

A Thesis Entitled:

Proof

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by

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Our story begins in the late 1890s. Following the discovery of the light bulb in 1897, the American public became deeply interested in shifting their efforts toward industrialization. The Carolinas—which had been struck heavy-handedly with agrarian poverty—were especially motivated to electrify their communities and focus on textile production. The Niagara Falls Dam project, completed in the late 1890s and spearheaded by an engineer who was a South Carolina native, inspired the Southern Power Company—led by key stakeholders Dr. Gill Wylie, James B. Duke, and William States Lee—to dam the Catawba River for cheap and efficient hydroelectric power. The river begins in western North Carolina on the slopes of the Blue Ridge Mountains and flows 220 miles into South Carolina.

In 1904, the Southern Power Company—known today as Duke Energy, the kings of power and electricity in the Carolinas and throughout the southeast—created its first dam on the Catawba, commencing the nation’s first development of an entire river system. Throughout the 20th century, Duke built a series of 12 more dams across the span of the river, injecting 11 new artificial lakes into the unsuspecting terrain.

This story takes place on Lake Norman, one of the 11 reservoirs, located 20 miles north of Charlotte, North Carolina. After the Cowans Ford Dam was built in 1963, Lake Norman was created, spanning 520 miles of shoreline and four entire counties. As water flooded the land once the site of plantations, cotton mills, town centers, graveyards, battlegrounds, and summer camps, the former sleepy farm towns exploded into prospering lakefront communities. To power the population surge in these towns and beyond, Duke Energy built Marshall Steam Station—a coal power plant located on the border between Iredell and Catawba counties—in 1965, and McGuire Nuclear Station two decades later right across the street from Cowans Ford Dam.

From Huntersville, Cornelius, Davidson, and Mooresville on the eastern side of the lake, all the way across to Denver, each town on Lake Norman has its respective flavor, ranging from quaint main streets held together by local shop owners to neighborhoods dotted with mansions owned by NASCAR drivers. Linking the towns—beyond the same shared lake water—is a communal trauma, spurred by a deep-rooted fear of potential cancer clusters. In the early 2010s, members of the Lake Norman community started noticing a daunting pattern: pockets of cancer emerging in the towns, specifically thyroid cancer—which attacks a gland within the neck—in Mooresville, and ocular melanoma, a rare eye cancer, in Huntersville.

A cancer cluster is a place where there appears to be a higher concentration of a specific type of cancer than the average incidence rate. A historical cluster that easily comes to mind is the Love Canal tragedy from the 1970s, where at least 701 members of a neighborhood in New York were poisoned, and ultimately killed, by chemicals that were mindlessly dumped into the canal.

In the summer of 2015, the North Carolina Department of Health and Human Services Division of Public Health began investigating a situation that was the first domino to tip, sending waves of distress across Lake Norman. Three young women, Kenan Koll, Meredith Legg, and Summer Heath had each been diagnosed with ocular melanoma and had each attended Hopewell High School—a public school in western Huntersville—between 2001 and 2011.

The incidence rate of ocular melanoma in the United States is typically five to seven and a half cases per one million people per year (or about one case in every 200,000 people per year); however, there have been approximately 30 ocular melanoma diagnoses in the last decade within a five-mile radius of Huntersville, a town of only 50,000 residents. Typically, ocular melanoma is diagnosed in males older than 50, but in Huntersville, the victims are mostly female and below

the age of 35. Similarly, after a Mooresville resident expressed concern in 2017, the Iredell County Health Department investigated the incidence rate of thyroid cancer in the town, finding that the expected North Carolina incidence rate was about 116 diagnoses per one million people, while in Mooresville, the rate was as high as 218 cases per one million people.

The atypical and haunting nature of these situations naturally persuaded community members to seek out a cause. Questions have arisen from scientists, doctors, policymakers, and citizens alike: *why are all of these diagnoses happening, and more importantly, why are they happening here?* Because the location of the diagnoses is so central to these data, members of the community were compelled to point their fingers toward environmental concerns. From electromagnetic radiation sickness to radon poisoning caused by natural geological rock formation to coal ash contamination attributed to Duke Energy's coal power plant, members of the community have considered every possible environmental risk.

Cancer clusters are as spine-chilling as they are complicated: they exist at the collision point between assumption and science, testimony and statistics, emotion and fact. In the towns surrounding Lake Norman, this complication is palpable. There are those on the lake who have dedicated their lives to seeking an answer, those who have suffered from, fought against, and ultimately lost their lives to the disease, those who have experienced inexplicable grief, those who have relocated to different states in fear. Then, there is science, data, and hard facts, all working to make sense of the unnatural growths in patients' bodies, the unnatural growths in the land where they live.

