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Are Just Stop Oil's Dramatic Art Museum Protests Hurting Their Own Cause?

Written by Colin Davis

Members of the protest group Just Stop Oil recently threw soup at Van Gogh's "Sunflowers" in the National Gallery in London. The action once again triggered debate about what kinds of protest are most effective.

After a quick clean of the glass, the painting was back on display. But critics argued that the real damage had been done, by alienating the public from the cause itself (the demand that the UK government reverse its support for opening new oil and gas fields in the North Sea).

Supporters of more militant forms of protest often point to historical examples such as the suffragettes. In contrast with Just Stop Oil's action, when the suffragette Mary Richardson went to the National Gallery to attack a painting called The Rokeby Venus, she slashed the canvas, causing major damage.

However, many historians argue that the contribution of the suffragettes to women getting the vote was negligible or even counterproductive. Such discussions often seem to rely on people's gut feelings about the impact of protest. But as a professor of cognitive psychology, I know that we don't have to rely on intuition - these are hypotheses that can be tested.

The activist's dilemma

In one set of experiments researchers showed people descriptions of protests and then measured their support for the protesters and the cause. Some participants read articles describing moderate protests such as peaceful marches. Others read articles describing more extreme and sometimes violent protests, for example a fictitious action in which animal rights activists drugged a security guard in order to break into a lab and remove animals.

Protesters who undertook extreme actions were perceived to be more immoral, and participants reported lower levels of emotional connection and social identification with these "extreme" protesters. The effects of this kind of action on support for the cause were somewhat mixed (and negative effects may be specific to actions that incorporate the threat of violence).

Overall, these results paint a picture of the so-called activist's dilemma: activists must choose between moderate actions that are largely ignored and more extreme actions that succeed in gaining attention, but may be counterproductive to their aims as they tend to make people think less of the protesters.

Activists themselves tend to offer a different perspective: they say that accepting personal unpopularity is simply the price to be paid for the media attention they rely on to "get the conversation going" and win public support for the issue. But is this the right approach? Could activists be hurting their own cause?

Hating protesters doesn't affect support

I've conducted several experiments to answer such questions, often in collaboration with students at the University of Bristol. To influence participants' views of protesters we made use of a well-known framing effect whereby (even subtle) differences in how protests are reported have a pronounced impact, often serving to delegitimise the protest.

For example, the Daily Mail article reporting the Van Gogh protest referred to it as a "stunt" which is part of a "campaign of chaos" by "rebellious eco-zealots". The article does not mention the protesters' demand.

Our experiments took advantage of this framing effect to test the relationship between attitudes to the protesters themselves and to their cause. If the public's support for a cause depends on how they feel about the protesters, then a negative framing -- which leads to less positive attitudes toward protesters -- should result in lower levels of support for the demands.

But that's not what we found. In fact, experimental manipulations that reduced support for the protesters had no impact on support for the demands of those protesters.

We've replicated this finding across a range of different types of nonviolent protest, including protests about racial justice, abortion rights and climate change, and across British, American and Polish participants (this work is being prepared for publication). When members of the public say, "I agree with your cause, I just

don't like your methods," we should take them at their word.

Decreasing the extent to which the public identifies with you may not be helpful for building a mass movement. But high publicity actions may actually be a very effective way to increase recruitment, given relatively few people ever become activists. The existence of a radical flank also seems to increase support for more moderate factions of a social movement, by making these factions appear less radical.

Protest can set the agenda

Another concern may be that most of the attention obtained by radical actions is not about the issue, focusing instead on what the protesters did. However, even where this is true, the public conversation opens up the space for some discussion of the issue itself.

Protest plays a role in home insulation. It doesn't necessarily tell people what to think, but influences what they think about. Last year's Insulate Britain protests are a good example. In the months after the protests began on September 13 2021, the number of mentions of the word "insulation" (not "Insulate") in UK print media doubled.

Some people don't investigate the details of an issue, yet media attention may nevertheless promote the issue in their mind. A YouGov poll released in early June 2019 showed "the environment" ranked in the public's top three most important issues for the first time.

Pollsters concluded that the "sudden surge in concern is undoubtedly boosted by the publicity raised for the environmental cause by Extinction Rebellion" (which had recently occupied prominent sites in central London for two weeks). There's also evidence that home insulation has risen up the policy agenda since Insulate Britain's protests.

Dramatic protest isn't going away. Protagonists will continue to be the subject of (mostly) negative media attention, which will lead to widespread public disapproval. But when we look at public support for the protesters' demands, there isn't any compelling evidence for nonviolent protest being counterproductive. People may "shoot the messenger", but they do -- at least, sometimes -- hear the message.

How a Game of Role-Playing Murder Mystery Became a Huge Hit in China?

“A funeral has gathered six suspects and everyone has his or her own secrets. All of you had mysterious relationships with the deceased, so your job is to find out who invited you to the funeral and who is the murderer,” says the game arranger in a spooky voice.

This scenario could not be more familiar to young urban Chinese.

Live Action Role Playing (LARP) games, or Jubensha (translated to “Script Murder”) is a huge hit among younger generations. Players will be given character's backstories and dress up in costumes as they interact with other characters to solve a crime.

By collecting evidence from the crime scene and interrogating each other, players become Sherlock Holmes in just a few hours. If you are the “murderer” in the script, you can win the game only if no one suspects you and vote you out in the end. The game usually takes place in escape-room-style venues designed according to the script. With prices running up to 300 yuan (\$46) per person for 3 hours of fun, the game is usually played by groups of 5-8 people.

How LARP Brings You A “Third Life” Experience?

The murder mystery game is perfect for young people looking forward to releasing stress and getting away from the daily grind of life. “It felt like as I was cast to act in a movie,” said a 22-year-old LARP game fan Wendy Pan. Aiming to provide players a “third life” experience and improve their understanding of life, NINES, a celebrity-clustered LARP studio, is one of the first LARP studios to set up shop in China. NINES' founder Hu Ningfeng told Pandaily the importance of creating a “third life”.

“The first life is the inevitable one that you are born with; the second life is the ideal one that you are dreaming of, while the third life helps you to view this world in God's perspective. Only when you are viewing this world in a third-person perspective, you can reflect on your first life and shape it into the ideal one,” said Hu.

The murder mystery game is not just about fun but also a great way for social networking. Many players would come to the store to play with people they just met if they could not find enough people to form a group. “Destiny ties people together. Isn't that miraculous?” said a player at NINES's store.

It's also worth mentioning that LARP became a bonding tool for many companies. Mr. Yuan from a marketing firm told People's Daily that when he first joined the firm, he could not even remember colleagues' names, but after his team had a bonding in LARP studio, he became good friends with many of them instantly. “I got to know everyone's personalities and became a good listener,” said Mr. Yuan.

Why China's LARP Industry is Growing Rapidly?

The LARP industry has been growing rapidly in China. The number of live-action role-playing studios was 12,000 in 2019 and the number climbed to more than 30,000 in 2020, according to local media. The popular reality TV show “Who's the Murderer”, in which a group of celebrities plays the LARP game, became a hit among young people.

