



# Misinformation: going antiviral

CS 278 | Stanford University | Old Tom Holland





# Announcements

Final projects are due a week from Friday

Unfortunately, no late days on the final project...because, unfortunately, we don't get late days on reporting final grades for graduating students to the Registrar



# Last time

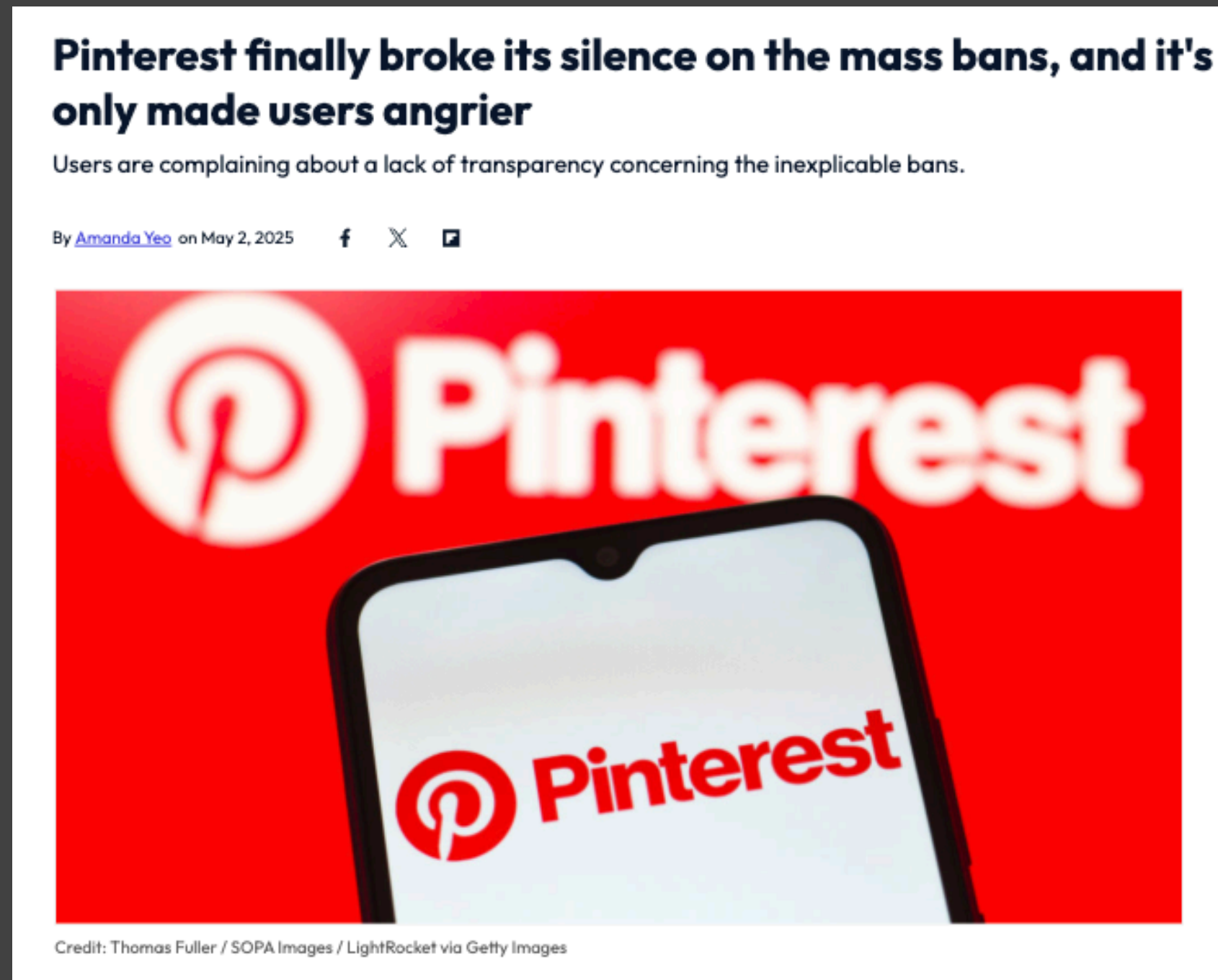
As Gillespie argues, moderation is the commodity of the platform: it sets apart what is allowed on the platform, and has downstream influences on descriptive norms.

Moderation works: it can change the community's behavior

Moderation classification rules are fraught and challenging — they reify what many of us carry around as unreflective understandings.



## “Moderation” example submitted by Julia Gendy



0.5% extra credit for examples relevant to recent or upcoming lectures. Submit on Ed under the “Extra Credit” category

Attendance



Pinterest mistakenly flagged artists' posts as spam or misinformation. Despite widespread outrage, Pinterest stayed silent for days, leaving users to speculate. The Help Centre confirms AI is used to “improve content moderation,” but this opacity only fueled backlash and even a class action lawsuit.





Business

# Russian propaganda effort helped spread 'fake news' during election, experts say



Russian President Vladimir Putin, in an interview with RT in 2013, said that he wanted to “break the Anglo-Saxon monopoly on the global information streams.”

News

Opinion

Sport

Culture

Lifestyle



## How Syria's White Helmets became victims of an online propaganda machine



WIRE

# Rumble Sends Viewers Tumbling Toward Misinformation

Research shows the emergent video platform can recommend conspiracy theories and other harmful content more often than not.

SUBSCRIBE

VARIETY

HOME > DIGITAL > NEWS

Facebook, Looking to Curb Misinformation, Is Starting to Prompt Users to Read Articles Before Sharing

By Todd Spangler

May 10, 2021 11:2

CNN BUSINESS

Audio Live TV Log In

Markets →

DOW	33,426.63	0.33% ▼
S&P 500	4,191.98	0.14% ▼
NASDAQ	12,657.90	0.24% ▼


Fear & Greed Index →

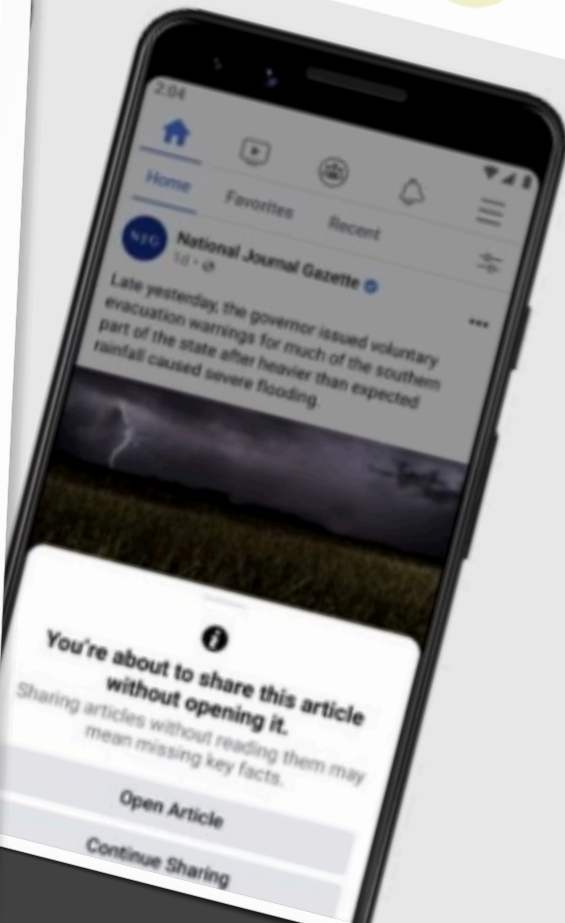
67

## TikTok's search engine repeatedly delivers misinformation to its majority-young user base, report says

By Emma Tucker, CNN

Published 7:11 PM EDT, Sun September 18, 2022





You're about to share this article without opening it. Sharing articles without reading them may mean missing key facts.

Open Article

Continue Sharing

The New York Times

PLAY THE CROSSWORD

THE INTERPRETER

## 'Belonging Is Stronger Than Facts': The Age of Misinformation

Social and psychological forces are combining to make the sharing and believing of misinformation an endemic problem with no easy solution.



# The opportunity

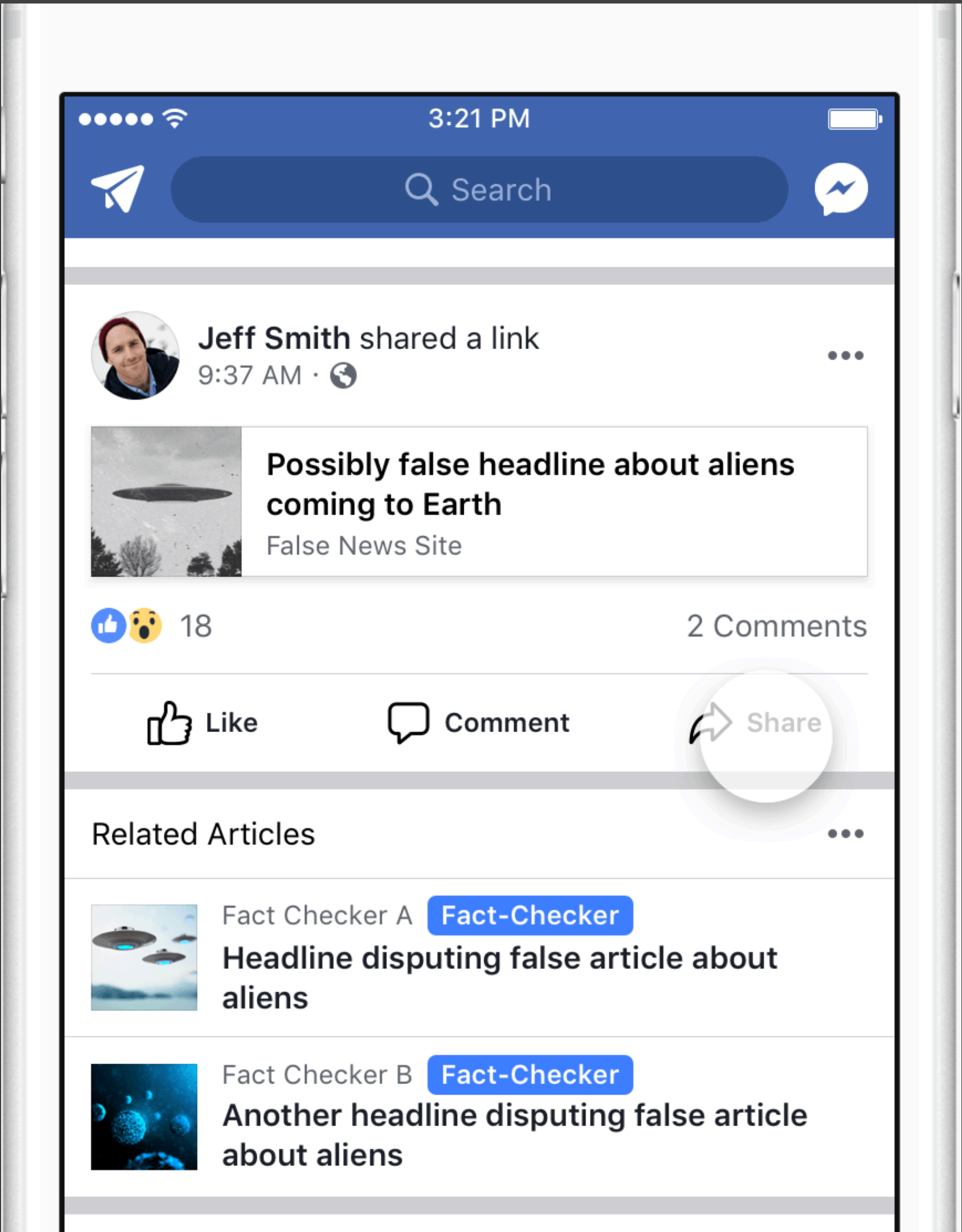
“The digitization of information exchange, however, also makes the practices of disinformation detectable, the networks of influence discernable, and suspicious content characterizable.”



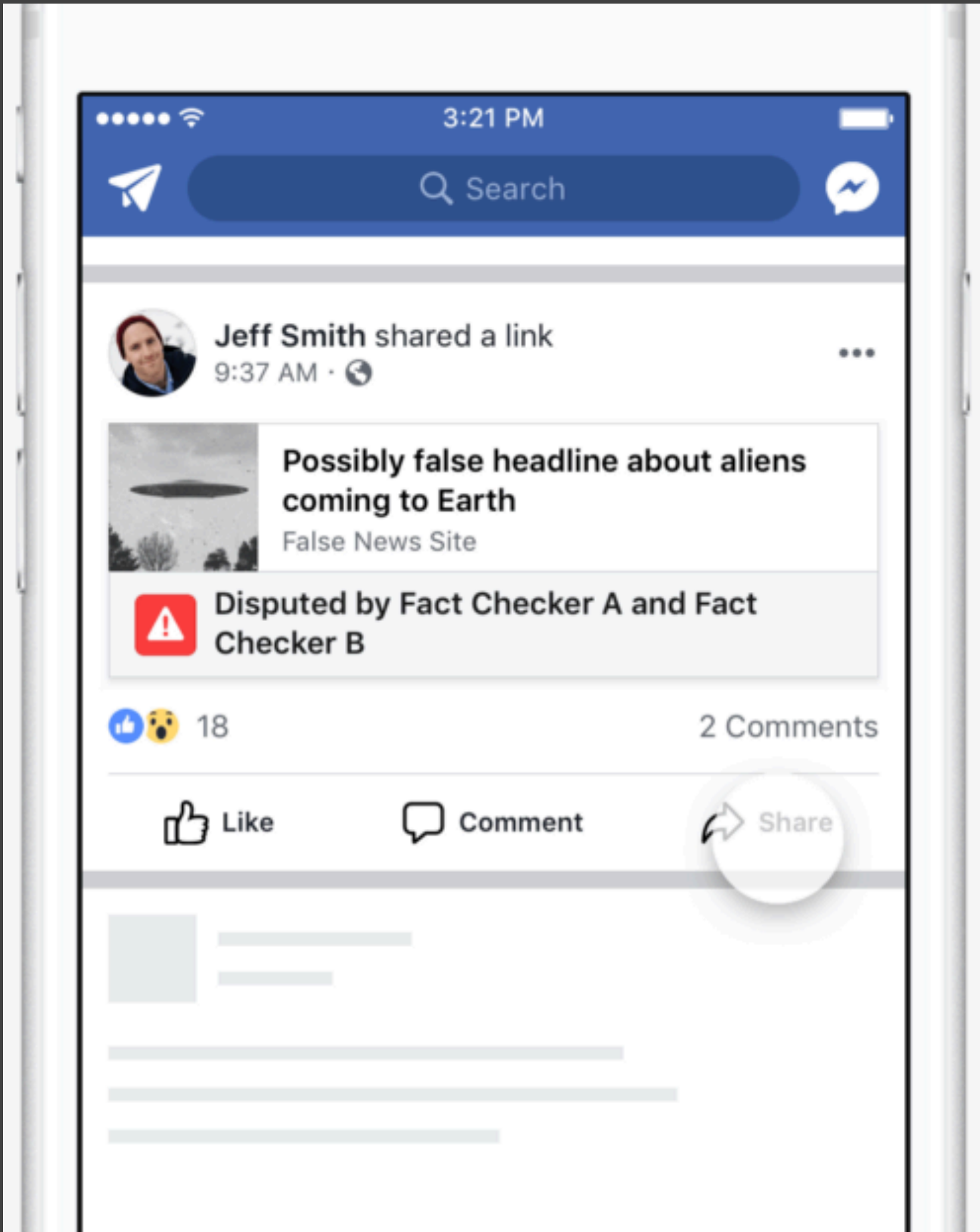


# Poll: which design will better reduce the spread of disinformation?

related articles



fact check





**From Whence  
Misinformation?**



# Let's talk terms

When will I be referring to **misinformation** and when to **disinformation** throughout this lecture?