Questions of proof—who should be the one to prove, what constitutes proof, where proof should come from, how much proof is necessary—are at the forefront of this story. Admittedly, I write this story with a dilemma of perspective: I have never had cancer, nor have I watched a

family member or friend suffer from the specific cancers on Lake Norman. My connection to this story began only with my shared zipcode but has grown into an inextricable link, set in motion by presenting proof; not the kind that will reveal all of the things we have not known, but the kind that is reminiscent of all that we do.

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In 2005, my parents purchased an isolated home on Cindy Lane, a thin and winding road on the west side of Lake Norman. Living in Charlotte—a city getting more crowded by the day—they desired a sanctuary away from all the noise. Denver, North Carolina, a town twenty-six miles north that was still considered “country,” would be just the place.

The house was a true fixer-upper: brown shag carpeting that felt damp to the touch, stained wood trim reminiscent of my parents’ childhood homes, a wood-burning stove later determined to be the burial ground for a family of dead squirrels, and two tiny windows overlooking the lake that you could see out of only if you stood on your tiptoes. As a five-year-old at the time, I certainly couldn’t.

Denver has been a constant in our lives for the past 16 years, through moves, life changes, and tough moments. Even as the sprinkled trailer homes on our street were replaced with luxurious mansions, and the drive up morphed into red taillights and Publix parking lots, for us, it has always been a safe haven.

Lake Norman, for many, is a place to settle down with a family, a place to build a dream home, a place that could do no harm. At the lake, we are, above all else, safe. Maybe it was my

naiveté, denial, or hopeless romanticism, but I always viewed the lake as a sanctuary, never as a potential threat.

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“Like a jury’s verdict or an adoption decree, a cancer diagnosis is an authoritative pronouncement, one with the power to change your identity. It sends you into an unfamiliar country where all the rules of human conduct are alien. In this new territory, you disrobe in front of strangers who are allowed to touch you. You submit to bodily invasions. You agree to the removal of body parts. You agree to be poisoned. You have become a cancer patient.”

-Sandra Steingraber, author of *Living Downstream*

Pastor Sid Druen walked through the front door right on time, sending a whirl of hot July wind into Main Street Coffee, a tiny brick building in Huntersville, North Carolina. He sported a sincere closed-mouth grin, jeans, and a white T-shirt, asked for his coffee black, and if you looked just hard enough, had a slightly drooping left eyelid covering an almond brown eye.

Sid is a recent ocular melanoma survivor who has spent much of his early adult life in Davidson, first as a goalie for the college men’s soccer team back in the early 2000s, then as a campus minister for the Reformed University Fellowship for six years starting in 2013, and finally as a pastor for Northcross Church until 2018, when his vision suddenly started to blur.

“At first, I thought I was just tired. It had been a long year for a number of reasons, so I thought I was just extremely fatigued. The floaters looked like see-through amoebas crawling across my vision,” he said.

Around us, we hear the clatter of the barista making drinks behind the counter, a slowed indie version of La Vie En Rose playing dimly from a miniature speaker, and a light rain hitting the front windows of the shop.

He takes another sip of his coffee and wipes his mouth with a napkin.

“Eventually, the floaters turned into flashes of light at the edges of my vision. The specialist I went to in Concord told me there was a growth in my eye that was detaching my retina.”

He continues, “I knew about the ocular melanoma cases at the time, but I didn’t even go there. I couldn’t go there. I was sent to another specialist in Greenville. He was the one who told me I had cancer.”

By the end of the summer, Sid was starting his brachytherapy, a higher dose, more direct treatment option where a lead-backed, radioactive plaque was surgically inserted into his eye.

After this procedure, Sid was radioactive and could not be around any of his family members. His wife rented a minivan—large enough to keep a safe distance between them—and drove him out to a family friend’s house on Lake Norman, where he would stay for the entirety of his treatment.

For seven days and nights, Sid lived in a small bedroom on the second floor of the house, overlooking the murky lake. The lights were dimmed, the curtains were drawn, darkness was only permeated by an occasional ping from his iPhone.

“It was excruciating. The worst pain I’ve felt in my entire life,” he said. “They had just inserted a giant plaque into my eye socket, and I was passing out from the pain. It was a torture chamber.”

Even worse than the darkness of the room was the silence. He lowered his voice. “During radiation, I tried listening to different stuff. I was listening to different sermons and talks, anything about suffering I could find.”

He tells me, “Suffering is a point in which you are forced to interpret your life. I was trying to get my head around what was going on and why it was going on. I kept a journal during that time. It was mostly audio on my phone because I couldn’t open my eye to write for a long time, but I knew that was how I could process.”