As immersive games gain popularity, the LARP industry has expanded to various digital sectors. During the peak of the pandemic last year in February, the number of downloads for digital LARP game app Woshimi or Mr. Mystery was so high that it crashed the company's server. Per Quest Mobile, in the iOS top free game list this year, Mr. Mystery made it to the top 3.

A sustainable LARP ecosystem has been formed in China with young entrepreneurs who have passions for immersive games, playwrights excited about writing the next suspense masterpiece, and fresh graduates flooding into the industry to turn their interests into careers. According to NINES' 2020 financial report, sales revenue surged by 37.6% in the post-pandemic season from April to June.

LARP's Origin in the West

Even though the LARP industry has been growing steadily in China, the role-playing murder mystery craze was initially from the West. Started with Cluedo and Jury Box, Western detective games were LARP's initial forms. In 1986, Mafia, also known as Werewolf (Langrensha), a social deduction game in which each player has secret identities and participants need to identify the killers among them, spread to China from Russia. It is not clear when the Werewolf craze spread to China, but this is definitely another hot pick among young Chinese.

In November 2016, Tencent video's reality show "Dinner Party Seduction" (Fanjudeyouhuo), in which celebrities play the game Werewolf on the dinner table, went viral online. That is when the table-top role-playing game became popular, paving the way for LARP games, which could then become even more popular as it requires participants to actively search for crime clues in a specially-designed venue.

With a strong performance at home, Hu is now planning to open his LARP studios overseas." The Toronto and London programs are on the way and we made adjustments specifically for foreign players just in case they could not understand the scripts with Chinese historical elements. Also, we made consumer research globally and we got very positive results back," said Hu confidently.

Why Some People Are Mosquito Magnets?

It's impossible to hide from a female mosquito -- she will hunt down any member of the human species by tracking our CO2 exhalations, body heat, and body odor. But some of us are distinct "mosquito magnets" who get more than our fair share of bites. Blood type, blood sugar level, consuming garlic or bananas, being a woman, and being a child are all popular theories for why someone might be a preferred snack. Yet for most of them, there is little credible data, says Leslie Vosshall, head of Rockefeller's Laboratory of Neurogenetics and Behavior.

This is why Vosshall and Maria Elena De Obaldia, a former postdoc in her lab, set out to explore the leading theory to explain varying mosquito appeal: individual odor variations connected to skin microbiota. They recently demonstrated through a study that fatty acids emanating from the skin may create a heady perfume that mosquitoes can't resist. They published their results in *Cell*.

"There's a very, very strong association between having large quantities of these fatty acids on your skin and being a mosquito magnet," says Vosshall, the Robin Chemers Neustein Professor at The Rockefeller University and Chief Scientific Officer of the Howard Hughes Medical Institute.

A tournament no one wants to win

In the three-year study, eight participants were asked to wear nylon stockings over their forearms for six hours a day. They repeated this process on multiple days. Over the next few years, the researchers tested the nylons against each other in all possible pairings through a round-robin style "tournament." They used a two-choice olfactometer assay that De Obaldia built, consisting of a plexiglass chamber divided into two tubes, each ending in a box that held a stocking. They placed *Aedes Aegypti* mosquitoes -- the primary vector species for Zika, dengue, yellow fever, and chikungunya -- in the main chamber and observed as the insects flew down the tubes towards one nylon or the other.

By far the most compelling target for *Aedes aegypti* was Subject 33, who was four times more attractive to the mosquitoes than the next most-attractive study participant, and an astonishing 100 times more appealing than the least attractive, Subject 19.

The samples in the trials were de-identified, so the experimenters didn't know which participant had worn which nylon. Still, they would notice that something unusual was afoot in any trial involving Subject 33, because insects would swarm towards that sample. "It would be obvious within a few seconds of starting the assay," says De Obaldia. "It's the type of thing that gets me really excited as a scientist. This is something real. This is not splitting hairs. This is a huge effect."

The researchers sorted the participants into high and low attractors, and then asked what differentiated them. They used chemical analysis techniques to identify 50 molecular compounds that were elevated in the sebum (a moisturizing barrier on the skin) of the high-attracting participants. From there, they discovered that mosquito magnets produced carboxylic acids at much higher levels than the less-attractive volunteers. These substances are in the sebum and are used by bacteria on our skin to produce our unique human body odor.

To confirm their findings, Vosshall's team enrolled another 56 people for a validation study. Once again, Subject 33 was the most alluring, and stayed so over time.

"Some subjects were in the study for several years, and we saw that if they were a mosquito magnet, they remained a mosquito magnet," says De Obaldia. "Many things could have changed about the subject or their behaviors over that time, but this was a very stable property of the person."

Even knockouts find us

Humans produce mainly two classes of odors that mosquitoes detect with two different sets of odor receptors: Orco and IR receptors. To see if they could engineer mosquitoes unable to spot humans, the researchers created mutants that were missing one or both of the receptors. Orco mutants remained attracted to humans and able to distinguish between mosquito magnets and low attractors, while IR mutants lost their

attraction to humans to a varying degree, but still retained the ability to find us.

These were not the results the scientists were hoping for. "The goal was a mosquito that would lose all attraction to people, or a mosquito that had a weakened attraction to everybody and couldn't discriminate Subject 19 from Subject 33. That would be tremendous," Vosshall says, because it could lead to the development of more effective mosquito repellents. "And yet that was not what we saw. It was frustrating."

These results complement one of Vosshall's recent studies, also published in *Cell*, which revealed the redundancy of *Aedes aegypti*'s exquisitely complex olfactory system. It's a failsafe that the female mosquito relies on to live and reproduce. Without blood, she can't do either. That's why "she has a backup plan and a backup plan and a backup plan and is tuned to these differences in the skin chemistry of the people she goes after," Vosshall says.

The apparent unbreakability of the mosquito scent tracker makes it difficult to envision a future where we're not the number-one meal on the menu. But one potential avenue is to manipulate our skin microbiomes. It is possible that slathering the skin of a high-appeal person like Subject 33 with sebum and skin bacteria from the skin of a low-appeal person like Subject 19 could provide a mosquito-masking effect.

"We haven't done that experiment," Vosshall notes. "That's a hard experiment. But if that were to work, then you could imagine that by having a dietary or microbiome intervention where you put bacteria on the skin that are able to somehow change how they interact with the sebum, then you could convert someone like Subject 33 into a Subject 19. But that's all very speculative."

She and her colleagues hope this paper will inspire researchers to test other mosquito species, including in the genus *Anopheles*, which spreads malaria, adds Vosshall: "I think it would be really, really cool to figure out if this is a universal effect."

No Lone Wolves

By Vera Bergengruen

The gunman accused of murdering 10 people in a Buffalo supermarket seemed to fit a familiar pattern. Isolated and bored during the pandemic, he had become radicalized by consuming white-supremacist content online. He had previously threatened to commit violence at his high school and been sent for a mental-health evaluation, according to authorities. After he allegedly carried out the violent solo massacre, targeting Black shoppers, police said they believed he acted alone. So it's no surprise that Payton Gendron, 18, was widely portrayed as a "lone wolf" attacker, like many white-supremacist terrorists before him.

