

BUILDING PUBLIC TRUST IN SCIENCE

A Virtual Summit

OCTOBER 25, 2021



Summit Organizing Committee

The Virginia Academy would like to thank members of the organizing committee for their hard work in making our virtual summit a success. We are particularly grateful to the committee's general chair, Chuck English, Virginia STEM Coordinator at the Science Museum of Virginia, for his work shaping the program and for his willingness to moderate the summit. In addition, we would like to recognize:

- Jim Aylor, *President, Virginia Academy of Science, Engineering, and Medicine*
- Chris Dovi, *Executive Director, CodeVA*
- Antonio Elias, *Vice President, Virginia Academy of Science, Engineering, and Medicine*
- Anne Peterson, *Science Coordinator, Virginia Department of Education*

We would also like to show our appreciation for our panel moderators—Lance Collins, Jon Goodall, Dick Guerrant, and Kelli Lemon—and the Virginia Academy COVES fellows—Adele Balmer, Janey Dike, and Nikita Lad—who served as panel monitors.

Summit Partners

The Virginia Academy would also like to thank its partners: CodeVA, Science Debate, the Science Museum of Virginia, the Virginia Department of Education, Virginia Press Association, Virginia Public Media, and the Virginia Secretary of Education's Office through Virginia STEM.

Senator Mark Warner



This year's Virginia Academy summit posed a very important question: how can we build the public's trust in science? It is remarkable that in 2022—after having successfully developed, tested, and distributed three life-saving COVID vaccines—there remains deep-rooted suspicion of science. Stunningly, more than 20 percent of our fellow citizens in Virginia and across the country refuse to get vaccinated, and a similar proportion of the population deny basic scientific principles.

An evidence-based understanding of the world around us is absolutely crucial to solving the many complex challenges we face as a nation. As a result, the suggestions about restoring science to our national discussions offered by our summit speakers—the result of hard-earned experience—are extremely valuable.

In making this topic the theme of the summit, the Virginia Academy was fulfilling the role we envisioned for it nine years ago when I convened a small group composed of Virginia-based members of the National Academy of Sciences, the National Academy of Engineering, and the National Academy of Medicine, along with the presidents of Virginia's premier research universities. Our purpose was to develop an independent body of experts to advise state policymakers on the issues of the day and to provide nonpartisan insight into topics of concern to all citizens.

If anything, the Virginia Academy's role is more important now than ever. While we can take different positions on politics, philosophy, and other issues, the truths established by science are immutable.

Sincerely,

A handwritten signature in blue ink that reads "Mark R. Warner". The signature is fluid and cursive.

Mark R. Warner
United States Senator



Chuck English

At the end of 2020, I met with Jim Aylor to discuss a virtual Virginia Academy summit. We were in the midst of the pandemic, and it became clear as we talked that we could make a real contribution by holding a conversation about building public trust in science. Given the response to issues like masking and social distancing, it was evident it would be worthwhile to have a discussion about how we talk about science and how we communicate it to the general public.

One of the things we agreed on was that we wanted to bring in an audience for whom this would be more than an academic conversation. In addition to scientists, we wanted to make sure we invited the media, educators, and members of the public—people for whom understanding scientific issues, interpreting them for others, and acting on them are everyday concerns.

We wanted to bring this audience together with a group of speakers who have thought deeply about these issues and who could share what they have learned from their experience promoting scientific literacy, addressing misinformation, and finding common ground. I think I can safely say that all of us who participated in the summit gained from this experience.

Virginia STEM Coordinator, Science Museum of Virginia



James Aylor

This year's meeting was somewhat different from our previous summits, which focused on scientific, technical, and medical issues. But it was on a topic—Building Public Trust in Science—that we felt could not be more timely and more important. Given the many challenges we face—from climate change to public health—it is clear that restoring that trust will be critical to our future.

The distrust of science that has undermined our ability to address the pandemic owes much to our justifiable suspicion of science's unintended consequences, but it also reflects ignorance and our all-too-human tendency to emphasize the negative and take the good for granted. And in our political climate, trust in science marks a partisan divide.

These are all complex issues to unpack. In developing this summit, we were extremely fortunate to be able to team up with individuals from a number of organizations interested in science and public perception, including universities, museums, government agencies, and the press. We benefited from their diverse perspectives.

Together, they raised a number of points about what we can do to restore trust. This report contains the best of their recommendations.

President, Virginia Academy of Science, Engineering, and Medicine
Dean Emeritus, UVA School of Engineering and Applied Science

Sheril Kirshenbaum

BUILDING PUBLIC TRUST IN SCIENCE IN THE AGE OF “A

Sheril Kirshenbaum kicked off the summit by exploring some of the reasons why trust in science is so important to society. “Why does science matter?” she asked. “And why does science communication matter?” Kirshenbaum is the executive director of Science Debate, a nonprofit organization dedicated to restoring science to its rightful place in politics. After polling the audience, she categorized the multiple ways science can function in the public sphere, including increasing knowledge, heightening awareness, building excitement, altering behavior, changing attitudes, and shaping public policy. When the public loses trust in science, the power of science to benefit society in all these ways diminishes.

