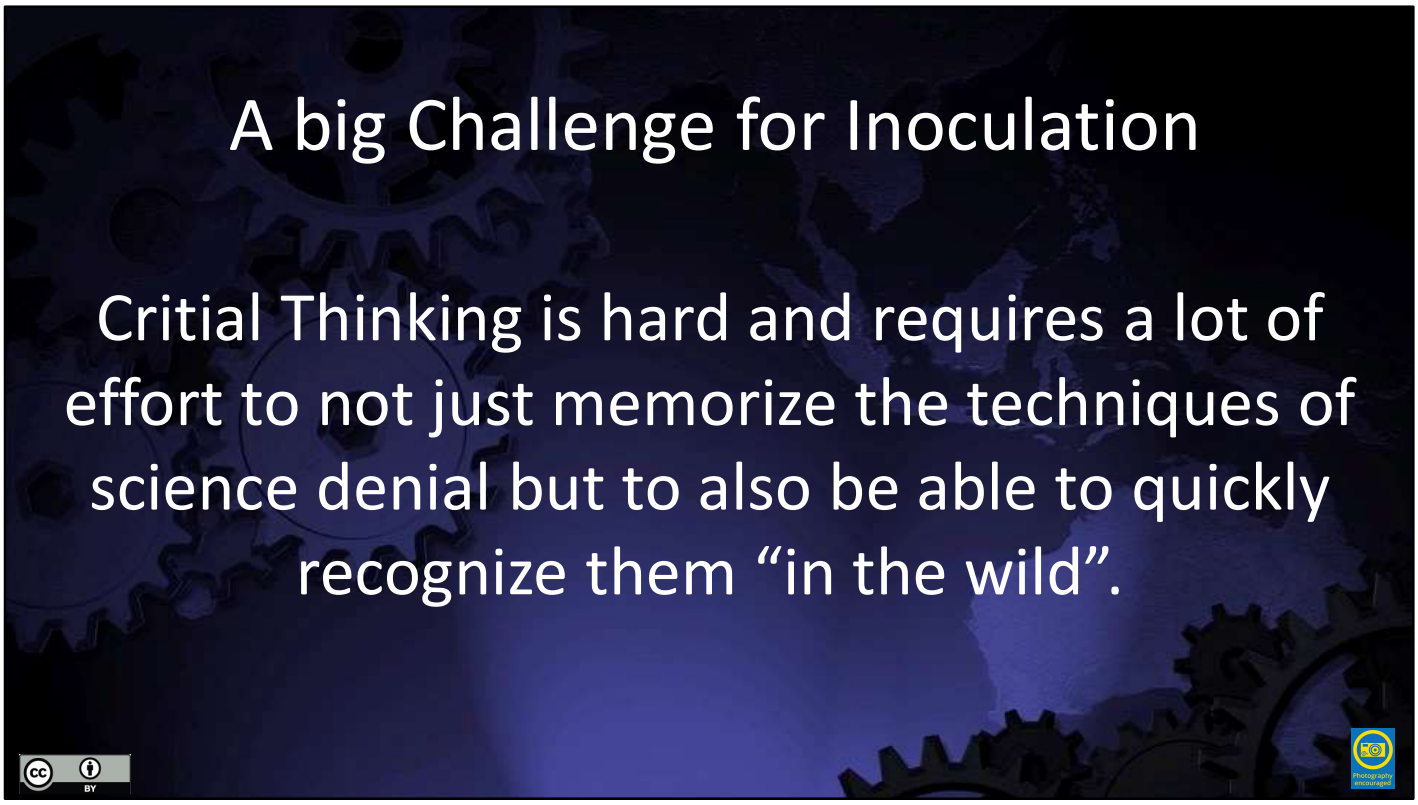

We tend to think of conspiracy theories as kind of amusing and a little bit ridiculous.


But there are actually really damaging conspiracy theories. And January 6 2021 has really underscored just how extreme, marginal, conspiracy theories can burst into the mainstream and then have devastating impacts on society. And even when you forget the violent aspects, just at a much more subtle level, conspiracy theories erode public trust in scientific and governmental institutions. And that is dangerous when it comes to climate change as well as when it comes to COVID.




These 5 main techniques are however just the tip of the proverbial iceberg!
Many fallacies can be broken down further and the current taxonomy includes 36 of them all told!

Which obviously is quite a lot to take in and memorize!.




It‘s also a big challenge for inoculation.

Especially if you want people to recognize them quickly when confronted with them „in the wild“!


This is where the Cranky Uncle game can help.


John Cook has been developing a smartphone game, that builds public resilience against misinformation by explaining these techniques of science denial.

The way the game works, is that a cranky uncle basically mentors you into how to become a science denying cranky uncle by explaining all the different techniques that he uses to reject science.

You'll first learn the five main techniques of science denial which – as we've already seen - are: fake experts, logical fallacies, impossible expectations, cherry picking and conspiracy theories.


The game is available for iOS, Android and browsers and can currently be played in 12 languages with more in the works.

# Thanks to John Cook

## for his slides as well as the Cranky Uncle cartoons used in this presentation!

More information is available at
https://crankyuncle.com

Credit where credit is due!

# Thank you!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More about me - https://sks.to/BaerbelW


# Resources & References


Van der Linden, S., Leiserowitz, A., Rosenthal, S., & Maibach, E. (2017). Inoculating the public against misinformation about climate change. *Global Challenges*, *1*(2), 1600008.

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

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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. http://edx.org/understanding-climate-denial


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


Is there a way to tell genuine scepticism – which is the cornerstone of scientific inquiry – from denial?