But the gunman did not act in a vacuum. He saw himself as part of an engaged community. In lengthy online writings being examined by authorities, he situated his alleged crimes as part of a larger movement. Part of the document is written in a conversational question-and-answer format and cites his "many influences from others" about how to take violent action to prevent white Americans from being "replaced" by Jews, immigrants, and people of color. Dozens of pages lay out a clear instruction manual for the next attacker to follow.

"I think that live streaming this attack gives me some motivation in the way that I know that some people will be cheering for me," the document states. After driving several hours to a grocery store chosen for the high percentage of Black residents in the area, the gunman donned a military-style helmet with a GoPro camera attached, and proceeded to broadcast the massacre.

The Buffalo shooting highlights one of the most pernicious and poorly understood aspects of the recent wave of domestic terrorist attacks. Even when crimes like these are committed by solitary extremists, the perpetrators see themselves as acting on behalf of a movement. "There is a community of like-minded individuals that give these people strength and make them feel like they're part of a greater cause," says Daryl Johnson, a former Department of Homeland Security senior analyst who authored a 2009 report warning of the rise of right-wing extremism. "And when you have that sense of community, it makes your cause seem more legit."

For a new generation of extremists, this online engagement has taken the place of formal affiliations, group meetings, and plots. But it should be taken just as seriously. Documents circulate from attacker to attacker, who build on and claim allegiance to one another while laying out the playbook for the next violent act.

The Buffalo shooter's screed is covered in anti-Semitic and racist memes, and in isolation might be dismissed as the delusional ravings of a madman. But such documents, however abhorrent, need to be understood as part of a coherent political ideology, former U.S. extremism officials and experts tell TIME—one whose reach extends far beyond fringe internet forums. According to new polling, about 1 in 3 U.S. adults believes an effort is under way to replace native-born Americans with immigrants for electoral gains, which is the root of the "replacement theory" cited by the Buffalo attacker.

That's why portraying individuals like the Buffalo shooter as lone extremists whose self-radicalization on the internet led them to commit inexplicable, "evil" acts divorces their actions from the larger movement they belong to. "We shouldn't be dismissing these people as mentally ill or just a one-off," Johnson says. "There are many, many people out there that are on a spectrum of radicalization following each other's path." Rarely has this feedback loop been as clear as in the case of the Buffalo shooter. The alleged gunman did not leave a hint of doubt as to his motivations, chronicling his radicalization in his diatribe. After "extreme boredom" during the early months of the pandemic, he wrote, his browsing on outdoor-sports and gun forums led him to white-supremacist material. But it wasn't until he saw a video of the 2019 Christchurch, New Zealand, mosque shootings, he said, that he was inspired to act.

Significant sections of the Buffalo gunman's document are copied from the writings of the man who killed 51 people in the Christchurch massacre. The Buffalo shooter cites other racist mass shooters as well, including Dylann Roof, who killed nine Black parishioners during a Bible study in Charleston, S.C., in 2015. He situates

his act as part of “the movement,” discusses “techniques that increase media coverage,” and encourages fellow extremists to “use edgy humor and memes in the vanguard stage, and to attract a young audience.”

“This is not just violence in the name of what they believe to be a righteous cause. It’s also performance. It’s signaling... to potentially like-minded people,” says Seyward Darby, a journalist and researcher of the evolution of white- nationalist movements.

“There’s no such thing as a lone wolf,” Darby adds. “Racism and white supremacy are not mental illnesses. They are learned behavior. Saying that is a way for people in positions of privilege and power to comfort themselves that they have no responsibility here.”

Turmoil in Britain

Welcome to Britaly

A country of political instability, low growth and subordination to the bond markets

IN 2012 LIZ TRUSS and Kwasi Kwarteng, two of the authors of a pamphlet called “Britannia Unchained”, used Italy as a warning. Bloated public services, low growth, poor productivity: the problems of Italy and other southern European countries were also present in Britain. Ten years later, in their botched attempt to forge a different path, Ms Truss and Mr Kwarteng have helped make the comparison inescapable. Britain is still blighted by disappointing growth and regional inequality. But it is also hobbled by chronic political instability and under the thumb of the bond markets (see Britain section). Welcome to Britaly.

The comparison between the two countries is inexact. Between 2009 and 2019 Britain’s productivity growth rate was the second-slowest in the G7, but Italy’s was far worse. Britain is younger and has a more competitive economy. Italy’s problems stem, in part, from being inside the European club; Britain’s, in part, from being outside. Comparing the bond yields of the two countries is misleading. Britain has lower debt, its own currency and its own central bank; the market thinks it has much less chance of defaulting than Italy. But if Britaly is not a statistical truth, it captures something real. Britain has moved much closer to Italy in recent years in three ways.

First, and most obviously, the political instability that used to mark Italy out has fully infected Britain. Since the end of the coalition government in May 2015, Britain has had four prime ministers (David Cameron, Theresa May, Boris Johnson and Ms Truss), as has Italy. The countries are likely to stay in lockstep in the near future. Giorgia Meloni is expected to be sworn in as the new prime minister in Rome; Ms Truss’s future could not be more precarious. Ministerial longevity is now counted in months: since July Britain has had four chancellors of the exchequer; the home secretary resigned this week after just 43 days in office. Trust in politics has declined as chaos has increased: 50% of Britons trusted the government in 2010 and less than 40% do now. The gap with Italy on this measure has shrunk from 17 percentage points to four.

Second, just as Italy became the plaything of the bond markets during the euro-zone crisis, so they are now visibly in charge of Britain. The Conservatives have spent the past six years chasing the dream of enhanced British sovereignty; instead they have lost control. Silvio Berlusconi was removed from power in Italy in 2011 after falling foul of Brussels and Berlin; Mr Kwarteng was kicked out of his job as chancellor of the exchequer because of the market reaction to his package of unfunded tax cuts. Traders in gilts are the arbiters of British government policy at the moment. Jeremy Hunt, the new chancellor, has eviscerated most of the tax cuts and rightly decided to redesign the government’s energy-price guarantee scheme from April 2023. The decisions he must take to fill the remaining hole in the public finances are being designed with markets in mind.

Just as Italians fret about *lo spread* between benchmark government bonds and Bunds, so Britons have had a crash course in how gilt yields affect everything from the cost of their mortgage to the safety of their pensions. In Italy institutions like the presi-

dency and the central bank have long acted as bulwarks against politicians. So it is now in Britain. By ending its emergency bond-buying on October 14th, the Bank of England forced the government to reverse course faster. There is no room for Mr Hunt to disagree with the Office for Budget Responsibility, a fiscal watchdog. These institutions were constraints on elected MPs before, but now the chains bind tightly and visibly.