This is an issue that predates the pandemic, Kirshenbaum stressed, pointing to lessons she learned from her work at Michigan State University (MSU), where she directs the MSU Food Literacy and Engagement Poll. She found that respondents have a real desire to know

more about the food we eat, where it comes from, and how food production affects health. Yet food illiteracy is pervasive. Take the hot-button issue of genetically modified organisms (GMOs). Some respondents asserted that all foods containing any form of DNA should have a non-GMO label, even though all food from organic sources, genetically modified or not, contains DNA.

One reason that the facts of basic science are ignored, Kirshenbaum found, is that many people find the answers to their food questions by turning to social media and the Internet, where the priority is placed on popularity, not expertise. “Algorithms are written in such a way that what is liked and retweeted gains currency, whether it is true or not, no matter whom it comes from,” she observed.

But she noted that members of the public are not simply turning to convenient places for information; they’re turning away from science. Science has not always been applied for the public good, she said. As an example, she noted that scientists in the sugar industry knew as far back as the 1960s that high levels of sugar consumption are correlated with heart disease and certain kinds of cancer. The industry’s response was to halt all studies and bury the research. “There are bad actors in the system, and the public remembers them,” she said.

But Kirshenbaum pointed out that science illiteracy is not just the preserve of the general public. We see legislators introducing bills to ban GMO foods, apparently unaware of the extent to which GMO corn and soy are already in the marketplace.

“Algorithms are written in such a way that what is liked and retweeted gains currency, whether it is true or not, no matter whom it comes from.”



ALTERNATIVE FACTS” AND FAKE NEWS

But, Kirshenbaum added, science illiteracy is not limited to food. Science-based decision-making is critical for successfully managing our energy transition from fossil fuels, providing access to safe drinking water, and producing advances in medical care. Unless we can base decisions in these areas on science, she asserted, we are going to fall short.

The Challenge: Reconnecting the Public to Science

In the late 1950s and early 1960s, Kirshenbaum recalled, American science was celebrated by journalists, lawmakers, and ordinary citizens. Organizations throughout the government took pride in collecting scientific data to make better decisions on policy issues. And the government invested in expanding that body of knowledge: about 12 percent of the federal budget was dedicated to research and development. In the latest federal budget, this figure was just 2 percent. Science has lost its privileged role in decision-making.

Restoring that role will take deliberate effort.

Kirshenbaum noted that she began her career as a marine scientist and, after serving on Capitol Hill as a science fellow, focused on such issues as conservation, energy, and water before turning to food. “In all these areas,” she said, “the challenge has been the same—how to connect with people and explain complex issues in ways that go beyond talking points.”

A number of obstacles must be overcome, Kirshenbaum believes. Perhaps the most basic is what C.P. Snow described as the “two cultures problem.” Science is not the only way of understanding the world. She cited Stephen Colbert, who noted the difference between those who think with their heads and those who know with their hearts. In essence, the goal of science communicators is to bridge the gap, to persuade those who know with their hearts to also think with their heads.

Based on her experience on the Hill, Kirshenbaum concluded that scientists have often shown themselves ill-prepared to make this leap. “They came to meetings

with facts and statistics,” she said. “Rarely would they bring a straightforward, effective message.” Many from the pseudoscientific groups she encountered were more persuasive. “They were funny, well-spoken, and better prepared,” she recalled. “They had a message, and they stuck to it.”

To be effective science communicators, Kirshenbaum stressed, we must go beyond the expectation that facts will speak for themselves. Instead, she recommended a series of evidence-based relational strategies. Before composing a message, we must connect to our audience. “There are millions of Americans and many different Americas,” she said. “To be successful at reaching them, you need to understand the group you’re talking to, tailor your message accordingly, and give your audience a reason to listen to you. You can’t take a one-size-fits-all approach.”

One of the most effective ways to understand an audience is to take the time to listen to them. Not only does this help us better reach our audience, but the simple act of listening—showing that we’re willing to consider other points of view—creates a bond that will increase the likelihood that they will be more receptive to what we have to say.

Once we’ve established this connection, how can we make the most of it? Kirshenbaum offered the following advice: “Translate the scientific language. Don’t try to explain everything. State your key ideas as clearly as possible and choose your cultural references carefully. And rather than rely on facts, tell stories that connect your information to something that matters to them.” For instance, when Kirshenbaum discusses with environmentalists the need to reduce food waste, she might tie her argument to climate change.

Kirshenbaum cautioned, however, that restoring public trust in science requires persistence. We have to show up, she said, whether it’s a meeting with our representative or a town hall gathering. We need to reach people where they are. And we cannot expect that everyone will be reached through a single encounter with a single influencer. “We all have to stick with it,” she said.

