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# Here's how scientific misinformation, such as climate doubt, spreads through social media

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Social media is no doubt a powerful force when it comes to the sharing of information and ideas; the problem is that not every article shared on Facebook or Twitter is true. Misinformation, conspiracy theories and rumors abound on the Internet, helping to propagate and support sentiments such as climate doubt and other forms of environmental and scientific skepticism.

Figuring out how such ideas diffuse through social media may be key to scientists and science communicators alike as they look for ways to better reach the public and change the minds of those who reject their information. A [study](#) published Monday in Proceedings of the National Academy of Sciences sheds new light on the factors that influence the spread of misinformation online.

The researchers conclude that the diffusion of content generally takes place within clusters of users known as “echo chambers” — polarized communities that tend to consume the same types of information. For instance, a person who shares a conspiracy theory online is typically connected to a network of other users who also tend to consume and share the same types of conspiracy theories. This structure tends to keep the same ideas circulating within communities of people who already subscribe to them, a phenomenon that both reinforces the worldview within the community and makes members more resistant to information that doesn't fit with their beliefs.

The researchers conducted their study by examining the diffusion of content on Facebook, examining the spread of both conspiracy theories, or “alternative, controversial information, often lacking supporting evidence,” (for example, the idea that vaccines can cause autism) and scientific news. They found that highly segregated communities, or echo chambers, existed around each type of content, and then content tends to circulate only within its own community.

“I would say that in the spreading of misinformation, online confirmation bias is the driver,” said the study's senior author, [Walter Quattrociocchi](#) of the IMT Institute for Advanced Studies in Lucca, Italy. Confirmation bias is the tendency of individuals to pay attention to or believe information that confirms the personal values and beliefs they already hold, rather than allowing their beliefs to be changed by new information.

It's a powerful force that many researchers have suggested plays a key role in the persistence of phenomena such as climate doubt. With an overwhelming abundance of evidence pointing to the

existence of anthropogenic climate change, for instance, many scientists have questioned why skepticism continues to be pervasive in society. Sociologists have suggested that the reason has to do with the fact that it's difficult to change an individual's worldview simply by presenting new information. Confirmation bias, rather, leads people to seek out evidence — however small or poorly supported — that supports their existing personal beliefs.

The new study is among the first to make a case for this type of behavior when it comes to the spreading of scientific information or misinformation online, Quattrociocchi said.

“Until now, we have from one side the psychological or social studies that are working mainly with speculation and few experiments,” he said. “[Now] we have specific evidence of confirmation bias in the sense that once you choose a narrative, the selection criteria is basically confirmation: ‘I will choose evidence that coexists with things that I already believe are true.’”

These results are in line with the findings in studies of other platforms, such as news media. A [2014 paper](#) in the Journal of Communication, for instance, found that the echo chamber effect exists within partisan news outlets when it comes to climate change. The paper found that conservative media use was associated with a lower certainty in anthropogenic global warming, and that nonconservative media use was associated with a higher certainty. The [authors argued](#) that consistent messages from the two types of media outlets are instrumental in keeping the same audiences coming back to them because the positions taken by the outlets continue to reinforce their personal beliefs.

So the findings in this paper, while new on the social media front, are by no means surprising. The question that remains is how this information can be useful to scientists or communicators hoping to better reach members of the public who disagree with their views.

“They really need to take this kind of bifurcation of their audiences seriously,” said [Robert Brulle](#), a professor of sociology and environmental science at Drexel University. “Continued preaching to the choir is not going to work.”

Brulle, who has conducted research on the funding behind the climate change contrarian movement, suggests that climate scientists consider ways they might break into large audiences rather than attempt to convert individuals one by one by showering them with evidence. Buying advertising space from large media outlets is one strategy funders of the climate change contrarianism have successfully used to present their views, he pointed out.

However, it's a question without a simple solution, one that poses “a real challenge to climate communication,” he said. “Individuals want to maintain their self-identity and self-image. They're not going to read something that challenges their values, their self-worth, their identity, their belief system.”

Quattrociocchi added that he plans to conduct more in-depth experiments on the diffusion of content by examining the effects of altering the way an idea is communicated, or “the way you are telling the story,” he said.

Making strides in this area could be critical for climate communicators looking for more effective ways to reach audiences that, until now, have been largely impenetrable. And on a broader scale, it could be a major step forward for scientists spanning many fields of expertise who wish to correct the misconceptions that continue to persist online and elsewhere and find simpler, more effective ways to communicate their work.