Third, Britain’s low-growth problem has become more entrenched. Political stability is a precondition of growth, not a nice-to-have. Italian governments struggle to get anything done; the same is true of brief administrations in Britain. When changes of leader and government are always round the corner, pantomime and personality replace policy. Mr Johnson was nicknamed “Borisconi” by some; by continuing to hover on the political scene, he may make this comparison sharper still.

And although fiscal discipline should calm the bond markets, it will not by itself increase growth. Mr Hunt is racing to balance the books as part of a medium-term fiscal plan to be unveiled on October 31st. Saving money by spending less on infrastructure would be fine for gilt yields but is not going to help the economy grow. There is little room for swingeing cuts to public services. Better to phase out the “triple lock”, a generous formula for raising state pensions, and raise money in more sensible

ways: scrapping “non-dom” tax status, for instance, or raising inheritance taxes. A rise in income tax would be better than reinstating the increase in national-insurance contributions, which fall solely on workers.

For now, things are turning ever more Britalian. Tory MPs are in disarray—evident in a chaotic vote on fracking and rumours of more resignations—and again consumed by intrigue

about how long their prime minister can last. Ms Truss has become the human equivalent of *Larry the cat*, living in Downing Street but wielding no power. If (or rather, when) Tory MPs decide to bin her, they need to find a replacement themselves rather than outsourcing it to Conservative Party members. The odds of their feuding factions alighting on a unifying figure are low.

Spaghetti junction

The case for an early general election is becoming stronger as a result. It is unlikely to happen: why would Tory MPs vote for their own demise? The argument that Ms Truss or any successor lacks a mandate is flawed in a parliamentary system. But if Parliament is unable to produce a functioning government then it is time to go to the voters. That moment is drawing closer.

Holding elections has not resolved Italy’s problems. But there is reason to feel more hopeful about Britain, where political instability is now a one-party disease. The Tories have become nigh-on ungovernable, due to the corrosion from Brexit and the sheer exhaustion of 12 years in power. Ms Truss is right to identify growth as Britain’s biggest problem. Yet growth depends not on fantastical plans and big bangs, but on stable government, thoughtful policy and political unity. In their current incarnation the Tories cannot provide it. ■



Heat, Hope and Hydrogen

Using electricity to do things currently done with fossil fuels means generating more of it. If all America's cars were EVs and Americans drove as far in them as they drive today, the country's power consumption would rise by 28%. If just two of Germany's largest industrial sites—the Ludwigshafen complex run by BASF, a chemicals goliath, and the Duisburg plant run by ThyssenKrupp, a steel giant—were to run on currents not hydrocarbons, the country's electricity consumption would be increased by 15% at a stroke, says Klaus Schmitz of Arthur D. Little, a consultancy.

That is a daunting prospect for developing countries which do not have the capacity to meet today's demand. It is less worrying for countries like America, Germany and Japan where new capacity is affordable and grids are getting more sophisticated. But it is still a huge challenge. And there are still difficult decisions to be made about what is electrified directly and what is electrified indirectly with green hydrogen.

The cost of making hydrogen from renewables is high. But it is also plunging. The falling cost of renewable energy itself is being amplified by improvements in the technologies of hydrogen manufacture—notably the electrolysis apparatus in which water molecules are torn apart to make hydrogen and oxygen. Electrolysis apparatus are ripe both for innovation and for economies of scale. They may well be the next technology to shoot down a precipitous cost curve in the way that solar cells and batteries have. Emma Champion of BloombergNEF, a research firm, predicts that by the end of this decade green hydrogen will be cost-competitive with hydrogen from fossil fuels, even if it is made without CCS.

And it will keep going. Vinod Khosla, a venture capitalist with a longstanding interest in climate change, expects cheap renewables making cheapish hydrogen will lead to a booming market for the stuff. “If this path starts to work, our needs for electricity will grow hundreds of percent over our current forecasts for 2040, making solar even cheaper,” he predicts.

Such hydrogen will not, though, be a one-for-one replacement for natural gas in all applications. In high temperature turbines it makes sense. In domestic boilers it generally does not. Going from a natural-gas-fired boiler to a hydrogen-fired one may sound nice and likely to be minimally disruptive. But using electricity to make hydrogen to burn in a boiler is much less efficient than using it to run a heat pump.

Electric heat pumps are, in effect, air conditioners that run in reverse. The energy they use does not heat things up directly. Instead, it moves heat from one place to another, and moving heat can be more effective than producing it. A heat pump that heats a house using warmth from the ground beneath it can produce 400w of heating for every 100w of electricity consumed. Retrofitting houses with heat pumps can be costly and inconvenient, and the workforce needed to do so at scale does not exist. But it still seems more sensible than burning hydrogen, a process which always releases less energy than making the hydrogen required in the first place. For living spaces, workspaces and industrial processes requiring “low grade” heat, which is to say temperatures below that of boiling water, heat pumps look like the way to go.

This is a tall order. In a scenario designed to limit warming to 1.5°C above the preindustrial level produced by IRENA, a UN body devoted to renewable energy, the number of industrial heat pumps will have to rise from fewer than 1m in 2019 to 35m in 2030 and 80m in 2050. In buildings, it calls for growth from 53m in 2019 to 142m in 2030 and 290m in 2050.

For high-grade heat, above 500°C, hydrogen probably has the edge. And it will have other niches, too. One of the reasons that the chemicals and steel industries are locked into fossil fuels is that they make use of their chemistry—the way the carbon and hydrogen inside them react with things—as well as the energy stored up in them. Making iron from iron ore and then steel from iron requires chemistry as well as heat, and the steel industry has grown up relying on fossil fuels for both.

At a factory in Toledo, Ohio, Cleveland-Cliffs, the biggest supplier to the American automobile industry, uses natural gas to remove the oxygen from iron ore, producing briquettes of direct-reduced iron (DRI).

Hydrogen can do much the same job. Lourenco Goncalves, the firm's boss, says that replacing 30% of the natural gas with hydrogen would be easy if the plant had a reliable hydrogen source, and 70% could be achieved with limited modifications, slashing emissions by over 1million tons a year. Going hydrogen-only would be harder, but such plants are quite possible.

The DRI made in Toledo still goes into coal-fired blast furnaces. But it could be put into electric-arc furnaces (EAFs) which melt iron with electricity. The addition of some carbon to turn the iron to steel is still necessary; heat produced by fossil fuels is not. In the net-zero-emissions scenario published by the IEA in May around two-thirds of primary steel production in leading industrialized countries used the hydrogen DRI-EAF route by 2050. India's Tata Steel said last year that it would use this approach to green steel at a big plant in the Netherlands.

For a sense of the multifaceted, and integrated approach to energy infrastructure that climate action makes necessary and technology makes possible, come back to Berlin. Reuter West, one of the largest generators on the 50Hertz grid, is a large coalfired plant operated there by Vattenfall, a Swedish firm. By 2030 the firm hopes to have it running on natural gas and be hydrogen-ready.

The district-heating system which relies on the plant's hot water will be augmented with heat pumps. Hot water will be used for energy storage, too, in the form of a giant vacuum flask which can hold 56,000 tons of water at a couple of degrees below boiling.

