Skeptical Science: Giving facts a fighting chance against (climate) misinformation

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Skeptical Science

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Introduction

History

Rebuttals

Myth Debunking

Projects

Resources
Skeptical Science (SkS)
➢ ... is an international website and non-profit science education organization
➢ ... was founded by John Cook in 2007
➢ ... debunks misconceptions and misinformation about human-caused climate change
➢ ... features a database with more than 200 rebuttals based on peer-reviewed literature
➢ ... is a team project with volunteers from around the globe
➢ ... actively contributes to published research, with one of the highlights being the often cited 97% consensus paper published in 2013.
Skeptical Science (SkS) went live with John Cook publishing his rebuttal database in July 2007.

Skeptical Science became active on Facebook and Twitter. Translations were introduced.

More than 580 blog posts were written by 85 authors and SkS won the Eureka Prize from the Australian museum.

Members of the SkS team published a study finding a 97% consensus among papers stating a position on human-caused global warming.

Twenty-something blog posts were published in what John Cook called a pretty boring year.

The introduction of three levels of complexity for the rebuttals was pivotal as the author team was born.

SkS increased its reach with research summaries, detailing the history of climate science and more.

The SkS-team continued publishing research papers and ran the „97hours of consensus“ campaign.
Collaborating with the University of Queensland, the MOOC Denial101x gets launched.

Skeptical Science celebrates its 10th Birthday and daily rebuttal views can be tracked.

Our consensus paper published in 2013 hits one million downloads in July!

The Cranky Uncle game gets launched and several handbook translations become available.

SkS receives the „Friends of the Planet award“ from NCSE.

Team members contribute to the IPCC 1.5°C report and more myth-debunking resources are published.

Several resources to help with debunking were published with SkS involvement.

Cranky Uncle „learns“ new languages and conference participations become routine.
REBUTTALS
THE REBUTTALS

Rebuttals
➢ ... are the backbone of Skeptical Science
➢ ... tackle common misconceptions about global warming such as “It’s not happening”, “It’s not us”, “It’s not bad”, and “It’s too hard”.
➢ ... come with explanations in basic, intermediate, and advanced versions
➢ ... reference peer-reviewed primary research
➢ ... are regularly viewed, some more than 10,000 times per month.
➢ ... are listed by popularity, fixed numbers or taxonomic categories for systematic access.
CHALLENGES & ISSUES

➢ Availability of volunteers
➢ Finding helping hands for specific time-consuming and often rather mundane tasks (like fixing broken links or keeping published materials current)
➢ Most of the rebuttals were created between 2007 and 2010
➢ Content of many hadn’t been “properly” updated in the last 5 years or more.

These add up to a rather big issue with rebuttals countering climate myths and misinformation as the information provided should be as current as possible.

<table>
<thead>
<tr>
<th>Code</th>
<th>Argument Title</th>
<th>Rebuttal Level</th>
<th>Rebuttal Status</th>
<th>Date Created</th>
<th>Last Rebuttal Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970s</td>
<td>Ice age predicted in the 70s</td>
<td>Basic</td>
<td>Published</td>
<td>2007-05-08</td>
<td>2015-07-05</td>
</tr>
<tr>
<td>1998</td>
<td>It hasn’t warmed since 1998</td>
<td>Basic</td>
<td>Published</td>
<td>2007-05-09</td>
<td>2017-09-29</td>
</tr>
<tr>
<td>antarctica</td>
<td>Antarctica is gaining ice</td>
<td>Basic</td>
<td>Published</td>
<td>2007-05-21</td>
<td>2020-01-31</td>
</tr>
<tr>
<td>climatedate</td>
<td>Climategate CRU emails suggest conspiracy</td>
<td>Basic</td>
<td>Started</td>
<td>2009-11-21</td>
<td>2010-08-12</td>
</tr>
<tr>
<td>hockey</td>
<td>Hockey stick is broken</td>
<td>Basic</td>
<td>Started</td>
<td>2007-05-08</td>
<td>2010-08-12</td>
</tr>
<tr>
<td>lag</td>
<td>CO2 lags temperature</td>
<td>Basic</td>
<td>Published</td>
<td>2007-05-08</td>
<td>2021-04-21</td>
</tr>
<tr>
<td>past</td>
<td>Climate’s changed before</td>
<td>Basic</td>
<td>Published</td>
<td>2007-05-21</td>
<td>2015-08-06</td>
</tr>
<tr>
<td>sun</td>
<td>It’s the sun</td>
<td>Basic</td>
<td>Published</td>
<td>2007-05-18</td>
<td>2017-04-02</td>
</tr>
<tr>
<td>temp</td>
<td>Temp record is unreliable</td>
<td>Basic</td>
<td>Published</td>
<td>2007-08-11</td>
<td>2017-08-15</td>
</tr>
<tr>
<td>thermo</td>
<td>2nd law of thermodynamics contradicts greenhouse theory</td>
<td>Basic</td>
<td>Published</td>
<td>2010-05-19</td>
<td>2017-10-07</td>
</tr>
</tbody>
</table>
Questions regarding updates on social media and via email. Skeptical Science is often cited as the “go to resource” when myths about climate change need to be debunked.
UPDATED REBUTTALS