## Skeptical Science

https://skepticalscience.com


For detailed information about Skeptical Science please check the display presented at EGU2020

https://sks.to/egu2020-display

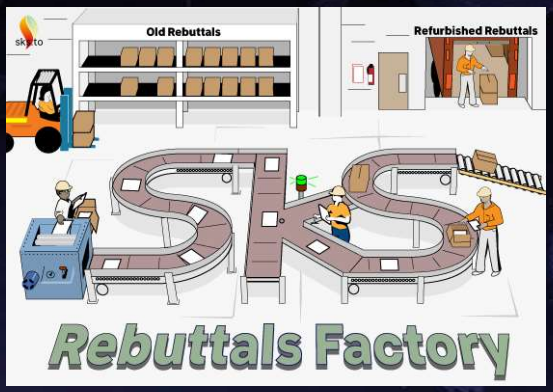
Skeptical Science (SkS) is a website and registered non-profit science education organization with international reach founded by John Cook in 2007. Our main purpose is to debunk misconceptions and misinformation about human-caused climate change and we have a database that currently has more than 200 rebuttals based on peer-reviewed literature.

We employ what science tells us about how people listen and think to deliver more effective communications, which is better than guessing. We encourage all science communicators to do this. What follows are a few examples of how we apply this.

For detailed information about Skeptical Science please check the display presented at EGU2020 https://sks.to/egu2020-display

## Skeptical Science – Rebuttal Updates

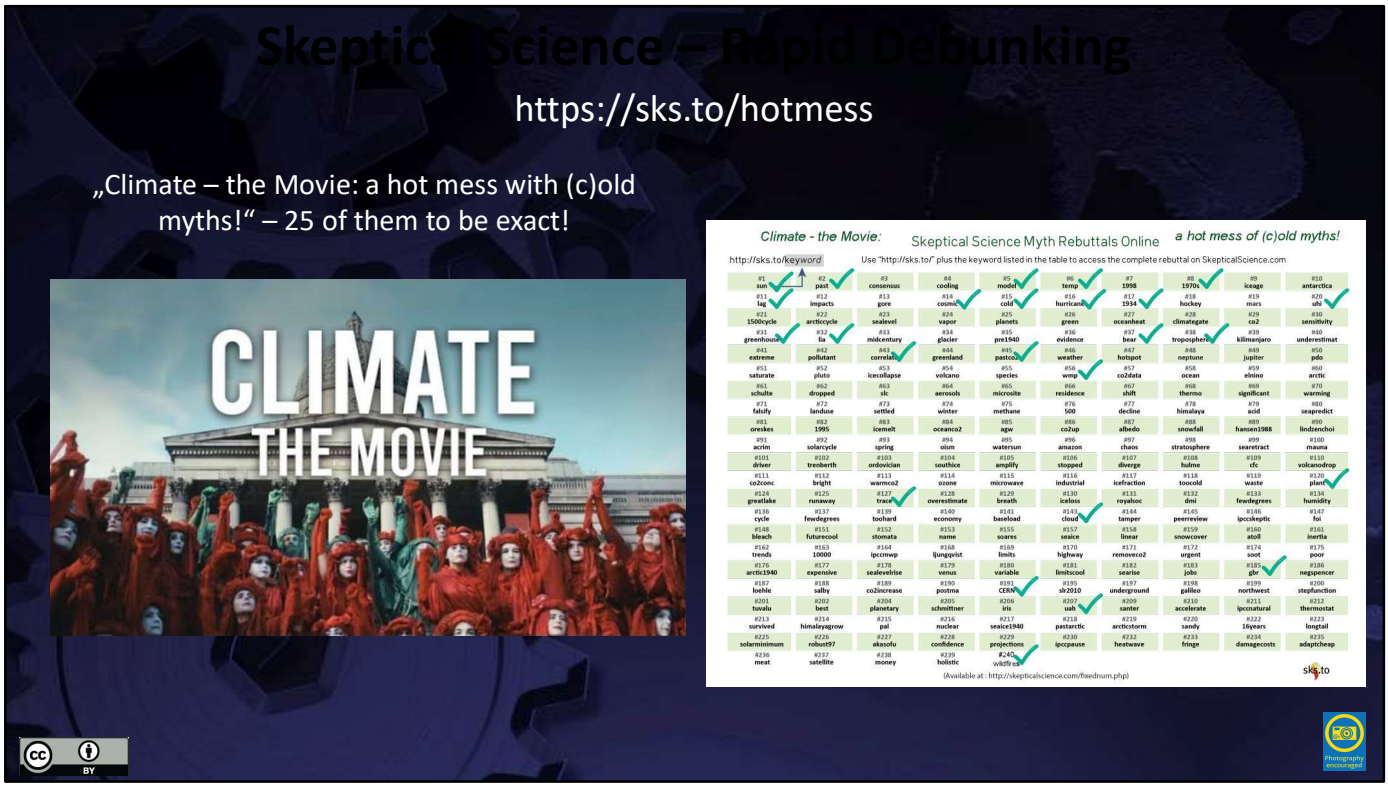
https://sks.to/at-a-glance


For detailed information about our rebuttal updates please check the display presented at EGU2023
https://sks.to/egu23-abstract-1