Like all the paths forward in this report, the project is constrained by the history of what came before. It combines informed, perhaps idealistic, technical imagination with the kick-the-tyres conservatism of good engineering. It depends on the integration of technologies old and new to control immense flows of power. And it is a work in progress. If you want a mascot for the energy transition, you could do much worse.

How Will Elon Musk Use His Superpowers?

As the boss of Tesla, the world's most valuable carmaker, and SpaceX, the world's second-most valuable unicorn, Elon Musk is the stuff of business legend. As a gifted technologist with an enduring air of misfit adolescence he also has more than a whiff of the comic book about him. When he is talked about as an inspiration for Tony Stark in the "Iron Man" and "Avengers" movies, it is not just because he too is a fabulously rich, frequently irritating egotist with a savior complex. It is because he has every intention of using the remarkable technological capabilities under his control to change the future course of history.

Mr. Stark wanted to put a suit of artificially intelligent armor around the world. Mr. Musk wants to help stabilize its climate (hence his focus on electric cars) and to establish an outpost of civilization on Mars (hence the rockets, one of which sent four astronauts to the International Space Station on October 5th). To help fund the Mars effort, SpaceX launched Starlink, a huge constellation of satellites that provide internet access to isolated users. Meanwhile, Mr. Musk said on October 3rd that he would, after all, buy Twitter, a social-media platform—a move he portrays as a civilization-preserving defense of free speech (see Business section).

Given Mr. Musk's desire to change the future, it is hardly surprising to see him using the powers he is accruing to intervene in the present, too. After the invasion of Ukraine, SpaceX sent Starlink terminals and switched on satellite coverage. Ukraine has been vocal in its gratitude for this intervention, which helped its cities restore vital services and its forces prevail on the battlefield (see Briefing). But it was less thrilled when Mr. Musk took to Twitter this week to suggest a "peace plan" that would give Crimea to Russia, and possibly other occupied territories, too. Volodymyr Zelensky, Ukraine's president, asked his own 6.7m followers whether they preferred a pro-Ukraine Mr. Musk or a pro-Russia one—a reminder, if one were needed, of Twitter's influence in shaping global perceptions of the war.

The fact that Mr. Musk can, in a single week, get into a Twitter spat with the president of Ukraine, in an online discussion forum that he has just agreed to buy, while also sending people into orbit, demonstrates the extent to which his growing technological superpowers have granted him geopolitical clout. Should that be cause for admiration or concern?

In themselves, Mr. Musk's political musings on Twitter matter little. But given the platform's important role in the febrile world of politics, his decisions about Twitter itself (such as whether to reinstate Donald Trump's access), will matter a lot more. So will decisions about Starlink. Whatever your politics, it is worrying that one man can choose whether to extend internet access to anywhere on Earth, can decide who can use it—and can turn it off at will.

There is no commercial case against Mr. Musk's accumulation of power. Starlink is not a monopoly; nor is SpaceX's satellite-launch business (though it is currently the West's only option for launching astronauts into orbit); nor is Twitter. But all three have global importance, and will do for some time to come.

Mr. Stark's attempt to put armor round the Earth led to its near destruction; the chastened billionaire subsequently accepted U.N. oversight. Mr. Musk seems unlikely to follow suit. Comic-book fans must hope instead that he takes to heart the wisdom imparted to Peter Parker, aka Spider-Man: "With great power comes great responsibility." As Robert Caro observed in response to Lord Acton's famous dictum, power may not always corrupt, but it always reveals. What Mr. Musk's power reveals will bear close inspection.

Nap Like a Genius

Thomas Edison was famously opposed to sleeping. In an 1889 interview published in *Scientific American*, the ever energetic inventor of the lightbulb claimed he never slept more than four hours a night. Sleep was, he thought, a waste of time.

Yet Edison may have relied on slumber to spur his creativity. The inventor is said to have napped while holding a ball in each hand, presuming that, as he fell asleep, the orbs would fall to the floor and wake him. This way he could remember the sorts of thoughts that come to us as we are nodding off, which we often do not recall.

Sleep researchers now suggest that Edison might have been on to something. A study published recently in *Science Advances* reports that we have a brief period of creativity and insight in the semilucid state that occurs just as we begin to drift into sleep, a sleep phase called N1, or nonrapid-eye-movement sleep stage 1. The findings imply that if we can harness that liminal haze between sleep and wakefulness—known as a hypnagogic state—we might recall our bright ideas more easily.

Inspired by Edison, Delphine Oudiette of the Paris Brain Institute and her colleagues presented 103 participants with mathematical problems that had a hidden rule that allowed them to be solved much faster. The 16 people who cracked the clue right away were then excluded from the study. The rest were given a 20-minute break period and asked to relax in a reclined position while holding a drinking glass in their right hand. If it fell, they were then asked to report what they had been thinking prior to letting go.

Throughout the break, subjects underwent polysomnography, a technology that monitors brain, eye and muscle activity to assess a person's state of wakefulness. This helped to determine which subjects were awake rather than in N1 or if they were in N2—the next, slightly deeper phase of our sleep.

After the break, the study subjects were presented with the math problems again. Those who had dozed into N1 were nearly three times more likely to crack the hidden rule as others who had stayed awake throughout the experiment—and nearly six times more likely to do so as people who had slipped into N2. This “eureka moment,” as the authors call it, did not occur immediately. Rather it happened after many subsequent attempts to solve the math problem, which is consistent with previous research on insight and sleep.

It's less clear that Edison's technique of dropping objects to ward off deeper sleep works. Of the 63 subjects who dropped the glass as they drowsed, 26 did so after they had already passed through N1 sleep. Still, the findings suggest that we do have a creative window just before falling asleep.

Oudiette says that, like Edison, her personal experience with sleep inspired the study. “I've always had a lot of hypnagogic experiences, dreamlike experiences that have fascinated me for a long time,” she says. “I was quite surprised that almost no scientists have studied this period in the past two decades.”

A study published in 2018 found that a brief period of “awake quiescence,” or quiet resting, increased the odds of discovering the same mathematical rule used in Oudiette's experiment. And psychologist Penny Lewis of Cardiff University in Wales suggests that both rapid-eye-movement (REM) sleep—the phase in which our eyes dart back and forth and most dreams occur—and non-REM sleep work together to encourage problem-solving.

Yet for the most part, Oudiette is not aware of any other research specifically looking at the influence of sleep onset on creativity. She does, however, point to plenty of historical examples of this phenomenon.

“Alexander the Great and [Albert] Einstein potentially used Edison's technique, or so the legend goes,” she says. “And some of the dreams that have inspired great discoveries could be hypnagogic experiences rather than night dreams. One famous example is the chemist August Kekulé finding the ring structure of benzene after seeing a snake biting its own tail in a ‘half-sleep’ period when he was up working late.” Surrealist painter Salvador Dalí also used a variation of Edison's method: he held a key over a metal plate as he went to sleep, which clanged to wake him as he dropped it, supposedly inspiring his artistic imagery.