The newly added “At a Glance” section has its own heading and is visibly set apart from “Further Details” via the blue box containing a link to a feedback form.

The “At a Glance” section varies in length depending on the rebuttal’s topic and how much complexity needs to be explained but is ideally under 500 words.
SkS has provided translation capabilities since 2009 and selected content has been translated into 25 languages. The recently updated or soon to be updated rebuttals account for 480 existing translations in 20 languages.

We published a call for help in June to try and get as many translations as possible updated to include the new at-a-glance section. Volunteers for German, Italian, Spanish, Portuguese, Albanian and Macedonian responded thus far.
FLICC – THE TECHNIQUES OF SCIENCE DENIAL

➢ FLICC is a framework originally proposed by Mark Hoofnagle in 2007.
➢ It lists the **five techniques of science denial**:  
  ➢ **Fake experts**  
  ➢ **Logical fallacies**  
  ➢ **Impossible expectations**  
  ➢ **Cherry picking**  
  ➢ **Conspiracy theories**  
➢ John Cook has **expanded the taxonomy** of different techniques used to mislead.
➢ FLICC became the **underlying framework** for the collaboration between Skeptical Science and the University of Queensland for the **free online course** Denial101x: Making Sense of Climate Science Denial.
FLICC – THE POSTER

- The FLICC Poster is a collaborative effort between Skeptical Science and its German language partner website klimafakten.de.
- The poster was initially created in German (PLURV), but there was a decision to create an English (FLICC) version as well.
- The poster is also available in several other languages:
  - Dutch (PLOKS)
  - Portuguese (EFEST)
  - Spanish (FRESI)
  - French (FLIPiC)
  - Luxemburgish (FLOKK)
  - Polish (PLOWS)
The Conspiracy Theory Handbook was written by Stephan Lewandowsky and John Cook.

The handbook explains the popularity of conspiracy theories and provides guidance on identifying traits of conspiratorial thinking.

It offers effective strategies to respond to conspiracy theories.

The handbook distills important research findings and expert advice on dealing with conspiracy theories.

It introduces the abbreviation CONSPIR as a mnemonic to remember the seven traits of conspiratorial thinking.

The handbook has been translated into 18 languages since its publication:
Albanian, Czech, Croatian, French, German, Greek, Hungarian, Italian, Macedonian, Polish, Portuguese, Romanian, Russian, Serbian, Slovak, Spanish, Swedish, Turkish
The Debunking Handbook 2020 was written by 19 co-authors, invited by the lead authors Stephan Lewandowsky, John Cook, and Ullrich Ecker.

The handbook reflects the scientific consensus on combating misinformation and emphasizes its importance.

Misinformation has the potential to cause harm and tends to persist, making preemptive action necessary.

When preempting misinformation is not possible, it should be debunked frequently and effectively.

The handbook provides guidelines on how to properly debunk misinformation.

The handbook has been translated into 18 languages since its publication: Albanian, BCMS, Bulgarian, Czech, Dutch, Galician, German, Greek, Italian, Macedonian, Portuguese, Romanian, Russian, Slovak, Spanish, Swedish, Turkish, Ukrainian
THE CRANKY UNCLE GAME

➢ **Cranky Uncle** is a critical thinking game created by John Cook.
➢ It builds resilience against climate misinformation.
➢ Players gain understanding by assuming the role of a cranky uncle themselves.
➢ The game starts with teaching players the main FLICC techniques of science denial.
➢ Cranky Uncle mentors players on how to deny science, explaining his methods and presenting trial questions.
➢ Players practice their denial spotting through cartoon quizzes, earning cranky points and progressing through the game.
➢ As players advance through the cranky levels, their mood becomes increasingly crankier.
In February 2022 we launched the multilingual version of the Cranky Uncle game with two languages: Dutch and German.
In August 2022, Spanish and Portuguese versions followed.
In December 2022, French, Italian, and Swedish versions were launched.
In April 2023, Turkish was added.
More languages are scheduled to be launched soon.