Sid was not just forced into solitude because of the radiation. He did not want his family to witness his suffering. He is the father of two daughters and one son, all of whom were aware of his condition, but were too young to understand its severity.

Like all people dealing with a cancer diagnosis, his children processed the news in their own ways. He remembers a moment, a few days before the treatment, watching over his six-year-old daughter as she played with her dollhouse. One of her dolls entered through the front door and announced that she had developed eye cancer. The rest of the dolls surrounded her, consoling her, telling her there was a greater plan that she was a part of.

The only time he wasn’t completely alone during his stay at the house was when his wife sat in the hallway outside of his room with the door closed between them.

“I cried the most when people were very kind to me,” he says. “People wrote letters to me. My wife would sit in the hallway and would read people’s letters to me. I wept a ton,” he continues. “That was really healing and helpful. Even after the radiation, I wept multiple times a day.”

“I remember waking up one morning during my stay in the room from a dream,” he offers. “I remember I was younger in the dream, just a kid doing random kid things like driving

my car, hanging out with friends. I was happy. But I remember waking up and immediately reaching up to feel my eyepatch.” Sid moves his hand to cover up his left eye. He closes the other eye.

“That was one of the moments in the room where I knew that my life would never be the same.” He opens both eyes.

“The worst part,” he says, “was the re-entry. There is a whole agony in undergoing something, but when people ask you to go back to normal after that, it is very difficult. The expectation for it to feel normal, you just can’t. You feel so fragile, and it takes a long time to get your stamina back, but you are trying to do normal life. It took some time.”

Despite the seriousness of the conversation, Sid laughs then.

“It’s funny,” he quips. “You feel like a peeled grape. You are all of a sudden very sensitive to the environment around you.”

Suffering forces the interpretation of your life.

“Some people laugh, some weep, some people yell about it,” Sid adds.

“What’s comforting about the cancer, in some way, is that I know that I didn’t do something wrong to get it. It’s also why I didn’t pursue why it happened, or what exactly caused it.” Sid is referencing the cancer cluster research.

“I know enough about what happened to me, so I chose consciously not to dig into why it happened, mostly because frankly, we just don’t know. What I’ve read research-wise is no one really knows the true cause.”

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The precise cause of the perceived cancer clusters around Lake Norman, as Sid rightly points out, is still unknown. The truth is, proving that a cancer cluster exists is nearly impossible. According to the Center for Disease Control, a cancer cluster is “a greater than expected number of cancer cases that occurs within a group of people in a geographic area over a defined period of time,” a formula that presents a series of roadblocks to proving that an area is actually a cluster.

Dr. Sally Bullock, professor of Public Health and Epidemiology at Davidson College, walked me through these potential roadblocks. “It's rare that we ever find a direct cause for certain ‘clusters’ because different cancers might be caused by a variety of different factors,” says Bullock. “Also, cancer often takes a long time to develop, so you're exposed to all of these various factors throughout your life, so even if you invest a ton of money [in researching clusters], the chances of you being able to make a causal link between one particular factor and an outcome is very slim.”

A perfect example of this national complication is the perceived association between brain cancer and professional baseball. With the passing of Phillies legend Darren Daulton in 2017, unanswered questions about their association caught national attention.

The Phillies, who played on synthetic turf at Veterans Stadium from 1971 to 2003, lost four players to glioblastoma, an extremely aggressive brain cancer, from 2003 to 2017. Many believe that the chemicals within the turf have to be the link between these cases. This theory is supported by the death of three Kansas City Royals players, all of whom passed away from aggressive brain cancers and incidentally played on artificial turf.

Even with a case that seemed obvious to fans and players, researchers were never able to identify a causal link between the diagnoses and a single, common source. The reason for this: the deaths on the team fit cancer patterns that occur in the general population: men between the

ages of 45 and 70, which is the group that was ultimately affected by the disease, are at the highest risk for glioblastoma. Researchers have also pointed out that, although the media has reported each of these incidents as glioblastomas, many of them have not been identical tumors, meaning each of them could be tied to completely different causes.

Dr. Bullock continues, “I think often when you or a loved one is diagnosed with cancer, you're searching for different reasons that you [or they] might have it. People jump to these environmental factors, but there are also a lot of known lifestyle risk factors for cancer which are also clustered geographically. For example, exposure to cigarette smoking or access to healthy eating or healthy food is *also* geographically clustered. So there may be some other factor that is causing it beyond or in conjunction with the environment.”

Additionally, cancer clusters are difficult to pin down because of the final part of the CDC's vague definition. It is inherently challenging to study a specific location over a period of time because people rarely stay within one area throughout their lives. From what research tells us, cancer takes years, maybe even decades, to develop, so if individuals move, those patterns are difficult to track.

