Union of Concerned Scientists

{C Catalyst

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50 YEARS of SCIENCE and ACTION

[Union of Concerned Scientists]

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The Union of Concerned Scientists puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with people across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe, and sustainable future.

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The Next 50 Years

The author addresses attendees of the Union of Concerned Scientists' 50th-anniversary celebration in February at the California Academy of Sciences in San Francisco, one of four events planned for 2019.

By Ken Kimmell

At the Union of Concerned Scientists, we feel well-earned pride this year as we reflect on accomplishments that now span a half-century. But we're not taking our eyes off the immense amount of work that lies ahead. The past two years have often seemed like an all-out assault on science, reason, facts, and our democracy, and a political moment of great peril. But there are also many hopeful signs.

The midterm elections have ensured a return to the checks and balances on power that the Constitution envisions. The House of Representatives can conduct meaningful oversight of the Trump administration's suppression of science (see more on p. 12)—and UCS will provide input. State commitments to clean energy, led by California's pledge to generate electricity from 100 percent carbon-free sources by 2045, are truly inspiring. And the recent commitment of nine states to curb transportation emissions (see p. 4) marks a powerful, bipartisan step in combating climate change.

As we plan for the years ahead, we're focusing our work where UCS can have the most impact. Scientists say we have little more than a decade to break our dependence on fossil fuels, and there is not a minute to lose in this transition to a clean energy future. We are working toward this goal on all fronts, including planning landmark federal climate legislation to implement quickly after the next election, mobilizing a wide and diverse constituency to support it, and ensuring it includes policies that address the pollution that disproportionately impacts the most vulnerable communities.

We also plan to redouble our efforts on an issue that galvanized our founders to form UCS 50 years ago—the threat of nuclear weapons. The stakes could hardly be higher, given the president's plans to build new weapons systems and abandon arms control treaties, the continued threat from North Korea, and the potential for a new, destabilizing arms race. Finally, building on the recent passage of the federal farm bill, we'll be pressing hard toward our long-term vision of a food system that is sustainable, healthy, affordable, and fair.

In all this work, we look forward with confidence that, with your active support, our most important victories are ahead of us.

Photo: Reny Preussker

WHAT OUR MEMBERS ARE SAYING

Here's a sampling of recent feedback from the UCS Facebook page (*www.facebook.com/unionofconcernedscientists*) and Twitter feed (*www.twitter.com/ucsusa*).

ON THE TRUMP ADMINISTRATION IGNORING THE NATIONAL CLIMATE ASSESSMENT

Roxanne Bittman:
It's as if they think shifting the focus to look less dire will change the outcome. It won't.

Heath Moody:
Or they understand and just don't care because they don't feel like they'll be around to deal with the consequences. That's how self-serving it seems like these people are.

William Simpson:
When will the attacks on scientists and scientific studies end?

Yves Archambault:
Fortunately, there are a lot of hardworking people at the state and municipal levels who have a clear vision of what has to be done.

ON KOCH-FUNDED ATTACKS ON THE FEDERAL ELECTRIC VEHICLE TAX CREDIT

Marged Wakeley:
Every improvement in auto safety and pollution has been fought tooth and nail, since the beginning.

Tony Peters:
Koch can't stop it! The carmakers already know where this is going. Oil burners are dinosaurs!

Linda Khandro:
The future of transportation is fraught with complex challenges. But nothing positive will happen if we do not make it happen, even if it seems like one slow baby step at a time.

@Suzwarto:
Over $152 million to kill the EV tax credit? They want fewer electric cars, increased global warming, and more air pollution and health problems so they can be richer. Awful!

ON THE USDA PLAN TO MOVE TWO RESEARCH OFFICES AWAY FROM WASHINGTON, DC

Paul R. Cordeiro:
Wow. This is worse than anyone can imagine. The USDA is the main reason farmers are so successful. Data science saves lives. This administration is purposely deconstructing what keeps us safe.

Nancy Federman Kaplan:
Completely consistent with this gang's general war on science, across all departments.

Nancy Christine Winne:
Because when you appoint people devoid of education and experience, the only purpose can be for destroying the very system they head.

[IN THIS ISSUE]

8 **50 Years of Science and Action**
UCS celebrates a half-century of activism

14 **Art for Science Rising**
Our innovative project uses art to remind voters why science matters