Misinformation = anything false

Might be a rumor, or something not necessarily intentionally false

Disinformation = the specific intent is to deceive

Often built around a true or plausible core, wrapped up in a misleading way

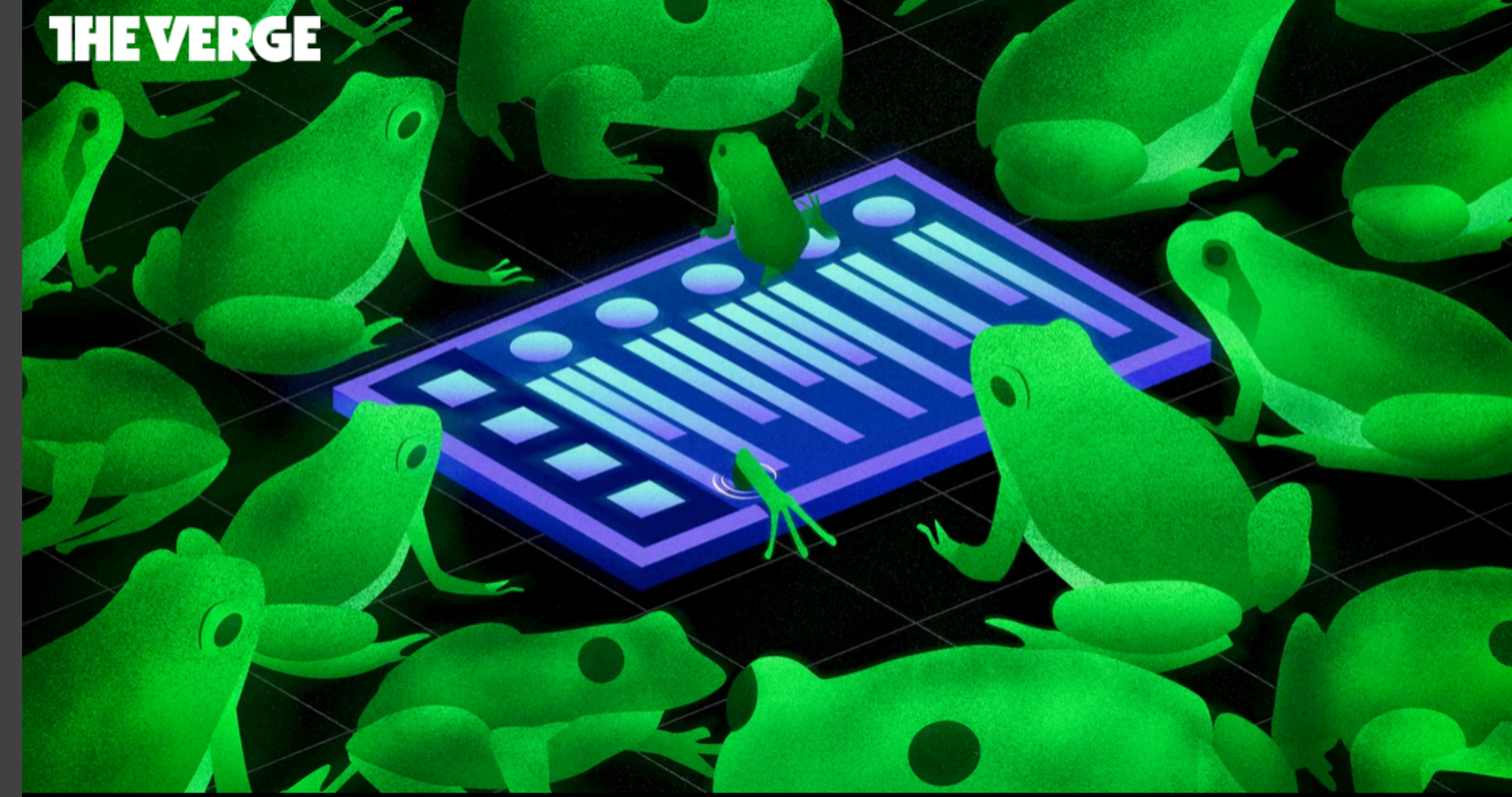


# Why now?

The effort required to connect groups together has lowered, making it possible for identity-based groups to connect that might otherwise have not:

Positive: social movements that are forced underground, such as LGBTQ military service members, can connect with each other online [Sheng 2020]

Negative: hate groups can also connect with each other online



WEB

## HOW THE BIGGEST DECENTRALIZED SOCIAL NETWORK IS DEALING WITH ITS NAZI PROBLEM

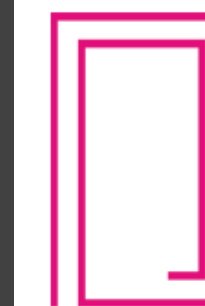
*Mastodon was built to be a kinder, more decentralized version of Twitter — then Gab showed up*

By [Adi Robertson](#) | [@thedextrarchy](#) | Jul 12, 2019, 2:51pm EDT

Illustration by [Alex Castro](#)



SHARE



ver the past few years, Mastodon has become the model for [a friendlier kind of social network](#), promising to keep out the hateful or ugly content that proliferates on larger and more centralized networks.

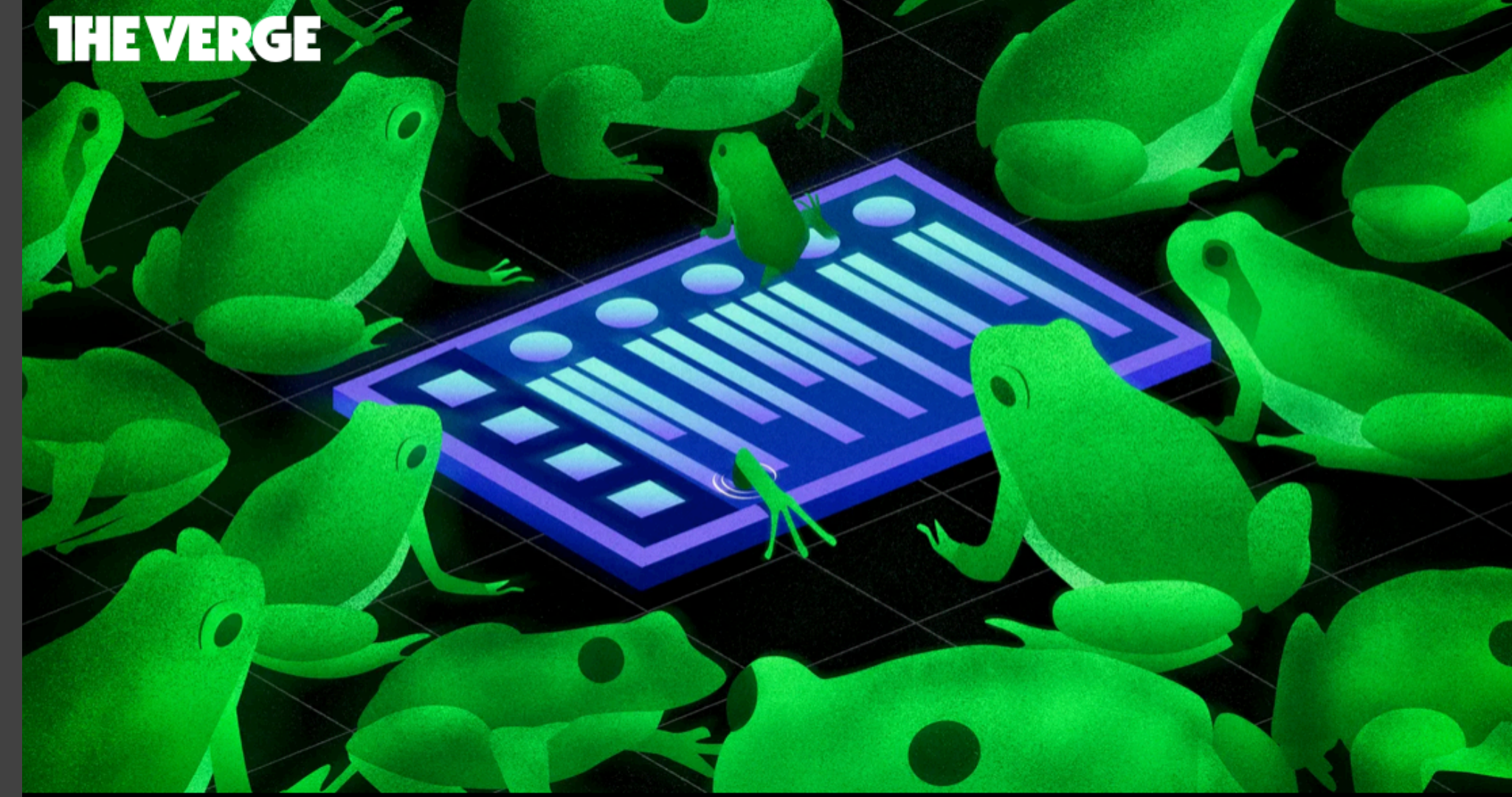
Journalists hailed it as “[Twitter without Nazis](#)” and for years, it’s generally lived up to that promise. But last week, the social



# Why does it matter?

When groups can convene and push their own narrative, it enables “common knowledge attacks on democracy” [Farrell and Schneier 2018]

In other words, it can destabilize democracy by flooding public debate and confusing our shared understandings and expectations, which are required for democracy to function



WEB

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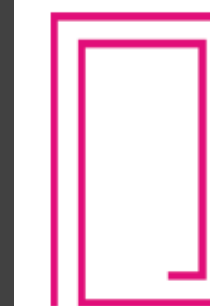
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# Fingers pointed

#1, “It’s trolls”: disinformation factories generate disinformation to harm us [Bail et al. 2020]

#2, “Post truth”: people default to motivated reasoning, which means that we are inclined to believe information that is consistent with our political views, and disinclined to believe information that contradicts our political views [Kahan 2017]. We are more loyal to political party than loyal to truth [Van Bavel and Pereira 2018]

Which, neither, or both? [1 min]

**While these explanations are not wrong, they are also not the explanations with the strongest evidence**

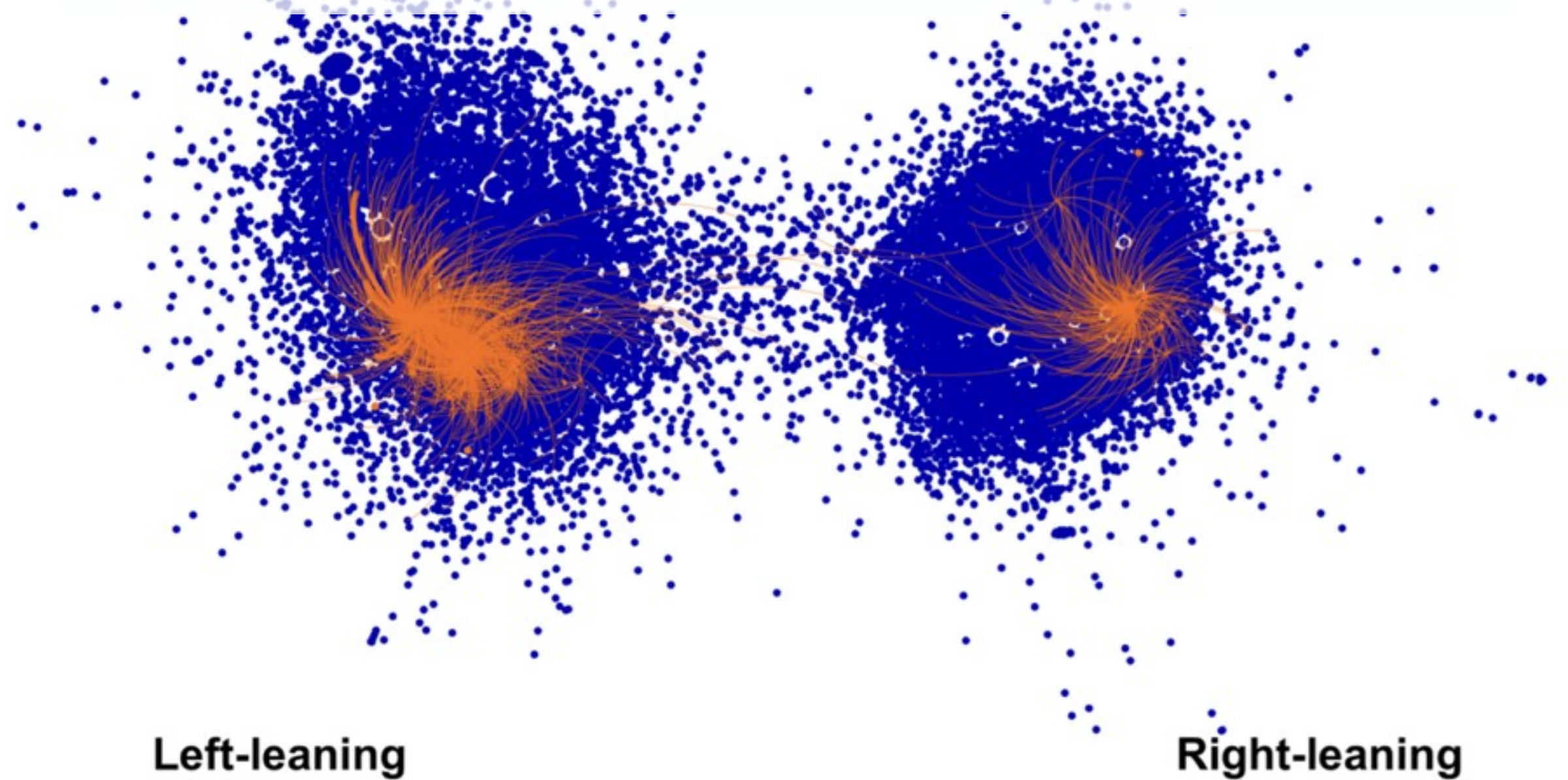


# Finger #1 📌 state actors

Yes, state actors exist.

Twitter retweet network for Black Lives Matter in 2016:  
Russian IRA (orange) both posed as BLM activists on the left, and infiltrated anti-BLM communities on the right [Starbird, Arif, and Wilson 2019]

Orange: accounts Twitter removed as being Russian IRA



BlackMatters @blackmattersus · 23h

U.S. Police Kill and Justify Murder Without Public Being Notified [goo.gl/ckj7lQ](https://goo.gl/ckj7lQ)  
#BlackMattersUs



14 5



Pamela Moore @Pamela\_Moore13 · Nov 27

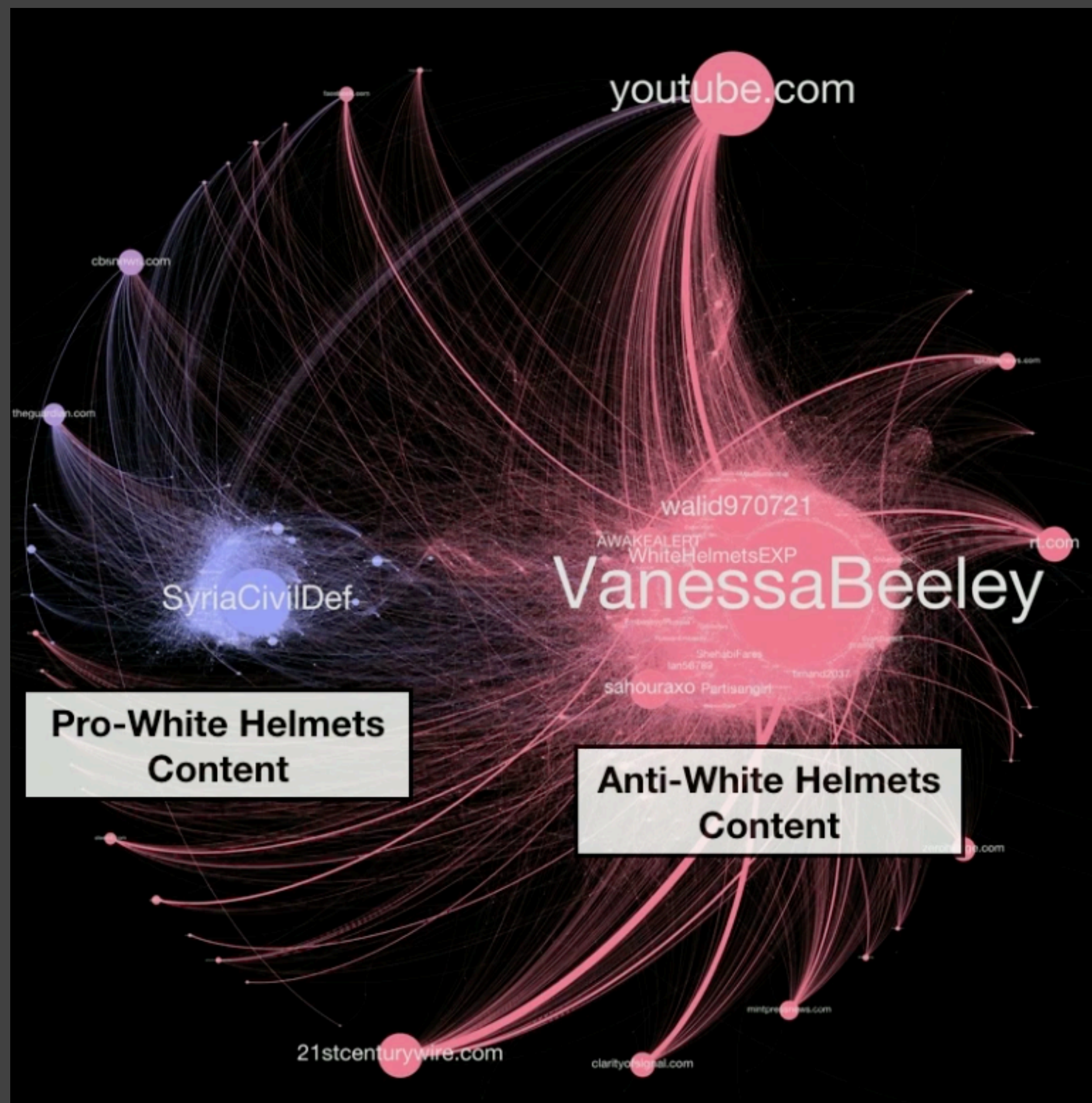
#blacklivesmatter protesters almost cost a child his life by blocking an ambulance...  
Here's them receiving Karma.