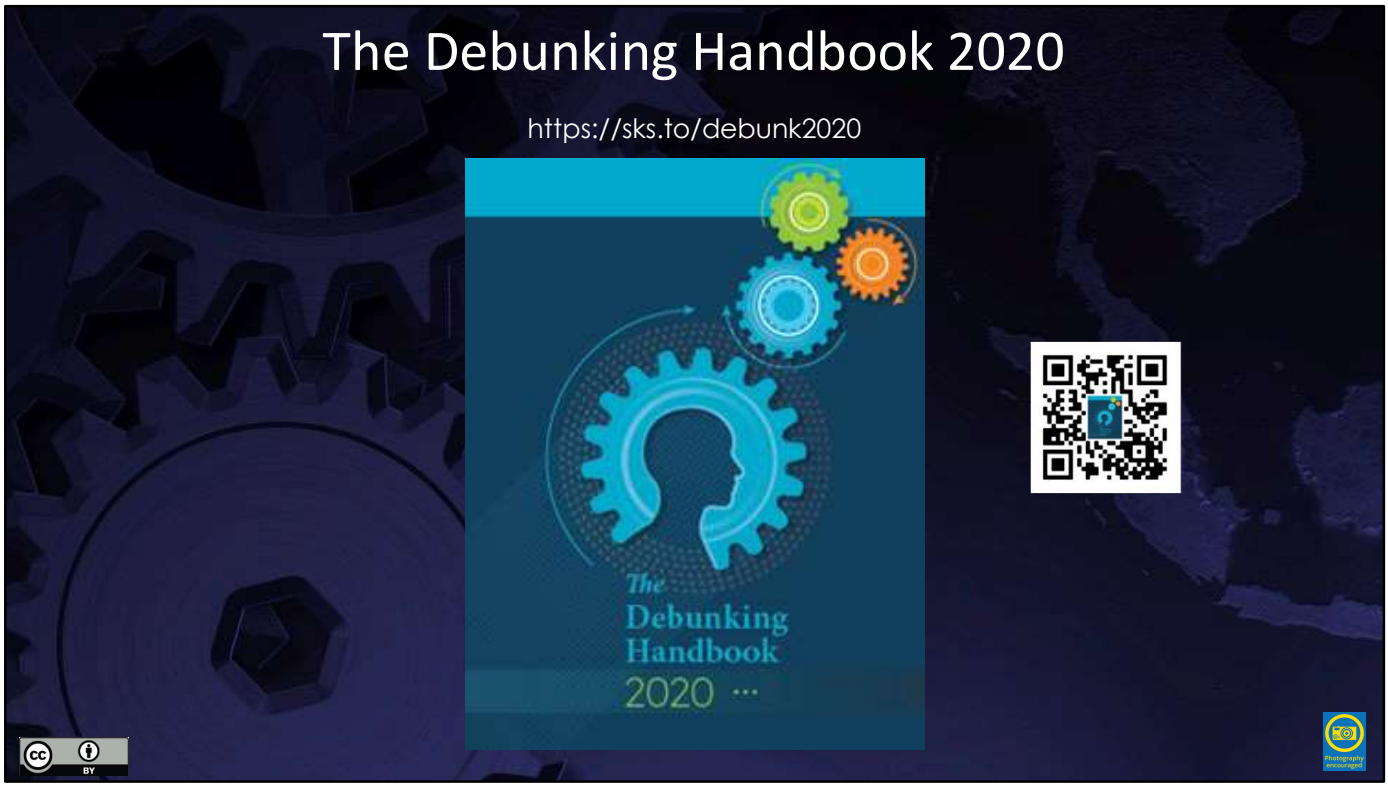
Since February 2023 we have been updating our rebuttals to common climate myths. They now feature an easy to understand "At a Glance" section in the basic level explanation followed by more details. Thus far, more than 60 of our more than 200 rebuttals have been updated and more are in the pipeline in our "rebuttals update factory".

For detailed information about our rebuttal updates please check the display presented at EGU2023 https://sks.to/egu23-abstract-1