2 *First Principles*
The Next 50 Years

3 *Observations*

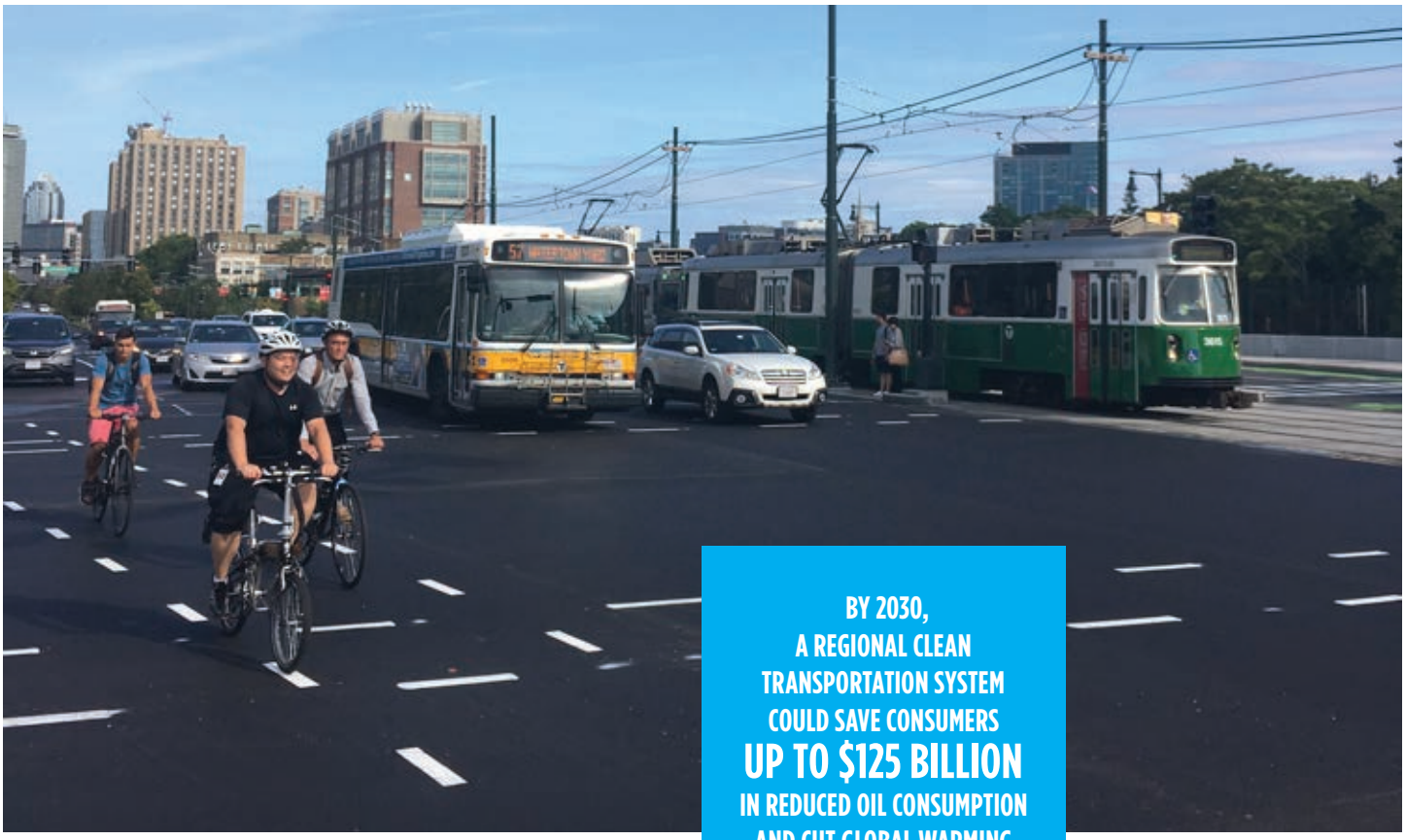
4 *Advances*

12 *Inquiry*
Interview with Gretchen Goldman

18 *Then and Now*
How UCS Helped Cut a *Half Billion Tons* of Carbon Emissions

22 *Final Analysis*
The Nuclear Dilemma: Plant Closures and Climate Reality

In Big Win, States Commit to Work Together for Clean Transportation



BY 2030, A REGIONAL CLEAN TRANSPORTATION SYSTEM COULD SAVE CONSUMERS UP TO $125 BILLION IN REDUCED OIL CONSUMPTION AND CUT GLOBAL WARMING EMISSIONS BY NEARLY 40 PERCENT BELOW 1990 LEVELS.

Late in 2018, leaders from nine Northeast and Mid-Atlantic states and Washington, DC, jointly announced the launch of an ambitious bipartisan effort to create a regional "cap-and-invest" transportation policy that will place a regional cap on global warming emissions from transportation while generating funds to invest in safe, sustainable, equitable transportation for all.

Not only does transportation in the United States tend to be outdated, inefficient, and inequitable, the sector is also the largest source of global warming emissions. By taking advantage of ample opportunities for modernization and emissions reductions, these states are setting a precedent for similar initiatives across the country.

This milestone marks the culmination of years of work by Union of Concerned Scientists staff. Our engineers and analysts showed decisionmakers how their states could cut transportation emissions. Our campaign staff facilitated meetings and traveled throughout the region building support and soliciting input from the communities most affected by air pollution from cars and trucks. And as the states hammer out the details of their joint policy, UCS is staying involved, helping to keep science and equity at the center of the policy as it evolves.

In recent years, UCS has urged supporters like you to stay hopeful despite the absence of federal leadership on climate change, as we shifted our strategy to focus on regional and state progress. You trusted that we could make it happen and stayed with us—and we're delighted to share this big win with you. For more information about the initiative, visit *www.ucsusa.org/timeforanupgrade*.

Photo: Eleanor Fort/UCS

New UCS Report Spotlights Anti-Science Leadership at the Department of the Interior

Internal documents show that, at the behest of mining and drilling companies, former DOI Secretary Ryan Zinke persuaded President Trump to shrink Bears Ears National Monument, shown here, by 85 percent—the largest reduction of public land in US history.

Ever since Ryan Zinke was appointed to lead the Department of the Interior in March 2017, UCS paid close attention to the many ways he led his agency away from its mission to protect public lands and waters, and toward a pattern of ignoring, sidelining, and attacking science at the expense of public health and safety.

Our report *Science under Siege at the Department of the Interior* (December 2018) compiles a record of the most egregious anti-science policies and practices carried out under Secretary Zinke prior to his resignation, including giveaways of public lands to his friends in the fossil fuel industry, reassignments of politically inconvenient senior staff, and his systemic failure to act on or even acknowledge climate change. This report not only created a compelling case for Zinke's dismissal, but will be of use to UCS and our allies in the public lands community as we seek to hold a new administrator accountable and repair the damages of Zinke's tenure.

The report has been blogged about by *Scientific American*, tweeted about by Leonardo DiCaprio, featured in the *Los Angeles Times,* and was even covered in the *Missoula Current* in Zinke's home state of Montana. Read the report, which includes recommendations for policymakers and voters on how to keep the DOI accountable, at *www.ucsusa.org/ScienceUnderSiege.*

UCS Pursues Clean Energy Opportunities in Illinois

UCS worked behind the scenes a few years ago to support a standard requiring Illinois' electric utilities to obtain 25 percent of their energy from renewable sources by 2025. The standard is on track to reduce carbon emissions 22 percent by 2030.

That was good progress, but according to new UCS analysis, the state could do better—a lot better. How? By ending subsidies for six unprofitable and polluting coal plants in central and southern Illinois, and creating more incentives for renewable energy development.