450 543



# But is it just state actors?



Context is the Syrian Civil War and the White Helmets, a humanitarian response group. Anti-White Helmet accounts — pink — are dominant in volume, delegitimizing the White Helmets' claims

Not just bots and trolls: lots are journalists aligned with Syrian and Russian government interests, Syrian and Russian government members, and alt. media

It looks more like **activism** than “just” disinformation

[Starbird @ CS 547, 2019]



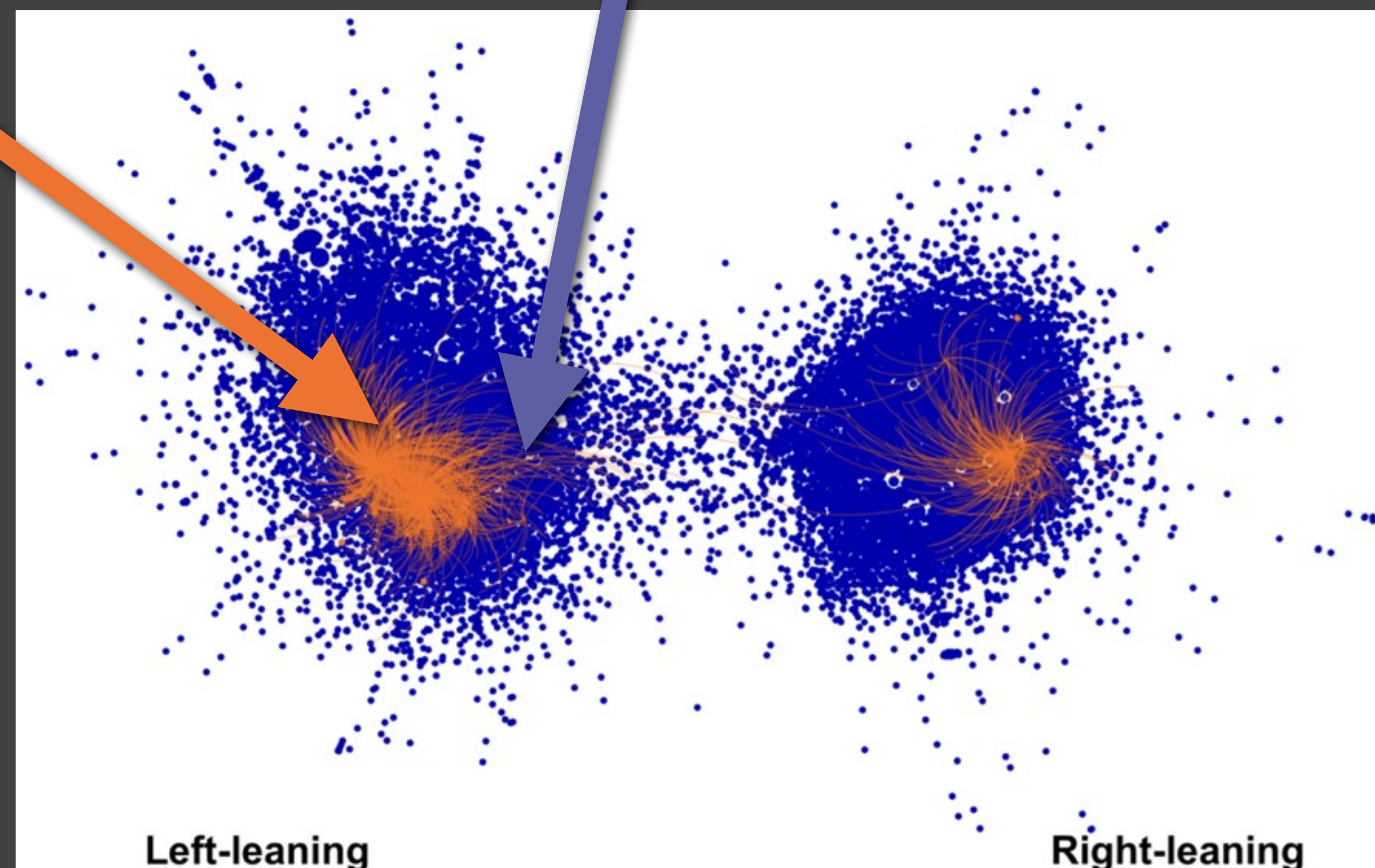
# But is it just state actors?

Disinformation campaigns often involve many **unwitting agents** who are unaware of their role and whose views and behaviors have been shaped by motivated actors [Bittman 1985, Starbird, Arif, and Wilson 2019]



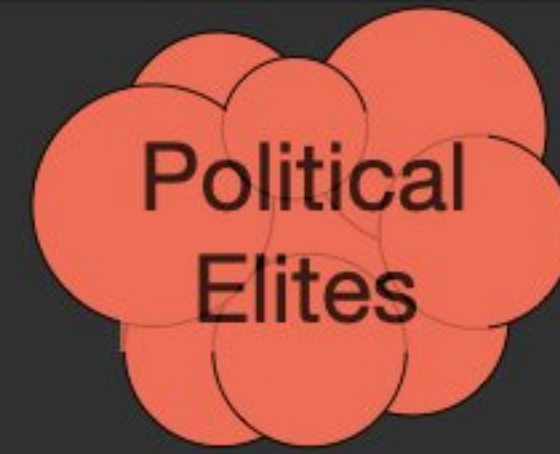
Cold War-era Soviet technique: sell journalists on anonymous tips aligned with their beliefs. Once one journalist took the bait, others became interested.





Orange arcs =  
blue accounts  
retweeting  
content from  
orange accounts  
= unwitting  
agents





# Participatory Disinformation

The “Big Lie” during the 2020 Election and the January 6, 2021 Attack on the U.S. Capitol







Political  
Elites

Repeated “rigged” messaging  
sets an expectation of voter fraud.  
This becomes a “frame” through  
which events are interpreted.



Audiences

# Participatory Disinformation

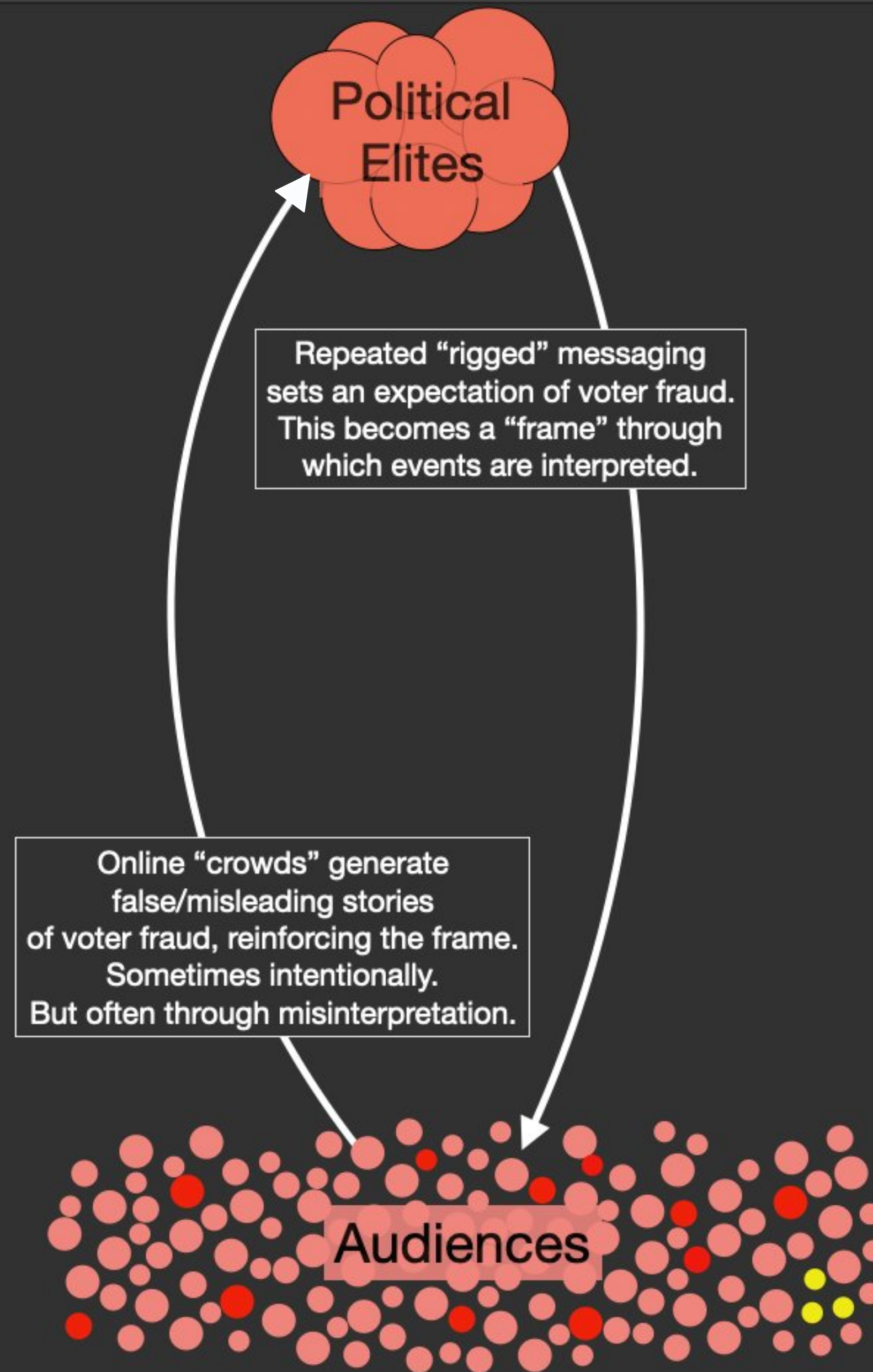
The “Big Lie” during the 2020 Election and  
the January 6, 2021 Attack on the U.S. Capitol





# Participatory Disinformation

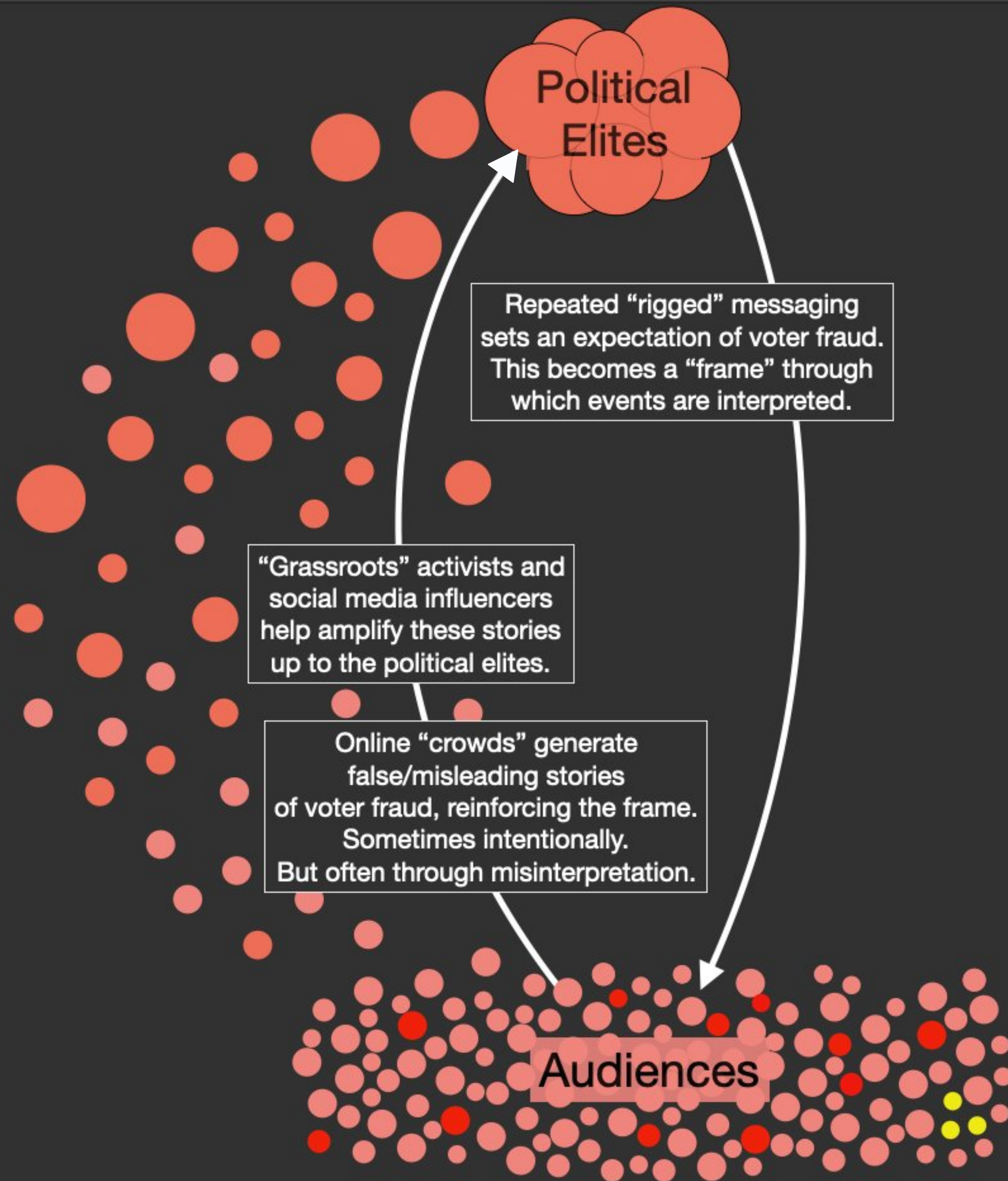
The “Big Lie” during the 2020 Election and the January 6, 2021 Attack on the U.S. Capitol





# Participatory Disinformation

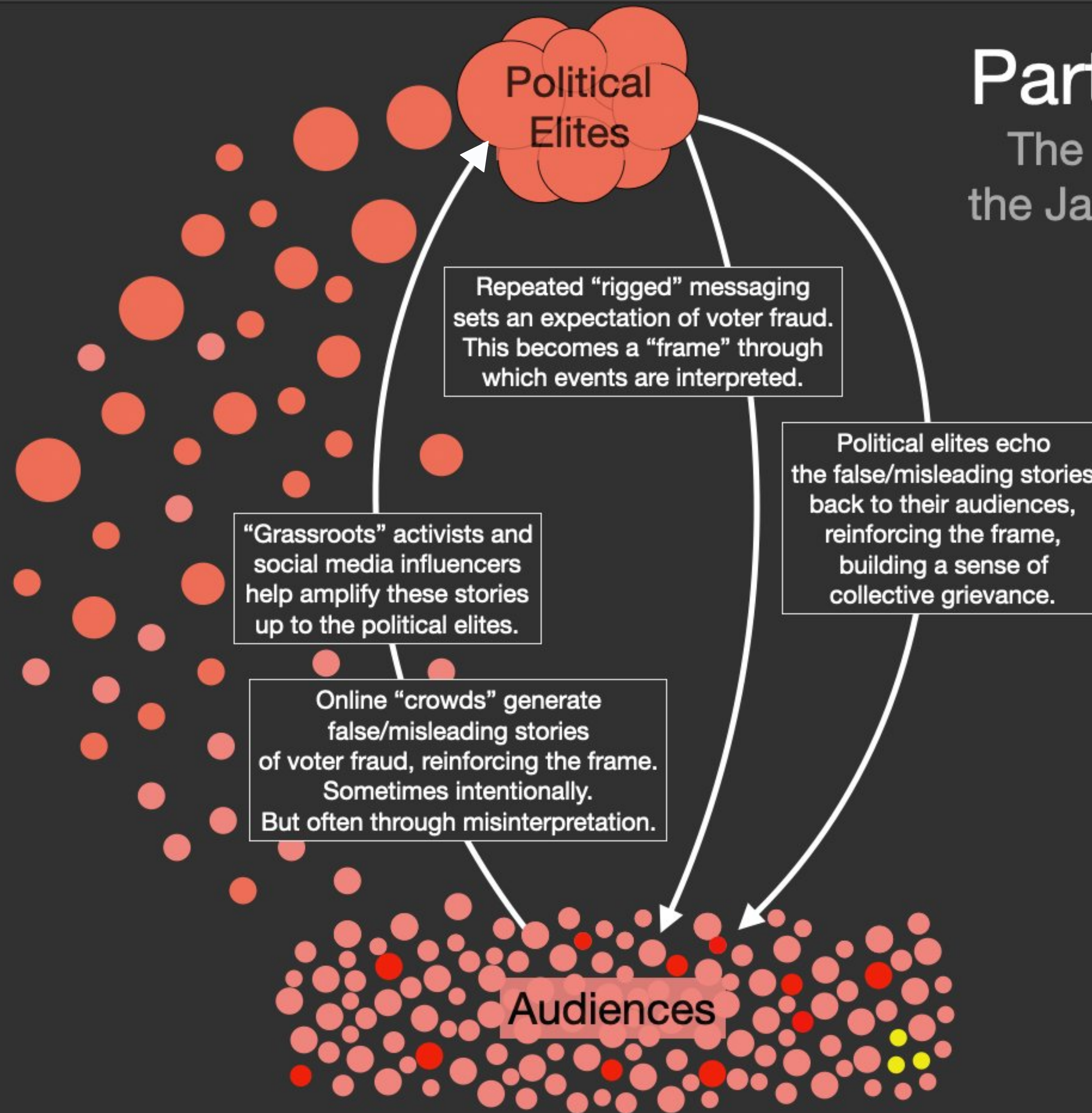
The “Big Lie” during the 2020 Election and the January 6, 2021 Attack on the U.S. Capitol