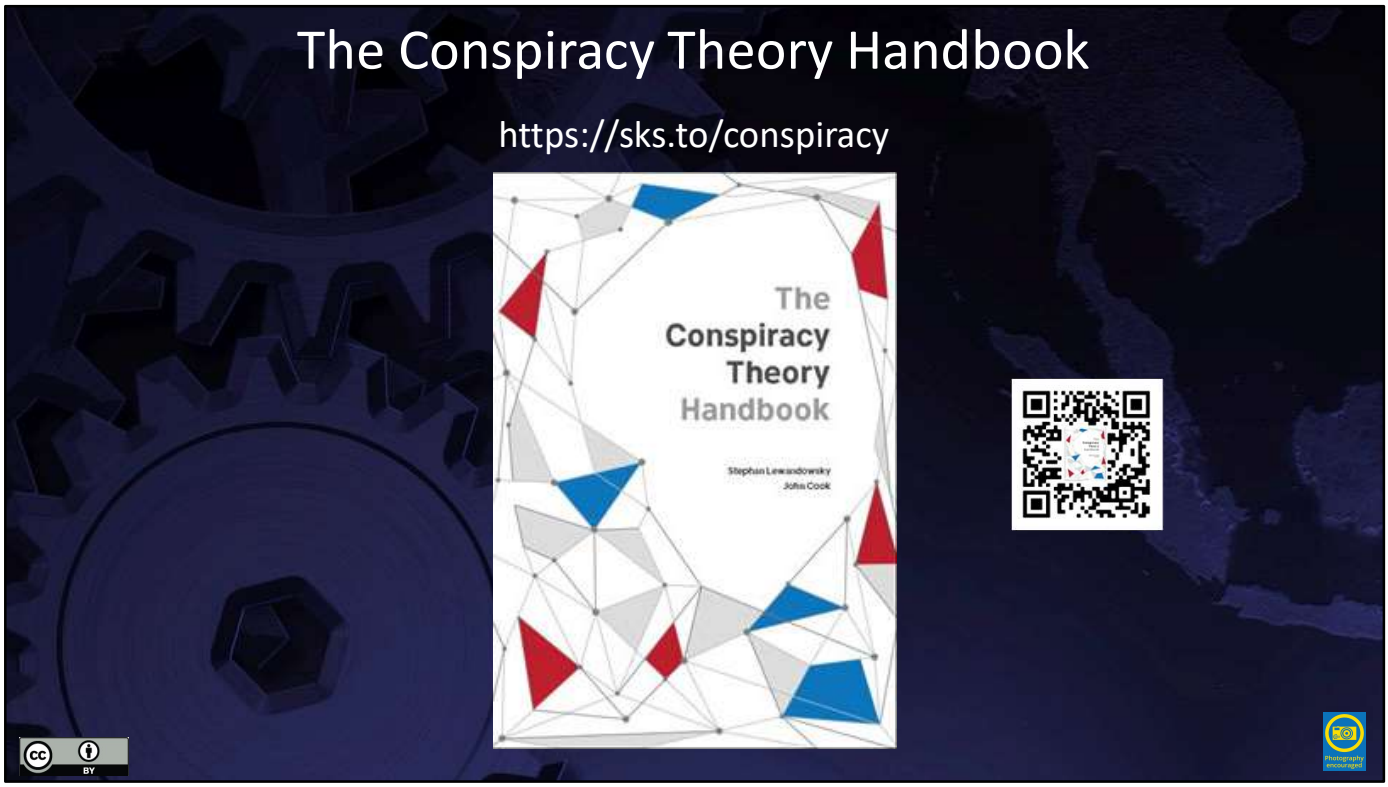

We sometimes manage to produce some “rapid debunking” like was the case in March 2024 when Martin Durkin’s sorry excuse of a movie was launched on Youtube and elsewhere. John Mason from our team sat down to watch it and took notes while doing so. He identified 25 old myths catalogued and debunked in our database, so within a day we cobbled together a blog post and published it on Saturday, March 23. It also contained the Myth Rebuttal Chart – a bingo card if you like – highlighting the myths identified. Thanks to being shared far and wide – including by Katharine Hayhoe – the blog post has been viewed more than 30K times, an order of magnitude more than our articles usually do. We just wish that we had the resources to do this more often than is possible right now!

You can read the blog post at [https://sks.to/hotmess](https://sks.to/hotmess)




We also provide downloadable materials like various handbooks. The Debunking Handbook is a consensus document written by 19 co-authors invited by the three lead authors Stephan Lewandowsky, John Cook and Ullrich Ecker based on their scientific status in the field. The Handbook explains what mis- and disinformation is, why it can cause substantial harm for individuals and societes, why it is often sticky and therefore hard to dislodge, why pre-bunking can be more effective than debunking and how to go about the latter best. Most importantly, it point outs to not refrain from attempting to debunk or correct misinformation out of fear that doing so will backfire or increase beliefs in false information.

Download the handbook at https://sks.to/debunk2020

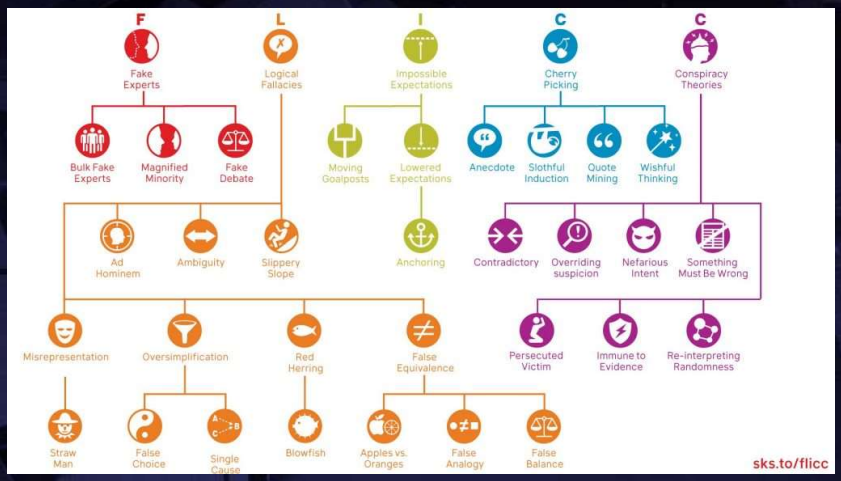



Conspiracy theories attempt to explain events as the secretive plots of powerful people. While conspiracy theories are not typically supported by evidence, this doesn't stop them from blossoming. Conspiracy theories damage society in a number of ways. To help minimise these harmful effects, The Conspiracy Theory Handbook written by Stephan Lewandowsky and John Cook explains why conspiracy theories are so popular, how to identify the traits of conspiratorial thinking, and what are effective response strategies.

Download the handbook from https://sks.to/conspiracy

# FLICC – the techniques of science denial

https://sks.to/flicc-sks

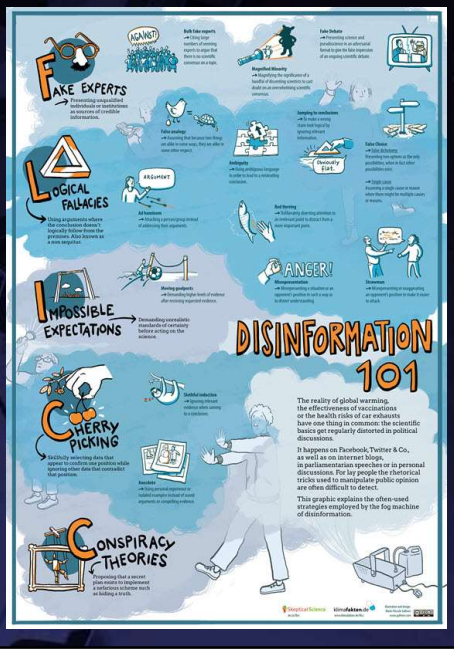



FLICC is a framework originally proposed by Mark Hoofnagle in 2007 who listed the five techniques of science denial: fake experts, logical fallacies, impossible expectations, cherry picking and conspiracy theories. These five main techniques are however just the tip of the iceberg and John Cook has gradually been building up a landscape of different techniques used to mislead.