The UCS report (online at *www.ucsusa.org/soottosolar*) found that replacing these plants with a combination of energy efficiency and solar and wind power would slash carbon emissions as much as 48 percent. It would also save ratepayers money and prevent nearly 1,000 premature deaths, 600 heart attacks, and 400 serious asthma attacks by significantly reducing soot, sulfur dioxide, and nitrogen oxide emissions.

"If Illinois wants to be a climate leader, protect its residents' health, and clean up its air," says Jessica Collingsworth, report coauthor and lead UCS Midwest energy policy analyst, "it must close more coal plants and close them faster."

Photos: Bob Wick/BLM (Bears Ears); Archigeek/Creative Commons (Flickr) (Illinois)

Announcing the 2018 UCS Science Defenders

UCS is proud to announce the 2018 Science Defenders—five individuals and groups who have taken a courageous stand in a hostile political climate.

PROTECTING THE PUBLIC BY STANDING UP FOR SCIENCE

Federal scientists, including AFGE Local 704: Many government scientists are resisting Trump administration policies that could harm the public, and the American Federation of Government Employees Local 704 has been particularly outspoken.

"What we ask of our members," says President Michael Mikulka, "is to empower themselves through the union to take a stand. It takes more than one person to do the right thing."

ENGAGING SCIENTISTS TO REBUILD

Ciencia Puerto Rico: After Hurricane Maria, this science education organization launched the Puerto Rico Science and Policy Action Network (PR-SPAN), made up of science and health professionals on the island and abroad who want rebuilding efforts to be based on science.

"We're contributing to the reconstruction of the island by giving scientists a seat at the table," says PR-SPAN cocreator Zulmarie Perez Horta.

WORKING TO BRING SCIENCE BACK INTO POLICYMAKING

David Daggett: When President Trump appointed a climate change denier to lead the EPA, Daggett was appalled—then motivated. He co-organized the Olympia, Washington, March for Science. He testified at the state capitol. He ran for the Washington House of Representatives and nearly won.

"I'd never thought about running for office," he says. "I was an engineer. But it's important for us to counter the bias against science."

STANDING UP FOR UNDOCUMENTED STEM STUDENTS

Evelyn Valdez-Ward: Valdez-Ward never doubted she would attend college, until she learned a painful truth: her family was undocumented. Deferred Action for Childhood Arrivals (DACA) had allowed Valdez-Ward to begin her academic career. When President Trump issued an executive order revoking DACA, Valdez-Ward published an op-ed in *Science* supporting DACA recipients.

"I chose to stand up and fight for my rights to science," she says.

LEADING SCIENTISTS TO ADVOCATE FOR CHANGE

Maryam Zaringhalam: The group 500 Women Scientists was founded to support science and scientists after President Trump's election. Co-led by Zaringhalam, it now has about 300 chapters worldwide that hold events, work on local science policy issues, mentor young people, and more.

"What we're advocating for is changing the idea of what a scientist looks like, and how she can use her expertise," Zaringhalam says.

Illustration: House9 Design; Photos: ZUMA Press Inc./Alamy Stock Photo (bus); Muriel Cooper (book cover); Umit Gulsen (video still)

UCS Advocacy Helps California Buses Go Electric

Los Angeles was one of the first California cities to commit to 100 percent electric buses in its fleet.

UCS scientists and analysts have produced many reports on the benefits of electrifying large vehicles such as buses, and we've cheered recent decisions by Los Angeles and San Francisco to electrify their transit bus fleets. Now, in an even bigger win, the entire state of California is following suit. The California Air Resources Board voted at the end of last year to require that all new transit buses produce zero heat-trapping emissions beginning in 2029. This is a victory for the climate, for communities affected by air pollution, and for the state's job market: four of the five major US bus manufacturers are located in California.

UCS Senior Vehicles Analyst Jimmy O'Dea, who coauthored a California-specific report from 2016 that details how a switch to electric buses can create jobs and improve public health, says this switch sets an important precedent both in California and beyond. "If we can successfully electrify transit buses, there is nothing stopping us from making school buses, delivery trucks, and garbage trucks zero-emissions, too," he says. "And hopefully, California's transit choices can inspire other states to follow suit as well."

Book Revisits the Founding of UCS

This spring, MIT Press is publishing a 50th-anniversary edition of the book *March 4: Scientists, Students, and Society*, containing many of the speeches made by participants in the 1969 teach-in and protest that led to the founding of UCS. Fifty years later, the book offers a fascinating glimpse at a key political moment; the new edition includes a foreword by UCS cofounder Kurt Gottfried.

Through March 31, UCS members can get a 30 percent discount off the print or electronic version of this book by ordering online at *https://mitpress.mit.edu/UCS* with the promo code UCS30.

New UCS Video Addresses Science and Racial Equity

At UCS, we believe science can and should be applied to reduce racial and economic inequity. As we expand our work on these issues, we often get questions from our supporters about what race has to do with science. Three UCS staff, including our president, Ken Kimmell, chose to answer these questions thoughtfully and candidly in a short video. We invite you to watch it at *www.ucsusa.org/racialequity*.

50

Faculty and students at the Massachusetts Institute of Technology joined forces on March 4, 1969, for a "research stoppage" to protest the government's misuse of science, and issued a call for scientists to serve the public good. This event led directly to the founding of UCS.

50 YEARS *of* SCIENCE *and* ACTION

Celebrating a half-century of activism, UCS takes stock of what's changed and what remains constant.

BY SETH SHULMAN

A US president with scant regard for the rule of law. Political instability, exacerbated by war and international tensions. Members of the scientific community mobilizing in response, in record-breaking numbers. It sounds a lot like our current moment. But these factors were also all in play 50 years ago—when an unprecedented political awakening led directly to the founding of the Union of Concerned Scientists.

In early 1969, Richard Nixon had been sworn in as president. Military service was compulsory in the United States and close to a half-million American soldiers were deployed in Vietnam. Students and other activists continued to protest across the country. At that tense political moment, a group of faculty members at the Massachusetts Institute of Technology and several other US college campuses announced that, on March 4, they would essentially go on strike, stopping their classes and research to hold a "teach-in." Their stated aim: to begin to "devise means for turning research applications away from the present emphasis on military technology toward the solution of pressing environmental and social problems."