# Participatory Disinformation

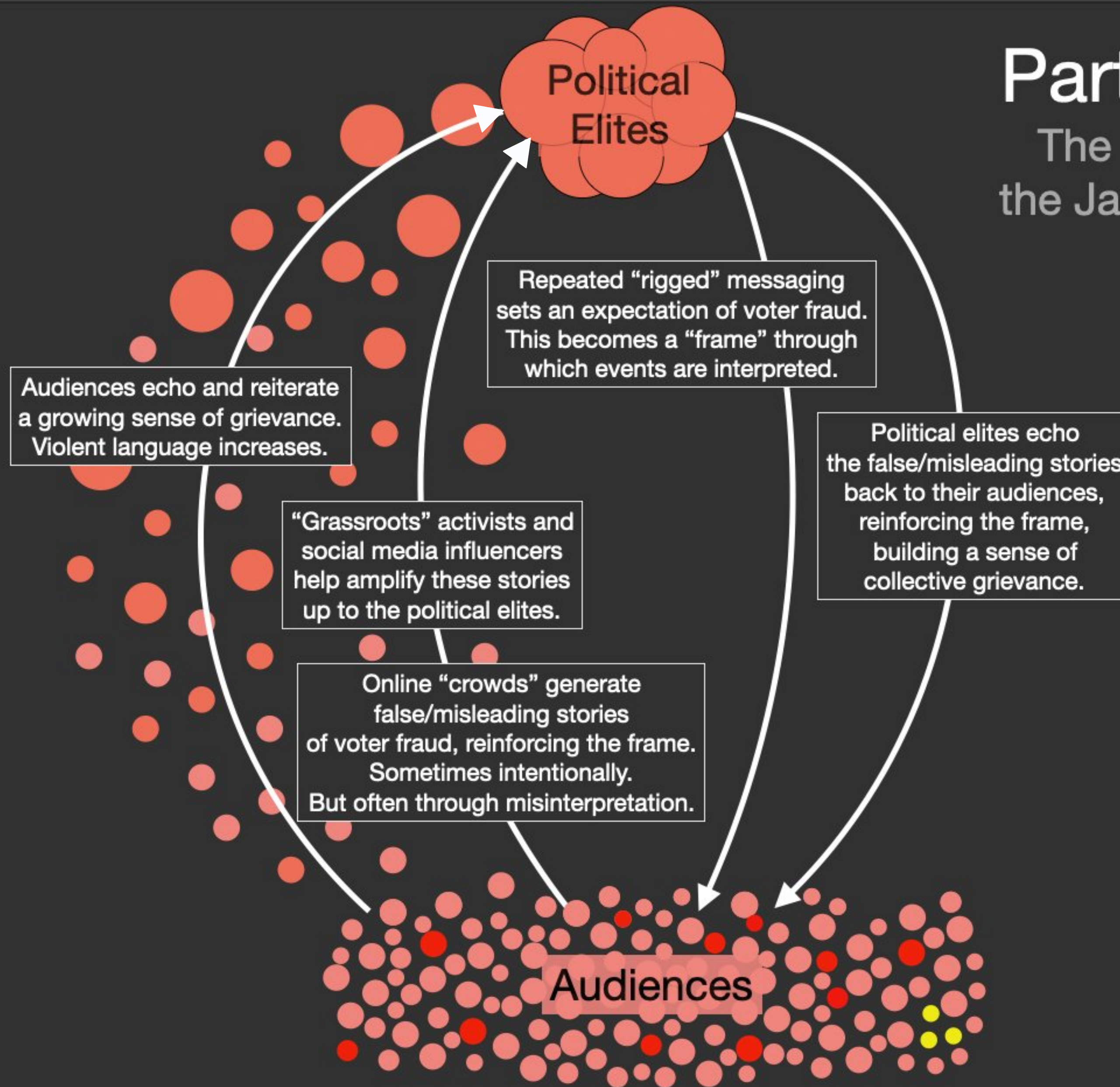
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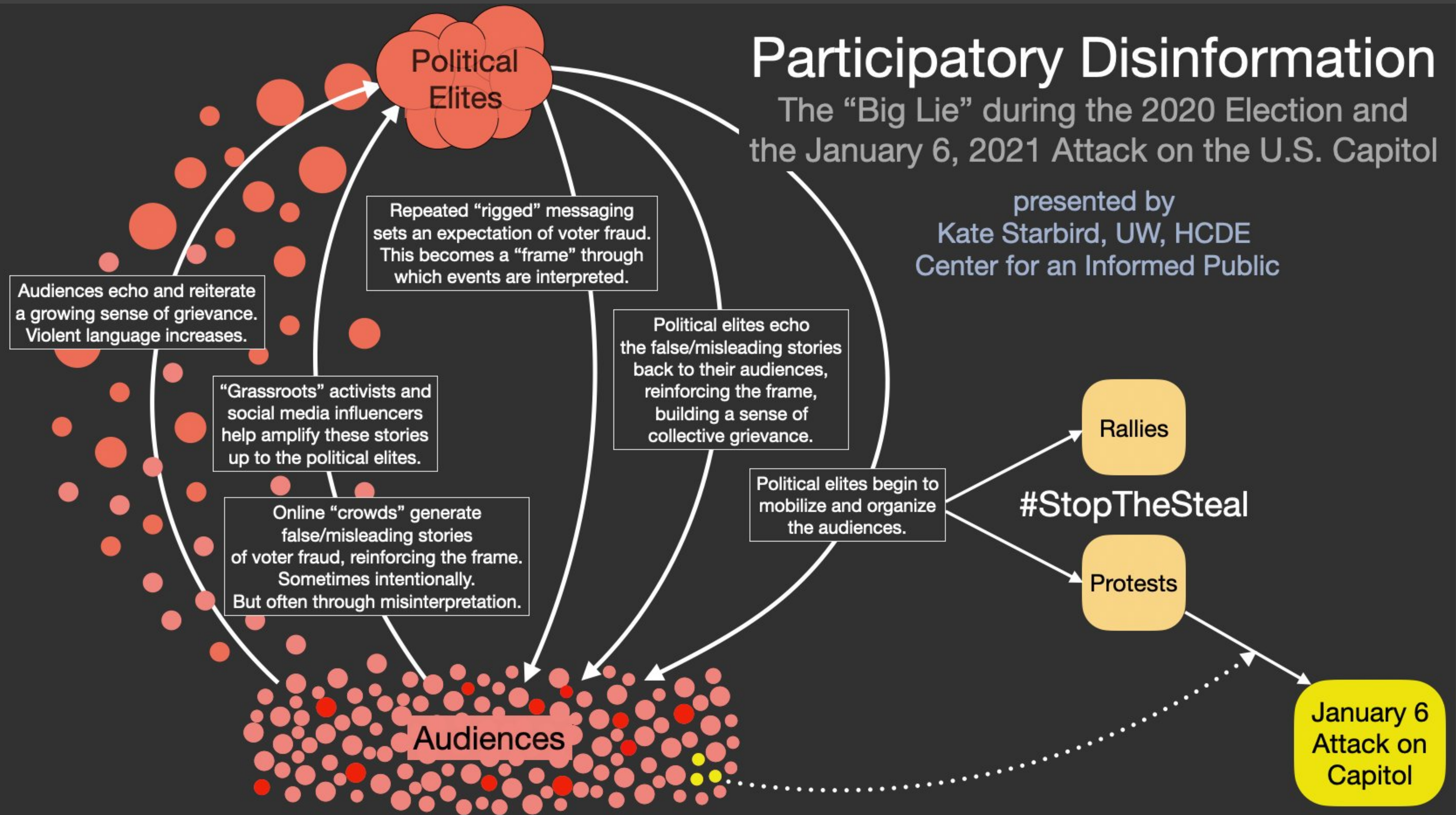




# Participatory Disinformation

The “Big Lie” during the 2020 Election and the January 6, 2021 Attack on the U.S. Capitol

presented by  
Kate Starbird, UW, HCDE  
Center for an Informed Public



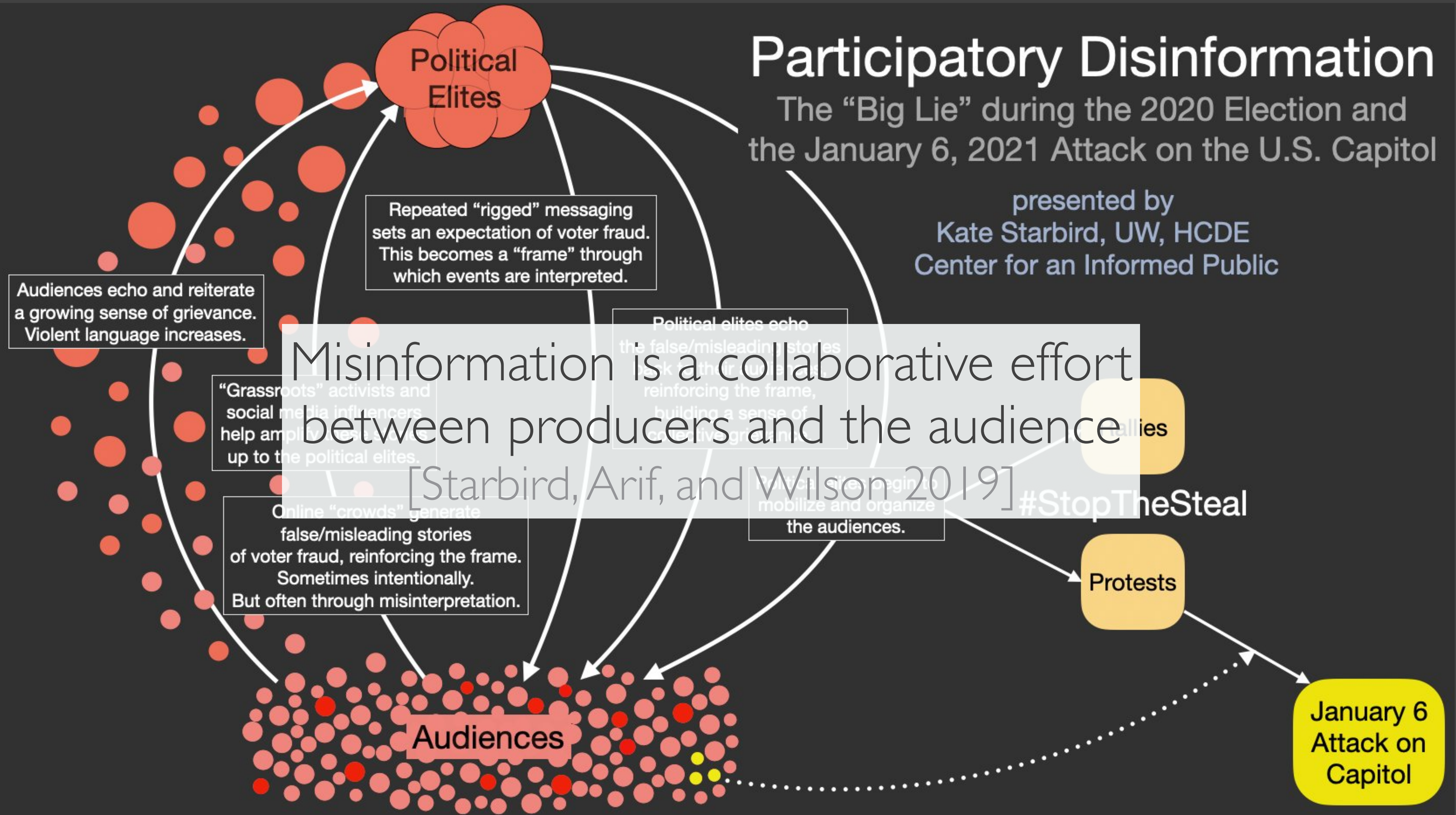
[Starbird 2021; Prochaska 2023]



# Participatory Disinformation

The “Big Lie” during the 2020 Election and the January 6, 2021 Attack on the U.S. Capitol

presented by  
Kate Starbird, UW, HCDE  
Center for an Informed Public



[Starbird 2021; Prochaska 2023]



# Finger #2 🙌 post-truth

While we are more likely to believe news that is concordant with our beliefs, the larger effect is whether we engage with higher-level reasoning instead of automatic reasoning [Pennycook and Rand 2021]



# More like post-attention...

[Pennycook et al. 2021]

People rate accuracy as the single most important factor when deciding whether to share

However, whether a headline is politically concordant has a much larger effect on sharing intention than the headline's accuracy

So what gives?

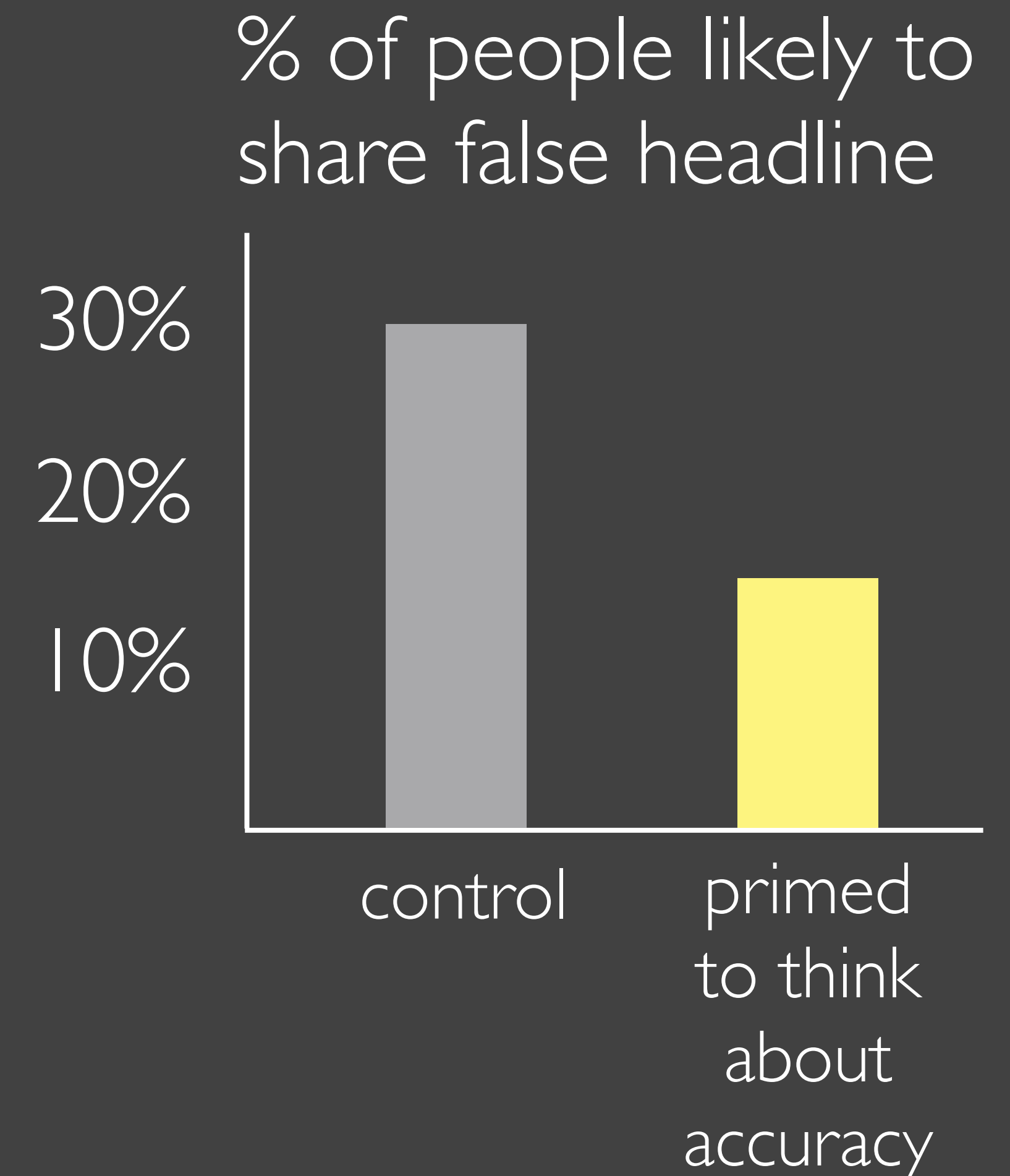


# More like post-attention...

[Pennycook et al. 2021; Pennycook and Rand 2022]

Theory: we don't pay attention to accuracy, and are more focused on pleasing followers or signaling group membership

Evidence: focusing participants' attention on accuracy before seeing a headline reduces sharing of false headlines by half





# How much do we consume?

Most people rarely see misinformation.

National sample of mobile, desktop, and TV consumption:  
misinformation is 0.15% of Americans' media diet [Allen et al. 2020]

The average US adult saw ~1 misinformation story in the 2016 election  
[Hunt and Gentzkow 2017]

Exposure to misinformation is highly concentrated [Guess, Nyhan,  
and Reifler 2020]: 1% of people account for 80% of exposures to  
misinformation [Grinberg et al. 2019]

This exposure is typically pro-attitudinal [Guess, Nyhan and Reifler 2020]

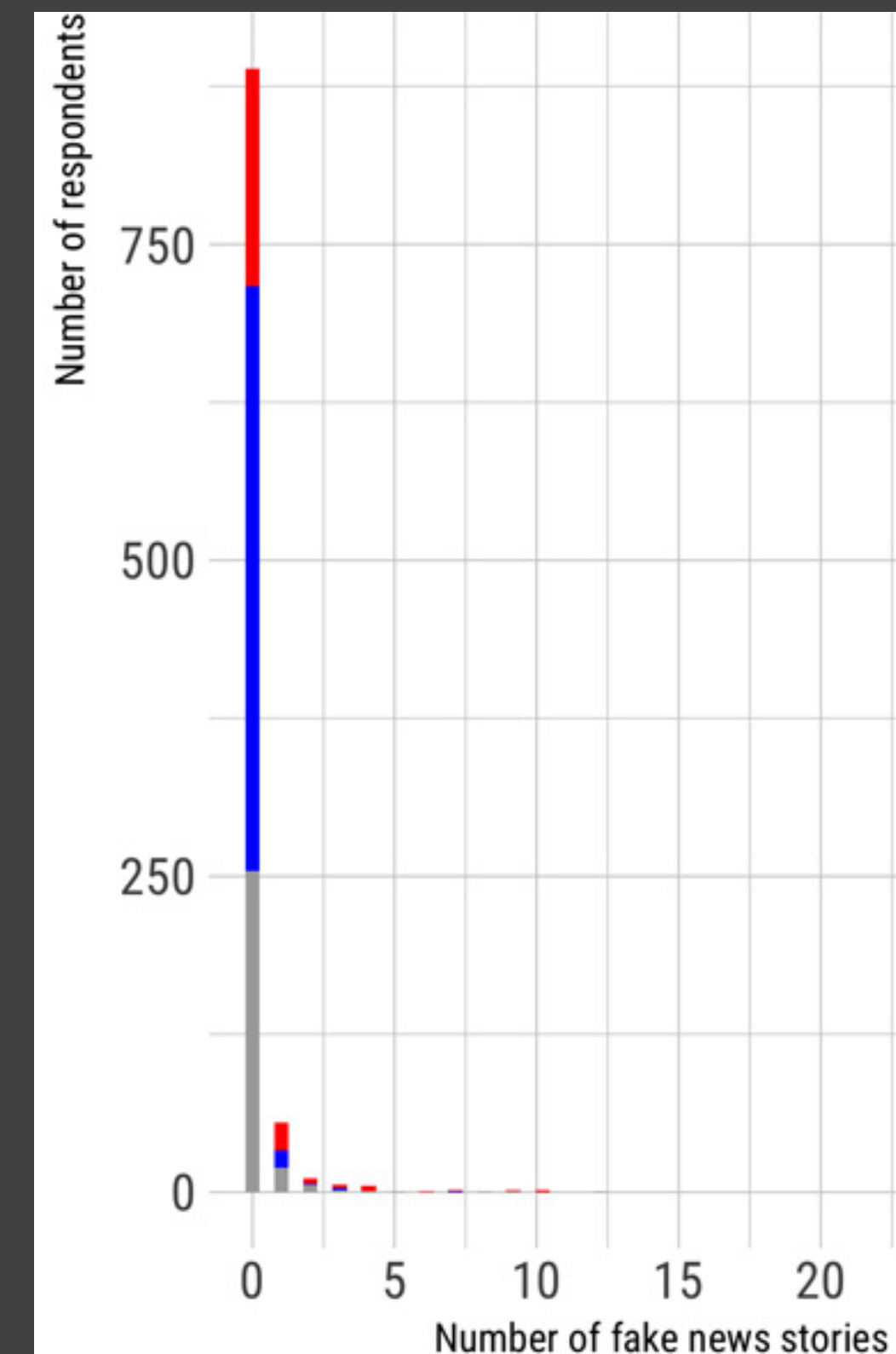


# How much do we share?

It's rare: **most never share disinformation**

In the 2016 election, >65 year olds were 7x more likely than teenagers to share disinformation, and conservatives were more likely to share than liberals [Guess, Nagler, and Tucker 2019]