The Teachers’ Guide to Cranky Uncle offers background information and classroom activity ideas for educators interested in using the Cranky Uncle game to teach critical thinking in their classes.
On May 16, 2013, our study "Quantifying the consensus on anthropogenic global warming in the scientific literature" led by John Cook was published in Environmental Research Letters (ERL).

The study examined over 12,000 peer-reviewed abstracts on 'global climate change' and 'global warming' published between 1991 and 2011.

The research found that over 97% of the papers taking a position on the subject agreed with the consensus position that humans are causing global warming.

The publication of the consensus study generated significant attention, including being tweeted by President Obama's Twitter account and being mentioned in many global media outlets.

Anticipating criticism, a project homepage was created to provide relevant links and FAQs to address concerns.

In April 2014, Environmental Research Letters named the Skeptical Science consensus paper as the journal's best article of 2013, a noteworthy achievement for a citizen science project.
DENIAL101x – Making sense of climate science denial

➢ Since 2015, SkS has offered the massive open online course (MOOC) called "Denial101x: Making sense of climate science denial."
➢ It is a collaboration with the UQx team at the University of Queensland.
➢ It consists of 60 lectures and 40 expert interviews, covering the fundamentals of climate science and debunking common climate myths.
➢ Myths addressed in the course include claims like "global warming stopped in 1998," "global warming is caused by the sun," and "climate impacts are nothing to worry about."
➢ Students learn the techniques of science denial and develop critical thinking skills to identify fallacies associated with climate myths.
➢ The course also explores the psychology of misinformation, enabling participants to effectively respond to climate misinformation.
➢ As of 2023, the MOOC has attracted over 42,000 participants from more than 180 countries.
➢ The SkS team members provide assistance and moderation in the MOOC's online discussion forum.
Automated detection of online misinformation is highly desired in fact-checking and holds great potential for theoretical insights and practical responses.

The SkS team worked with political scientists Travis Coan and Constantine Boussalis, and Mirjam Nanko to develop a taxonomy of climate misinformation.

They analyzed a corpus of over 287,000 documents from blogs and conservative think-tank websites.

Supervised machine learning techniques were employed to accurately detect specific skeptical claims about climate change.

The research enabled the construction of a detailed history of climate misinformation spanning 17 years.

The findings revealed that climate misinformation predominantly focuses on attacking the integrity of climate science and scientists, shedding light on a previously understudied aspect.

This research not only provides a new approach to understanding and detecting climate science skepticism but also lays the foundation for developing applications that can help inoculate social networks against misinformation.
OTHER RESOURCES
The Skeptical Science team regularly publishes blog posts written by team members or reposts from other outlets.

These blog posts aim to highlight recent research and other relevant topics related to human-caused climate change.

Recurring series exist, such as explaining climate science through analogies.

New Research articles are listed on a weekly basis.

Readers can subscribe to a daily email that lists the most recent post(s).
RESOURCES

➢ Skeptical Science offers a substantial collection of **graphics and animations** which are licensed under Creative Commons, making them easily accessible for reuse.
➢ The graphics and animations are created by skilled team members to support blog posts, rebuttals, and other materials.
➢ They have been widely reused in various formats, including books, textbooks, TV documentaries, and government reports.
The Skeptical Science team has developed several tools to provide perspective on climate science:

- The **Temperature Tool** was specifically created for the MOOC Denial101x and helps learners understand climate science concepts.

- The **Heat Widget** is a tool that can be added to other websites to provide climate-related information.

- Since 2013, the **SkS-Glossary** has been available, offering pop-up explanations for scientific terms used in blog posts and rebuttals.

- Additionally, the glossary stores and provides references for scientific papers.
RECOGNITION & CHALLENGES
RECOGNITION

➢ In September 2011, the Skeptical Science team won the Eureka prize from the Australian museum, which recognizes excellence in scientific research, innovation, leadership, and communication. The Eureka Prize is often referred to as Australia's "Oscars of Science."

➢ The National Center for Science Education (NCSE), a non-profit organization supporting teachers in the U.S., awarded Skeptical Science the Friend of the Planet Award in 2016.

➢ Skeptical Science is frequently recommended by scientists as a reliable resource for climate science information and debunking misinformation.

➢ The website has received endorsements from numerous scientists, and a collection of these endorsements can be found on the homepage.
CHALLENGES

➢ Skeptical Science, being a volunteer-based organization, faces challenges similar to other volunteer organizations, such as time constraints due to other commitments and difficulties in finding help for specific tasks like fixing broken links or keeping content up to date.