The MIT faculty group called itself the Union of Concerned Scientists. And the work these scientists began—insisting that science be harnessed to build a healthier planet and a safer world—endures as the unwavering mission of the organization that grew from their efforts.

Photo: Florence Haseltine/Smithsonian Institution

FAST FORWARD

The founders of UCS could scarcely have imagined the scale and breadth of the work undertaken by the organization today. With a half-million supporters and a network of more than 25,000 allied scientists around the country, today's UCS is engaged on multiple fronts. We're standing up for science when it's being attacked and developing evidence-based approaches to a host of pressing problems, including emerging ones that would have seemed like science fiction 50 years ago, such as how to harness the potential of self-driving vehicles, or grapple with the threat posed by new hypersonic weapons.

Just like our founders, we at UCS today are relentlessly focused on the vital issues at hand. Much of that work entails fighting back against the Trump administration's ongoing efforts to roll back hard-won environmental protections and public health safeguards.

Yet even as that urgent work continues, our 50th anniversary affords an important opportunity to both reflect on our past and celebrate the fact that UCS continues to thrive and grow after a half-century in existence. We will be commemorating "50 years of science and action" throughout 2019. We'll hold events in San Francisco, California; Washington, DC; Chicago, Illinois; and Cambridge, Massachusetts, and we hope you'll attend. A new timeline on our website highlights the organization's many accomplishments (*www.ucsusa.org/50-years-science-and-action*); take a look and share our sense of pride in all that you have helped us achieve so far. Issues of *Catalyst* throughout the year will recount some of these successes, offer "then-and-now" snapshots, and discuss our plans for the future.

On that note, this milestone also gives us the chance to think about where UCS goes from here—to recommit to the

Photos: Omari Spears/UCS (podcast); UCS (Henry Kendall); Allison Cain/UCS (Stand Up for Science); Florence Haseltine/Smithsonian Institution (March 4 events); Richard Howard (Kurt Gottfried)

UCS cofounders Kurt Gottfried and Henry Kendall launched the organization to apply science to some of the world's most pressing problems.

enduring values that first drew our staff and supporters together, and to envision the innovations and new initiatives we'll need to meet whatever challenges lie ahead. We'll be reaching out to you throughout the year, enlisting your continued input and support as we chart a path forward.

A WATERSHED MOMENT

As UCS staff planned for our anniversary, I had the privilege to conduct a series of interviews with UCS cofounder Kurt Gottfried (see below for his personal recollection of the events of 50 years ago). Not only did Gottfried draft the faculty statement calling for the landmark protest on March 4, 1969, he also established UCS as a nonprofit organization along with Henry Kendall, his former roommate and a soon-to-be Nobel laureate, and has continued to serve as a UCS board member to this day (and as board chair from 1999 to 2009).

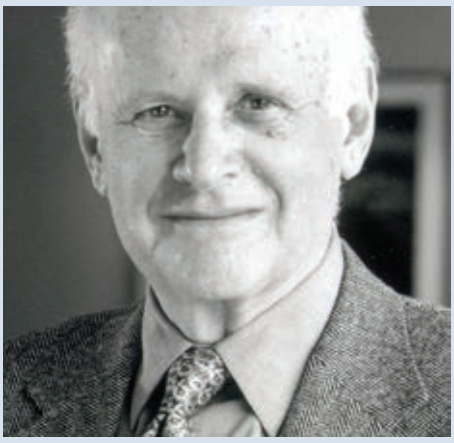
Notably, despite the intense focus on the war in 1969, Gottfried stressed that he and his fellow organizers chose to frame the issues broadly. That decision helps mark March 4, 1969, as more than merely a protest against the Vietnam War. As the scientists' impassioned statement explains, they sought to "explore the feasibility of organizing scientists and engineers so that their desire for a more humane and civilized world can be translated into effective political action."

At the time, this was a radical notion which met intense resistance within the scientific community, as many senior faculty members opposed the work stoppage, arguing that science ought to remain above the political fray. Though the year 1969 is often remembered for the events of July 20, when US astronaut Neil Armstrong declared his small step onto the moon's surface "a giant leap for mankind," the demonstrations on March 4 represented a fateful step too. A critical mass of prominent scientists stepped into the public eye, against the wishes of many of their peers, to insist that the power of science be applied to social problems and *human* needs, not just corporate and military needs.

DECADES OF SCIENCE AND ACTION

From humble beginnings with a single staff member, the organization quickly learned by doing. Its first report exposed

(continued on p. 20)



MARCH 4, 1969: A SENSE OF TENSION AND URGENCY

BY KURT GOTTFRIED

At this moment 50 years ago, opposition to US involvement in the devastating and morally suspect war in Vietnam and concerns over scientists' contributions to it had reached a crescendo that caused many of us to become very emotionally engaged with these issues.

It is hard to fully capture the level of tension and urgency we felt at that moment as students and faculty alike began planning a "teach-in" and a work stoppage—something that, as far as I know, US scientists had never contemplated before. The idea had caught on rapidly and was a consuming subject of discussion and debate at the time.

I had recently become a professor at Cornell but was spending the year as a visiting faculty member at MIT where I had earned my doctorate in physics. I became deeply involved in these activities and contributed an early draft of the statement put out by a group of faculty members that would soon call itself the Union of Concerned Scientists. That statement was ultimately signed by dozens of prominent scientists at MIT, Harvard, Cornell, and other schools across the United States.

What felt so new and compelling at the time was the extent to which these factors were causing scientists to explicitly confront their broader role and responsibilities in the political arena. For me, like many others, this was much more than just another extracurricular activity; it became practically an all-engrossing enterprise. Some colleagues at the time even discussed the prospect of abandoning their scientific work permanently.

Although concern over the Vietnam War was front and center, there was a good deal of debate and some friction and tension about how broadly to frame our concerns in the faculty statement.