Danny TK Avula, MD MPH

"I READ THAT ON TWITTER": PROMOTING SOUND PUBLIC HEALTH

As Director of the Richmond and Henrico Health Districts (RHHD), **Danny Avula** became one of the most recognizable faces in the Richmond Region in 2020 after he and the Department helped communities navigate the many unknowns of the emerging pandemic. In 2021, Governor Ralph Northam tapped him to lead the Commonwealth's COVID-19 vaccination effort, where he gained valuable insight into the factors that drive the public response during an evolving health crisis. "The issue of using data and science to drive guidance has been put on display in a way that I have never experienced in my 12 years in Public Health," he said. "There were so many reasons—some legitimate and some not—that caused the public to question what they were hearing. The year 2020 brought a lot of curve balls that I don't think a lot of us in public health could have anticipated."

Avula noted that even the most well-intentioned efforts sometimes went astray because of long-



"When a government agency uses social media, it doesn't land the same way it does when Nicki Minaj uses it."

established distrust of science and government. He cited RHHD's efforts in spring 2020 to extend PCR testing to African-American and Hispanic-Latino communities hard hit by COVID-19.

To their surprise, health department personnel often met with suspicion and outright resistance in public housing complexes and low-income neighborhoods. Instead of their being greeted with open arms, Avula noted, the response on social media was outrage. The testing program was undermined by preexisting narratives. African Americans recalled notorious incidents of medical researchers conducting medical testing on African-American subjects without their knowledge or consent. Latinos saw the testing program as a first step to deportation.

If anything, Avula found that the idea of vaccination was even more potent than testing at raising specters, some old and others new. Those against vaccination quickly tapped into the long-standing fear that any sort of vaccination might damage a fetus or prevent women from conceiving. Just before the vaccines were released, a German physician suggested that mRNA vaccines would damage placentas. Although this claim was thoroughly debunked, it touched a nerve and generated a firestorm on social media.

And while there is no reason to believe that rapper and pop-singer Nicki Minaj had any malicious intent when she tweeted to her 22 million followers that the vaccine caused a cousin's friend in Trinidad to become impotent, the damage was done. "I expect to be dealing with the fallout from this single tweet years from now," Avula remarked.

As unfortunate as Minaj's tweet was, deliberate disinformation, magnified by social media, is even more pernicious. Avula cited a study published by the Center

IC HEALTH GUIDANCE IN A SEA OF A MILLION VOICES

for Countering Digital Hate that found that 65 percent of COVID disinformation over a two-week period emanated from 12 accounts that used a number of misleading strategies to reach a larger audience.

A Three-Part Strategy

To deal with this level of distrust and disinformation, the public health community had to adapt. Avula listed three main takeaways: “We have had to evolve our communications, adapt our operations, and trust our partners.”

Before the outbreak of COVID-19, RHHD had been making an effort to engage in social media thoughtfully. “But when a government agency uses social media,” Avula conceded, “it doesn’t land the same way it does when Nicki Minaj uses it.”

In response, Avula and his public health colleagues turned to social media influencers, finding the right people and the right voices in the communities to amplify their messages. They also were more present in mainstream media and TV. “I never expected to be scheduling daily press conferences or daily media appearances,” he said, “but they dominated my life for several months at the beginning of COVID and then again during the vaccine rollout.”

Health districts also had to adapt their operations. Early in the vaccine rollout, Avula recalled, the imperative was to get as many people vaccinated as quickly as possible. “We did very well setting up mass-vaccination sites,” he said.

But Avula concedes that it wasn’t enough. Disparate segments of the population, for various reasons, were coming to mass vaccination centers. Health departments had to adapt their operations to meet the needs of these different segments of the community. They did a phenomenal job, he said, organizing pop-up clinics in neighborhoods, working with faith communities to provide on-site vaccinations, and dispatching mobile clinics that moved from neighborhood to neighborhood and paired up with community events.

The last lesson he learned was the importance of partnering with trusted organizations. For instance, Avula was able to tap into a virtual working group of African-American pastors initially established by the Massey Cancer Center to address health disparities in cancer treatment, but that quickly became a forum to educate faith leaders about COVID-19. These “Facts & Faith Fridays” grew quickly from a group of 20 pastors to more than 150 some weeks, representing a huge swath of Virginia.

Over the course of the pandemic, Facts & Faith Fridays brought scientists in to discuss various aspects of COVID-19: mitigation, testing, clinical trials, treatments, and vaccines. “These pastors became our best advocates,” he said. “They were the first to sign up and say that they wanted to get vaccinated on camera. And they addressed their congregations from the pulpit, telling them that we need to make sure we get vaccinated.” Thanks to their efforts, Virginia has a higher vaccination rate among African Americans over 65 than it does across the 65-plus population overall.

Looking Ahead

In concluding his address, Avula focused on a number of areas for improvement. While hiring community health workers is a first step, healthcare and public health providers must do more to ensure that their entire workforce looks like the communities they serve. He also feels that the public health community should do more to leverage the power of social media. “There are ways we can be edgier and convey messages with more impact,” he said, citing efforts to use platforms like TikTok to reach Gen Z.

Finally, he said, public health providers must have a long-term vision. Having a sustained commitment to being present in the communities they serve will be absolutely crucial to addressing the next health crisis.

“We clearly haven’t solved the issues of distrust and disinformation,” he concluded. “But we have figured out some ways to move the needle.”