Even though it was unlikely they would find a direct cause, community members in Huntersville still wanted the town to investigate the high rates of ocular melanoma. In 2016, the state granted Huntersville \$100,000 to conduct research, which the town allocated between three separate studies: an Environmental Site Assessment at Hopewell High School, a Geospatial Investigation, and a Whole Genome Sequencing study.

In May of 2016, Hopewell High underwent a Phase I Environmental Site Assessment (ESA) to identify a potential Recognized Environmental Condition (REC) in connection with the property. These assessments include a site visit, a review of historical records (including aerial

photographs, city directories, and topographic maps), and interviews with current and previous property owners. Phase I ESAs are typically used for commercial real estate transactions to determine whether a site could pose any threat to the environment or people. If during the assessment, an REC is identified, a more thorough Phase II ESA would take place, which includes direct sampling from the site.

Hart & Hickman, an environmental consulting firm based in Charlotte, composed a 393-page ESA at Hopewell and came to this simple conclusion: *This assessment has revealed no evidence of recognized environmental conditions (RECs) in connection with the property.*

The trouble here is Phase I ESAs are standardized assessments that are not exhaustive enough to guarantee that there is no subsurface contamination. Even commercial real estate attorneys recommend that prospective buyers conduct their own title searches to have a solid legal foundation in the case that there is an environmental concern on the property. In other words, Phase I ESA reports on their own do not supply enough evidence to confirm or deny environmental hazards on a piece of land.

In April of 2018, John Cassells, a scientist from GEODYSEY Inc., an environmental consulting firm in Pennsylvania, released his Geospatial study to the public. Geospatial studies analyze where patients have been in the time leading up to their diagnosis, which helps to add time and place to the investigation. Cassells created an online multidimensional map with layers of pinpointed dots, each representing places where patients that had been diagnosed with ocular melanoma spent the most time, which varied in size and color based on the amount of time the patients spent there.

From the start of the investigation, GEODYSEY was not trying to determine whether Huntersville was a cluster. As they mention on their website, “It [the ocular melanoma cancer in

Huntersville] is recognized as an extremely unusual *coincidental* occurrence of rare cancer in a very unusual demographic population.” Rather, this investigation was looking for “environmental issues near the patient population which have been documented in scientific literature to have possible associations with ocular melanoma cases”.

This study, again, did not detect any clear associations between the environment and the incidence rate of ocular melanoma. According to the Lake Norman Media Group website, in a board meeting in the Hunterville town center, Cassells admits his frustration: “Epidemiologists tell us these things are almost impossible to research, and sometimes, they are just random.”

In 2019 and later in 2021, the remainder of the \$100,000 went toward Whole Genome Sequencing studies from Columbia University and the University of Miami in partnership with The New York Genome Center Incorporated. According to the Town of Huntersville website, “Whole Genome Sequencing (WGS) is the science of determining the order of genetic material also known as DNA at a specific time... This allows the comparison of different types of ocular melanoma populations and among public databases to identify cell changes that might suggest an environmental exposure of origin or specific mutational process that is unique to that cell.”

In this study, only six patients had sufficient tissue for testing, and the final report concluded that, from the data present, there was “nothing unique about the DNA sequences among the ocular melanoma cases and did not signal any likelihood of an occupational or environmental exposure”. According to the lead doctor in these studies, Dr. Brennan, there are next steps that should be taken to continue this study further to compile more data and address patients that have been more recently discovered. In short, additional research, and in turn more funding, is warranted.

Funding, however, is difficult to come by, according to Natasha Marcus, North Carolina Senator for District 41. Senator Marcus deals mostly with the state budget and state laws, and thus far, has not received a cent of funding from the budget to further investigate the situation in Huntersville, regardless of how hard she has pushed for it.

“I don't need a bridge with my name on it, but I would like some funding for this thing that is killing people in my district. I feel like it's not political. It's not about me, it's not about me being a Democrat, it's just that we [need to] figure out why this keeps happening and so far I've been denied.” The unfortunate reality, according to Marcus, is that this issue has become politicized, creating limitations on funding.

“I've tried to talk to lots of Moms in the area,” says Marcus. “I'll keep trying to get the state funding, but in the meantime, I encourage them to keep the fundraising going.” And fundraise they did.

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“What is it that you notice more...after the diagnosis I mean?”

“The birds.” Christy Jay, another ocular melanoma survivor, says after a few moments of thought.