(continued on p. 21)

Protecting Science's Role in Democracy: It's Why We're Here

INTERVIEW WITH GRETCHEN GOLDMAN

The Center for Science and Democracy at UCS released a report last month titled* The State of Science in the Trump Era *(online at* www.ucsusa.org/ScienceUnderTrump*). What new conclusions have you and your team drawn?

GRETCHEN GOLDMAN: In the beginning of the Trump presidency, we were certainly worried about the likely rollback of public protections, but also a variety of other issues. For example, the possibility that scientists' ability to speak to the media would be restricted. There was also a lot of concern about federal data being deleted or taken offline. Some of those things did happen. But some did not happen to the degree we feared, partly because people mobilized around them.

But now the administration is changing its tactics. They've started to interfere more with the process by which science informs decisionmaking. We have long-standing environmental laws that require us to use science to make policy decisions that protect public health, safety, and the environment. And they're basically chipping away at the foundation of these science-based laws. If they're able to change the process by which we use science to make decisions, we're in trouble. That will have long-lasting impacts and set a really dangerous precedent.

How is UCS responding to these changing tactics?

GRETCHEN GOLDMAN: It's a hard question: what do you do when the administration doesn't care about following policies, or care about its public image when it ignores or attacks science? We've done a lot of work to respond and put a lot of thought into how to get out of this mess, including thinking about the kinds of policies that will undo the damage done and prevent future damage. The best method we have to fight back right now is to take advantage of opportunities with the new Congress to create better accountability and restore some checks and balances.

We've put together a long list of different oversight activities that fall into three categories. One is promoting public health and safety. Another is fighting corruption, which we wanted to include specifically because this administration's corruption scandals have affected its ability to make science-based decisions. The last is protecting scientific integrity within agencies; in other words, ensuring that agencies' work is carried out without undue influence.

Which of these categories do you see as offering the best oversight opportunities?

GRETCHEN GOLDMAN: I think we have a great opportunity to address the corruption issues, because a lot of the science-based attacks are related to the fact that we have agency leaders with significant conflicts of interest, who came from or lobbied on behalf of industries they now regulate. We should be pushing our members of Congress to think about how we can fight that corruption, if new rules should address whether registered lobbyists can work in government, and if there's sufficient transparency about potential conflicts of interest.

Personally, I'm most excited about the ability of the new Congress to hold hearings. These issues haven't gotten a lot of airtime or transparency. Some instances of corruption have been covered in the media, but then that was sort of the end of the story.

Now Congress can hold investigations. They can call people to the stand and ask them why they made certain decisions. They can look at impacts and hear from scientific experts about what this all means. It seems like a small thing, but I'm excited that some

GRETCHEN GOLDMAN is the research director for the Center for Science and Democracy at the Union of Concerned Scientists, where she leads research efforts on the role of science in public policy, with a special focus on public health impacts. Goldman currently serves as the chair of the Air and Climate Public Advisory Committee for the Metropolitan Washington Council of Governments, and sits on the advisory board of the nonprofit InfluenceMap, which tracks how corporations influence public policy.

Photo: Rick Ciaburri

> *"The best method we have to fight back now is to take advantage of opportunities with the new Congress to create better accountability and restore some checks and balances."*

of these decisionmakers can now be held accountable.

Are there certain aspects of the problem you are less optimistic about?

GRETCHEN GOLDMAN: I think I'm most pessimistic about how long-lasting some of the damage is likely to be. We can reverse policies; we can ameliorate some of the things the Trump administration has done once we have a new Congress in charge. But, unfortunately, some of the things they're doing are going take a long time to walk back—like the loss of agency expertise and capacity. They're trying to encourage people to leave the EPA, for example, with buyouts and early retirement. They're decimating federal employees' morale and agency reputations, and that's a big problem. We need good people to work in federal government. If people don't want to be there, or the people who have been there a while are leaving, that leaves a huge capacity gap, and we'll lose a lot of institutional knowledge, as well as public trust in these agencies. That problem won't be solved overnight.

You and your team at the Center for Science and Democracy have been scrupulously documenting and resisting every attack on science and scientists since President Trump took office. How do you stay motivated to keep fighting back?

GRETCHEN GOLDMAN: Honestly, what motivates me the most is that our Center for Science and Democracy was created for this work. UCS began focusing on scientific integrity in the federal government during the George W. Bush administration, and launched the Center during the Obama administration. And sometimes, prior to President Trump's election, people would ask, "Science and democracy, what do those have to do with each other?" Now, it's so clear what our purpose is, what we're doing, and why it matters to the world. I feel like we were created for the moment when President Trump was elected—because by that point, we had gotten important protections in place, like whistleblower protection for government scientists, and media policies at certain agencies that protected scientists' ability to speak to the press. These have held us in good stead in the Trump years.

What should UCS members do now that there's the promise of oversight?

GRETCHEN GOLDMAN: I think it is hugely important that members of Congress hear that their constituents care about science and scientific integrity, because when science is sidelined, people get hurt. New House members especially are figuring out what they're going to prioritize. They have a big menu of issues they could work on, but limited time and capacity. So, people who care about science should tell their representatives what they want to see them work on. Look for issues you care about, issues that affect you locally, and share those with your elected officials, along with the solutions we've proposed in our new report. This is certainly a time to stay engaged. There are a lot of things we can and should get started on if we want to make progress. {C}

Photo: Kathryn Hansen/NASA

ART FOR SCIENCE

RISING

With an innovative project, UCS enlists artists to help remind voters that science matters.

BY PAMELA WORTH

In 2018, UCS took every opportunity before the midterm elections to reach prospective voters with the message that science and evidence are crucial to our democracy. As part of that effort, we launched Science Rising, a national mobilization of thousands of scientists and science enthusiasts who hosted more than 100 events emphasizing the importance of science to our health and safety. Then, in order to draw even broader attention, we thought outside the lab.

The resulting project, *Art for Science Rising*, began with a UCS call to artists around the country to create visible, bold work in outdoor public spaces that would communicate the vital role science plays in our lives. We received dozens of inspiring proposals that were evaluated by a team of artists, art curators, and science communicators. Six artists and collectives made the cut, and we awarded them grants to develop and install their works.