REACHING A SKEPTICAL

PANELISTS: **John Almarode, PhD; Cary Funk**
Robert Holsworth, PhD

The entrepreneur, consultant, and community activist **Kelli Lemon** moderated a panel discussion that brought together four experts whose careers have led them to think carefully about gaining the public's trust. Lemon herself has been charged by Lee Enterprises, owner of the *Richmond Times-Dispatch*, to build a digital platform for the paper. She is acutely aware that if the publication is to reach new generations who have different ways of interacting with information, it must develop new forms of credible communication.

Cary Funk, director of science and society research at Pew Research Center, studies specific segments of the public and examines factors that raise and lower their trust in science. The good news, Funk stressed, is that, in aggregate, the public is confident that scientists and medical researchers act in the best interest of citizens.

She noted, however, that attitudes toward science have become increasingly divided along partisan lines. This matters during a pandemic because those who don't have confidence in science are largely unvaccinated, putting the rest of the populace at risk. "This is why, at the Center, we spend time thinking about how we talk to groups so we can address their concerns, their values, and their sources of skepticism," she said.

The other panelists all described how their work intersects with the public perception of science.

John Almarode, an associate professor of education at James Madison University, works with preservice teachers of elementary and childhood science methods courses and consults with school divisions to implement best practices for science education. Teaching people how science works, a prerequisite for trust, is central to his work.

Frank Niepold is the senior climate education coordinator at the National Oceanic and Atmospheric Administration's (NOAA) Climate Program Office, the largest climate communication and engagement division in the U.S. government. "Trust is essential if we are to be effective," he said.

Finally, **Bob Holsworth**, president of Virginia Tomorrow, is a political scientist who has examined issues of public trust for decades. "It used to be said that everyone was entitled to their opinion but not their facts," he observed. "We seem to have moved into a post-fact era." If we are to understand trust in science, he maintained, we have to understand what is going on in the political sphere.



Kelli Lemon



John Almarode



Cary Funk

LAUDIENCE

MODERATOR: **Kelli Lemon**

Frank, PhD D; Frank Niepold

How Did We Get Here?

In her first question, Lemon reiterated the panelists' sentiment that lack of confidence in scientific information threatens our public safety and security and ultimately our economy. "How did we get to this place?" she asked.

Almarode pointed to human cognitive architecture. He noted that thanks to advances in technology and communication, we are exposed to so much new information that we experience cognitive overload, and our working memory system becomes fatigued. We start to respond in predictable ways, picking and choosing what we pay attention to.

For his part, Niepold zeroed in on the kinds of misinformation campaigns that have complicated his efforts at NOAA. Societies have been using the powerful tool of misinformation for millennia, he said, and it works. "We need to teach people how to unpack and disable misinformation so we can have proper civic discourse with credible issues," he said.

Holsworth pointed out that the partisan divide that leads to distrust in science is also expressed in distrust of media. "The laws that govern your universe depend on which cable station you watch for political news," he said. "We have to deal with that polarized media environment if we are to restore trust in science."

How to Deal with Raw Data?

Lemon next asked the panelists if they thought people are exposed to too much raw data. Almarode adopted a nuanced approach. He noted that overly curating the data can be a mistake. "When things

are left out, we either assume bad intentions or fill in the missing information with our preconceptions," he said. "At the same time, we can't just flood people with data without providing the context they need to make sense of it."

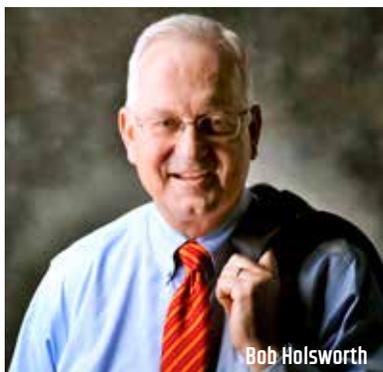
Niepold concurred, noting that commentators as well as citizens have to learn to sift through information and extract credible knowledge. This education can take place in the schools, but it also has to occur more generally across society, he said.

Holsworth approached the topic from a different point of view, highlighting the challenge of neutralizing confirmation bias. "One of the unresolved questions I have is whether it is possible to make a thoughtful presentation of information that doesn't lend itself to being picked apart to support disparate viewpoints," he said.

Have Standards of Journalism Changed?

Lemon then turned the discussion to the emergence of bloggers and citizen journalists, and its impact on the responsibility of journalists to verify information. Funk noted that, compared to 20 years ago, there are many more content providers, often with large followings and distinct points of view. As a result, the potential to spread unverified information—even outright misinformation—around the world has grown significantly. "There are few ways to stop it from having an impact," she said. "That's why we are having this broader conversation about balancing free speech with the public interest."

Lemon concluded by asking how we can regain the public's trust. Niepold turned this question around by noting that most people trust science—and stressed that we have to be careful, while focusing on misinformation, to provide opportunities for those who trust science to be heard. "Ultimately, building trust for us at NOAA entails maintaining trust," he said.