More information: [https://sks.to/flicc-sks](https://sks.to/flicc-sks)

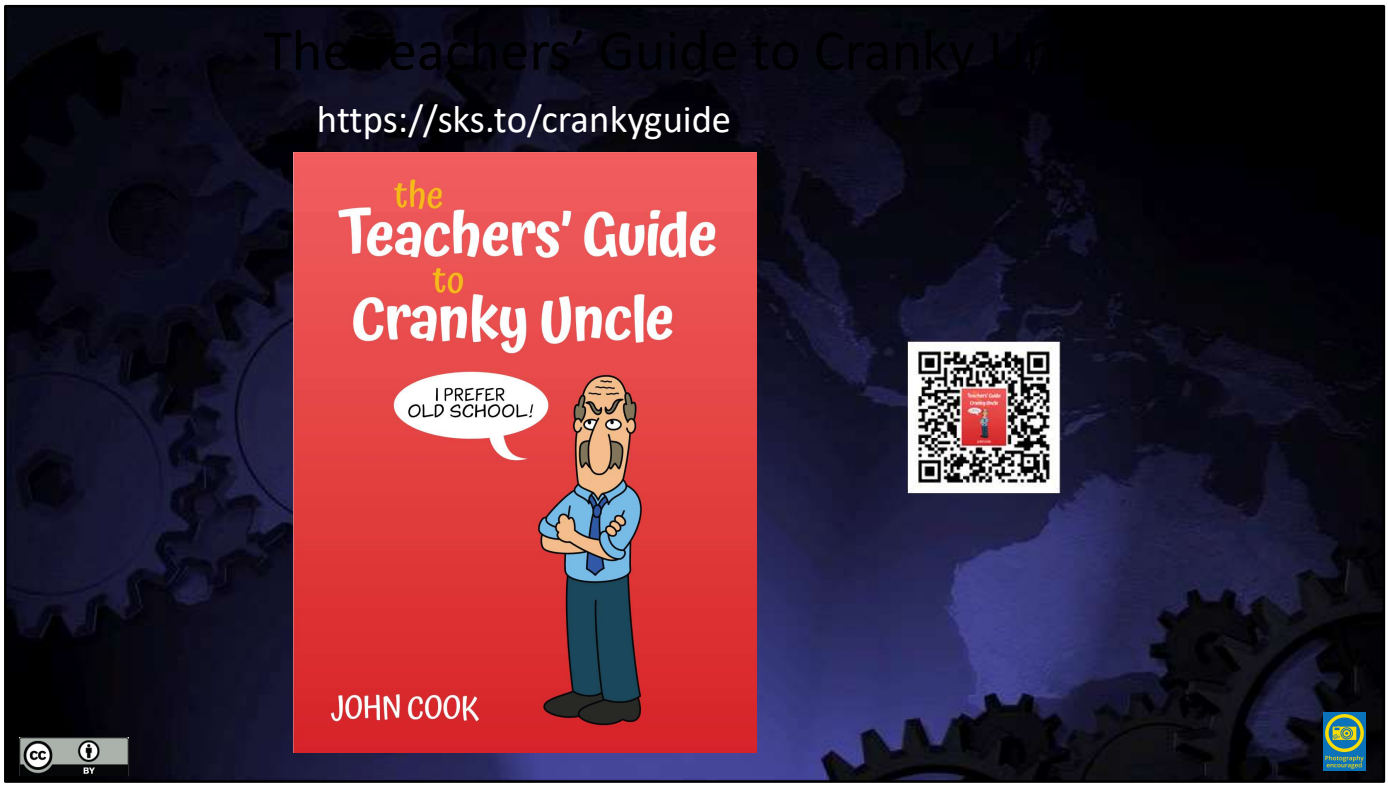
# The FLICC Poster

https://sks.to/flicc-poster



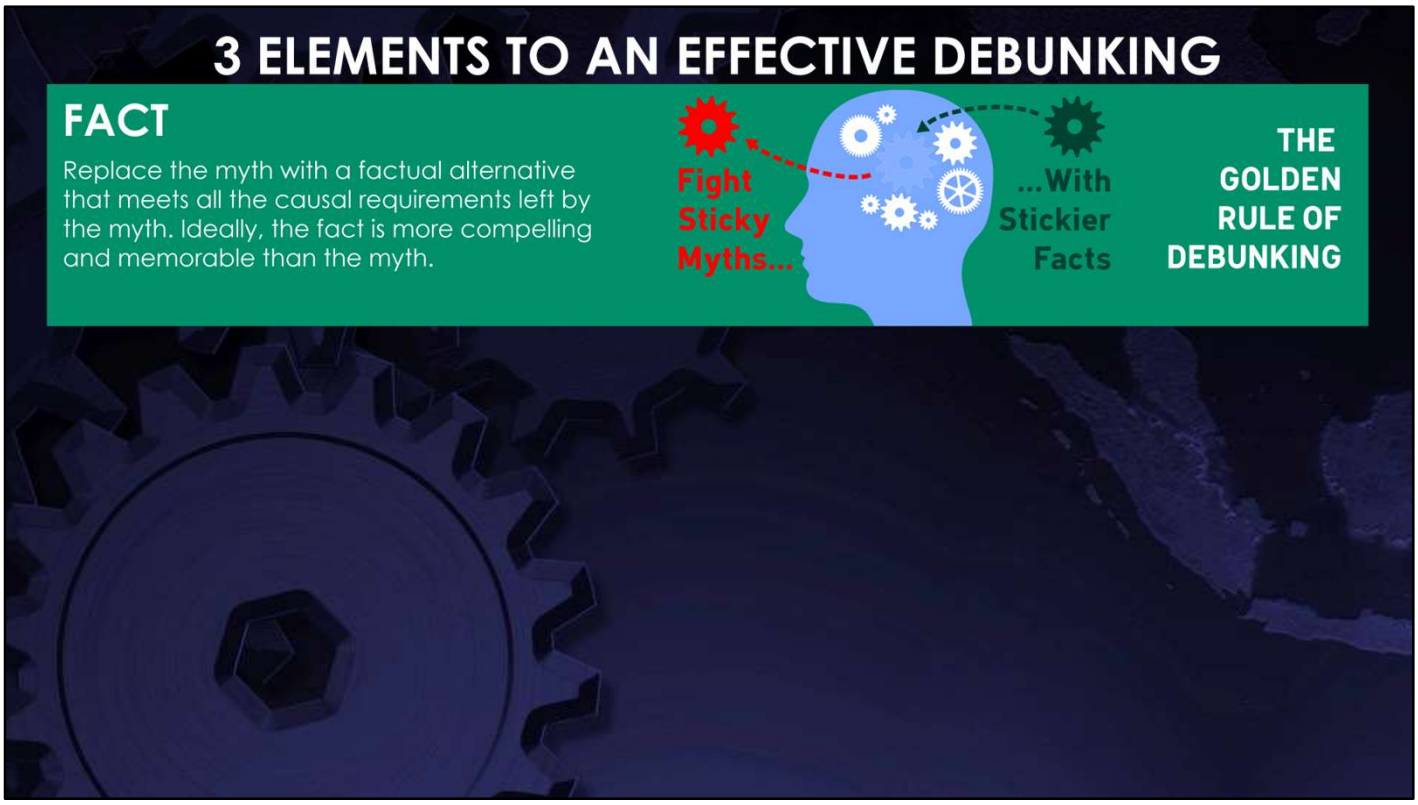

Many of these techniques are depicted in the FLICC Poster, which is the result of a successful collaboration between Skeptical Science and our German language partner website klimfakten.de. The poster's first version was in German but the