Pitch (to either Current Conservation, The Scientist, or other backup venue)

Dear (appropriate editor depending on the venue),

The decline of invertebrate species around the world has been dramatically deemed the "insect apocalypse" (Black, 2019), and without a clear understanding of why and how it got that intimidating title, we are surely doomed to succumb to its implications. Unfortunately, bugs are not much loved by the general public, but the bias against invertebrates does not end with them. Bugs don't get their fair share of funding and research, even though they constitute 97% of all animals on Earth (National Geographic, 2012) and comprise a large portion of the base of food webs (Losey & Vaughan, 2006). Even within the field of entomology, the more attractive, charismatic species like butterflies get more attention than their slimy, squirmy, and many-legged relatives. Bringing this bias to the attention of science educators and communicators who have the ability to make real changes in how we perceive these species is crucial to making sure bugs get the recognition, research, and funding needed to keep the planet—and ourselves—alive.

I would like to propose a [feature or opinion] piece for [Current Conservation/The Scientist], "The Unseen Earth: Why Our Fear of Bugs is Threatening the Planet." Based on extensive research for my master's thesis, this article will address the mechanisms behind our fear of invertebrates, how that fear permeates even the scientific community, and why it is detrimental to conservation efforts in every part of the world. I will outline not only the cruciality of invertebrates to a healthy planet, but also the ways in which bugs improve our lives every day without any recognition from the general public or conservation funding agencies.

After overcoming my own fear of bugs, my mission now is to educate both the general public and science professionals about these preconceived notions we all harbor without even questioning their validity. I have written several papers on the subject as part of my master's thesis, and have even started a family-friendly blog about bugs, told from the perspective of the bugs themselves. Outside of class assignments, I have done my own research on bug-related topics in order to create informational handouts, graphics, and social media posts, and recently wrote about the Brood X cicadas for the Cincinnati Zoo. A publication like [Current Conservation/The Scientist] is the next logical step in my science communication journey.

I would love to collaborate with you and [Current Conservation/The Scientist] to advocate for "the little things that run the world" (Wilson, 1987). You can reach me at biordigm@miamioh.edu, or at 513-503-8211.

Thank you for your time, and I look forward to talking with you about publishing a piece in [Current Conservation/The Scientist].

Sincerely,

Gabrielle Biordi

The Unseen Earth: Why Our Fear of Bugs is Threatening the Planet (and What to Do About It)

When renowned biologist E. O. Wilson addressed the crowd at the 1987 opening of the invertebrate exhibit at the National Zoological Park in Washington, D.C., he called invertebrates "the little things that run the world," citing their responsibility for most of the resources and processes that support the basic functions of a healthy environment for the rest of life on Earth. While pollinators get most of the publicity for their services, there are over *10 quintillion* other insects (commonly referred to as "bugs") busy keeping our planet healthy and running smoothly (National Museum of Natural History, n.d.-b)...and that's just the insects. Add on top of that number the rest of the bugs— invertebrates like worms, snails, squids, shellfish, spiders, single-celled organisms, and many others— and it adds up to about 97% of all animal life on Earth (Krueger, 2017). Bugs do so much more than pollinate our crops; they are also crucial players in decomposition and nutrient cycling, form the base of most food webs, and contribute greatly to human culture and medicine. If all bugs disappeared tomorrow, all other life would peter out in a staggeringly short timeframe (Wilson, 1987).

This bleak future is not science fiction; over the last 27 years, an estimated 76 to 82% of flying insects in Germany have been lost (Hallman et al., 2017), and the global estimate for all invertebrates lost over the last 40 years is about 45% (Dirzo et al., 2014). Despite these worrying numbers and the overwhelming scientific evidence for the importance of invertebrates, the public image of bugs is still one of disgust, fear, and danger. We have all seen someone scream or jump in fright when confronted with a bug, or have had that reaction ourselves. While it might be easy to dismiss these negative feelings toward bugs as harmless personal preference, they actually have dire consequences for our world as a whole. Negative opinions of organisms correlate with unwillingness to support their conservation (Martín-López et al., 2007), and this bias prevents the funding of mutually beneficial work toward a better understanding of bugs in a time when these species need our help the most. This might not matter as much if only the general public harbored these feelings, but this bias extends into the scientific community as well, where even conservationists focus more of their efforts on mammals and birds than on bugs and reptiles (Clark, 2002). Although deserving of respect and protection in their own right, these large, charismatic animals are generally not as immediate a threat to global ecosystems if lost to pressures such as climate change, which brings their research prioritization into question.

The negative reactions to and preconceived notions about bugs permeate nearly all of human culture. Twenty to thirty percent of people in the UK have fearful reactions to spiders (Davey, 1994), and arachnophobia has been identified as one of the most common animal-related fears (Gerdes et al., 2009). Arachnophobia, in particular, is something of an irrational fear, as only 0.1% to 0.3% of the 38,000 documented species of spiders actually have adverse medical implications for humans (Steen et al., 2004). In fact, most of the world's many bugs rarely, if ever, actually make contact with humans, and those that do rarely cause any physical harm or spread disease outside of their species. Yet in scientific studies, people tend to rate the potential danger of certain bugs much higher than the actual danger posed (Gerdes et al., 2009). In short, the misguided widespread misinformation, mythology, and irrational negative emotions surrounding bugs are detrimental to the survival and continued research and conservation of these immensely important creatures.