➢ As a prominent resource on human-caused climate change, Skeptical Science has become a target for various forms of attacks.

➢ The team and individual members have been subjected to ad hominem attacks, and conspiracy theories about the website's funding can be found online.

➢ In 2012, the Skeptical Science website was hacked, and content from the private author forum was posted online.

➢ The content from the forum has been quoted by interested parties to portray the team in a negative light.
INTERESTED IN HELPING SKEPTICAL SCIENCE?

➢ Various translation projects
➢ Help with rebuttal updates
➢ Summarizing scientific articles in blog posts
➢ Creating new rebuttals to counter solution denial

Interested? Please let us know: https://sks.to/contact
THANKS!

Bärbel Winkler

https://sks.to/BaerbelW
Additional material
John Cook originally earned a Bachelor of Science at the University of Queensland, achieving a First Class Honors with a major in physics. He obtained a PhD in cognitive psychology at the University of Western Australia, with the thesis "Closing the “consensus gap” by communicating the scientific consensus on climate change and countering misinformation". Currently, he is a Senior Research Fellow with the Melbourne Centre for Behaviour Change at the University of Melbourne, with a research focus on understanding and countering misinformation on scientific issues such as climate change and vaccination.

The roots of Skeptical Science can be traced back to early 2007, when Cook decided to create a private database as a resource to more easily counter the arguments from family members regarding anthropogenic global warming (AGW). He described the backstory in a Guardian article in 2011:

"My exploration of climate change denial began innocuously enough – namely some vigorous discussions with sceptical family members. This provoked me to dig a little deeper into the science (no one wants to lose an argument with their father-in-law), but before I knew it, I had wandered into a bewildering labyrinth of raging online debates and bottomless pits of misinformation. How to make sense of it all?

At this point, my inner-computer geek asserted itself and I began constructing a database of climate 'sceptic' arguments. To cut to the truth of each argument, I made peer-reviewed science the ultimate authority. There's no higher standard than evidence-based research conducted by experts, which is then rigorously scrutinised by other experts. As I began to piece together the various pieces, a clear picture began to emerge."
AUTHOR INFORMATION

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Bärbel Winkler lives and works in Germany. She has always had a lot of interest in environmental issues and has been active as a volunteer at the local zoo and a conservation group for many years. Over time and while learning more and more about it, Bärbel became increasingly aware and concerned about climate change and what it will mean for generations to come. As a means to turn her concerns regarding climate change into something productive, Bärbel joined the Skeptical Science team in 2010 and started translating selected content into German. Since 2013 she has been coordinating the translation efforts for all languages, contributes a blog-post every once in a while, helps with many projects and became co-author of several consensus-related studies the Skeptical Science team has published over the years. She also coordinates the moderation team for the online course “Denial101x – Making sense of climate science denial”.

https://sks.to/BaerbelW
https://twitter.com/BaerbelW
LIST OF LINKS

INTRODUCTION
Skeptical Science – https://skepticalscience.com
Welcome page - https://sks.to/welcome

HISTORY 1

HISTORY 2
2017 – https://sks.to/sks2017
2018 – https://sks.to/sks2018
2019 – https://sks.to/sks2019
2020 – https://sks.to/sks2020
2021 – https://sks.to/sks2021
2022 – https://sks.to/sks2022

REBUTTALS
Fixed numbers – https://skepticalscience.com/fixednum.php

BLOG POSTS
97hours – https://skepticalevidence.com/nsh/
Cook et al. 2016 – https://sks.to/coc
One Million downloads – https://sks.to/tcp-one-million

DENIAL101x
Making sense of climate science denial – https://sks.to/denial101x

TRANSLATIONS
All translations – https://skepticalscience.com/translation.php
Helping with translations – https://sks.to/help-translate
Rebuttal translations – https://sks.to/transl-at-a-glance
Debunking Handbook – https://sks.to/debunk

FLICC
History of FLICC – https://sks/to/flicc-sks
FLICC-Poster – https://sks/to/flicc-poster

RESOURCES
Interactive timeline – https://skepticalscience.com/cshistory.php
The Escalator – https://sks/to/escalator

CARDS
Computed assisted recognition of Denial and Skepticism – https://cardsclimate.com

TOOLS
Temperature Tool – https://skepticalscience.com/temperature_tool.html
Heat Widget – https://sks/to/heat

CHALLENGES
Hack – https://sks/to/hack

RECOGNITION
NCSE – https://ncse.com/

JOHN COOK