With their distinct and indelible messages, these works of public art have reached hundreds of thousands of people and garnered media attention from print and television outlets. UCS is proud to have facilitated this unique exchange among scientists, artists, and the public.

Here are the projects (which are also on the UCS website at *www.ucsusa.org/art-science-rising*. And stay tuned for more *Art for Science Rising* projects in 2020.

WE ARE THE ASTEROID II

Justin Brice Guariglia, Chicago, IL

Artist and environmental activist Justin Brice Guariglia's unusual inspiration was something many of us see every day: a large LED sign on the side of the highway, flashing traffic-related alerts.

"I thought, this is the perfect metaphor," he says. "It's a great way to get people to slow down and think more about the unprecedented changes taking place in the natural world around us." Working with Rice University professor and author Timothy Morton, Guariglia refurbished a solar-powered message board and programmed it with text Morton drafted. He then installed the sign at Chicago's Navy Pier, where hundreds of thousands of passersby watched it flash a series of aphorisms:

WARNING: HIGH CO2 • TRIASSIC WEATHER AHEAD
GLOBAL WARMING AT WORK • GOODBYE ARCTIC ICE
DON'T ECO SHOP ECO VOTE • WE ARE THE ASTEROID

TREAD

Andy Rosen, Portland, ME

Nestled in the waters of Maine's Casco Bay—warming faster than most of the global ocean—is a stand of discarded pilings, decaying wooden posts that once supported a commercial dock. Amid those pilings, two deer made from aluminum, steel, and foam stood submerged and then exposed as the tides rose and fell, discomfiting some spectators and visitors with their warning about rising sea levels.

"I've been thinking about the metaphors that are often used for climate change, and this is a way to figure that out on my own terms," says artist Andy Rosen. "There's something about the presence of the water that's peaceful and threatening at the same time."

VOTE FOR SCIENCE

Class Action, New Haven, CT

Drivers on I-95 south of New Haven, Connecticut, encountered a series of three bold red-white-and-blue billboards breaking up a landscape of advertisements. Spaced out over a mile, these billboards created by the graphic design collective Class Action, read:

THANK GOD AND VOTE FOR SCIENCE
PRAY FOR ALL AND VOTE FOR SCIENCE
HOPE FOR THE BEST AND VOTE FOR SCIENCE

The project expanded to Indiana and Florida, where billboards also read:

KEEP THE FAITH AND VOTE FOR SCIENCE

In a joint statement, the collective says it hoped the billboards' simplicity would jar drivers into considering their meaning.

"It means considering the implication of candidates who deny science—what will they base their decisionmaking power on, if not rigorous research and facts?"

Photos: Sebastian Buffa (p. 14); Andy Rosen (top); Class Action (bottom)

WE ARE ALL CREW

Resident Arts, Columbia, MO

Take a walk on the MKT rail trail that winds through Columbia and you'll pass a massive mural artfully displaying the city's climate-related challenges, complemented by depictions of what residents can do to address them. Included are the words of philosopher Marshall McLuhan:

THERE ARE NO PASSENGERS ON SPACESHIP EARTH, WE ARE ALL CREW.

"I hope it engages people to start thinking: how do I take responsibility for what I'm doing to my environment?" says artist and project leader Madeleine LeMieux. From its conception, with input from the city's office of sustainability, to its execution, with young artists helping to paint, the mural has been a collaborative project. "We'll all be stewards of the imagery, and the message," LeMieux says.

WITH/OUT WATER

Yu Wen Wu, Boston, MA

On a site in Boston where hundreds of Chinese families were displaced from their homes in the 1960s, Yu-Wen Wu staged an installation featuring the voices, words, and images of the city's current Chinatown residents speaking about immigration, climate change, and community. Underscoring the theme of immigration, these were projected inside tents, along with messages of hope from young attendees. Visitors were encouraged to join in discussions and workshops about the neighborhood's environmental concerns.

"I wanted to address current issues to the members of this community—many of whom are immigrants," Wu says. "I think that understanding this issue, and asking for mitigating measures as Chinatown undergoes planning and housing crises, is really important."

LIKE THERE IS NO TOMORROW

Lina Dib, Houston, TX

In the Mid Main neighborhood of Houston, images of the Flower Garden Banks coral reef—located off the Texas coast—wavered, projected in the windows of an art gallery. As people passed by, their presence bleached out the images, simulating the real danger to reefs around the world as ocean waters warm. Inside, others attended workshops on ocean conservation. Artist Lina Dib teamed with technical designer Taylor Knapps to create this work.

"It's a playful piece," says Dib, "but it's also sad, as it displays the effects we have on these ecosystems. The kinds of changes we'll have to make as a civilization aren't going to be easy. I like that this work amplifies these states of conflicting or unresolved emotions."

Photos: Resident Arts (top); Audrey Eyring/UCS (center); David DeHoyos Photography (bottom)

How UCS Helped Cut a *Half Billion Tons* of Carbon Emissions

When UCS began working on transportation issues back in 1991, fuel economy standards were stuck in reverse. Congress hadn't passed legislation to strengthen them since 1975. In 1985, the National Highway Traffic Safety Administration (NHTSA) under President Reagan *lowered* the standards for 1986, then did so again in 1987 and 1988. A few years later, when the Clinton administration tried to jump-start the process for raising fuel economy, Congress responded by blocking NHTSA from doing so.

Since then, thanks largely to UCS, those standards have zoomed forward, helping cars and trucks go farther on a gallon of gas, saving consumers billions of dollars, and slashing carbon emissions—until now, that is.

HOW DID WE PULL IT OFF?

To get the job done, UCS went west: in 1992, our transportation team opened a satellite office in California. Because the Golden State began regulating air pollution before the federal government did, it has the unique authority to set and implement its own tailpipe emissions standards, and other states are allowed to follow its lead. So, over the next few years, the UCS team proposed a number of innovative ways for California to reduce tailpipe pollution and convinced the state to strengthen its low-emissions and zero-emissions vehicle standards.