I think about the Great Blue Heron that sits on the bank at our home on Lake Norman; for hours it perches on a single leg, resembling a sculpture from a museum until it moves and all at once you are reminded of its presence. It glides seamlessly, creating a meddling whirr across the top of the dark water. Of course, it is always there, it always has been, but it has a habit of disappearing from memory, even if only for a moment.

I wondered about which birds she noticed most.

Christy is a native of eastern North Carolina with a thick coastal accent to match, and she has lived on Lake Norman since 1992. She is a tremendously amiable, polite, and optimistic woman: she constantly thanks God throughout our conversation for a new perspective of life, one that has forced her to appreciate all that she has. From what I can gather on her Facebook page, she loves fishing on the lake with her young son. They have the same smiles that spread wide across their faces.

Before 2012, Christy had never heard of ocular melanoma. In February of that year, she had a regular check-in with her dermatologist, where a short commercial was playing on the TV screens in the lobby. It was entitled “Dear 16-year-old me.”

“Usually, I never pay attention to those things, but for this video, I was. There was a young girl in the video and something about her caught my attention. She had dark eyes and dark glasses,” Christy says.

The commercial was a rallying cry to get checked for melanoma at a young age, made up of 10 or so folks who have been diagnosed. Each of them shared parts of their story; one woman shows a scar underneath her breast where a tumor was removed, another says “Malignant melanoma? That’s not a very friendly word”, another—the woman who Christy is referring to—warns “Yours is going to be a really rare kind in your left eye”.

“I was diagnosed that April with Ocular Melanoma. It was in my left eye.”

As we speak, I can tell she has told this story many times before; it does not get easier the more times it is spoken. She seems to be exhausted by the details—they all come so quickly; her story has become a memorized transcript that flows off the tongue with troublesome ease.

I ask her about what it’s been like, having cancer.

“You go through all kinds of things. It's amazing. I was determined not to cry; I don't know why. I still won't let myself do it. That's the only reason I allow myself every year [to cry] when I get my scans. I go to Huntersville, and I have the same tech every year, and every year we go through the same scenario. He asks, ‘what music do you want to listen to,’ and I say, ‘nothing sad,’ so he puts on hard rock. He knows to talk to me the whole time. Every time during the exam, I feel the tears rolling down my face....”

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If you grew up in Charlotte or its surrounding towns, the name *Duke* is common; the haunted Duke Mansion, the Duke University Blue Devils, Duke's Mayonnaise on everything, and of course, Duke Energy. Duke Energy has had a complete hold over this region's power, which places them in the community spotlight, for better and, more noticeably, for worse.

Duke Energy's history is an integral part of this story. Throughout the 1990s and early 2000s, Duke Energy sold off coal ash to a number of third-party companies, including National Gypsum, as fill dirt for construction projects. This was the best deal for both parties: Duke wanted to get rid of their massive excess of ash, so they set a price that was hard to pass up for these companies. At the time, this type of sale was entirely legal and regulated by the state, although in retrospect, it is up for debate whether Duke was aware of the dangerous nature of distributing this product. In 1994, Duke wrote a letter, petitioning the state to change a long-standing rule that required companies to report who exactly they were selling their coal ash to, and how much.

In the letter, Duke claimed that the current rule made it impossible for them to sell the product in large quantities. They asked the state to change coal ash's classification as solid waste, which would eliminate the requirement to "record its use on property deeds." The state did not permit this change because not enough research had been done to rule out coal ash as a hazardous material.

Nowadays, the Mooreville community speculates that coal ash does cause the thyroid cancer cluster, and consequently, they blame Duke Energy. From their unlined basin in Lake Norman to their smokestacks that have been confirmed to blow tiny amounts of coal ash in the air, of course, the hundreds of tons (an exact number, we will never truly know, because not all transactions were recorded accurately) of their coal ash that sits under highways, roads, businesses, schools, and homes alike Duke's hands do not appear to be clean.

Duke, however, has always claimed that its distribution of coal ash has been safe and up to standard. According to an article written by WCNC, a spokesperson for Duke claimed that the letters were just a small fragment of a quarters-century-old conversation between Duke and the state and that instead, the community should focus on "a very strong body of science" that proves that all traces of coal ash in the area are below the levels established by the EPA. According to the same spokesperson, "Health experts researching these local concerns reviewed the medical literature and confirmed there is no known connection to the ingredients of coal ash. Multiple universities and research groups continue to look into this topic, and no one has found any connection between coal ash and health concerns. Decades of scientific monitoring in and around Lake Norman make it clear that people and the environment are well-protected from coal ash impacts."