Misinformation supersharers who accounted for 80% of shares in 2020 were disproportionately Republican, middle-aged white women living in low educated but high income neighborhoods [Barbiri-Bartov, Swire-Thompson, and Grinberg 2024]



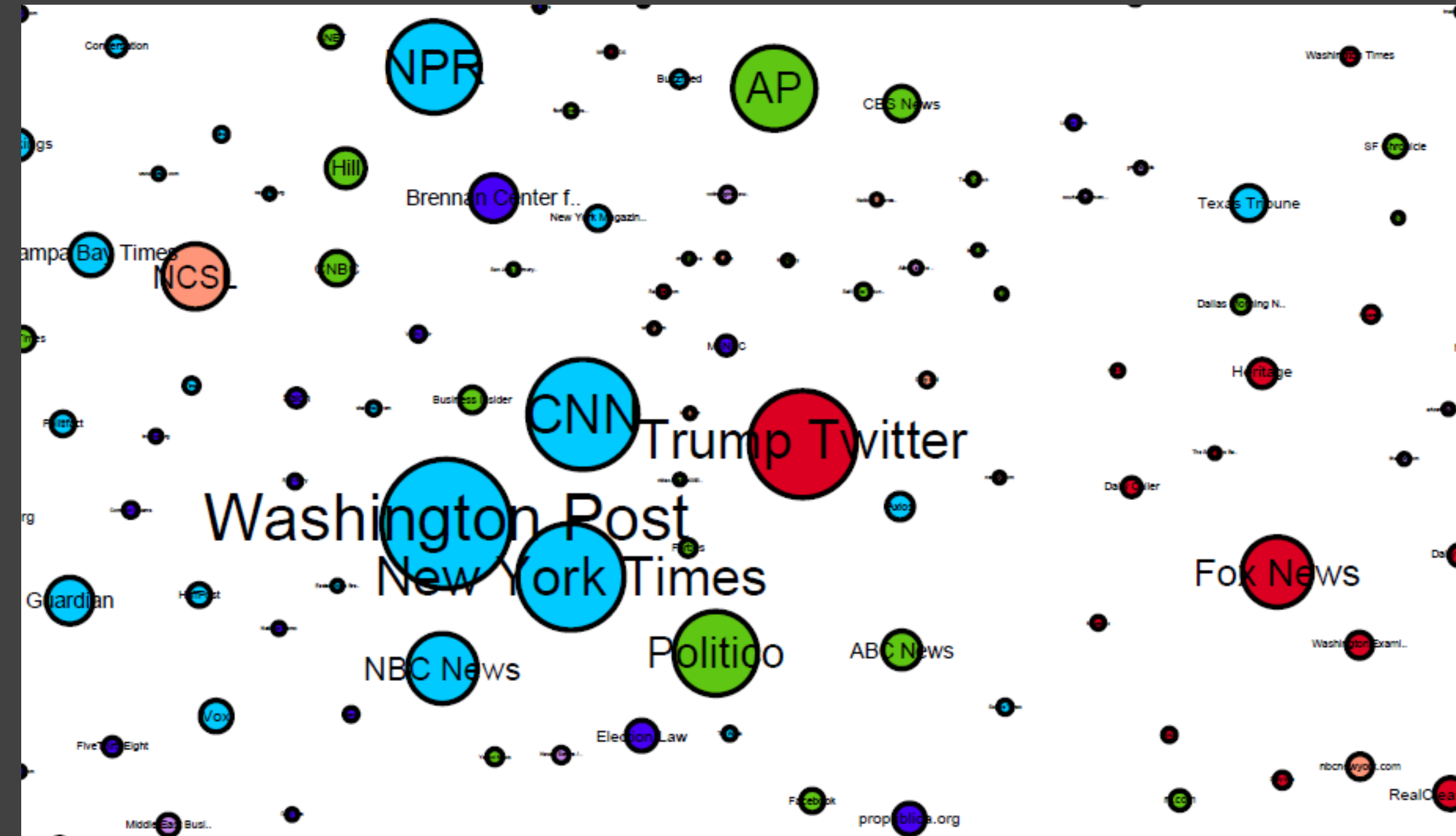


# Mainstream media amplify the message

Analysis of mail-in voter fraud disinformation suggested that social media played a smaller role than mainstream media in 2020:

1) Trump tweets

2) Mainstream media, trying to be neutral and avoid claims of anti-conservative bias, cover Trump's claims and thereby spread them





# So, from whence misinformation?

Finger #1: “It’s trolls.”

Actually: “It’s motivated actors, who activate unwitting agents.”

Finger #2: “Post-truth”

Actually: “People care about being accurate, but generally aren’t paying attention to accuracy when they share.”

“It’s everywhere”

Actually: “Exposure and sharing is rare, but very concentrated.”



# Classification



# Machine learning

Some categories of misinformation (e.g., near copies of flagged articles) can be flagged automatically

ML APPLICATIONS

## Using AI to detect COVID-19 misinformation and exploitative content

May 12, 2020

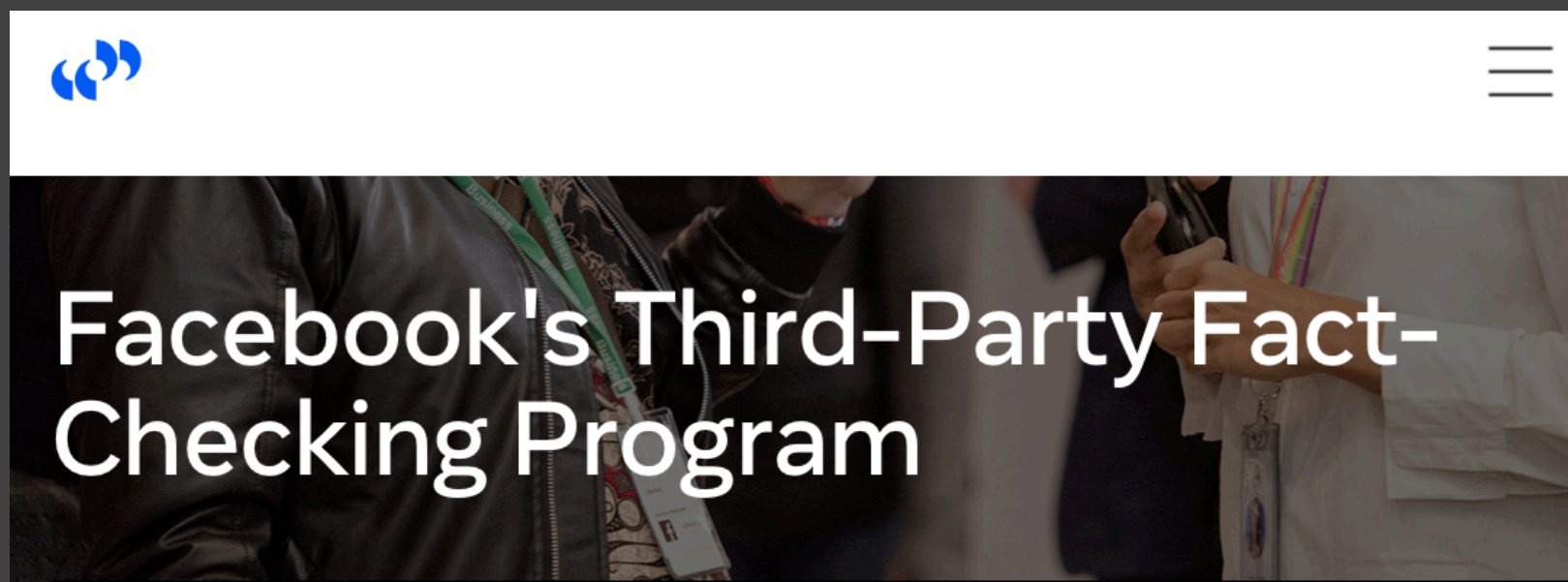
The COVID-19 pandemic is an incredibly complex and rapidly evolving global public health emergency. Facebook is committed to preventing the spread of false and misleading information on our platforms. Misinformation about the disease can evolve as rapidly as the headlines in the news and can be hard to distinguish from legitimate reporting. The same piece of misinformation can appear in slightly different forms, such as as an image modified with a few pixels cropped or augmented with a filter. And these variations can be

<https://ai.facebook.com/blog/using-ai-to-detect-covid-19-misinformation-and-exploitative-content/>



# Factcheckers

Twitter and Facebook have historically relied on third party fact checkers to decide whether an article is misinformation




## Facebook's Third-Party Fact-Checking Program

### Our Approach to Integrity on Facebook

Fighting misinformation is an ever-evolving problem and we can't do it alone. In 2016, we started our third-party fact-checking program, working with [IFCN-certified](#) fact-checkers around the world to [rate and review](#) the accuracy of content on our platform.

The fact-checking program is one part of the three-part approach we take to addressing problematic content across the Facebook family of apps.



Blog

## Product

# Updating our approach to misleading information

By [Yoel Roth](#) and [Nick Pickles](#)  
Monday, 11 May 2020

[Twitter](#) [Facebook](#) [LinkedIn](#) [Link](#)

In serving the public conversation, our goal is to make it easy to find credible information on Twitter and to limit the spread of potentially harmful and misleading content. Starting today, we're introducing new labels and warning messages that will provide additional context and information on some Tweets containing disputed or misleading information related to COVID-19.



# Factcheckers

Twitter and Facebook have historically relied on third party fact checkers to decide whether an article is misinformation


**Factchecking works!** Fact checker labels reduce belief in the article even for those who distrust fact checkers [Martel and Rand 2024]

**However**, this does not cover the long tail: Facebook's partners comprise 26 fact checkers who collectively review **200 articles per month** [Rodrigo 2020]

Fact checkers can also **take days to do the research**, by which time the article or video has spread widely




# Twitter's pre-Elon criteria




**This claim about election fraud is disputed**

Help keep Twitter a place for reliable info. Find out more before liking.

[Find out more](#)

 Like



<i>Misleading Information</i>	Label	Removal
<i>Disputed Claim</i>	Label	Warning
<i>Unverified Claim</i>	No action	No action*
	Moderate	Severe
Propensity for Harm		

See [Atreja, Hemphill, and Resnick 2023] for more



# Disinformation campaigns

[Starbird, Arif, and Wilson 2019; Allen, Watts, and Rand 2024]

Instead of classifying individual pieces of content, we can study and classify **disinformation campaigns** — a collection of information actions

- 1) Is this campaign pushing a false narrative? Then, classify:
- 2) Is this article a part of this disinformation campaign?

Otherwise, much is missed: vaccine-skeptical posts had an effect 46x greater than the actual misinformation that the platforms flagged. ("Unflagged stories highlighting rare deaths after vaccination were among Facebook's most-viewed stories")



# Community Notes

Representative samples of “crowd jurors” can be **as accurate as fact checkers** and much faster [Allen et al. 2021]

Result via a difference-in-difference study: community notes **reduce retweets by half** [Renault, Amariles, and Troussel 2024]

But, they are **still too slow**: tweets get half of their total views within 80 minutes, but **community notes don't appear on average until after two days** [Chuai 2024]



healthbot   
@thehealthbot

Subscribe

...

The cure for cancer was discovered in 1976



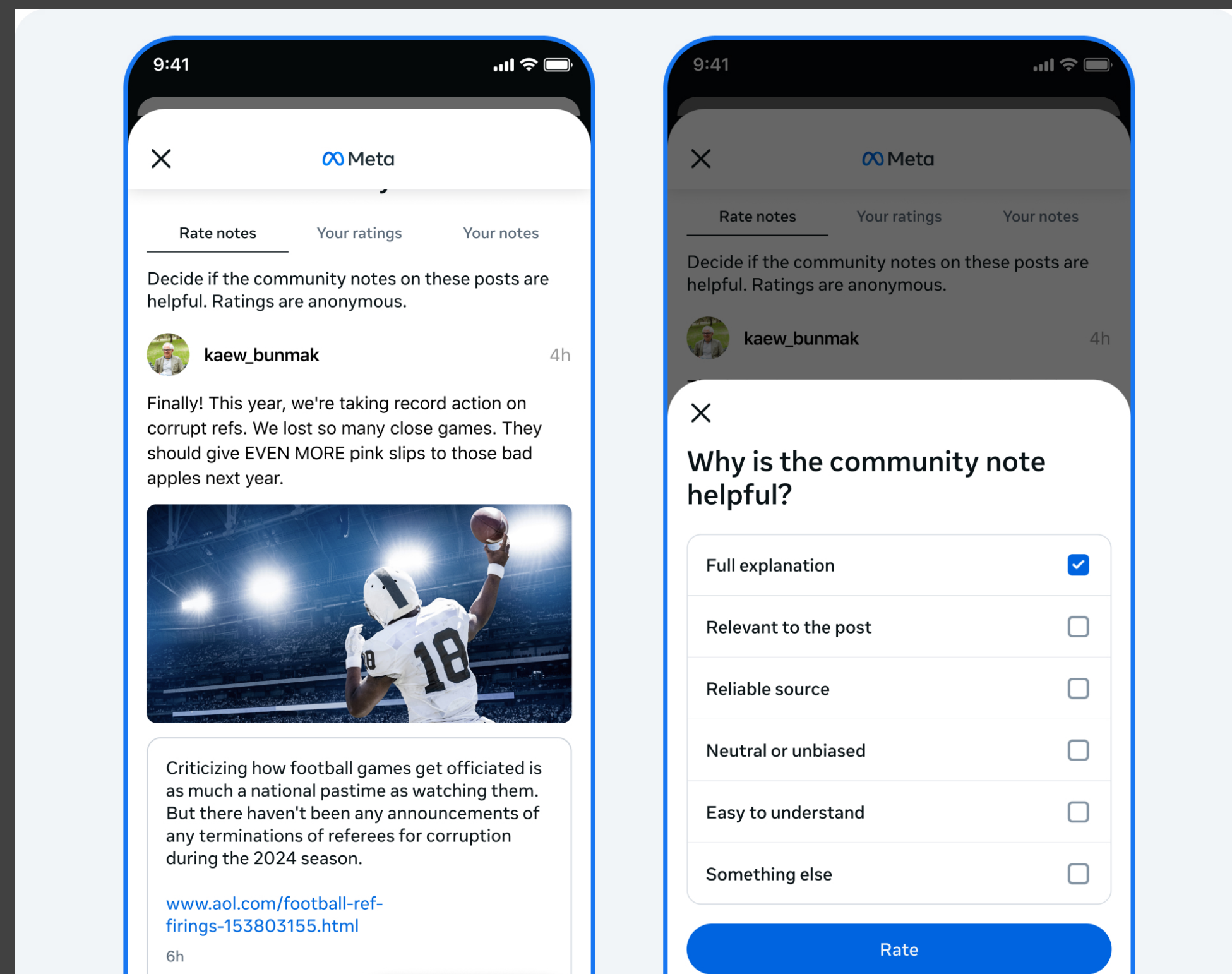
 Readers added context

No, it wasn't. Cancer is a complex group of diseases with various types, subtypes & stages. Dr. Burzynski's work on Antineoplastons therapy has



# Community Notes

Post-Trump's reelection, Meta is now pushing crowdsourced post annotation as "less biased than the third party fact checking program" (their quote, not mine)





# Interventions



# Reduce feed ranking

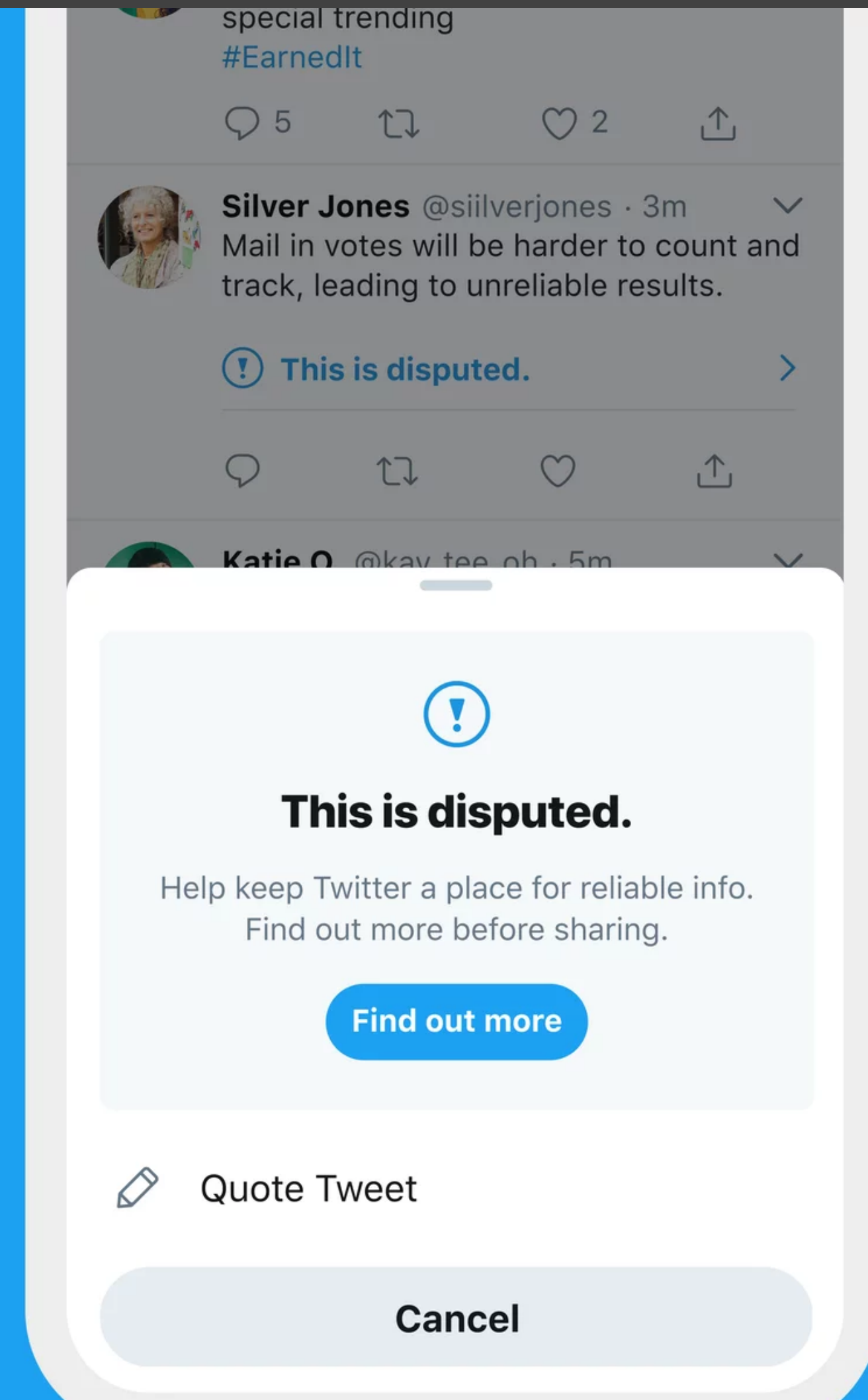
Platforms can (temporarily) reduce the feed ranking of links that might be disinformation, **slowing their spread while fact checkers review it**