Before long, our work on transportation issues began to pay off nationally. In 2003, we published *Building a Better SUV: A Blueprint for Saving Lives, Money, and Gasoline* as the centerpiece of a campaign to break through years of congressional gridlock. That report, coupled with other analyses, media education, public pressure, and Capitol Hill tutorials, led to a major victory in 2007 when Congress passed a landmark energy bill strengthening fuel economy for the first time in three decades. The bill boosted fuel economy standards for cars and light trucks to a fleetwide average of at least 35 miles per gallon (mpg) by 2020—nearly 10 mpg higher than the average at the time.

A WIN-WIN-WIN

California also led the way by adopting the world's first vehicle global warming emissions standard in 2004, once again informed by UCS technical analysis. And after the Obama administration took office, the UCS team really put the pedal to the metal. In 2009, UCS engineers published the design for a minivan that demonstrated the feasibility of meeting California's global warming emissions standard.

That same year, President Obama took note of California's action and announced the federal government's first joint fuel economy and global warming emissions standards, boosting the fleetwide fuel economy of new vehicles sold in the United States to 34.1 mpg by model year 2016 and requiring automakers to reduce tailpipe carbon emissions by nearly 30 percent compared with the average emissions of new vehicles sold in 2009.

More successes followed. UCS analysis helped the Obama administration make history in 2011 when it set standards intended to nearly double car and light truck efficiency by 2025. By cutting US oil consumption nearly 1.5 billion barrels

In 2003 UCS vehicle engineers designed a prototype for an SUV that used existing technologies to improve fuel economy, save consumers money, and increase driver safety—all while retaining vehicle size and performance. Since the report's release, automakers have incorporated many of these technologies across their fleets.

NUMBER OF ELECTRIC VEHICLES ON THE ROAD IN 2009:
ZERO
NUMBER TODAY: MORE THAN
1,000,000
WITH AT LEAST 40 DIFFERENT MODELS ON THE MARKET

The Obama administration, guided by UCS analysis, set standards aimed at doubling car and light truck fuel efficiency by 2025. We are now fighting to prevent these standards from being weakened or overturned.

SINCE 2005, FUEL ECONOMY HAS IMPROVED BY NEARLY 25 PERCENT, THANKS TO THE FIRST IMPROVEMENTS IN FUEL ECONOMY STANDARDS IN MORE THAN TWO DECADES.

per day by by 2030—or 23 billion gallons of gasoline annually—these standards would save drivers some $50 billion that year alone and reduce heat-trapping carbon emissions by more than *500 million tons*—the equivalent of closing 136 typical coal-fired power plants.

"These standards are the culmination of two decades of blood, sweat, and tears," says Michelle Robinson, who joined UCS in 1992 and has directed our Clean Vehicles Program since 2003. "Our analyses, coalition leadership, media education, and decisionmaker engagement were all instrumental in pushing the standards across the finish line."

ROADBLOCK AHEAD

The future of this signature UCS accomplishment, however, is now in jeopardy. The Trump administration plans to freeze fuel economy requirements at the 2020 model year level, a change that would needlessly increase US fuel consumption by nearly a million barrels of oil per day by 2040. The administration has also threatened to eliminate California's ability to set its own tailpipe standards. California, the 14 states that follow its lead, and a handful of other states have pushed back. The same day the administration made its announcement, 19 state attorneys general joined a lawsuit with California Attorney General Xavier Becerra, who declared that his state would "use every legal tool at its disposal to defend today's national standards and reaffirm the facts and science behind them."

UCS will continue to provide indisputable facts and science to, as former California Governor Jerry Brown put it, "fight this stupidity in every conceivable way possible."

"We have shown time and time again that the auto industry can meet the standards," says Robinson. "Given that the transportation sector is now the biggest source of US carbon emissions, we simply can't afford to let the Trump administration put the country back in reverse." {C}

50 Years of Science and Action

(continued from p.11)

the flaws in the Nixon administration's plans for an anti-ballistic missile system, and built public support for the US-Soviet Antiballistic Missile Treaty—an important milestone in nuclear arms control.

Many consequential analyses followed; among them an eerily prescient warning about nuclear power safety. Just two months before the 1979 accident at the Three Mile Island nuclear power plant in Harrisburg, Pennsylvania, a UCS report called on the US government to shut down that facility and 15 other nuclear reactors due to fundamental concerns about the safety of their designs.

UCS continued to build an impressive record of successes: discrediting Ronald Reagan's flawed "Star Wars" missile defense proposal, sounding the alarm on the reckless overuse of antibiotics on farms, working with states across the country to establish renewable energy requirements, exposing decades of fossil fuel company deceptions about climate change—the list goes on.

In 1992, UCS issued the "Scientists' Warning to Humanity," a seminal effort to alert the public to the threat of climate change and other human impacts on the environment. With this statement, signed by some 700 members of the National Academy of Sciences and a majority of the world's living Nobel laureates, the organization demonstrated its impressive ability to mobilize the scientific community.

PARTNERING WITH A BROADER PUBLIC

Much of our work in subsequent decades has sought to broaden our reach, to communicate complex issues more effectively to the public, and to focus more directly on issues of environmental justice: partnering with the communities most affected by pollution and climate change, listening to their concerns, and collaborating on solutions. As part of that work, in 2012 UCS launched the Center for Science and Democracy, which has built strong, lasting, and diverse partnerships with communities whose voices are often ignored in policy discussions.

The Center, like UCS as a whole, is committed to working for racial and economic justice, because we know that science can—and should—not only improve health, security, and the environment at a general level, but also alleviate existing disparities and inequities. For example, it is not enough to reduce pollution nationally; we need to make sure all communities receive health and environmental benefits from pollution reductions and share in the opportunities created by clean energy. It is not enough to build a food system based on more sustainable farming practices; we must ensure that everyone has access to healthy and affordable food. These considerations of equity and justice inform all our efforts, from issues of transportation to nuclear safety. If our work over

Photos: Florence Haseltine/Smithsonian Institution (top left, center); UCS (all others)

> ***UCS is larger and stronger than ever and we're just as dedicated and passionate about standing up for science as our founders were.***

five decades has taught us anything, it is that only a broad coalition—representative of the entire nation—can manage to overcome the powerful vested interests that stand in the way of change. We're firmly committed to building such a coalition.