Bob Holsworth



Frank Niepold

CLIMATE CHANGE

MODERATOR: **Jon Goodall, PhD**

PANELISTS: **Jeremy Hoffman, PhD**
Elliott Robinson

Panel moderator **Jon Goodall** has direct experience communicating with the public about climate change. A professor of civil engineering at UVA specializing in management of water systems, he was the lead author of a recent Virginia Academy publication, *The Impact of Climate Change on Virginia's Coastal Areas*.

Goodall was joined by **Jeremy Hoffman**, the David and Jane Cohen scientist at the Science Museum of Virginia. As a scientist, Hoffman has had frequent contact with the media. His research on urban heat islands has been featured in the *New York Times* and *Richmond Times-Dispatch* as well as on National Public Radio. His fellow panelist, **Elliott Robinson**, approaches the issue of science communication from the complementary perspective of a journalist. He is news director at VPM, Central Virginia's public television, and has served in a variety of editorial roles at profit and nonprofit news organization in the Commonwealth.

Goodall turned to his panelists to solicit their perspectives about communication across the media divide. Robinson noted that he has had close relationships with scientists since the beginning of his career as a young reporter covering pollution from chemical plants on the James River. He has found that

scientists are, on the whole, very receptive to sharing their knowledge. One advantage of working in Virginia, he said, is the sheer number of research institutions with experts in virtually every discipline.

As a scientist, Hoffman said he personally felt it was his responsibility to share his knowledge with the widest audience possible, and he was glad to learn from Robinson that this view was widespread. "While a single person making the effort to speak to the media is itself admirable, bigger gains in building public trust in science come when readers or viewers hear the same message from a variety of scientific sources," he said.

Hoffman also said it is important for scientists to put their information in a context that matters to the journalist's audience. "Sea level rise might seem like an abstraction to people in Central Virginia, but not when you talk about the impact of people moving inland from the coasts," he said. "As climate change becomes more of an issue for the state of Virginia, scientists and journalists need to be creative in finding ways to make this connection."

Choosing Words Carefully

Another way scientists can help journalists connect to the public, Robinson asserted, is to make a point of using language that is more accessible to nonscientists. "For a journalist, having a clear starting point is immensely helpful in making sure that we get the science right, even in the face of deadlines and space limitations," he said.

Robinson has found that reporters new to a subject are sometimes embarrassed to ask scientists to clarify something they find obscure. "When I know the topic is going to be technical, I ask people to speak to me as if I were their niece or nephew" he said. He also recommends that scientists not hesitate to ask if journalists understand their explanations. That simple give-and-take can make



Jon Goodall

a big difference in getting accurate information to the public.

Hoffman recommended that before speaking to the press, scientists should compose a little elevator pitch: a short, clear summary of the points they would like to convey. A number of professional organizations encourage this practice by asking scientists to write plain-language abstracts of their papers. “This practice is really helpful,” he said.

Turning Science into a Story

Goodall turned to the theme of narratives, declaring that he had been influenced in his research by journalism



Jeremy Hoffman



Elliott Robinson

that emphasizes the human side of climate change: “After reading an article, I’ve said to myself, ‘This is really a problem that I ought to look into.’” Goodall asked his panelists how they view the role of narratives in helping the public makes sense of complicated issues like climate change.

Hoffman said that stories that follow the day-to-day experiences of an individual, group, or community are particularly effective, because they allow others to see the world through the protagonists’ eyes. Robinson agreed. Anything a journalist can do to make the story more vivid is helpful. “If you can report from downtown Norfolk and show the waves lapping onto the sidewalk, you’re enabling your audience to visualize climate change.”

Hoffman also stressed the benefits of placing science in the context of a social or historical narrative. He recounted the evolution of his investigations of urban heat islands in Richmond, which led to his linking heat islands there to redlining and other housing policies that confined African Americans to specific neighborhoods.

When he first started studying extreme heat in Richmond, Hoffman recalled, they didn’t know what they would find. The city’s climate action plan, RVA Green 2050, didn’t have any localized, highly detailed kinds of data about how climate change would affect neighborhoods. His group discovered that when it was 95 degrees at the airport, it might be 103 or 87 in the city, depending on the neighborhood.

A number of their collaborators noticed that the maps researchers were using to understand social justice issues in Richmond looked exactly like heat maps. Urban heat islands tend to be food deserts and have higher asthma rates and a generally lower quality of life than cooler areas. Studies conducted by the University of Richmond Digital Scholarship Lab on redlining matched

new data—and Hoffman’s group found similar situations in Portland, Takoma, and Baltimore. In effect, they received widespread coverage for their science because they were able to link it to social issues that meant something to their audience

Robinson was able to make similar connections while serving as editor of *Charlottesville Tomorrow*. The publication printed a series of articles on the social determinants of health and found that struggling neighborhoods

were heat islands that had been redlined. “We were able to hammer home to people that decisions over time have consequences that can be measured scientifically,” he said.

Bridging the Divide

In summary, Goodall stressed that scientists and journalists can work together to restore public trust in science by better understanding their audiences, using clear language, and turning to narratives. Hoffman made it clear that the challenge is not insurmountable. He noted that the Yale Program on Climate Communication and the Six Americas project have demonstrated that the vast majority of Americans agree that human beings are the fundamental cause of climate change and that much more needs to be done. “Certainly, partisan politics is an issue,” he said, “but there is already a great deal of consensus.”