Although these are their claims, Duke has been rightfully wrapped up in litigation for decades. Since 2014, after the infamous Duke Energy Dan River Spill—a historic coal ash spill in Eden, North Carolina—coal ash regulation has become implemented into North Carolina state laws. North Carolina conservation groups and environmental law firms including the Southern Environmental Law Center (SELC) petitioned North Carolina’s Environmental Management Commission to require that Duke Energy remove its coal ash from its unlined pits. Their lead attorney, D.J. Gerken, fought against Duke for years until they finally came to a settlement to excavate all of the coal ash from Marshall station.

Gerken tells me, “I tell our young lawyers [at the SELC] to remember that a corporation is an animal that eats profits, and it will go where the profit is. It doesn’t really matter if you’re talking to a nice person at the company who means well and is trying to do the right thing. If they stand in the way of making the most profit, they will be thrown to the side. In this case,” Gerken continues, “Duke operates in a culture of minimalized costs and maximized revenue for their shareholders, not in a culture that is concerned with the health of the community around them.”

In the Dan River spill, for example, Duke failed to prevent the spill even when an engineer at the facility recommended that they take precautionary measures to hold the coal ash back. The proposed measures included a minute \$15,000 expense for the company, and yet, Duke still refused to pay. The result was 20 million gallons of coal ash polluted water and 39,000 tons of coal ash spilled into the Dan River. Thus began the SELC’s involvement in the case.

The specific litigation in the Marshall case is complicated because, when the SELC started to investigate the site, there were no federal or state regulations specifically about coal ash. The Clean Water Act is a federal law that encourages states to pass and enforce their own

state-wide laws about surface water and groundwater. Gerken says, “At the start, we went after Duke for violating the Clean Water laws at the state and federal levels for surface water on the lake and the groundwater at Marshall. The complication here is that there are a whole other set of laws about waste and landfills from 1985, which made open dumps illegal.” According to Gerken, the Marshall Steam Station was an open dump landfill, but they used a legal trick to persuade the state that they were actually a settling pond.

“This is why people hate lawyers,” he says. “For Duke’s convenience, they remove the coal ash out of the boiler with water. The water has no point in this process beyond removing the coal ash, but because the clean water laws and waste laws are different things, they claimed the water had become contaminated with an industrial byproduct of coal ash, so they built and operated a ‘settling pond’ where they could treat the water and safely discharge it into Lake Norman.” He scoffs, “By calling this massive station a settling pond as opposed to a landfill, Duke’s lawyers placed it into a different set of laws and allowed them to keep dumping and accumulating coal ash for decades, even after every other dangerous landfill had to close in 1985.”

From August 2014, when North Carolina first passed the Coal Ash Management Act—a law that required excavation of only four of the fourteen Duke Energy sites—to 2016, when the Wake County Superior court ordered the cleanup of three additional sites, to January 2, 2020, when the NC DEQ, Duke Energy, and the SELC announced a settlement to clean up coal ash in six more sites, Duke was finally held responsible, at least in part, for the damages, and are expected to clean up their sites by 2035.

I ask Gerken what he thought about Duke’s dedication to cleaning up their coal ash impoundments, to which he responds, “I’ve spent eight years litigating against them to get that

site cleaned up, so I'm not going to give them very high marks for taking ownership. They were compelled to clean those sites up. They agreed to excavate Marshall when we closed every other possible door for escape.”

“The part of this job that I love most is not unique to this particular space. I love being the person who stands up to bullies, for someone who has been bullied. It is what gets me fired up. That's not universal. I have colleagues who work just as hard as I do and they are primarily motivated by their love of natural beauty, but that's not why I'm here. If I'm being honest with myself, I'm here because I can't stand a bully,” Gerken exhales deeply.

...

“I knew something was wrong,” says Susan Wind, “because that's not normal, to have that much cancer, let alone four necks cut out on my street.” Susan Wind, mother and advocate from Mooresville, speaks into the phone with a hushed voice that is ready at any moment to fire. As soon as she answers the phone, she gets to the point; she is not the kind of woman to dance around the subject. She is the mother of a cancer-fighting kid. There is no time to dance.

Susan's daughter, Taylor Wind, was diagnosed with papillary thyroid cancer when she was only 16 years old. What started as a pea-sized growth behind her ear in 2014 transformed into the life-changing diagnosis on a summer day in 2017: cancer, and not just the tumor that had been slowly growing behind her ear, but more than a dozen tumors that had been developing throughout her neck.

Although we are speaking through the static of a phone, there is an unmatched warmth to her voice. She awaits each question—never turning away even the smallest inquiry—and she is quick to answer without hesitation.

Susan has to achieve a constant balancing of emotions. She is healing and processing her daughter's sickness, all while holding onto the fierce stamina of a cancer-cluster investigator.