As UCS marks its 50th anniversary in 2019, the organization is larger and stronger than ever and we're just as dedicated and passionate about standing up for science as our founders were. We are grateful for their foresight; and we are grateful for the passion and loyalty of our supporters who have been with us on this journey. While we are proud of the organization's successes over the last five decades, we are steadfast in our commitment to our mission and confident that our most important accomplishments lie ahead. As UCS Board Chair Anne Kapuscinski recently put it in a message to our members: "Heroic victories for a safer and more sustainable world lie ahead, and you are part of every one of them." {C}

March 4, 1969

(continued from p.11)

It felt important to me and many others at the time to place the issue in a broader context.

For instance, many of us were particularly concerned with nuclear weapons and the prospect of nuclear war—an issue with enormously complex scientific and technical aspects that could literally lead to the destruction of civilization. Similarly, the issue of human rights and the broader role of science in society seemed integrally linked to many of us and it is noteworthy that one of the sessions on March 4 was devoted to the dissenting voices in the Soviet Union led by Andrei Sakharov.

This link to human rights was especially strong among a subset of those who had fled fascist regimes in Italy or other parts of Europe. In my case, I was born in Vienna to Jewish parents and our family fled the Nazis when I was nine years old after our home was raided on Kristallnacht. Other colleagues, such as Hans Bethe, an eminent physicist at Cornell and Nobel laureate, told me at the time that older scientists such as him had lived through the 1930s and had seen firsthand that politics cannot be cleanly divided from science and technology. Their experience with the rise of fascist regimes meant that they didn't need to be lobbied to get involved at this time in 1969, or to support the broader notion that science, like almost all things, is connected to and dependent upon its social and political context. In retrospect, the choice to frame the issues more broadly stands as an important decision that I think adds significantly to the historical impact of this event.

During that year at MIT in 1969, I was reunited with my former roommate and fellow physicist Henry Kendall. After the March 4 event, he and I launched a nonprofit organization to carry on the work we had begun, and we gave it the same name as our faculty group: the Union of Concerned Scientists (UCS).

At the very least, I believe the events of March 4, 1969, helped spark a wider acceptance of the notion that scientists, like others, need to actively engage and cannot stand apart from the political implications of their work. As I wrote at the time, the scientific community has the "responsibility to educate the public, to evaluate the long-term social consequences of its endeavor, and to provide guidance in the formation of relevant public policy. This is a role it has largely failed to fulfill and it can only do so if it enters the political arena."

Fifty years on, the existence and continued strength of UCS is a testament to the power of that idea. While our current political moment is certainly cause for grave concern and a huge amount of work remains to be done, the call to action on March 4, 1969, remains as relevant and urgent as ever. As we see science sidelined by the federal government today, the words remind us of the work that lies ahead as we strive to build a healthier planet and a safer world.

This piece is adapted from the foreword to the 50th anniversary edition of March 4: Scientists, Students, and Society, *a collection of the proceedings of the demonstrations held that day (MIT Press 2019).*

The Nuclear Dilemma: Plant Closures and Climate Reality

By Steve Clemmer

Last October, a United Nations report concluded that the goal of keeping global temperatures from rising above 1.5°C, and limiting the worst effects of climate change, will require steep cuts in global warming emissions, including "net zero" emissions by mid-century. A month later, the Fourth National Climate Assessment, produced by 13 US federal agencies, presented the starkest assessment to date of the national consequences of climate change, projecting that the US economy could lose more than 10 percent of its value by century's end.

A third report, by UCS, reminded us that in order to cut emissions to the point we'll need to, we must keep an open mind about all of the tools we have to do so—even those that pose other risks.

Our report, *The Nuclear Power Dilemma: Declining Profits, Plant Closures, and the Threat of Rising Carbon Emissions*, found that roughly a third of the nation's 60 nuclear plants in operation at the end of 2017—22 percent of US nuclear power capacity—are either unprofitable or slated to close within the next 10 years. Unless federal and state governments adopt new policies, our analysis showed that these and other economically marginal plants would likely be replaced primarily by natural gas. If that were to happen, we estimate that the US electric power sector's carbon emissions could *increase* as much as 6 percent by 2035. In contrast, the National Research Council has found that power plant emissions must *decrease* by 90 percent by 2040 to meet US climate goals.

The Perry Nuclear Generating Station in northeast Ohio is one of many plants around the country that are unprofitable, according to the UCS analysis.

To help boost investment in renewables and energy efficiency, and preserve currently operating nuclear plants, our report recommends that the federal government and states establish a price on carbon emissions, or a low-carbon electricity standard, either of which would help improve the financial viability of nuclear power compared with fossil fuels.

Absent those measures, some states are now considering subsidies to prevent uneconomic plants from closing. For states weighing that approach, our report recommends setting up strict criteria for subsidies: Plants must meet or exceed the most stringent federal safety standards; subsidies should be temporary and adjusted over time, limiting rate increases to consumers; subsidies should be accompanied by increased investments in renewables and energy efficiency; and plant owners should be required to develop plans for their facilities' eventual retirement and decommissioning.

Energy efficiency measures are not being scaled up enough—and low-carbon technologies such as renewable energy are not being implemented quickly enough—to replace existing nuclear, coal, and natural gas plants and achieve the emissions reductions we need. In an era of hard choices, policies that keep safely operating nuclear plants running while we transition to clean, renewable power can be an indispensable tool. {C}

Steve Clemmer *is the director of energy research and analysis in the UCS Climate and Energy Program. Read more from Steve on our blog,* The Equation*, at* http://blog.ucsusa.org. *Find the full report and individual plant data on the UCS website at* www.ucsusa.org/nucleardilemma.

Photos: Richard Howard (Steve Clemmer); Nuclear Regulatory Commission (nuclear plant); Twinpix/Getty (family)

Union of Concerned Scientists

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For our 50th anniversary, UCS is looking for 500 people to step forward with a legacy gift to strengthen our future.

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