A Free Inquiry Into Air

When we think about depicting environmental disruption, we often envision charred forests, melting glaciers, or rising floodwaters. In my filmmaking I'm interested in the scourges that we *can't* see: the pollutants that are too small or the climatic disasters that are too vast—in time and space. What cannot be easily caught on camera—and what are we overlooking—as we gravitate toward apocalyptic visions of Earth?

In my previous films, twenty-one in total, I have tried to bypass such visual limitations, for example, by creating a sonic articulation of plastic pollution through the sounds of Styrofoam (*Tenebrio molitor,* 2019) or recording reflections of rare-earth elements in black-mirror devices in material witness of the ecological costs of mining (*The Lanthanide Series*, 2014). For my proposal to the CHA, I am focusing on a new film about Earth's air, with a working title of *A Free Inquiry into Air*, with an expected completion date of Spring or Summer 2022. Popular cinematic representations of air have been restricted to ambience, atmospherics, or industrial demonization. Instead, I am exploring what it means for air to be a protagonist, leading me, in turn, to study and feature the behavior and properties of cyanobacteria. These organisms changed the Earth's air on a global scale 2.4 billion years ago during the Great Oxygenation Event. After expelling oxygen for 200 million years, utilizing sunlight to split water molecules, cyanobacteria made the air of today. An oxygen-rich atmosphere allowed for the evolution of complex creatures while driving other species to extinction. Cyanobacteria permanently altered their own air, just as humans are doing today, and thus they permanently changed the planet's ecology, its fate.

A few months ago, I became artist-in-residence in the laboratory of biochemist Dr. Jeffrey Cameron at the University of Colorado Boulder. The lab has custom-built cameras, attached to microscopes, to track bacterial growth at the level of a single cell; they can control light, temperature, and air composition. Framing and in-camera movement can be manually composed and conducted by the operator. A single cell

can be seen dividing, and then splitting again. In seconds, a family of cells fills the screen, each in a distinct position, until a bubble of oxygen—a toxic waste product of the cells' own making—sweeps like a tsunami, flushing all life off-screen.

Cinema in the past has found ways to react to changes in the air, though more in terms of a mood or tone, a proto-awareness. Take Alfred Hitchcock's first film, entitled, *The Lodger: A Story of the London Fog*, from 1926. It makes use of the smoky mystery of the city's nighttime lighting to create a place of horror, rife with murder. At the root, it employs the city's pollution for its own atmospheric purposes. Or look at the film *Red Desert*, directed by Michelangelo Antonioni. Premiering in 1964, at the cusp of the early environmental movement, the film examines how humans live, breathe, and mentally suffer in industrial wastelands pocked with blood-red radio towers, hulked over by factories, and suffused in pea-soup fogs. Antonioni denied that he was "condemning the inhuman industrial world which oppresses the individuals..." Rather, he said, "the neurosis I sought to describe in *Red Desert* is above all a matter of adjusting. There are people who do adapt, and others who can't manage." No artist had taken the psychological effects of environmental degradation to such extremes until Todd Haynes' 1995 film *Safe,* with his focus on the character of Carol White, plagued by multiple chemical sensitivity, an"allergy" to life in Los Angeles.

Although I'm in subtle dialogue with these cinematic works, I am trying to find ways of featuring non-human characters, giving other species time and presence on screen. At one point in *Red Desert,* Monica Vitti's character, Giuliana, asks, "I feel my eyes tearing up. What should I do with my eyes? What should I watch?" Another person replies, "You ask what you should watch. I ask how I should live. It's the same thing." And with those lines, Antonioni reminds us that, just as the saying goes, "you are what you eat," one could as easily affirm, "you are what you see." At this point in media saturation, we need to see less of ourselves, more *other*. I believe we need alternate visual representations of the world.

The imagery emerging from the Cameron lab presents a novel way of assessing our species' positionality in the ecosystem: these organisms are fascinating in their own right, yet also offer a glimpse of ourselves in doppelgänger.

As a filmmaker who derives inspiration and sometimes narration from history and literature, I have also been thinking about a range of other past perceptions of altered air quality. In 1257, Eleanor of Provence, an outspoken queen and occasional poet, declared that the air at one of her castles was so "full of stench of sea-coal smoke" that she must leave instantly for the good of her health. Well before that, the playwright Seneca wrote in a letter in 61 AD that Rome's air was heavy with "the stink of chimneys," and he understood the change to his surroundings could be permanent; his symptoms were relieved, he said, once he left town for a vacation. "Fly the city, shun its turbid air, breathe not its chaos of eternal smoke" echoed the British poet and physician John Armstrong in 1744. These are early instances of environmental inequity playing out in privileged mobility. On an aesthetic level, Ralph Waldo Emerson realized that urban women were forced to dress in dowdy fashion, in his estimation, because they couldn't keep white linen white. This was true for house interiors, too: dark wallpaper, upholstery, and rugs would hide the build-up of creosote. All to say, air pollution is not new.

However, we certainly have reached a different plateau in global air quality. We track particulate in cities, as well as in more rural areas when wildfires, like the ones in California and Oregon this year, burn out of control. Studies are accumulating around the injurious effects of air pollution for people of all ages, but particularly children. We are creating our own tsunami of foul air that threatens to overtake us, just like the cyanobacterial belching of oxygen.