V A C C I N E S

MODERATOR: **Richard Guerrant, MD**

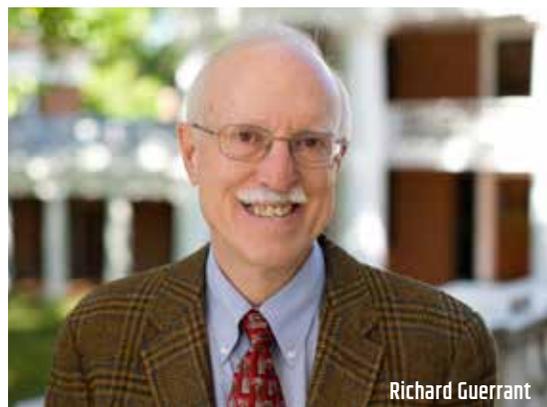
PANELISTS: **Carol O'Donnell, PhD**
Pranay Sinha, MD

National Academy of Medicine member **Dick Guerrant** could not have been a better choice to lead the panel discussion on vaccines and trust in science. He has devoted his career to studying infectious diseases and founded the UVA Center for Global Health to help public health leaders adapt straightforward methods to lessen the incidence and impact of deadly and debilitating disease.

He was joined by **Carol O'Donnell**, the director of the Smithsonian Science and Education Center and a member of the InterAcademy Partnership Global Council for Science Education. Completing the panel was **Pranay Sinha**, the Burroughs Wellcome Fund/American Society of Tropical Medicine post-doctoral fellow at Boston Medical Center and author of two dozen articles on medical issues that have appeared in such publications as the *New York Times*, *Los Angeles Times*, and *HuffPost*.

Museums: Trusted Sources of Information

O'Donnell stressed that the Smithsonian Science Education Center, which was founded jointly by the U.S. National Academy of Sciences and the Smithsonian



Richard Guerrant

Institution in 1985, has developed a three-part rubric—discover, understand, and act—as a way to teach young people about science: “Students discover by examining a problem through social, environmental, economic, and ethical lenses. They understand by carrying out local investigations on global problems, using their communities as their laboratories. And they act, ultimately taking local action to address the issue in their own communities.” The Center has used this framework for a module it has developed to teach students how to use science to help their communities make informed decisions about vaccines.

O'Donnell notes that the Smithsonian provides an excellent platform for this kind of work. “Museums have largely retained their position as trusted sources about science,” she said. “They are widely seen as educational assets for their community.”

An Individual Trusted Voice

In contrast, Sinha uses his role as an individual physician and researcher to narrow what he described as “the chasm of knowledge” between science and the public. The lessons he has learned contending with vaccine hesitancy are based on his firsthand experiences.

Among his conclusions: public attention is finite, and it is being overwhelmed by an onslaught of mis- and disinformation. Like O'Donnell, Sinha asserted that developing scientific literacy in young people is critically important. He added that, at the same time, we should focus on how best to create trust in adults, who may or may not be scientifically literate.

Explaining why he writes for the popular press, Sinha made the point that “the public doesn't read the *New England Journal of Medicine*.” He advised that scientists and physicians seek out media training and embrace

opportunities to talk to the press. “The public is being overwhelmed by anti-vaccine messaging,” he said. “We need to get more positive messages out there.”

But simply writing articles, in Sinha’s view, is not enough. Scientists and journalists must write articles that leverage the emotional appeal of stories.

“The power of antivaccination messages lies in personal narratives, real or fictional,” he said. “We can counter by communicating the tragedy of missed opportunities, the irreversible effects of COVID-19, and the ensuing loss of life. If we use the rhetorical device of pathos in addition to ethos and logos, we will strengthen our message and ensure it has more of an impact.”

Finally, Sinha argued that we need to be compassionate. It’s discouraging, he admitted, to hear patients repeating false claims about vaccination, but it’s very important to try to counter these statements in a sympathetic way. “We need to think about our tone,” he said. “It’s hard for adults to admit they’re wrong. We need to make it easier for other people.”

O’Donnell concurred, noting that we have all been in rooms with people we don’t agree with. The challenge is to convey information in such a way that we don’t dismiss their perspective. “It’s so important when educating the public to stress that we all have different views,” she said. “The first thing we need to do is listen. We have to integrate our social skills with our scientific ones.”

The Issues Impeding Vaccination

That act of listening is often revelatory. Guerrant asked Sinha and O’Donnell about the concerns they hear most often about vaccinations. Sinha noted that fear of the vaccine causing sterility is prevalent among some men and women, while others are anxious that mRNA vaccines cause cancer. These fears are all compounded by the sense that the vaccines were developed too quickly.

O’Donnell pointed to a particular worry of young people: how can I convince my parents to allow me to get vaccinated? Some have even sent her Center PowerPoint



“The first thing we need to do is listen. We have to integrate our social skills with our scientific ones.”

slides they put together for their parents. As science educators, she said, we need to help young people communicate with adults as well as their peers.