“This study gives us simultaneous insight into consciousness and creativity,” says Adam Haar Horowitz of the M.I.T. Media Lab, who has devised technology to interact with hypnagogic states but did not collaborate with Oudiette’s team. “Importantly,” he adds, “it’s the kind of study that you can go ahead and try at home yourself. Grab a metal object, lie down, focus hard on a creative problem, and see what sort of eureka moments you can encounter.”

For University of California, Santa Barbara, psychologist Jonathan Schooler, who also was not involved with the project, the study does not necessarily prove that just anyone will be able to mine their creativity during this early phase of somnolence. As he points out, “residing in the ‘sweet zone’ might have also simply refreshed the study participants, making it easier for them to solve the problem later.” But Schooler acknowledges there may be something very solid in the study’s findings. “The new results suggest there is a creative sleep sweet spot during which individuals are asleep enough to access otherwise inaccessible elements but not so far gone the material is lost,” he says.

Despite its reputation as the brain’s period of “shutting off,” sleep is, neurologically speaking, an incredibly active process. Brain cells fire by the billions, help to reactivate and store memories, and, it seems, allow us to conjure our mental creations.

Oudiette hopes not only to confirm her findings in future research but also to determine if focusing on our hypnagogic state might help solve real-world tasks and problems by harnessing the creative potential of that liminal period between sleep and wakefulness. Additionally, she and her group are considering the potential of brain-computer interfaces to precisely identify brain-wave patterns associated with the onset of sleep, allowing the precise identification of when people should be woken up during their moments of putative insight.

“We could even teach people how to reach this creative state at will,” Oudiette envisions. “Imagine playing sounds when people are reaching the right state and other sounds when they are going too far into sleep. Such a method could teach them how to recognize the creative state and how to reach it.”

Experimental Alzheimer's Drug May Have Contributed to Death of Study Participant

By Jen Christensen, CNN

A monoclonal antibody treatment for Alzheimer's disease that showed promise in a Phase 3 trial may have contributed to a study participant's death, according to an adverse events report obtained from digital health publication Stat.

Eisai, the company that makes the experimental drug lecanemab, said in a statement to CNN on Friday that because of patient privacy issues, it could not provide specific information about patients or comment on information from other sources.

Stat reported that an investigator on the study told Eisai about the death and that it was a result of bleeding in the brain. The investigator had concluded that the bleed was related to the drug, but the company pointed to other possible factors.

The company told Stat that there was "at least a reasonable possibility lecanemab may have contributed to the" hemorrhage. Other factors may have been the participant's "multiple falls, a heart attack, a respiratory infection, and mini-stroke-like events," according to Stat. The participant in question was also on blood thinners for a heart condition, according to the adverse events report Stat says it reviewed. Stat says the death is still being investigated.

"STAT News was accurate overall in how difficult it can be to determine the specific cause of death in any given patient, in particular when they are elderly and have multiple medical problems," Eisai's statement said.

The company said it has created a rigorous safety monitoring process to make sure participants are safe, including an independent data safety monitoring committee of outside experts, and said it promptly communicated safety information to investigators, regulators and participants.

The company added that in Phase 2 of the trial, the rate of deaths in participants who received the drug "was no more frequent" than in those who got a placebo.

"The well-being of the patients enrolled in our clinical studies is always Eisai's top priority," the statement says.

Dixie Ecklund, president-elect of the Society for Clinical Trials, acknowledged that deaths can certainly happen in the course of testing a new drug but thinks trials remain crucial "because with scientific rigor, you can design trials well and get answers and then make a difference in our society." Ecklund is not affiliated with Eisai and was not involved in the trials.

She points to the importance of an outside data safety monitoring board with this trial, as these boards are "very particular about scientific rigor."

"There are lots of checks and balances built into clinical trial industry in the United States between the FDA and NIH, peer review, and all those things can lead to the ability for an individual to make a responsible assessment."

In September, Eisai reported preliminary results from the trial that found the treatment slowed the progression of cognitive decline by 27% compared with a placebo.

It also met all secondary endpoints, showing "target engagement" with reduced amyloid levels – a protein that is one of the hallmarks of Alzheimer's – and positive effects on cognition and the ability to perform everyday tasks when compared with a placebo.

The company said at the time that it believed that the study results "prove the amyloid hypothesis, in which the abnormal accumulation of [amyloid beta] in the brain is one of the main causes of Alzheimer's disease."

Dr. Richard Isaacson told CNN in September that this is not proof *per se* but that the trial was significant. Isaacson is the director of the Alzheimer's Prevention Clinic in the Center for Brain Health at Florida Atlantic University's Schmidt College of Medicine.

“In the past, reducing amyloid in the brain has not always been tied to cognitive improvements or any meaningful clinical improvements. In this study, every endpoint was positive. That’s never happened before.”

The early results showed that nearly 3% of the trial participants who took the drug had a side effect called ARIA-E, swelling in the brain, but no one who took the placebo did.

The rate of symptomatic ARIA-H, brain bleeding and iron buildup in tissue, was 0.7% in the drug group and 0.2% in the placebo group.

Eisai will present the results from the drug trials at the Clinical Trials on Alzheimer’s disease conference in late November.

Eisai, which is working with the company Biogen, said they plan to publish the results in a peer-reviewed journal and seek approval from US regulatory authorities by the end of March.

Beware Elon Musk's Takeover of Twitter

There is obviously a danger that large job cuts would undermine the site's ability to moderate its content.

Elon Musk's statements regarding his recent purchase of Twitter suggest that he either doesn't understand what he is getting into or is being disingenuous.

On Thursday, Elon Musk completed a forty-four-billion-dollar purchase of Twitter, which he and a group of investors are financing, and, by the end of day, he had fired at least four of the social-media company's top executives. These abrupt moves came barely a day after Musk walked into Twitter's San Francisco headquarters carrying a bathroom sink, and then posted a video of his arrival, along with the message "Entering Twitter HQ—let that sink in!"

In a note to Twitter's advertisers that he posted on Thursday, Musk described the takeover as a philanthropic venture designed to "help humanity, whom I love." Repeating some of the themes that he has raised since launching the takeover bid, back in April, he also wrote, "The reason I acquired Twitter is because it is important to the future of civilization to have a common digital town square, where a wide range of beliefs can be debated in a healthy manner, without resorting to violence."

On the face of it, this sounded like a commendable statement. In actuality, though, the phrase "common digital town square" is an oxymoron, which suggests that he either doesn't understand what he is getting into or is being disingenuous. Standing on a soapbox in a town square, the delirious ranter, or even the genuine prophet, can reach a few hundred people. Twitter is a global communications platform, on which celebrities—including Musk himself—can reach tens of millions of people; where online mobs (some of them carefully orchestrated) can target individuals relentlessly; and where bad actors, such as political extremists, terrorists, and rogue intelligence agencies, can plant misinformation to sow hatred and violence.