In the same year of her daughter's diagnosis, Susan discovered that three other people on their tiny street in Mooresville also had thyroid cancer. "They knocked on my door and told me. People here are private. They aren't just going around announcing 'I have cancer,' so people started coming to me in the town I live in and telling me they also had cancer. People were giving me so much information, so I went to my daughter's doctors and I said, 'I think there's something wrong,'" Susan says.

At the same time, Susan found that Taylor was only one among 21 other students from Lake Norman High School in Mooresville who had developed cancer; she found that there were 9 different kinds of cancer, including thyroid, leukemia, Hodgkin's lymphoma, and testicular, and that five of the 21 students had passed away.

Susan decided then to take matters into her own hands: "I used to map crime for police departments 15 years ago, so I started mapping this data, and I found that there was so much cancer on these streets. I wanted to know if the air, water, and soil were safe... I had tried to get help. And I went and raised money. And I tried to go through all the government channels, local government, state government and fought for years, and I had to raise money to get studies done on my own."

Susan's efforts pioneered the discovery of over 43,000 tons of coal ash at a site directly off of Doolie Road in Mooresville—about 50 yards from Lake Norman High School.

Coal ash—or Coal Combustion Residuals (CCRs)—is created when pulverized coal is burnt in a power plant. It is a known carcinogen, with high levels of arsenic, mercury, lead, radium, and chromium.

Duke Energy sold their coal ash to the property's previous owners, Race Park USA, and according to the power company, followed all of the necessary state permits at the time. In the agreement between Duke and Race Park USA, the new owners of the coal ash assumed all responsibility for the fill's maintenance. The most recent land buyer, Triangle Real Estate—who bought the land because it was cheap—is planning to build an apartment complex on the land, and in preparation for construction, they removed the vegetation that kept the buried coal ash intact and safe from erosion. Once the root systems were removed, traces of coal ash surfaced.

In October 2018, Members of the North Carolina Department of Environmental Quality investigated the site, where they quickly realized the coal ash was exposed in several pockets throughout the construction zone: thick streaks of soot-colored material ran through the red clay. The NCDEQ has a responsibility to regulate these structural fill sites, and at least to some degree, has done so. They have created a publicly accessible map of known toxic land, which includes the Huntersville Ford Dealership—a business with an estimated 62,614 tons of coal ash resting underneath it—and they are investigating multiple areas containing coal ash, including a Tire Masters in Mooresville that has developed a nearly unfixable, massive sinkhole. According to the NCDEQ, over one million cubic yards of coal ash have been buried across the towns surrounding Lake Norman, making it the most coal ash-contaminated area in the state.

To investigate whether coal ash was responsible for her child's and other child's cancer, Susan raised \$110,000 to fund a chemist at Duke University's Nicholas School of the Environment, Dr. Heather Stapleton, to investigate the area. Stapleton was fascinated by

environmental cancers but did not have the money to conduct any studies. Stapelton, along with a colleague from Duke, Dr. Avner Vengosh—coal ash and water contamination expert—analyzed decades’ worth of cancer data in Mooresville and studied the environment around Lake Norman.

In an article in *USA Today* from September 2019, Susan recounts joining Stapelton and Vengosh on the lake while they collected water samples. Susan writes, “Dr. Vengosh looked across the lake at the towers of Duke Energy’s Marshall Steam Station, one of the two plants in the area, and asked, ‘You live right next to that?’ At that moment, I wondered whether I had failed my family.”

Stapelton and Vengosh, along with four other scientists who joined from Appalachian State University, conducted their study starting at Marshall and radiating outward in Mooresville. The group utilized a set of tests that could detect coal ash with “unprecedented sensitivity,” according to a press release from Duke University on July 22, 2021. The tests were created in response to the mere size of coal ash particles, which are so small that other, more common tests would not have been able to pick them up.

Coal ash is divided into two categories of ash based on the relative size of the particles: fly and bottom. Fly ash rises upward into the exhaust stacks when coal is being burnt, while bottom ash is heavier and settles on the ground within the boiler. Although most fly ash is mostly trapped and disposed of within the power plants, some particles still escape and are emitted into the air and amass in soil deposits downwind from the plant. The tests from Duke University focused on that the escaped particles.

The group conducted two primary tests. First, they collected soil samples to measure the levels of metals that are more prevalent in fly ash-contaminated soils, and if those levels were high, they used two extremely sensitive geochemical indicators to detect even the smallest traces

of coal ash in the soil. For the second test, the chemists looked at the soil underneath a microscope to see if there were physical particles of ash present in the soil.

They tested 20 different sites around Mooresville with these methods, and the findings confirmed that there was coal ash contamination in most of the sites, but at a low enough concentration that they did not exceed any mandated health guidelines.