Another issue that causes confusion, according to both O’Donnell and Sinha, is that the public doesn’t really understand the scientific method. As O’Donnell pointed out, scientists understand the standards for gathering evidence, and they understand that science is not static. The public, on the other hand, regards changes in mask mandates or in the estimated efficacy of a vaccine as indications that scientists are confused. In this case, uncertainty leads to doubt.

Sinha agreed. He noted that when he talks to his patients about such topics as the evolution of the virus and the need to wear masks, he stresses that his information is based on current knowledge—but might change. “We need to get people used to the idea that science is not a fixed entity, and that it is constantly evolving,” he said. “This is why scientific literacy is so important and why teaching it to young people is critical. Understanding how science works is essential for trust.”

In essence, panelists concluded, the prevalence of these concerns underscores the need for more science communicators, whether students, journalists, physicians, or scientists. These are knowledgeable people who listen carefully and respond sensitively, building narratives around science that others can understand to make better decisions. It may not work all the time—for instance, to prevent personal attacks on communicators like Anthony Fauci on social media—but it is the only path forward.

ENERGY

MODERATOR: **Lance Collins, PhD**PANELISTS: **David Roop****Chuck English**

Lance Collins has spent much of his professional life at the intersection of technology and the public. The former dean of engineering at Cornell and a member of the National Academy of Engineering, he is now the inaugural vice president and executive director of the new Virginia Tech Innovation Campus in Alexandria.

Panelist **David Roop** is also a member of the National Academy of Engineering and was the director of electric transmission operations and reliability for Dominion Energy. Based at the Science Museum of Virginia, panelist **Chuck English** is Virginia STEM Coordinator and, as such, is striving to pull together the wealth of opportunities across the Commonwealth for STEM education.

Having worked in the power industry for decades, Roop has had ample opportunity to consider the factors that make it difficult to communicate energy issues to the general public. They include complexity—energy infrastructure, he noted, is one of the most complex systems that man has ever developed—and the related tendency of specialists to discuss it, because of its complexity, using mathematics and statistics. Compounding this difficulty is the fact that electricity is not visible, and that the reliability of energy systems is taken for granted by the public. “Most people don’t understand electricity,” he said, “but they don’t worry about what they don’t know.”

The conversation around energy is also clouded, Roop pointed out, by controversy and partisanship. Many vested interests are weighing in on energy issues with opposing and sometimes contradictory statements. As a result, the public often does not know what to believe or whom to trust.

Roop suggested that public utilities could earn trust by being more engaged with the communities they serve. “Representatives of

energy companies need to join boards, attend public meetings, and make themselves available to educators,” he said. He noted that energy companies in Virginia have been particularly active in funding research at the state’s universities. This practice builds trust among faculty and serves students, he said.

He also urged communicators to be cautious about using absolutes and to stress that there’s not a single way forward to our energy future. Finally, he recommended avoiding industry jargon, advocating instead the use of illustrations and other visualization tools.

Both English and Roop pointed to changes in the media business that have created obstacles to bringing accurate information about energy to the public. Publications have always used news to sell papers, English said, but scientists and science communicators now have to be more proactive in working with the media to help them see why information about energy is worth sharing. “If we don’t make that extra effort,” he said, “it won’t appear.”

Roop pointed to shrinking newsroom budgets as one of the origins of the problem. “Early in my career,” he



“Most energy users are more interested in what energy enables them to do than in how the energy system works. We should focus on the impact of changes on their daily lives.”

recalled, “you dealt with scientific journalists who could translate your information into terms that were easy for the public to understand. They have been replaced by general reporters.”

Finally, he cautioned that conflicts over our energy future have as much to do with beliefs, values, and interests as they do with facts. Concentrating on the facts alone will not sway an audience.

Framing the Message

Roop made a number of observations about ways we could better communicate about energy. He mentioned that communicators should frame their messages to better relate to the concerns of their audience. “Most energy users are more interested in what energy enables them to do than in how the energy system works,” Roop said. “We should focus on the impact of changes on their daily lives.”

English amplified Roop’s remarks by stressing that different people have different reasons to be interested in energy. Some, he noted, are motivated to learn more because they are worried about climate change. Others simply want to cut their energy bills. At the Science Museum of Virginia, where anybody can walk through the door, the curators try to accommodate both interests.

In practice, this means cutting back on the amount of information the Science Museum presents and providing

something shorter and more interactive. “We used to assume that people visiting museums had a vested interest in science,” he said. “Our challenge now is to create that interest.” He noted the Science Museum has been developing new digital presentations and relying more on videos and video

blogs to attract wider audiences. “The Science Museum takes the position that we are the marketing agency for science,” he said. “We want to encourage our guests to consume more science.”

Placing Science in the Big Picture

At this point, the discussion turned to K–12 education. As Virginia STEM Coordinator, English has met with teachers around the state and been impressed with the extent of the individual initiative and creativity they have shown in developing modules on energy. At the same time, he believes that these efforts need to be more tightly integrated and placed in a broader framework: “We need to work to ensure that energy education is not a series of discrete lessons but part of a broader discussion about how it fits into our world now and in the past.”