Cyanobacteria were Earth's strongest influencers in deep time, making life possible. They might also provide some "solutions" to our air in future. The Cameron lab and others are studying the ways in which these organisms "eat" sunlight, sequester carbon dioxide, and give off oxygen—now the perfect

formula for improving humanity's chances for survival. These delicate microorganisms drive global-scale processes and entire carbon cycles. They are what created much of our fossil fuels. We are intertwined as species more than most of us know. Can they give us a different history of our planetary air?

To return to the specific research I have begun in the Cameron laboratory, let me speak to its slow pace. Every cinematic capture can take days or weeks to gather a few seconds of footage: a week of growth condenses, in time lapse, into a few seconds. The spectrum of bacterial species varies tremendously, offering infinite possibilities for composition. The lab can only spare the equipment for "artistic purposes" on occasion. Sometimes the growth fails for any number of reasons—the light is too bright, the agar contaminated, and so forth.

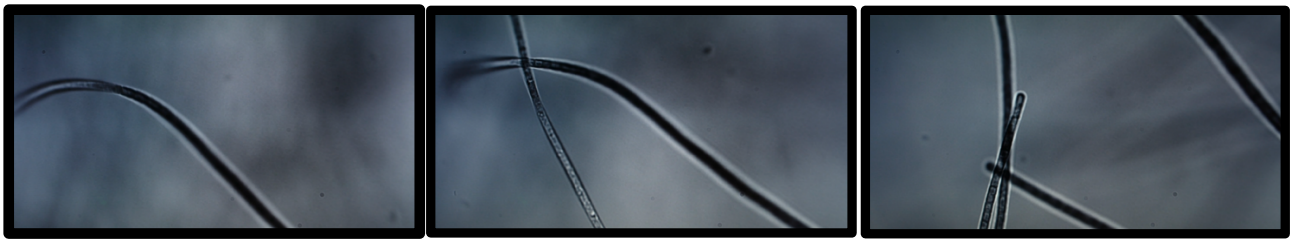
Given the laborious process, I would benefit from having protected time to finish *A Free Inquiry into Air* in 2021-2022. My commitments this current academic year have been dominated by a Mellon Sawyer Seminar grant, which focuses on "Environmental Futures" and art's role in confronting change. I am curating eco-art exhibits at the Dairy Center (exterior) and Union Hall gallery in Denver (October 22, 2020-January 9, 2021). Moreover, I am co-teaching a newly designed class with my A&AH colleague, Brianne Cohen. The teaching demands of the Mellon grant engagements are fueling my thinking around environmental art, yet my personal filmmaking research has been neglected; the timing of a CHA fellowship next year would be ideal to complete a film I see as timely and necessary.

Let me conclude by pointing out that *A Free Inquiry into Air* is not a documentary about art and science. It *is* science and it *is* art. I do not believe this distinction can be overemphasized in thinking about its contribution to the fields of cinematic arts and biochemistry. The project has already generated new scientific data for the laboratory: elements in the videos that I have designed revealed cellular activity that had never seen before; a paper is currently being published by the Cameron lab. I look forward to exploring these ideas even further and finding ways to put cyanobacteria on a larger screen.

ERIN ESPELIE
Outline

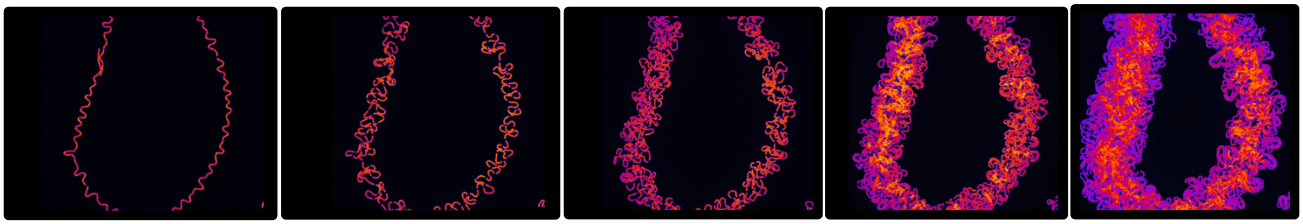
A Free Inquiry Into Air

Many of the moving images I am helping to generate in my residency in the Cameron biochemistry laboratory at the University of Colorado Boulder are at the level of the single cell. Other scales of view exist, too, including live-monitoring of colonies in motion, which, in bright-field microscopy as seen below, resemble Japanese sumi-e ink painting.



My film, *A Free Inquiry into Air*, will look at the diversity of cyanobacterial colonies, alongside their varied movements and aspects. The film will begin in monochrome, with black sooty cells upon pale sky-like screens. Then the film will move into color, just as Claude Monet made a noticeable shift in his color palette when he began visiting London in 1899 (painting the "yellow fog" hanging above the Thames River). Indeed, the electric colors used by Monet may have been truer to life than one might imagine, derived from sulfur and other air pollutants reflecting against the Sun.

False color in microscopy allows scientists to highlight certain cellular activity. I'm drawn to these methods and attempts at clarity, which create a distinct aesthetic and a reality of our digital existence, reliance, and vistas (as in the *Anabena* colony we captured below).



Ultimately, the film will offer a meditative look at cyanobacteria, drawing parallels between their ability to change Earth's atmosphere and humanity's history of altering the air.