idea to also create an English version soon came up. Several other language versions have been created since then.

Download the poster from https://sks.to/FLICC-poster
Collaboration https://sks.to/FLICC-poster-collab.



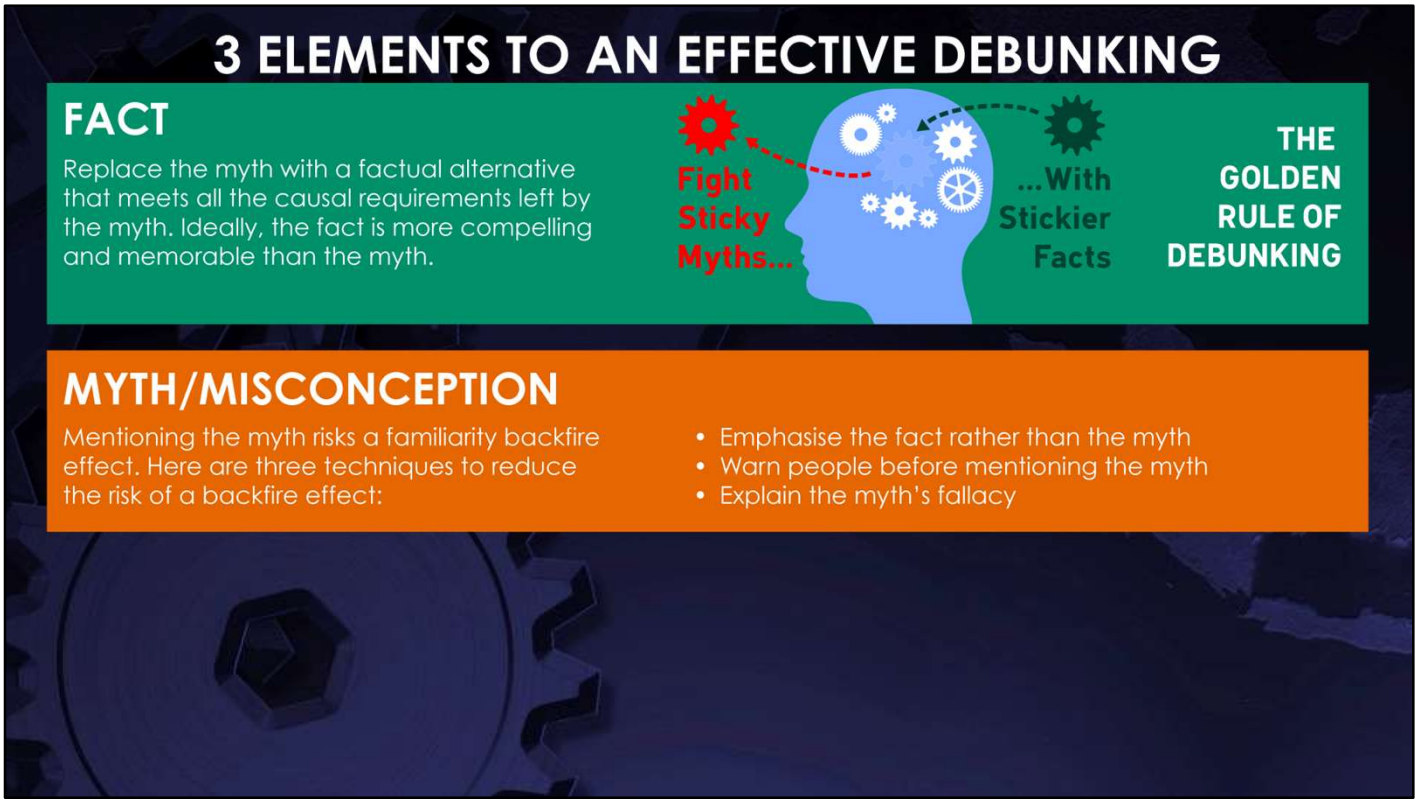

The Teachers' Guide to Cranky Uncle explains the science behind the game and contains resources for various class activities. It has been translated in several languages already.

