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Repairing Relations With Science

How can scientists and research institutions
contribute to social justice?

In July 2017, California Governor Jerry Brown signed Assembly Bill No. 617, a law that requires state regulators to establish community-level monitoring in neighborhoods heavily affected by air pollution and to develop plans to reduce emissions in communities with high cumulative exposures to air pollutants. At a January 2018 workshop to announce and get feedback on their plans to implement AB-617, Bay Area Air Quality Management District (BAAQMD) staff acknowledged that local communities had not benefitted equally from regional air quality improvements in the past. The staff welcomed the opportunity to correct disparities. They assured attendees that the additional monitoring and emissions reduction plans called for in AB-617 would be developed through what they called a “community-driven process.” They recognized and expressed admiration for the expertise of community leaders who had already been working with BAAQMD on air monitoring programs. They even invited prominent critics of the law to speak at the kick-off meeting as part of a “community panel.”

Brian Butler, an organizer for Greenaction, a health and environmental advocacy group, spoke on the community panel and cast doubt on the claims that BAAQMD’s efforts would result in progress toward environmental justice. Butler, a Black man with an engineering degree, began his remarks by declaring, “If we do not quickly reduce community exposure to harmful and toxic air pollutants, then this effort will have failed. Point blank, period.”

Butler then drew the audience’s attention to an editorial cartoon featuring two men. The man on the right was

portly and wearing a suit with a bow tie. On his head was a mortarboard. He scribbled on a small notepad as he stared at the second man. That man was skinny. He had shaded skin and what could be an Afro; his clothing was casual. What especially differentiated him from the portly man was that he was mounted on a wall like a specimen in a butterfly collection, wrists and ankles outstretched and held in place by semicircular restraints, his head drooping. The relationship between the two men was clear at a glance: The man on the right was a scientist; the man on the left was an object of study.

“The reason why I put this image up here,” Butler explained, “is that this is what the community monitoring will be if we don’t reduce exposure.... What’s most important for me is that whatever data that communities generate has real impacts. This isn’t some exercise in academics or intellectual pursuit.” Butler sounded this note of caution, it seemed, because he saw BAAQMD becoming focused on science at the expense of “real impacts.” Reflecting on comments made by agency staff earlier in the workshop, he said, “We want to identify these communities, we want to identify the pollution ... we want to better understand what’s going on in here, but there’s no need to identify or figure out everything. We know where the places are. *We know* where the places are.” Given that knowledge, Butler continued, “What we are calling on the Air District to do is to do what ... their regulatory responsibility is, and to protect public health.”

In effect, Butler was telling BAAQMD staff to take off their scientist hats and put on their regulator hats so that they

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THE AIR WE SHARE

Landscape paintings usually freeze a snapshot in time. However, in my practice as a naturalist turned visual artist, the only constant in nature is change. My paintings of nature capture succession and evolution. In my work, the elements of the natural scenes from which I draw inspiration are linked, whether weeds in Massachusetts or the Rocky Mountains in Canada or roiling rivers in Vermont.

In my most recent show at the American University Museum at the Katzen Arts Center in Washington, DC, I

focused on those weeds—the plants we step over, pull up, and spray. My paintings give them the scale and attention usually reserved for mountains. My surfaces move between the intimate and the immense: A swath of fluid color reads as an entire watershed from across the room, then resolves, up close, into the capillaries of a single leaf. The pictures are about plants, but they are also about what connects them. Each is bound to the water that feeds them, the air they trade, and the larger systems in which nothing stands alone.



ILANA MANOLSON, *Exhale-Inhale*, 2025, print on mulberry, 21 x 38.5 inches. Previous spread: *Milkweed Teenybopper*, 2024, acrylic on yupo, 30 x 38 inches. Courtesy of the artist.

That double vision—of the minute and the monumental—grows out of how I was trained to see. I studied botany and worked as a naturalist at Parks Canada before studying printmaking and painting at the Rhode Island School of Design. The science came first, and it never left. Today I live in Concord, Massachusetts, on the banks of the Assabet, one of the rivers Henry David Thoreau once paddled. Here, it feels as though I have moved into one of my paintings. I walk and kayak the river's edges daily, checking the ground for what's growing, then looking at the birds and the ducks.