Ex: Article is lower in your Instagram feed, video is recommended less often on YouTube

Pros: walks a line between removal and unconstrained spread

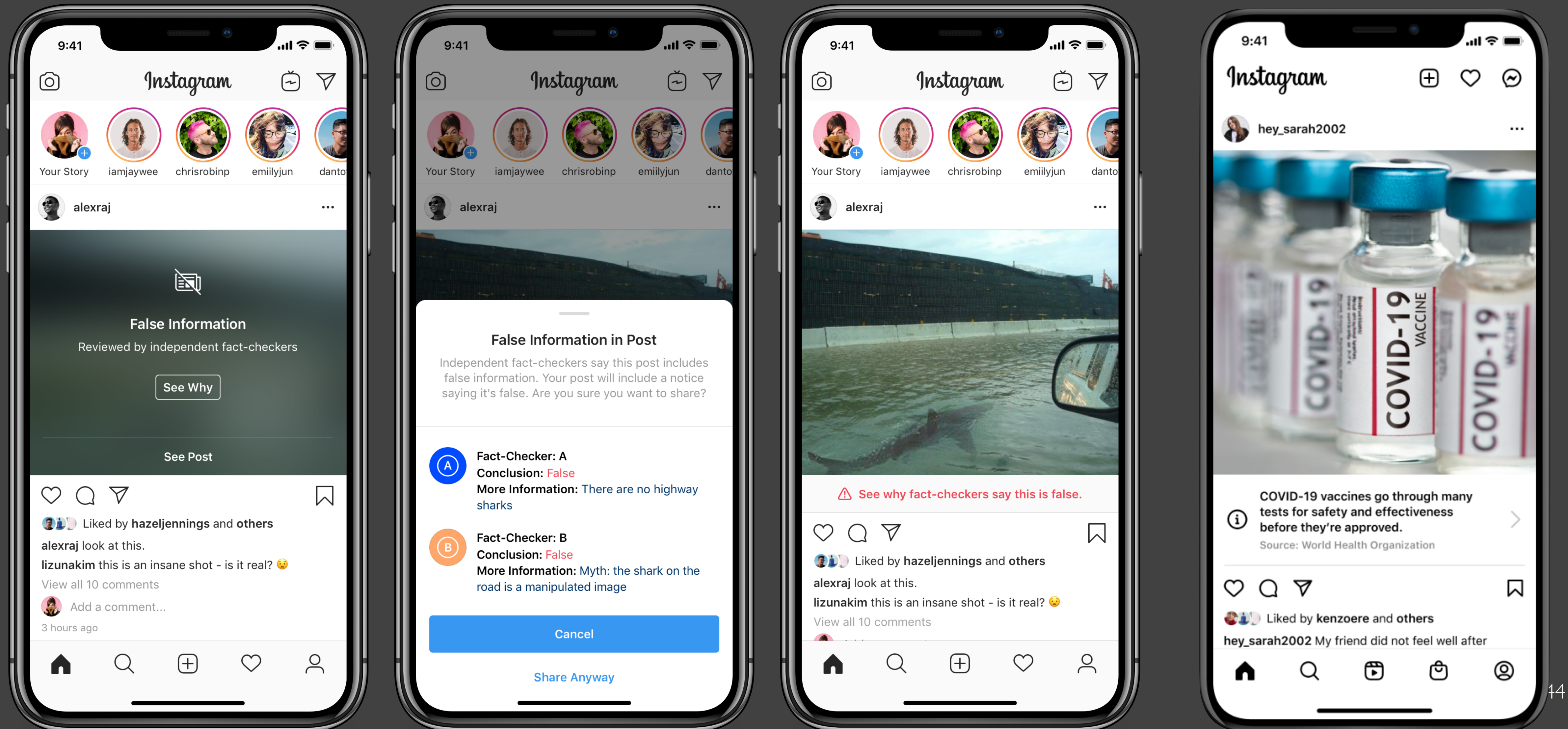
Cons: opaque, unclear when it's happening, likely too late once other media start reporting on it

# An intervention gallery



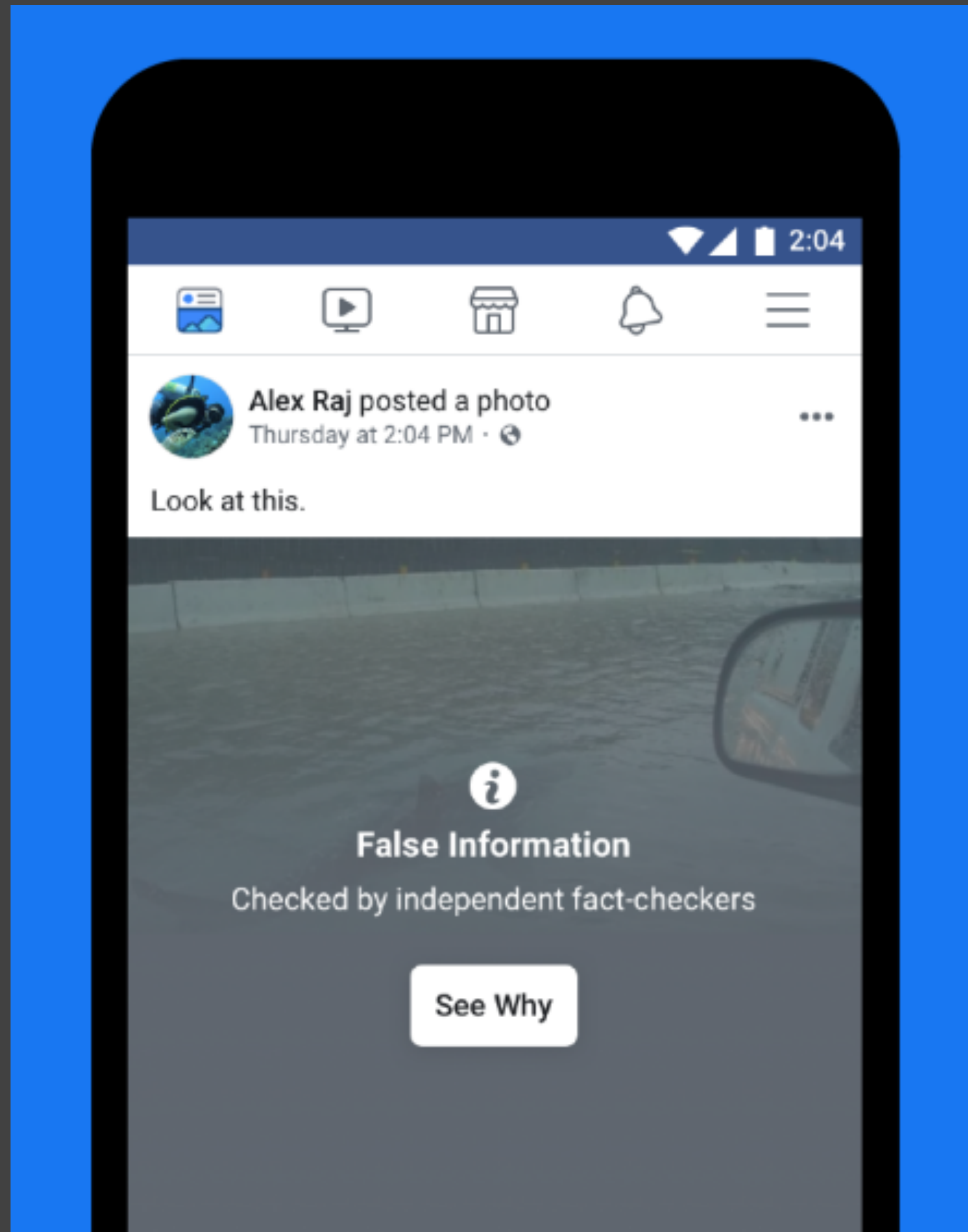


# An intervention gallery





# An intervention gallery





# An intervention gallery



## U.S. elections

Robust safeguards help ensure the integrity of election results.

[LEARN MORE](#)

CHRISTINA BOBB: Trump won. MSM hopes you don't believe your eyes.

# Implied truth effect

Labeling some stories as false leads people to believe that everything not explicitly labeled as false...is true.

[Pennycook et al. 2020]

This is problematic when fact checkers can only check a tiny percentage of all content on the site.





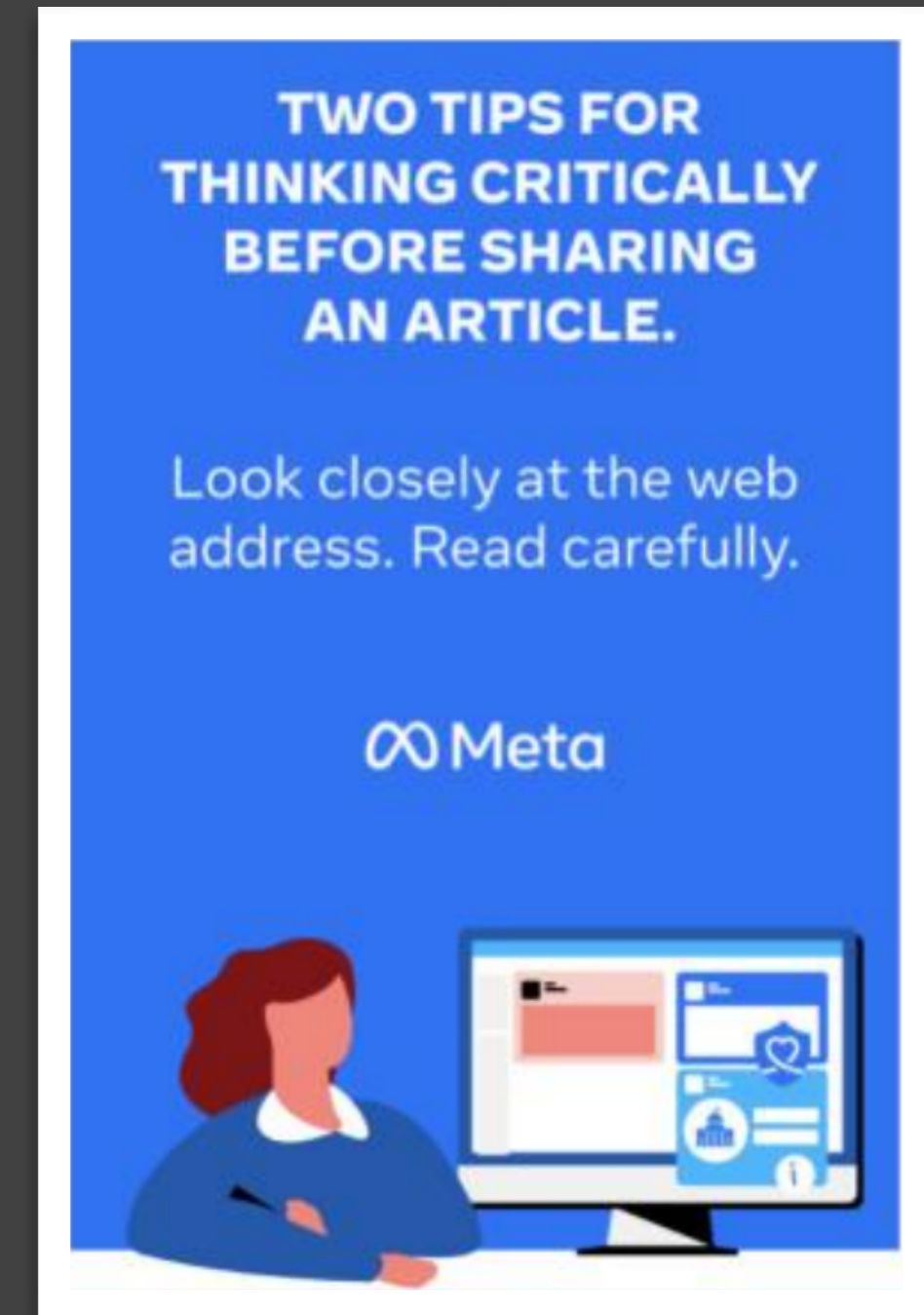
# Priming accuracy

Bringing attention to the accuracy of information shared on FB+Twitter **moderately improves the quality of news shared later**

[Pennycook et al. 2021; Lin, Garro, et al. 2024]

Why? Recall: we're not in a post-truth world, where people don't care about accuracy. We instead tend to be more focused on other motivators, like pleasing our followers.

Since they rely on redirecting attention, these are not long-lasting effects (yet).





# Priming accuracy in practice



**IrrationalLabs**  
@IrrationalLabs



We designed an intervention that reduced shares of flagged content on TikTok by 24% via a large scale RCT, thread 👉 1/7



**IrrationalLabs** @IrrationalLabs · Feb 3



We put a short prompt on videos that reminded people to think about the accuracy of the content they were watching. And then - when people went to share the video - we reminded them again that the video was flagged & asked them if they were sure they wanted to share. 3/7

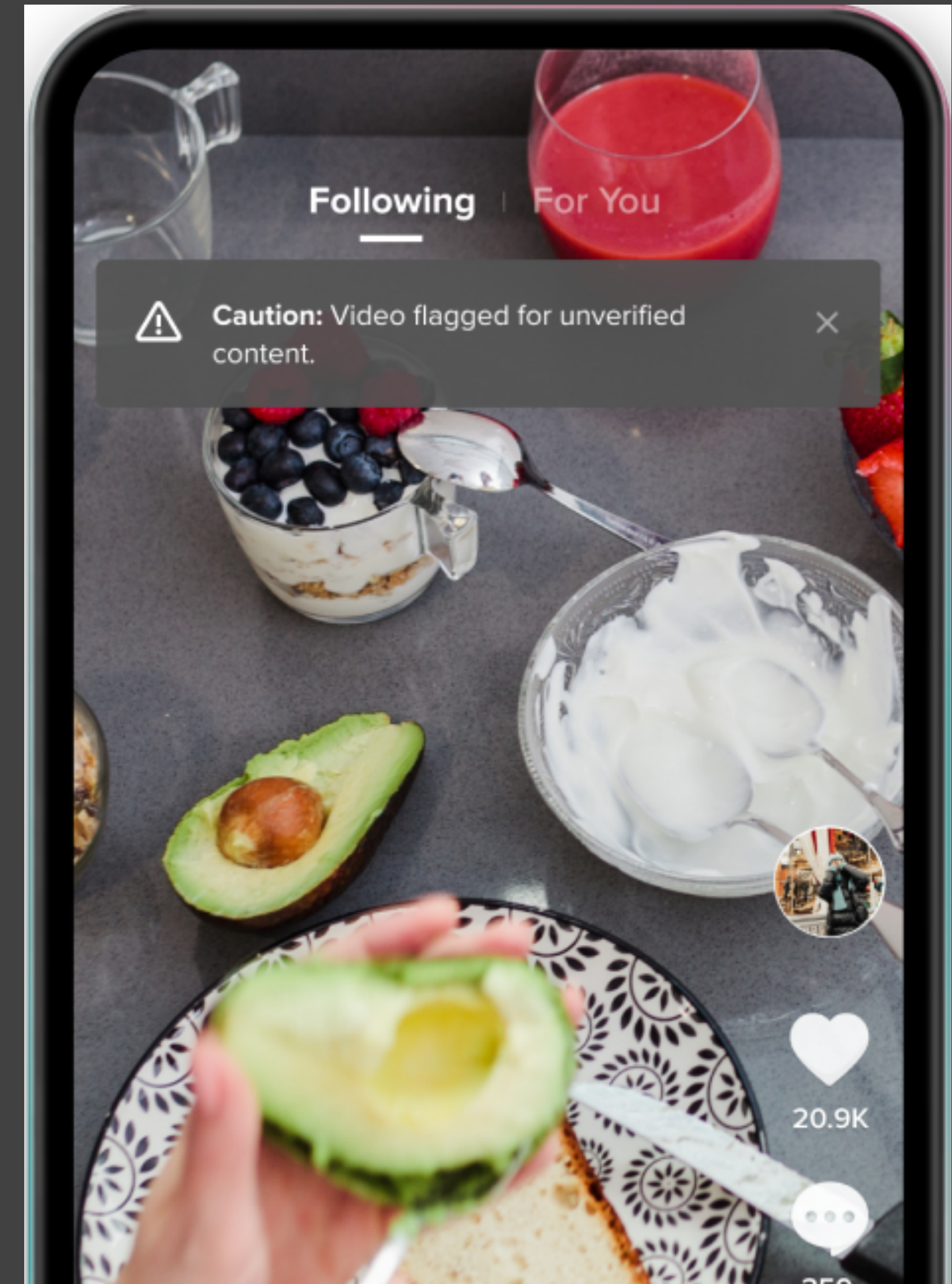


**IrrationalLabs** @IrrationalLabs · Feb 3



In addition to successfully reducing shares by 24%, our intervention also reduced likes by 7%, and views by 5%. 6/7