English noted that he is working with Gregory McDougal, science specialist with Virginia’s Department of Education, to help educators not only understand what they need to teach but also how an individual activity fits into the larger picture.

Roop added that we need to do a better job emphasizing STEM sooner in students’ educational development: in middle school or even earlier. “There are many decisions we as a society will be making about energy in our current students’ lifetimes,” he said.

“They need to have the background to participate in the discussion.” At the same time, Roop noted, by reaching them earlier, we have a better chance of encouraging them to pursue careers in energy. “Our energy future will depend on having an educated energy workforce,” he said.



David Roop



Chuck English

SPEAKER BIOGRAPHIES

John Almarode, PhD

An associate professor of education at James Madison University, Almarode is a best-selling author who has worked with schools, classrooms, and teachers around the world translating and applying the science of learning to classrooms, schools, and home environments.

Danny Avula, MD

Avula was director of the Richmond and Henrico Health Districts from 2016 to 2022 and served as COVID-19 Vaccine Coordinator for the Commonwealth of Virginia. He is now Commissioner of the Department of Social Services.

Lance Collins, PhD

Collins is an engineer and professor of mechanical and aerospace engineering at Virginia Tech. He was previously the Joseph Silbert Dean of Engineering at Cornell University and is now the inaugural vice president and executive director of the new Virginia Tech Innovation Campus.

Charles English

As Virginia STEM Coordinator, English pulls together the wealth of opportunities across the Commonwealth in STEM education. He helps STEM leaders work collaboratively and share experiences, resources, and energy, creating a unified vision and heightening their collective impact.

Cary Funk, PhD

Funk is director of science and society research at Pew Research Center, which looks at the social, ethical, and policy implications of scientific developments in areas such as climate and energy, emerging issues in genetic engineering, and food and space science.

Jonathan Goodall, PhD

A professor of civil engineering in UVA's Department of Engineering Systems and Environment, Goodall employs data and computational sciences to improve the understanding, forecasting, and management of water systems. Much of his current work focuses on real-time flood mitigation in coastal urban communities experiencing sea level rise.

Richard Guerrant, MD

An internationally recognized expert on enteric infections, Guerrant is the founder of UVA's Center for Global Health Equity. He is a member of the National Academy of Medicine and recipient of the Walter Reed Medal from the American Society of Tropical Medicine and Hygiene.

Jeremy Hoffman, PhD

Hoffman is the David and Jane Cohn Scientist at the Science Museum of Virginia and an affiliate of the L. Douglas Wilder School of Government and Public Affairs and Center for Environmental Studies at VCU. His recent research has focused on the environmental justice history of extreme heat in cities.

Robert Holsworth, PhD

A political scientist, Holsworth was the founding director of both the Center for Public Policy and the L. Douglas Wilder School of Government and Public Affairs at VCU. He is a managing principal at DecideSmart, a firm that provides analysis and planning assistance to government entities and those with governmental interests.

Sheril Kirshenbaum, PhD

Kirshenbaum is a scientist and author working to enhance public understanding of science and improve communication among scientists, policymakers, and the public. She is coauthor of *Unscientific America: How Scientific Illiteracy Threatens Our Future* and hosts *Serving up Science* at PBS Digital Studios.

Kelli Lemon

An entrepreneur and consultant, Lemon leads the video initiative at the *Richmond Times-Dispatch* through the Virginia Video Network. She helped create the Jackson Ward Collective and Richmond Black Restaurant Experience, hubs that provide resources to Black-owned businesses, and owns the social café Urban Hang Suite in downtown Richmond. She is the voice of Virginia Lottery weekend days.

Frank Niepold

Niepold is the senior climate education program manager and coordinator at the National Oceanic and Atmospheric Administration's Climate Program Office (CPO) and co-manages its Communication, Education and Engagement Division. He also leads the education section of NOAA's public data and information web portal, [Climate.gov](https://climate.gov).

Carol O'Donnell, PhD

O'Donnell is the director of the Smithsonian Science Education Center, which is dedicated to transforming K-12 education through science in collaboration with communities across the globe. She also serves as the U.S. representative on the Global Council of the InterAcademy Partnership Science Education Programme, an appointment by the National Academies.

Elliott Robinson

Robinson is the news director of VPM, which operates public television and public radio stations reaching nearly two million people across Central Virginia and the Shenandoah Valley. He has worked in leadership roles at the *Hopewell News*, *The Daily Progress* in Charlottesville and, most recently, *Charlottesville Tomorrow*.

David Roop

A member of the National Academy of Engineering, Roop had a 43-year career in the electric utility industry, retiring as director of electric transmission operations and reliability for Dominion Energy. His firm, DWR Associates, provides consulting on electric power systems issues.

Pranay Sinha, MD

Sinha is an Infectious Diseases physician-investigator at Boston Medical Center. He received his medical degree at the University of Virginia. In addition to caring for patients, he studies the impact of undernutrition on the tuberculosis pandemic through epidemiological studies and health economic modeling.

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