Download available at https://sks.to/crankyguide

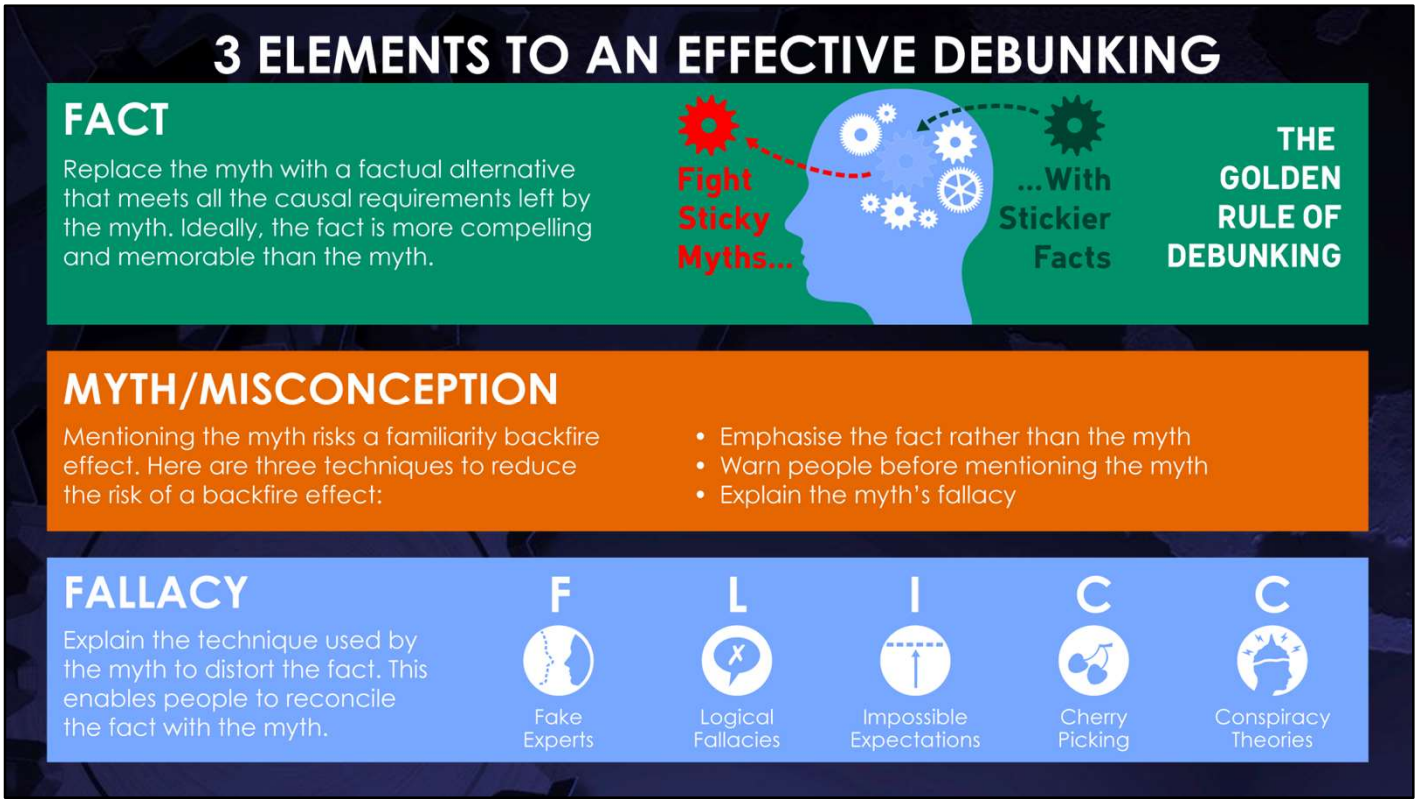



An effective debunking comes with three elements:

Start with the FACT and follow the golden rule of debunking by fighting sticky myths with stickier facts.




Before mentioning the misconception, preceed it with a warning to put people on guard.