In terms of human history, social-media platforms represent something radically new, and we are still learning about the impact that they have on people's cognitive-processing abilities, emotions, and behavior. But if the events of the past decade—including the U.S. elections of 2016 and 2020, along with the pandemic—have taught us anything, it's that these platforms can potentially be destructive of truth, democracy, and the very humanity that Musk claims to hold dear.

In his message to advertisers, he did implicitly acknowledge some of these dangers, writing, "Twitter obviously cannot become a free-for-all hellscape, where anything can be said with no consequences! In addition to adhering to the laws of the land, our platform must be warm and welcoming to all, where you can choose your desired experience according to your preferences, just as you choose, for example, to see movies or play video games ranging from all ages to mature." But what did that passage mean in practical terms?

In recent years, all the big social-media companies, Twitter included, have, under public pressure, invested in content-moderation policies, which employ artificial-intelligence programs and actual humans to search out posts and users that violate the platforms' terms-of-service agreements. On paper, Twitter's rules are quite strict. They say that users can't use the platform to "threaten violence against an individual or a group of people," nor promote the "glorification of violence," nor "promote terrorism or violent extremism," nor "encourage suicide or self-harm," nor "engage in the targeted harassment of someone, or incite other people to do so," nor "harass other people on the basis of race, ethnicity, national origin, caste, sexual orientation, gender, gender identity, religious affiliation, age, disability, or serious disease."

It was on the basis of these rules that Twitter, two days after the January 6th assault on the Capitol by supporters of Donald Trump, issued a permanent ban to the former President's account "due to the risk of further incitement of violence." Musk's insistence on "free speech" and his claims of "left bias" in Twitter policies have sparked concern that he would loosen content-moderation standards and let Trump back onto the platform. Such a move would likely be accompanied by the return of many other right-wing incendiaries

and disinformation merchants. Yet, according to some reports, Musk has told prospective investors that he intends to slash Twitter's workforce by nearly three-quarters. Although he reportedly denied that figure in a meeting with Twitter employees, there is obviously a danger that large job cuts would undermine the site's ability to moderate its content.

Edwin Chen, a data scientist who was formerly in charge of Twitter's spam and health metrics, told the *Washington Post* that huge layoffs would have "a cascading effect" on the site, putting its users at heightened risk of having their accounts hacked or being exposed to harmful material, such as child pornography. Another former employee raised doubts about Twitter's ability to stem the spread of falsehoods before the November 8th midterms. "Given the rapid growth in the scale of disinformation since 2020, it's reasonable to doubt whether they can keep up," Edward Perez, a former product director for civic integrity, said.

How will Musk reconcile these warnings with his stated intention to run a Twitter that promotes the common good? So far, he hasn't given an explanation. Another important issue that he hasn't addressed is whether there will be any changes in how Twitter deals with authoritarian countries that censor social media or mount disinformation campaigns on it; among the worst offenders are China and Russia, to whom Musk has business ties through his other companies. China is a major manufacturing center and product market for Tesla; Russia is an important source of raw materials used in the manufacture of electric cars, including lithium, aluminum, and nickel. Earlier this month, Musk tweeted out a peace proposal for Ukraine that included formally ceding Crimea to Russia. According to Ian Bremmer, the head of the Eurasia Group consulting firm, Musk told him that he had spoken to Vladimir Putin about Ukraine. (Musk subsequently denied this, saying that he had only spoken to Putin once, eighteen months ago, about space.)

The optimistic case for Musk's purchase is that, since he is reportedly investing tens of billions of dollars of his own money, he has a strong incentive to make a financial success of it, and this wouldn't be consistent with allowing the platform to turn into even more of a cesspit. To his credit, Musk has demonstrated a strong record of innovation at his other companies, and some of the proposals that he has floated for Twitter—such as eliminating spam or fake accounts; expanding subscriptions; and giving users more leeway to edit their tweets, or post longer ones—seem reasonable.

The pessimistic case is that Musk, in downplaying the dangers of adopting a laissez-faire approach to content, is being naïve, or that, despite his public assurances, he isn't operating in good faith. While he claims to be a political centrist and a responsible new owner of Twitter, some of his own tweets have targeted individuals for abuse or echoed right-wing memes. In 2018, he called a British diver who was involved in a rescue operation to save a group of Thai boys "pedo guy." (In a subsequent court case, Musk apologized and was cleared of defamation.) In April, 2020, during the initial coronavirus lockdowns, he tweeted, "FREE AMERICA NOW." Earlier this year, he said that he had voted Republican for the first time, supporting Mayra Flores, a conservative Texas congresswoman who won a special election in June. He also said that he was leaning toward supporting Florida's Republican governor, Ron DeSantis, in 2024.

Musk is entitled to his political views, of course. But the world's richest man now runs one of the world's most powerful social-media platforms, and, since he is taking the company private, he won't be answerable to public shareholders. That alone is an alarming development. Nobody should take it on trust that the outcome will be a benign one.

Republican Senate Staff Tout Lab-leak Theory of The Pandemic's Origin

The mysterious origin of the COVID-19 pandemic, like so many aspects of the response to it, has created deep divides along party lines in the United States. Today, the Republican minority staff of a bipartisan Senate committee set up to probe the origin of SARS-CoV-2 issued an “interim report” arguing for the narrative that the virus entered humans because of a lab-related incident and not a natural jump from animals to humans. Many virologists and evolutionary biologists who have studied the origins of outbreaks dismiss the lab-leak hypothesis, but other scientists have complained that the possibility was too readily downplayed, and it has become increasingly popular among conservative media outlets and some Republican politicians.

“Based on the analysis of the publicly available information, it appears reasonable to conclude that the COVID-19 pandemic was, more likely than not, the result of a research-related incident,” the minority staff concludes in its 35-page report. That conclusion stands in sharp contrast to those of other panels, including from the World Health Organization and U.S. intelligence agencies, which have deemed a zoonotic jump more likely or remained neutral given the lack of direct evidence on the origin of the virus.

Senator Richard Burr (R–NC), the ranking member of the Senate’s Committee on Health, Education, Labor, and Pensions (HELP), wrote in a forward to the report that the minority oversight staff spent 15 months reviewing scientific studies and interviewing experts. The goal, Burr wrote, was “to provide a clearer picture of what we know, so far, about the origins of SARS-CoV-2 so that we can continue to work together better prepared to respond to future public health threats.”

Michael Worobey, an evolutionary biologist at the University of Arizona who has co-authored scientific reports examining data from the early days of the pandemic that provide some of the strongest support for a jump from animals to humans, speculates that the timing of the report’s release could be “a cynical effort to try to win Republican votes” in the upcoming midterm congressional and state elections. Or, Worobey says, “it could just be a bunch of staffers with no ability to understand the science who stumbled across a bunch of misinformation and disinformation-filled tweets.” (“Senator Burr felt enough compelling, open-source information had been gathered during staff’s comprehensive review of the facts that an interim report was appropriate,” a senior aide to the minority staff told Science.)