What happens next is the heart of my practice: When a plant takes hold of my attention, I draw it, over and over, crouched in the field and again back in the studio, accumulating hundreds of botanical studies I never exhibit. I consider them a gift to myself because they're my time with a plant. In them I work out the structure most people never register: the venation of a leaf, the way it joins the stem, the geometry by which a seed is thrown to the wind. Only once I understand a plant from the inside do I loosen into the sweeping, half-abstract gestures of my finished work, adding the essence of what's not seen. The freedom is earned; the abstraction rests on accurate observation.

One thing I've learned is to look closely at the minutiae in order to see something much larger, to see the whole. A milkweed is also the monarch caterpillar that has evolved to cut the plant's leaves and drain the toxic latex before feeding; a dandelion is a nitrogen factory whose taproot aerates the soil for the plants around it. Every aspect of this plant gives. To paint one weed truthfully, I must paint its relationships; those connections are what my work depicts. In *Exhale-Inhale*, I render roots, stems, and air as a single continuous red web, deliberately echoing neural and capillary networks.

Nature as Mentor, a collaboration with the biologist Janine Benyus, reads four intact natural systems—milkweed, mangrove, mycelium, and gravel-bed rivers—for the design lessons they hold. This perspective represents a shift from protecting nature to learning from it, from seeing a wetland as a resource to seeing it as a working model refined over millions of years of evolution. That reframing makes the humble plants I paint a form of accumulated intelligence humans have only begun to read.

There is an argument folded inside the beauty. To hang a dandelion or a stand of loosestrife in a museum at the scale of a landscape is to ask why people have sorted these plants into "weeds" at all. I resist the tidy binary of native and foreign, valued and disposable, and hold that the overlooked deserves the closest possible look. My daily ritual at the river's edge is that whole conviction in miniature: *Day after day, I pilgrimage to this forgotten river's edge. I sink low away from the horizon line. At this union of water and soil, I inspect the most humble, incidental happening, and back in the studio with a brush, a spatula and paint, I grab its essence. I work in a world of visions for which there are no words.*

Ilana Manolson is a painter, printmaker, and naturalist whose exhibition *The Air We Share* was on view at the American University Museum at the Katzen Arts Center, Washington, DC, from February 7 to March 29, 2026.



ILANA MANOLSON, *Medulla*, 2017, acylic on yupo, 36 x 24 inches. Courtesy of the artist.

could do the work of upholding health norms. Consider the underlying message there, though: Butler was suggesting that merely doing science would not contribute to—and might actually detract from—doing the work required to create an inclusive moral community in which individuals hold each other accountable to shared standards of right and wrong. To the extent that the note-scribbling man in the cartoon represents the scientific enterprise, Butler's point is clear: Busy observing the other man's discomfort, the stereotypical scientist doesn't do anything to address it. He declines to uphold basic norms against allowing people to suffer.

As represented by the cartoon, Butler's reservations about the science likely to happen under the new state law highlight a defining difference between the kind of inquiry prescribed by scientific chauvinism (in which credentialed scientists are

granted sole authority to establish and uphold norms for knowing) and pursued by regulatory agencies, and the kind of inquiry that I call *reparative science*. The former maintains the pretense that science is separable from moral questions. Reparative science, in contrast, involves itself in the work expected of reliable members of a moral community: recognizing wrongs, holding wrongdoers accountable, and fostering hope that people who have been wronged won't be abandoned. Simply put, reparative science sticks up for people; the man in the mortarboard does not.

This difference has consequences when it comes to the role that research can play in promoting justice. As the cartoon suggests, people have lost trust in the scientific enterprise—not necessarily as a provider of facts, but as a contributor to the maintenance of good moral relations. Until science as an institution takes its rightful place in our moral community, the value of any research to the fight for social justice will be questioned.

That is not to say that every researcher and scientific institution must coalesce around the norms that Brian Butler or Greenaction would put forth. Where moral standards are contested or in flux, there are good reasons for the scientific enterprise to remain agnostic until norms become more widely shared. But pretending to be neutral is not the way to do that. Research institutions can remain involved in maintaining good moral relations without prematurely taking sides by actively combatting ignorance, insisting that the moral commitments of all research be subject to scrutiny, and fostering inquiry from multiple perspectives. Instituting these values would help establish the scientific enterprise as a trustworthy contributor to functional moral relations and help maximize the contributions of research to social justice.