In the Duke University press release, Vengosh says, “Low concentrations of toxic metals in soil do not equal to no risk. We need to understand how the presence of fly ash in soils near coal plants could affect the health of people who live there. Even if coal plants in the United States are shutting down or replaced by natural gas, the environmental legacy of coal ash in these areas will remain for decades to come.”

Susan plans on continuing her relationship with Vengosh and Stapelton, raising even more money on her own to conduct more research.

Although Susan is doing work that many people admire, Susan is well aware that within her community, plenty of people disagree with her efforts. For the most part, people are concerned with their property value, which could easily drop if a cancer cluster were revealed. “Until you have a bunch of studies,” says Susan, “people are not going to believe it. You get a lot of naysayers that say, ‘Well you can't prove it.’ But they couldn't prove that smoking [causes cancer] until a whistleblower came forward. Now, no one smokes anymore. It's looked down upon. Even if you walk by someone who's smoking you go to the other side of the street. I see that as the future for environmental cancers. It might take years, but it's going to happen.”

She continues, “Most people who will live on top of pollution are poor. And they're minorities. And it's called environmental injustice. And their voices are never heard. America suffers from this environmental nightmare.” She pauses. “But when it happens to the

wealthy—because I lived in Mooresville, right near the Point, you know, we were all living in million-dollar houses—they're like, 'This can't happen here. I just bought my dream house.' It can happen to rich people, too. And shockingly, when this all went down, I thought they would go protest at the state, the governor's office, at Duke Energy. But oh, no, they wanted nothing to do with this.”

She can tell I am tripping on my own words; I can't imagine why this denial is so deeply set. Before I speak, she adds, “I don't get it... I am convinced people believe what they want to believe. Facts don't matter anymore. It doesn't matter...”

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At the forefront of the research and advocacy efforts in this area are frightened mothers.

The mothers use Facebook pages to spread their own stories and research to reach families in the Lake Norman community that are willing to listen. “I'm kind of obsessed with it,” says Lori Dalton. “I tend to do research and post every single day. It's a part-time job of sorts. I'll spend the rest of my life going after what is going on in North Carolina because of what happened to my son. I believe it's connected to the contamination.”

Lori moved to Mooresville in 2000, so her children grew up on the lake. In 2018, her son, Aaron, was diagnosed with testicular cancer, which Lori believes is another rare form of cancer that could potentially be a cluster in this area.

“My son is currently fighting testicular cancer for the 3rd time since 2018. Huntersville has both types, rare eye and testicular. The testicular goes ignored across the state. Normally, it's a rare type, with about 8,500 men in the US diagnosed yearly, but we have at least 21 counties

[in North Carolina] with abnormally high rates. All of those counties are next to coal ash or PFA contaminated plants and rivers.”

She believes that because these potential clusters have been ignored, her son was misdiagnosed for a six-week period when he could have been starting his treatment: “Because the doctors didn’t know there was an issue here, my son is still sick. Three weeks ago, we found out it is back. This time, it’s in his lungs.”

Lori packs a punch. She is a small brunette woman who is best described by a story she shared with me. In 2019, she testified before members of the Environmental Protection Agency in Washington, D.C., to debate the settlement for Duke Energy’s site cleanups, all the while wearing a handmade t-shirt that reads, “Fuck Duke Energy. Fuck Coal Ash. Fuck Cancer.”

Lori is a hopeful woman: not once during our phone call does her voice break while talking about her son’s diagnosis, his fight, his pain. This hope pushes mothers like Lori and Susan along—the hope that someday something will come from their efforts.

In March of 2022, while scrolling through Facebook, I came across Lori’s Facebook page. Most recently, she had posted an image of her son Aaron, 27, and a note to her followers: “I just want to say thanks to everyone who has written and donated for my Aaron. I’m sorry I haven’t written back. Just having a tough time.” Aaron passed away on December 8, 2021, from cancer.

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I drive up to Denver, North Carolina one morning in early March. Residual rain from the night before lightly coats the brown patches of grass on either side of Cindy Lane, and as I round the final corner to our home, I am met with the newest construction that has taken place in the lot

next door to ours. The once-abandoned piece of land, overgrown with kudzu, has been cleared, leaving a flattened-out surface big enough to hold a two-story, lakeside, storybook home, one that will be owned by my family's very close friends, a retired couple from outside of Houston. What am I to do with the fact that the wife, Judy, has once survived breast cancer and is moving to this place? What am I to make of the fact that they, like so many, were never warned about this place?

Like the great blue heron that I watch fly gracefully through the air, cancer is here, it always has been, even if just for a moment, it escapes our memory.