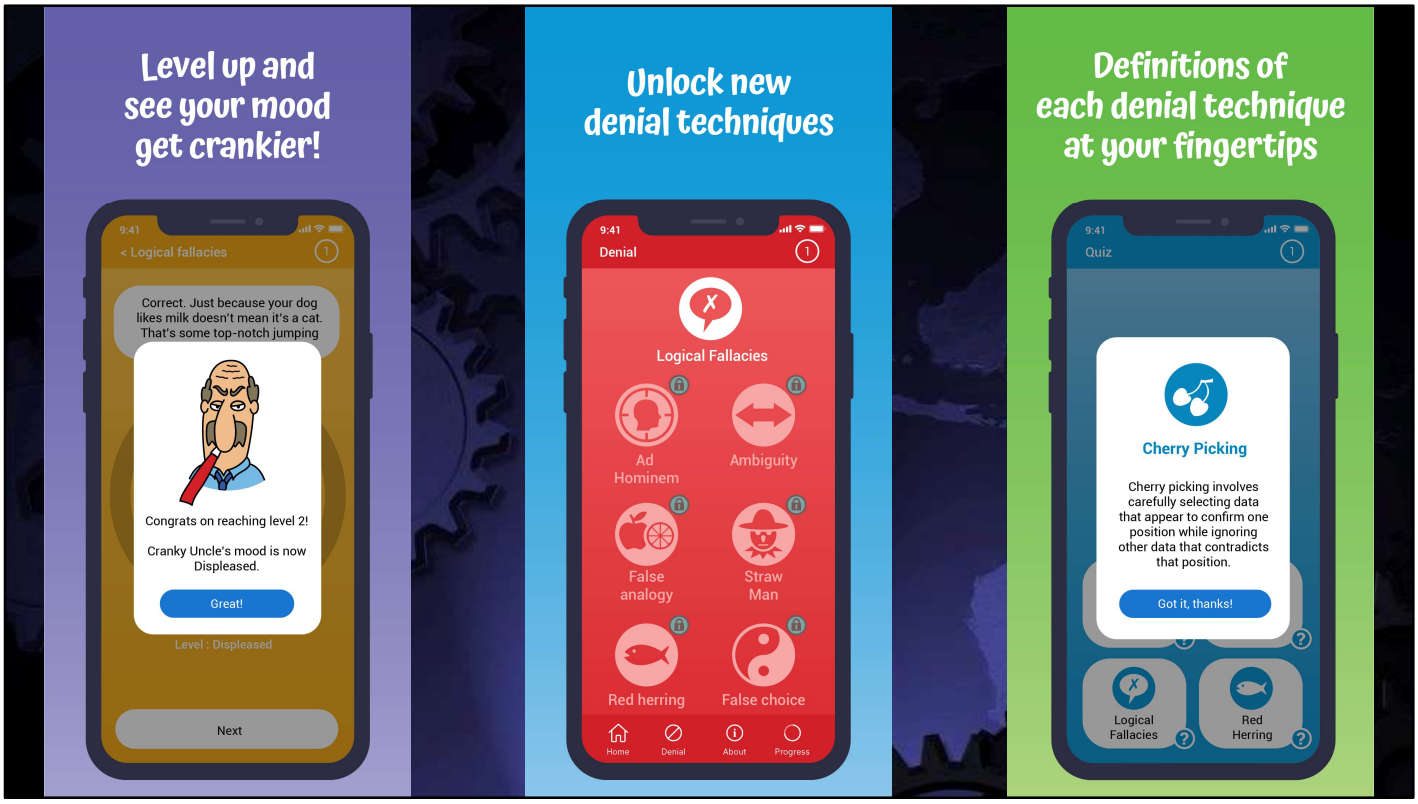



Finally, explain the fallacy employed by the myth


Cranky Uncle mentors you on how to deny science by using these FLICC techniques.

You then practice spotting these techniques with the help of cartoon quizzes and other forms of quiz questions.

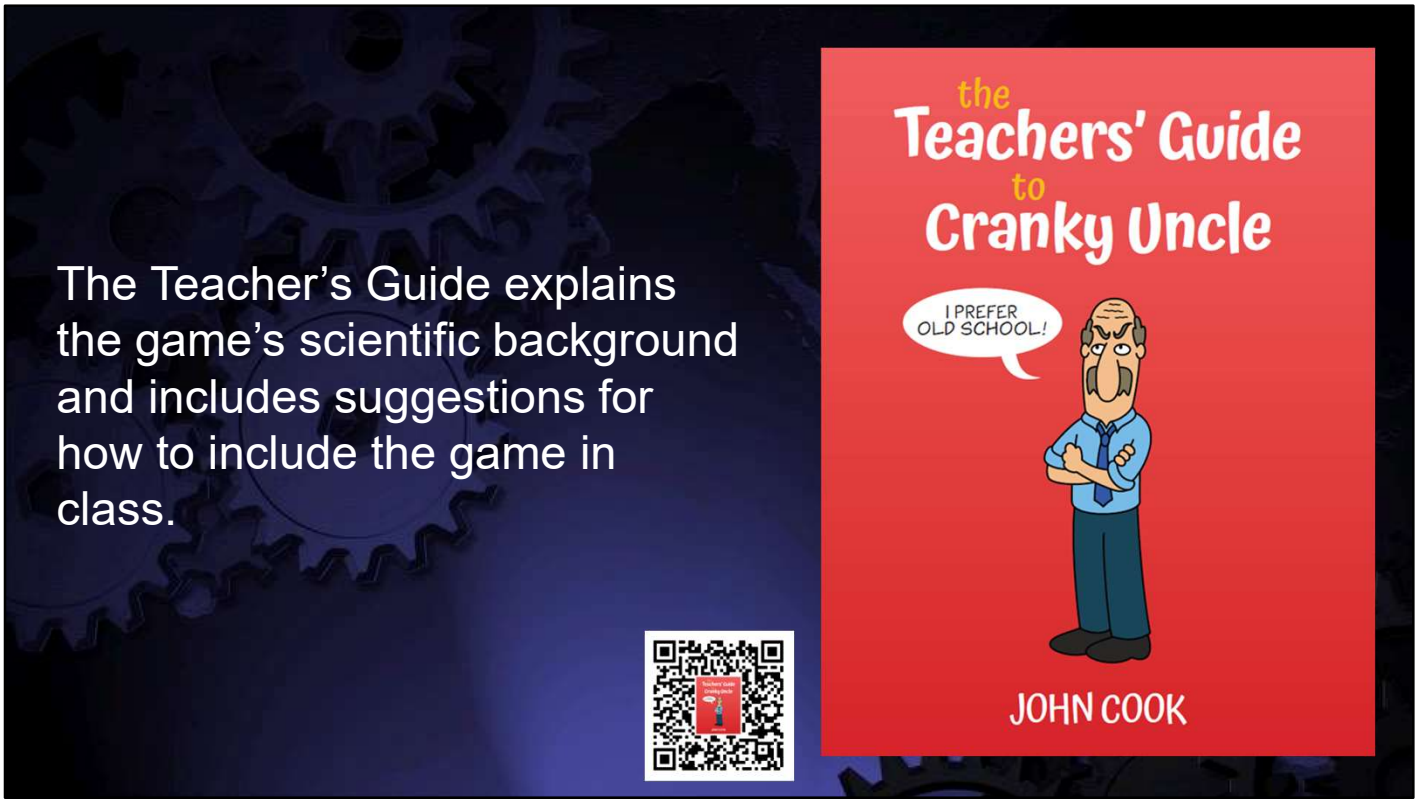
As you move along you build up Cranky points.




And the more cranky points you get, the more you are able to level up and see your mood get ever crankier.

Once you've mastered the intial five FLICC techniques more denial techniques will get unlocked.

And for each of the techniques, definitions are available right at your fingertips.




A Teachers' Guide explains the game's scientific background and contains suggestions of how the game can be included in class.

Teachers from across the globe have already shown interest in using the game in almost any subject as well as different age groups.


There is a lot more supporting material for FLICC as I can get into within 7 minutes, so here is a slide with QR-codes and links to several of them.