Reparative science shares the work

If the quest for knowledge is to be part of our strategy for creating a just world—as I think it ought to be—the cartoon's man in the mortarboard must cease to be recognizable as an avatar for science. Science needs to become a trustworthy part of our moral community by becoming an active contributor to the maintenance of functional moral relations.

It is possible for the processes of research to contribute to good moral relations without abandoning the goal of knowing well. Reparative science does not aspire to neutrality or detachment. Rather, inquiry that promotes functional moral relations is straightforward about its moral commitments. These normative commitments inform the methods used to collect evidence, as well as the conclusions drawn from the evidence. The reparative science projects I have documented expand norms for knowing well to incorporate the insights of

noncredentialed knowers. They deal with uncertainty and the potential for error in their results in a way that prioritizes communities' right to knowledge about how their environment may affect their health.

Communities want to know: How do we understand our relationship to our surroundings? How are our health, prosperity, and social relations affected by policy action or inaction? How are they affected by technological innovation and economic development? Reparative science projects pursue these questions earnestly. The answers they get aren't always convenient or helpful. In communities affected by petrochemical pollution, for example, air sample analyses sometimes said that whatever was in the air was at levels too low to detect. Data from the fenceline systems that activists worked so hard to establish sometimes turned out to be unreliable. Conclusive links between measured levels of pollution and the health effects people experienced were usually elusive. But it is the process of reparative science itself—rather than the mere facts that were or were not produced—by which science becomes a trusted part of the moral community.

The role of the research institution

Trustworthy scientific institutions need to help build an inclusive moral community (which entails acknowledging people as knowers), strengthen accountability (which includes expanding the realm of things for which accountability can be demanded), and promote the hope that, when people are wronged, others will stick up for them. Achieving these goals require that institutions operate by a clear set of principles and demonstrate that they are following them. First, research institutions should actively combat ignorance. Second, they should ensure that the moral commitments of all research are subject to scrutiny. Third, they should embrace pluralism and support research from a multiplicity of perspectives.

The principle of combatting ignorance arises from the awareness that ignorance is a problem for moral relations. Simply put, science can't stick up for people if scientists don't know—and acknowledge—their situation, whatever it is. Ignorance is also a challenge for science itself. The processes of producing new knowledge can simultaneously produce ignorance, for example, when researchers set aside findings that don't make sense within established paradigms, when they overextend available information to cover areas of uncertainty, or when they apply standardized research methods in contexts for which they are ill-suited. Unless researchers are vigilant about combatting ignorance, science can make injustice harder to see, such as when scientific methods for determining air quality fail to include measurements from neighborhoods near large industrial emitters—thus

rendering invisible the harms these neighborhoods suffer—as was the case as recently as 25 years ago.

If research institutions are to become reliable participants in maintaining good moral relations, they need to make science accountable not only for what it claims to know, but for what it fails to know. Put another way, research institutions should acknowledge—and even embrace—their own capacity to be ignorant. Universities and funders should stress the need for investigators to ask, “What could we be missing?” It's a question that can't be answered by credentialed scientists alone; research institutions should provide resources to engage people from diverse educational, economic, geographical, and political backgrounds, and incentives to take up their questions on their own terms—even if these terms are not recognizable within established scientific paradigms. Such expanded participation can help investigators not only identify areas of ignorance but also develop the concepts and methodologies needed to inquire about them. It would also increase the lines of direct accountability between scientific institutions and other knowers and mitigate the segregation of scientific norms from the moral community more generally.



ILANA MANOLSON, *Fireweed*, 2019, acrylic on yupo, 14 x 11 inches. Courtesy of the artist.

The second principle, what I call scrutability, responds to the fact that the research that scientists choose to do depends on what moral standards they choose to uphold. When standards are contested, functional moral relations demand, at least, accountability for those choices. Research institutions can promote that accountability for science by, first, acknowledging that research necessarily incorporates value judgments, norms, and moral priorities and, second, requiring that every research project make its normative commitments subject to scrutiny. Investigators should be expected to surface the norms that they mean to uphold and reflect on how those are expressed in their projects' methods, analysis, rhetoric, and treatment of error and uncertainty. They should be encouraged to suggest how they might have collected, analyzed, or presented their data differently had they prioritized different values or norms.