Worobey’s origin papers, which argue for a zoonotic jump at a market in Wuhan, China, come in for significant criticism in the report, to which he responded today in a Twitter thread to two reporters who sent him questions based on a draft of the report they apparently obtained in advance of its release. “These comments are either intentionally misleading or the result of honest misunderstandings, perhaps due to a failure to read our papers, which address these issues in great detail,” Worobey wrote. (Two of his most closely scrutinized papers were recently published by Science.)

The report recounts many details discussed at length in the media and the scientific literature since SARS-CoV-2 emerged in Wuhan in late December 2019. It focuses intense attention on the Wuhan Institute of Virology (WIV), which has a long record of studying bat coronaviruses, some of which have similarities to SARS-CoV-2. Those who argue for a lab-related release often suggest that WIV scientists either conducted experiments that created the virus or obtained it in the wild. They suspect it then escaped somehow, causing the first cluster of cases at the Wuhan market.

No direct evidence has surfaced that WIV had a version of SARS-CoV-2 in its lab or did such genetic engineering, but supporters of the lab leak scenario cite circumstantial evidence and suspicious patterns, which the report recounts in detail. It emphasizes the lack of transparency from the Chinese government and putative biosecurity lapses at the WIV labs with equipment such as air ducts.

As for the natural spillover theory, the report repeatedly emphasizes that no direct evidence exists that an animal sold at the Wuhan market or farmed in China was infected with a virus similar to SARS-CoV-2

prior to the pandemic. “While the absence of evidence is not itself evidence, the lack of corroborating evidence ... three years into the pandemic, is highly problematic,” it reads.

One section of the minority staff report focuses on a detail that has not received much attention to date: that Chinese scientists tested the first experimental COVID-19 vaccines in humans a month earlier than similar candidates developed through the U.S. government’s crash program Operation Warp Speed. The Chinese vaccines used a different technology from the first U.S. vaccines, but all depended on the genetic sequence of SARS-CoV-2. The speed of the Chinese vaccine effort leads the report to ask whether Chinese researchers had access to that sequence prior to the rest of the world. The report, however, doesn’t address whether other factors could explain the rapid pace, such as the urgency of the outbreak in China or different regulatory environments.

Senator Patty Murray (D-WA), who chairs the Senate HELP committee, issued a statement today that did not comment on the report’s content or the timing of the release. “The HELP Committee is continuing bipartisan work on this oversight report,” Murray’s statement said.

In Defense of Online Anonymity

BY MICHAEL LUCA

Anonymity on the internet has gotten a bad rap lately, and for good reason. The shield of anonymity has contributed to a toxic online ecosystem that is too often marred by cyberbullying, misinformation and other social ills. Removing anonymity has the potential to foster accountability and trust. This is not lost on tech executives, some of whom have enthusiastically advocated the removal of anonymity over the past decade. As early as 2010, Facebook’s marketing director argued that “online anonymity has to go away.” Airbnb CEO Brian Chesky echoed this sentiment in a 2013 interview, arguing that “When you remove anonymity, it brings out the best in people.”

But this overlooks an important fact: The internet needs some anonymity. To see why, consider the evolution of online marketplaces. Early marketplaces like eBay enabled arm’s-length transactions between buyers and sellers with a platform in the middle. This led to gains not only in economic efficiency but also, in some cases, equity. The relatively anonymous nature of online transactions removed markers of race, gender and other factors that sometimes were used to discriminate against customers in conventional transactions.

It isn’t that discrimination can’t occur on platforms like eBay—it can and, when race is evident, it does. In one 2015 experiment published in the Rand Journal of Economics, Yale and Harvard professors Ian Ayres, Mahzarin Banaji and Christine Jolls sold 394 baseball cards on eBay, varying only the color of the hand holding the cards. The researchers found that baseball cards held by darker hands sold for about 20% less than equivalent cards held by lighter hands. Still, it’s relatively rare to see such markers of race on eBay because of the way it and many other sites were designed to function. Sellers often use account names such as “shop123,” and pictures of sellers are not the norm.

On Airbnb, however, hosts were allowed to reject guests based on little more than their name and picture. Airbnb viewed this as a simple way to build trust among guests but failed to take note of the potential harm. As an economist studying the design of markets and platforms, I concentrate on whether companies are creating ecosystems that are both efficient and inclusive. My collaborators Ben Edelman, Dan Svirsky and I set out to understand the implications of Airbnb’s design choices. In 2015 we conducted an audit study, building on an approach used to analyze labor markets and offline rental markets. We sent identical booking requests to thousands of hosts, varying only the user’s name—using some names that birth records show to be more common among Black Americans and other names that are more common among white Americans. We found that the Black “guests” were roughly 16% less likely to be accepted, and the discrimination was similar whether hosts had only a single listing or multiple ones.

In response to our research, Airbnb commissioned a task force and then gradually reintroduced anonymity at various steps in the process. Since 2018, hosts have been required to make a decision about whether to accept or reject a guest before seeing their picture. In Oregon, the site has been spurred to go further by a lawsuit from Airbnb customers there who alleged discrimination on the basis of their names. Since January, the names of Oregon based guests are no longer disclosed before owners accept their bookings.

Anonymity has the potential to reduce discrimination more broadly, including in the hiring process. For example, software developed by a firm called Applied allows hiring managers to look at responses to structured questions without seeing the names of applicants. The goal is to help hiring-managers focus more on substance and to remove the biases that might otherwise creep into their decisions.

A lack of anonymity can discourage honest discussion in online reviews and other contexts. A 2015 working paper by business professors Chris Nosko and Steve Tadelis found that eBay shoppers whose identities were visible were reluctant to leave feedback reflecting a negative experience. Allowing ratings to be anonymous and shown only in aggregate can allow people to be more candid, especially for interactions in which buyers and sellers are working closely together.

Job boards like Blind allow people to post questions and to share information anonymously. It’s hard to imagine people candidly and publicly sharing their salaries and questions without the ability to remain

anonymous. A growing body of behavioral economics research has shown that even though people say they want privacy, they can at times be nudged to volunteer information. But just because companies can get that result, it doesn't mean they should.

Of course, anonymity needs to be implemented thoughtfully and comes with its own risks; the same anonymity that can help to protect honest feedback might protect illegitimate feedback as well. My research with Giorgos Zervas, published in the journal *Management Science* in 2016, found evidence of businesses extensively engaging in fake reviews, enabled in part by the shield of anonymity. Work by economists Dina Mayzlin, Yaniv Dover and Judy Chevalier, published in the *American Economic Review* in 2014, found that fake reviews are more common when there is less verification of reviews. Anonymity can also make us feel more disconnected even while exchanging views.

Still, some companies have realized that they missed the mark by underappreciating the value of anonymity. Reflecting on Airbnb's struggles with discrimination, Mr. Chesky acknowledged as much at a 2016 tech conference, saying, "As a founder, I think we were late to this issue." Companies need to be more thoughtful about when to have targeted anonymity and when to encourage more public interactions. Policy makers also need to take note of the unintended consequences of having too much information on the internet. And for users, it's important to understand when and how we want to be present, and when we'd like to preserve our privacy.