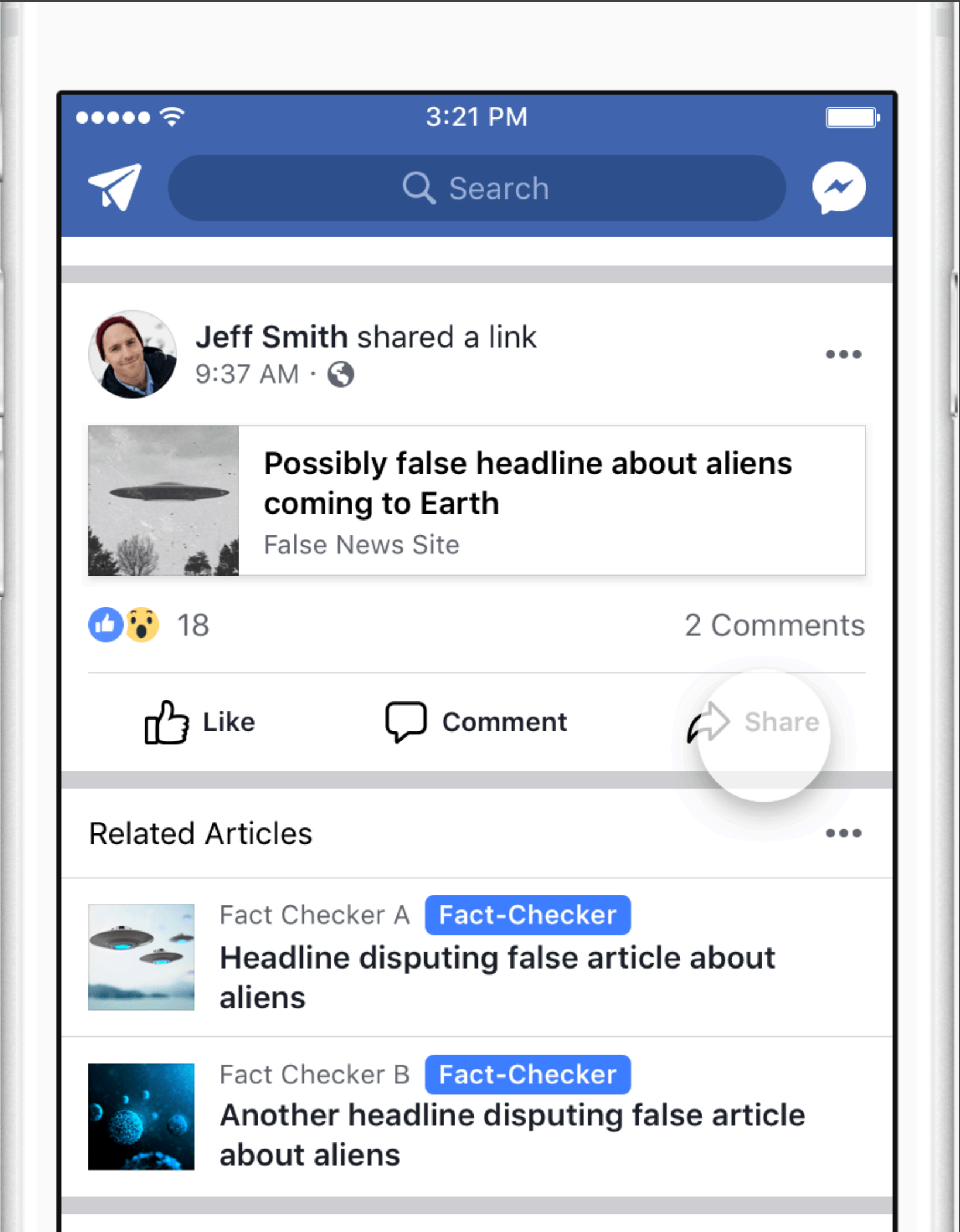
[<https://twitter.com/IrrationalLabs/status/1357033901311451140>]



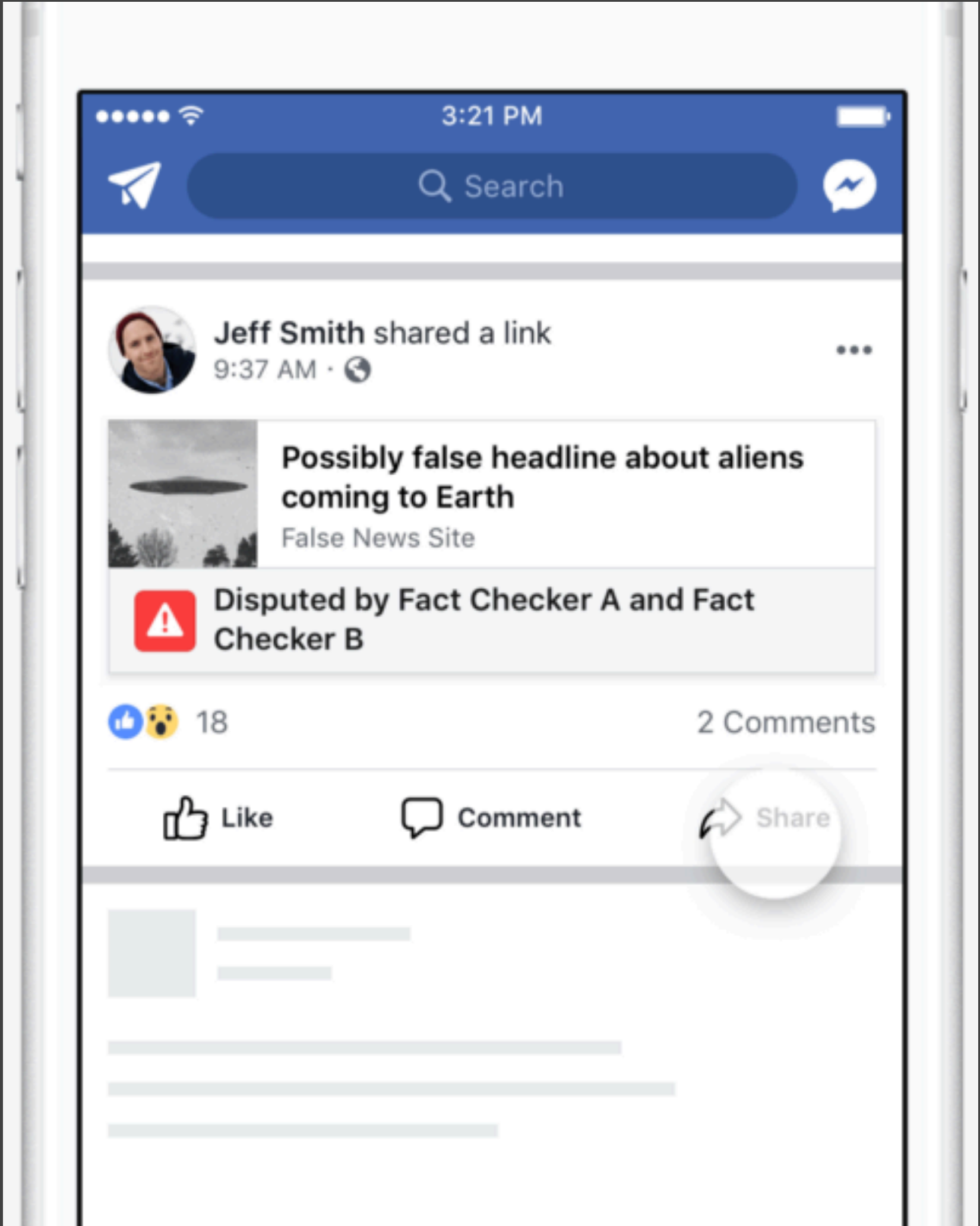


Back to our question: which design will better reduce the spread of disinformation?

related articles



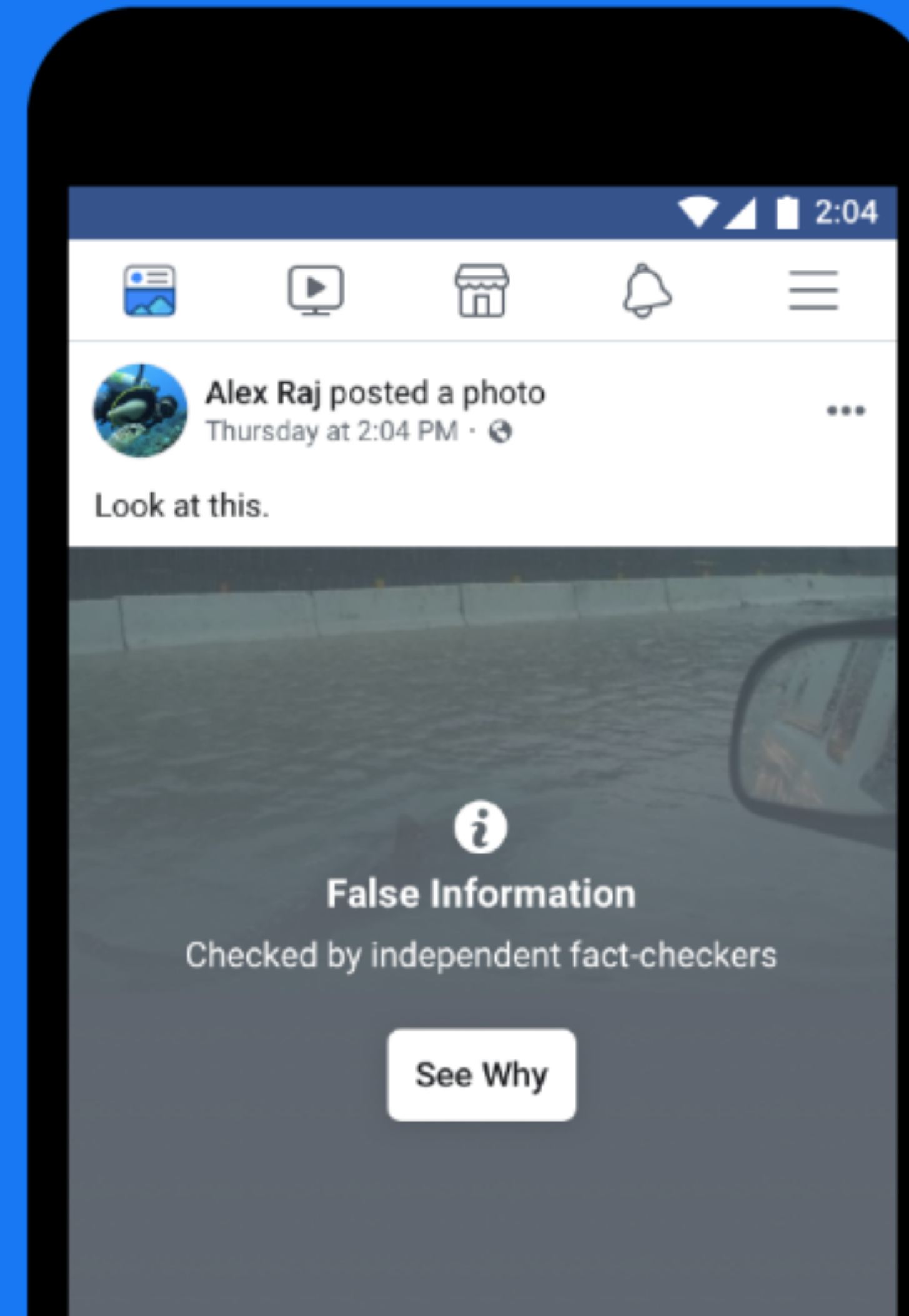
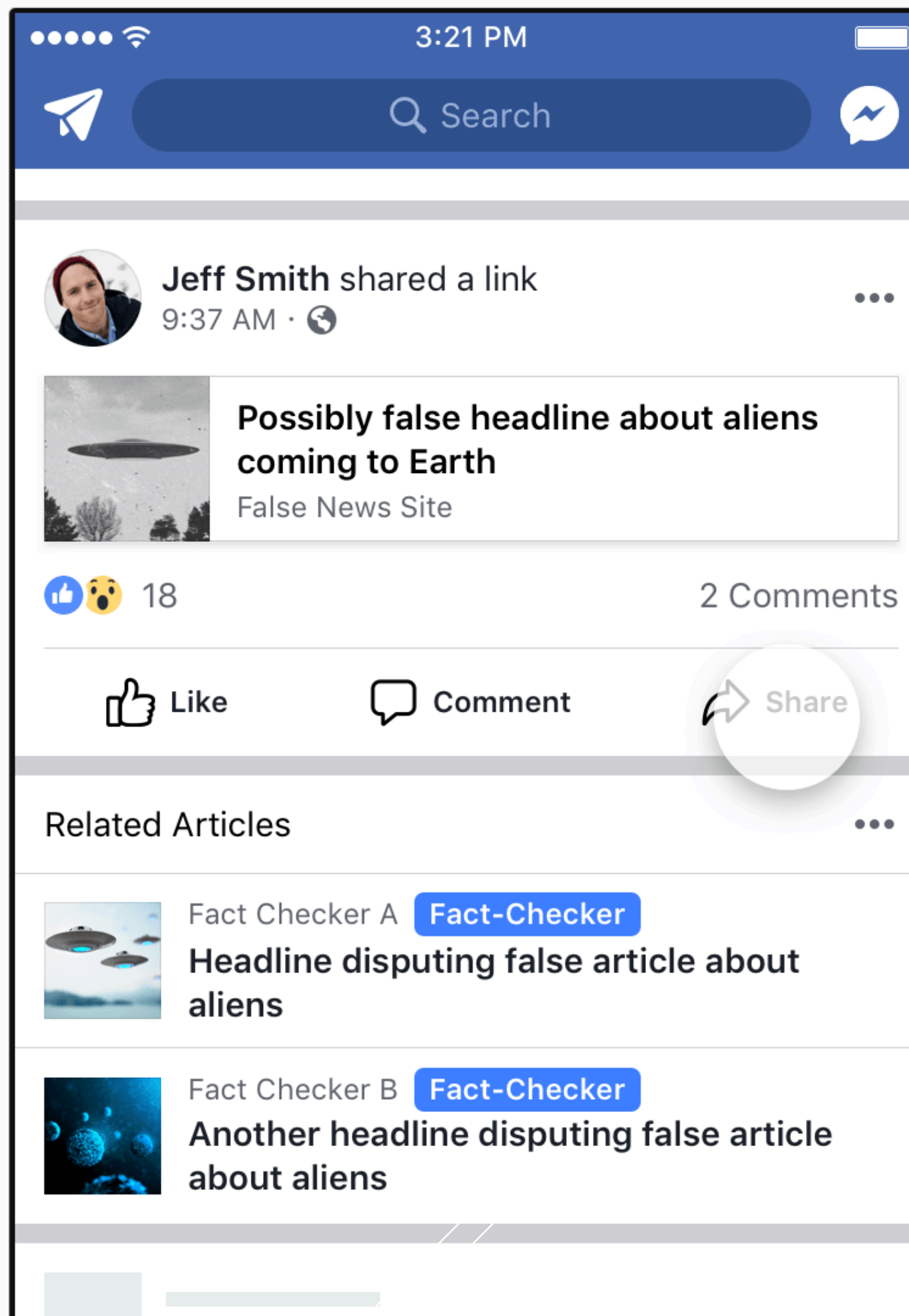
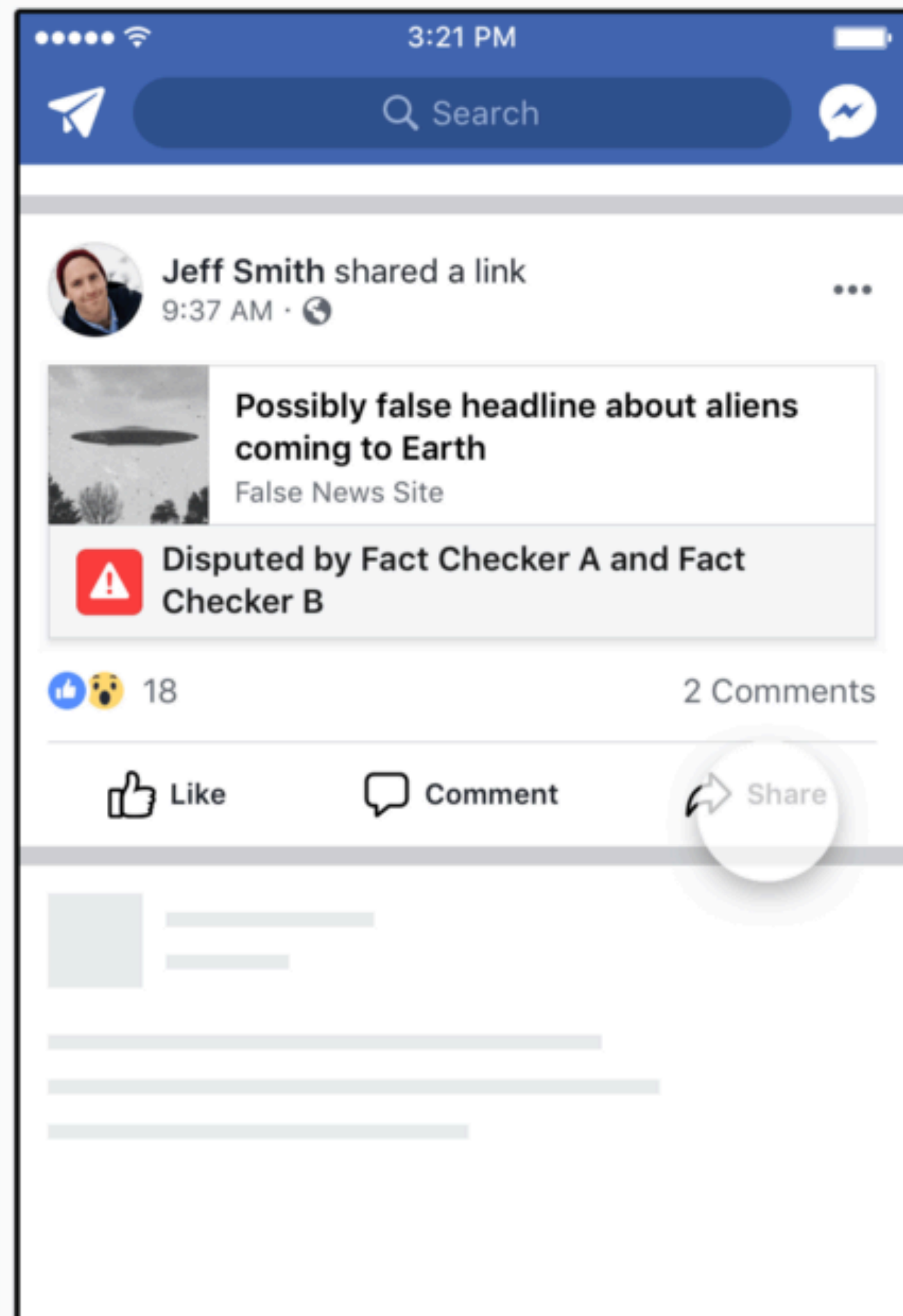
fact check