A commitment to scrutability would promote inclusion as well as accountability by leveling the playing field between norm-shifters and defenders of prevailing norms. Under a pretense of neutrality, investigators who, for example, prioritize human health over economic development when

Doing research that matters

Over the past decade I've tried to answer the question of how to maximize the contributions of research to social justice. Critiques such as those leveled by Butler against AB-617 call into question the very premise. Perhaps research, associated as it is with the detachment of the note-scribbling man in the cartoon Butler presented, is simply the wrong tool for promoting justice. I have wondered, for myself and for my profession, whether we should abandon our attempts, in Butler's words, "to identify or figure out everything," and instead act on the numerous wrongs already staring us in the face. We *know* what the problems are, to paraphrase Butler. Perhaps we are called to take action, not study the problems further.

But this either-or thinking is itself a symptom of a larger problem. Science has not been a trustworthy contributor to good moral relations. Scientific chauvinism has discouraged scientists from the work of upholding moral standards and has made reparative science, or science that works to improve moral relations, risky. Yet knowing well and being inquisitive can make real contributions to justice by

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interpreting evidence are subject to accusations of bias. In other words, their status as a reliable member of the moral community is called into question. If all moral reasoning in science is subject to scrutiny, however, the judgments made by those seeking to advance better norms could no longer be seen as anomalous or deviant but just one possible variation on the choices that any research project inevitably makes.

Finally, the principle of pluralism acknowledges that research institutions that wish to remain agnostic about contested moral standards can best do so by supporting research projects with diverse, possibly even divergent, normative commitments. Fostering pluralism in science can help create an inclusive moral community by, again, legitimating inquisitiveness from multiple points of view, including those of norm-shifters and norm-upholders, and credentialed researchers and knowers without formal training in science. In combination with scrutability, it can make the scientific enterprise more accountable for knowing the world fully and not just from a limited set of viewpoints. A pluralistic stance serves the goal of anti-ignorance as well: We are likely to see more things if we look from more directions.

helping to repair myriad aspects of the dysfunctional moral relations that allow injustice to flourish.

So how *do* we maximize those contributions? First and foremost, justice-oriented researchers need to understand that our goal is to foster more functional moral relations. That includes countering attempts to exclude individuals from full participation in the moral community on the basis of their credentials. It also includes advancing adequate norms that enable more people to call each other to account, both for their behavior and for their claims to knowledge.

Researchers can further maximize our contributions to justice by de-emphasizing *facts* in favor of *knowing well*. Facts, as they are wielded by experts, can short-circuit inquisitiveness and hide areas of ignorance. Under scientific chauvinism, facts can become a tool to restrict access to the moral community. Reparative science does not promote justice by bludgeoning people with facts about how gravely communities are harmed by pollution. Instead, it leverages the process of research to call people into the moral community and make everyone accountable for their claims to knowledge.



ILANA MANOLSON, *Luminary*, 2018, acrylic on yupo, 48 x 74 inches. Courtesy of the artist.

However, doing reparative science projects is only one part of the work that needs to be done. Our contributions to social justice will remain limited unless researchers act collectively to transform scientific institutions. Universities, professional societies, funding agencies, and other entities that support or set the terms for research need to stop pretending that science is, or could ever be, devoid of moral judgment. They need, instead, to do their part to maintain functional moral relations. Researchers can undertake projects that advance more adequate moral standards while their institutions remain agnostic about contested norms, as long as we are willing to ask what we are missing, to subject our normative commitments to scrutiny, and to embrace the idea that other investigators may be dedicated to upholding other norms that bring a different perspective to their research. We should help our institutions put structures in place that will demand anti-ignorance, scrutability, and pluralism across the board, not just for reparative science.

Research will not solve injustice. But injustice can't be solved without research, either—and not just any research will do. Reparative science offers an alternative to the detachment of the scientist figure in the cartoon, and it demonstrates the needlessness of scientific chauvinism. The work ahead of us—by researchers who are both inquisitive and called to work for justice—is not only to extend the model of reparative research into our own practices, but to make it the norm for any respectable attempt to understand the world better. In so doing, we can enact our hope that science will become a trustworthy contributor to good moral relations and a positive force for justice.

Gwen Ottinger is professor of politics and environmental studies at Drexel University. This essay is adapted from *The Science of Repair: How People Who Believe in Facts Can Build a Better Future*. Copyright © 2026 by Gwen Ottinger and published by Oxford University Press. All rights reserved.