# Facebook's arc

fact check →

related articles → fact check

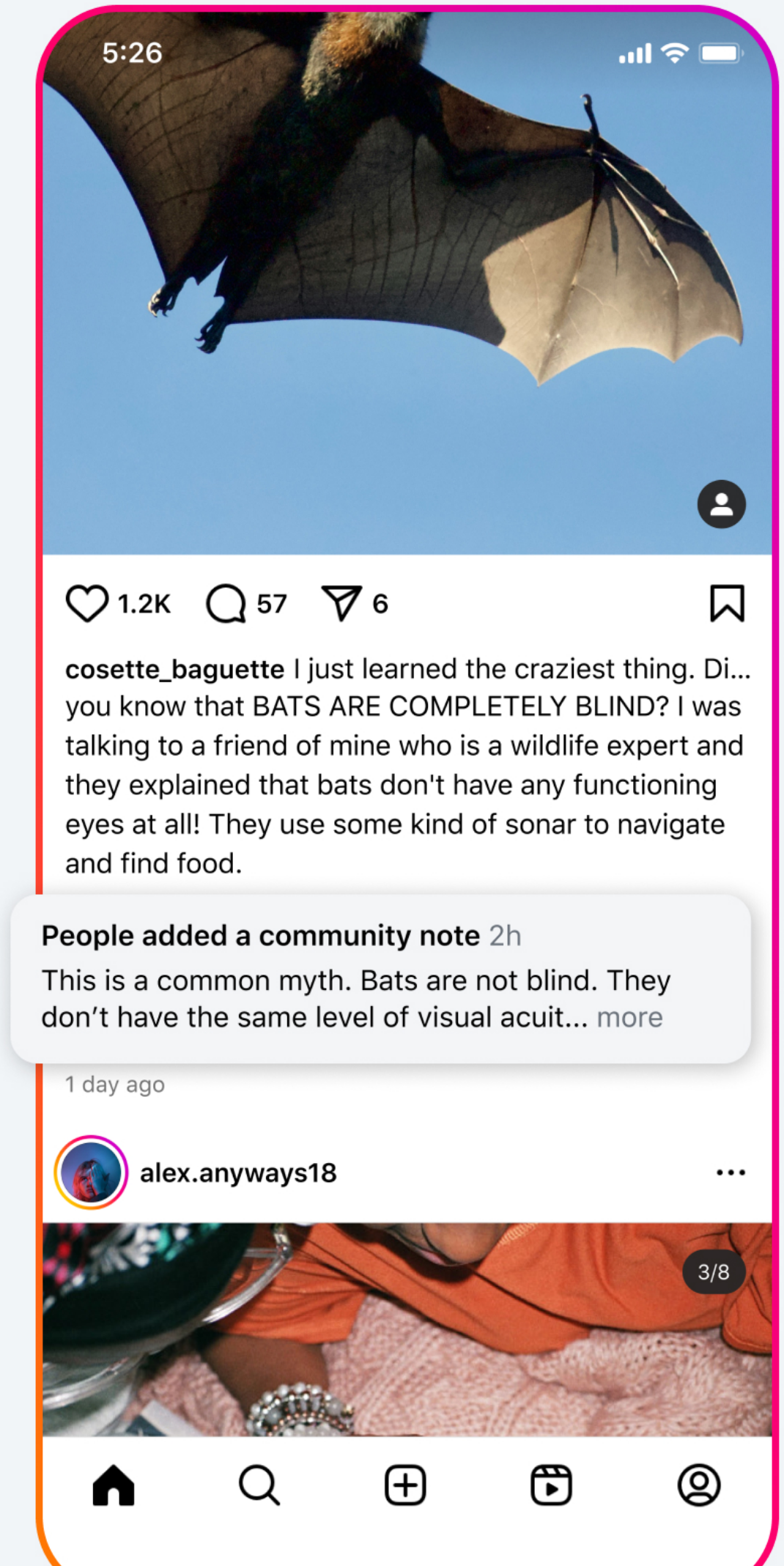
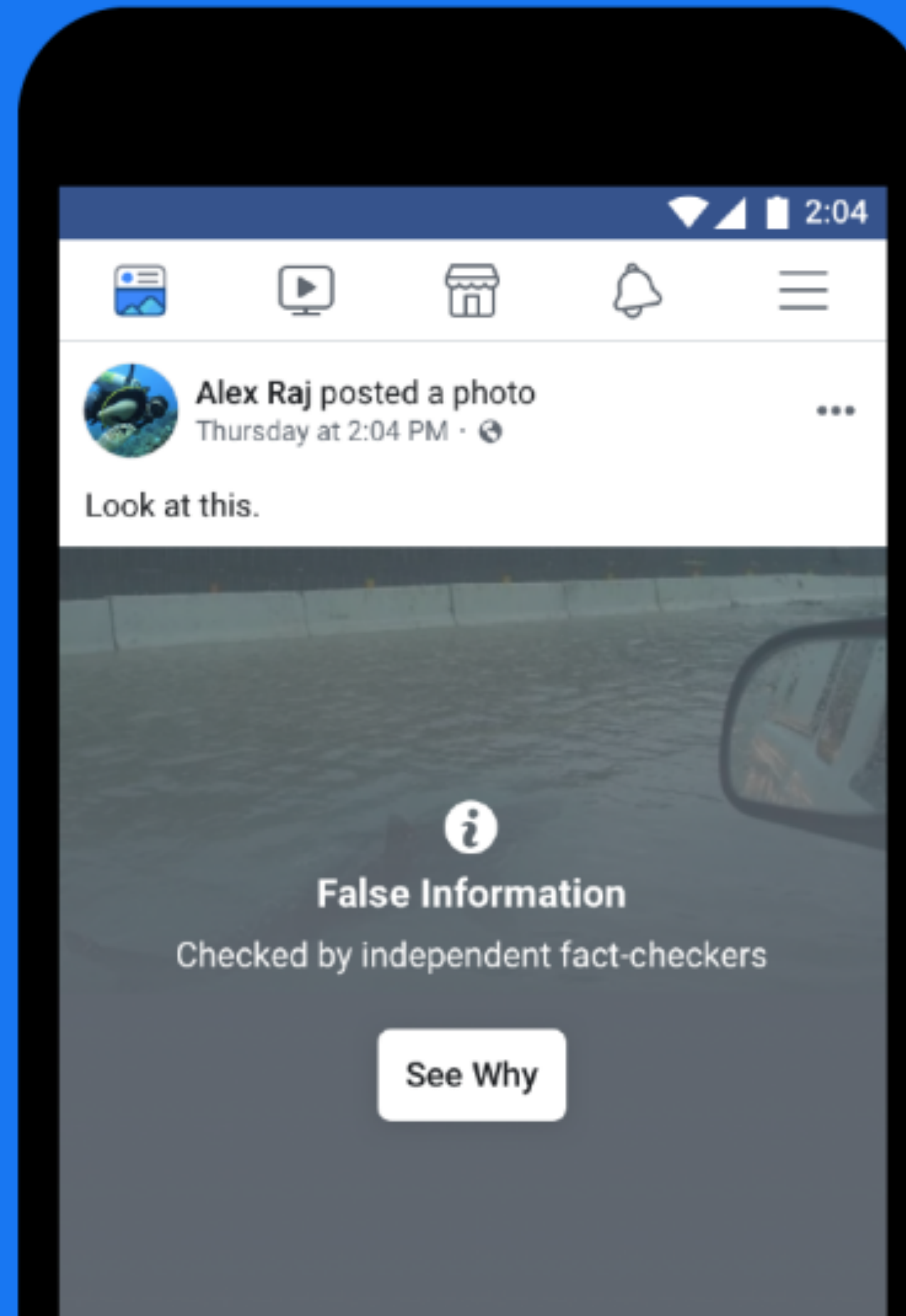
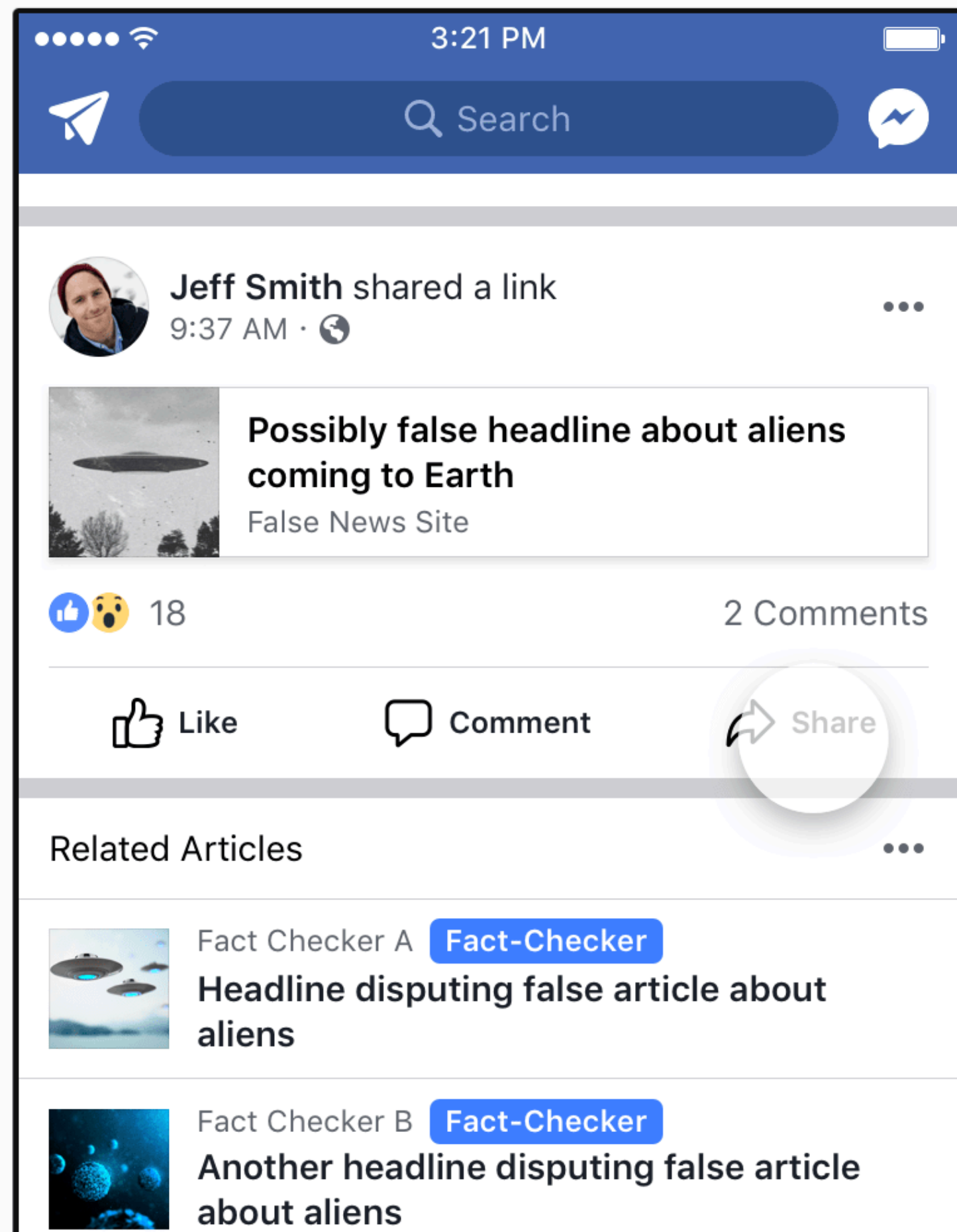




# Facebook's arc

related articles → fact check →

community notes





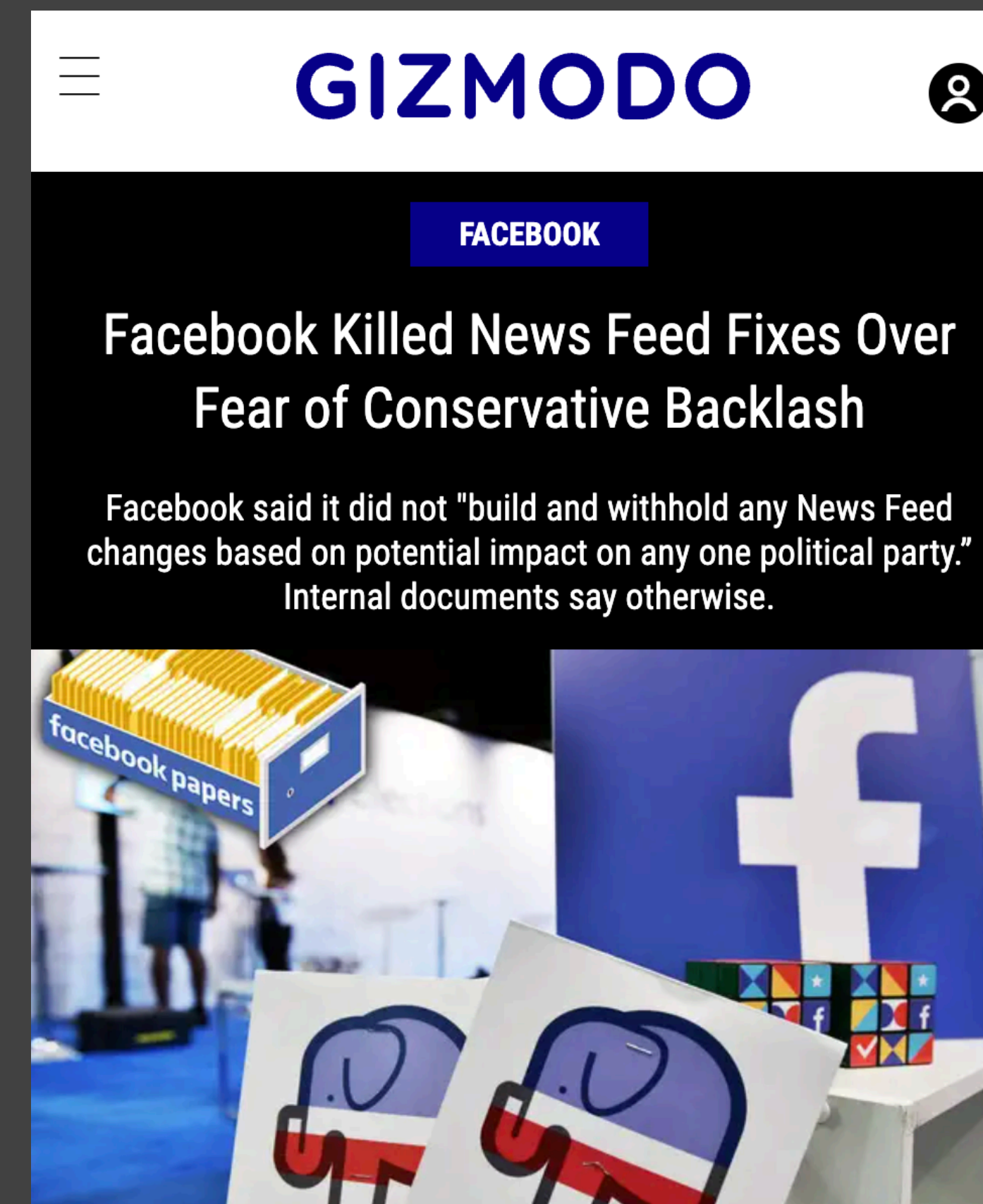
# No politically-neutral option

There exists **vastly more conservative-leaning disinformation** than liberal-leaning disinformation [Hunt and Gentzkow 2017; Törnberg and Chueri 2025]

This difference persists even if the links are evaluated by balanced groups, or by groups of only conservatives [Mosleh et al. 2023]

So **the issue is hot-button political**, in addition to intersecting questions of freedom of expression

What do **you** think the platforms should do? [2min]





# Summary

misinformation != disinformation

Disinformation is often created and amplified collectively by motivated actors and their audience

People share misinformation when they are not paying enough attention to accuracy cues

Misinformation is now as much a political issue as it is a sociotechnical one.

For more, check out [Budak et al. 2024]

**nature**

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[nature](#) > [perspectives](#) > article

Perspective | Published: 05 June 2024

## Misunderstanding the harms of online misinformation

[Ceren Budak](#), [Brendan Nyhan](#), [David M. Rothschild](#) , [Emily Thorson](#) & [Duncan J. Watts](#)

[Nature](#) **630**, 45–53 (2024) | [Cite this article](#)

**16k** Accesses | **818** Altmetric | [Metrics](#)

### Abstract

The controversy over online misinformation and social media has opened a gap between public discourse and scientific research. Public intellectuals and journalists frequently make sweeping claims about the effects of exposure to false content online that are inconsistent with much of the current empirical evidence. Here we identify three common misperceptions: that average exposure to problematic content is high, that algorithms are largely responsible for this exposure and that social media is a primary cause of broader

# References

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