Where did these widely held beliefs and reactions originate if not from the actual danger imposed by bugs? There are numerous theories ranging from genetic inheritance from our early ancestors, to psychological mechanisms working overtime, to word-of-mouth and media hype gone awry. The answer likely lies in a combination of multiple factors (Gerdes et al., 2009). To conquer these negative emotions, we must first understand exactly what they are and why we have them in the first place.

Nature or Nurture?

Fear and disgust are both human mechanisms that keep us safe from danger. In the case of fear, the "fight or flight" reaction helps us escape an immediately threatening situation, such as a hungry predator or hazardous environment. Disgust, on the other hand, stops us in our tracks and prevents us from touching or eating something that might be poisonous or contain pathogens (Phillips et al., 1998). Both of these mechanisms together comprise the "behavioral immune system," which leads to aversive behavior that protects us from harm (Schaller, 2006). This system has kept humans alive for as long as they have been on the planet. However, in the modern age where big cat attacks and tar pits are not as much of a threat as they once were, our behavioral immune systems have a habit of overreacting to minor or imagined threats. Seeing a potentially dangerous animal can trigger the behavioral immune system, and those negative feelings toward an organism decrease people's willingness to support that animal's conservation (Prokop & Fančovičová, 2013). These emotions are particularly detrimental to invertebrate conservation, since bugs are widely seen as dangerous and unclean, regardless of whether they actually pose any threat to humans.

One of the leading theories of how humans came to feel fear and disgust is the evolutionary model. Our ancient ancestors had to contend with far more predators and disease risks than their modern, technologically advanced descendants; therefore, those whose instincts helped them flee or avoid dangers (such as venomous spiders and snakes) survived to pass on that "biological preparedness" (Seligman, 1971) to their progeny (Gerdes et al., 2009). Modern evidence to support this model comes from studies of rhesus monkeys raised in labs versus their wild counterparts; while lab-raised monkeys show less fear of snakes than wild monkeys, they do learn this fear extremely quickly after seeing their wild-raised counterparts react fearfully to snakes, suggesting they are biologically predisposed to fear that specific danger (Mineka et al., 1984). The same mechanism seems to apply to human fears. Additionally, once a fear response to a typically dangerous animal is conditioned, it is extremely difficult to decondition that response (McNally, 1987).

However, the evolutionary theories of fear and disgust have come under some scrutiny from continuing research. One piece of evidence against the evolutionary model is that some bug phobias (in particular arachnophobia) only appear to be a significant problem in the Western world; many other cultures either do not have significant fears of spiders or actually consider spiders to be lucky or spiritually important (Isbister, 2004). There is more evidence for conditioning processes causing specific fears and disgust. Some studies show people with arachnophobia are actually more sensitive to evaluative conditioning— the process by which a previously neutral object gains a negative association after being paired with a negative stimulus— and therefore become scared more easily and have a difficult time overcoming that fear (Baeyens et al., 1992). For example, if someone sees a wasp fly past and, at the same time, feels a painful stinging sensation, that person will likely react to seeing wasps with fear in the future, even if they are not stung again.

Cultural transmission of fear and disgust is also likely part of the widespread hatred of bugs. Because bugs have historically been assumed to be causes of disease (in many cases, unsubstantiated claims), fear and disgust toward bugs have been passed down from generation to generation (Gerdes et al., 2009). Additionally, fears generally tend to become established in late childhood and the early teenage years (Sivek, 2002), often via observational (vicarious) learning (Reynolds et al., 2015). One study found children were more likely to want to save animals (including some bugs) than adults, suggesting they had not yet developed the fear or disgust toward specific animals that their adult counterparts had (Prokop & Fančovičová, 2013). When children see the adults in their lives react negatively to bugs, they learn bugs are something to be feared. Similarly, when they see adults devaluing bugs by wantonly killing them, they learn that bugs are not worthy of our respect or compassion.

There is also something to be said for the role ignorance plays in fear. Fear and ignorance often go hand in hand, one fueling the other. When humans do not understand something, their response is typically one of fear, or at least wariness. On the other hand, when people find something frightening, they tend to try to stay as far away from it as possible, both physically and intellectually. This leads to a feedback loop of fear and willful ignorance that can keep people isolated from parts of society and the world, and in turn becomes a breeding ground for stereotypes (Ward, 2020). This may be the reason behind the common fear of the dark; because we cannot see in the dark, we fear the possibilities of something dangerous waiting within the shadows.

Why the "Yuck" Factor?

Fear and disgust toward bugs cannot be easily explained by one mechanism alone. A combination of biological, psychological, and cultural factors all play into these widely held beliefs. Despite the evidence against the evolutionary theory of bug fears, there are likely at least some inherited mechanisms at work. Many animals have colorful features that evolved to warn predators they are dangerous, toxic, or otherwise inedible. One study found that animals with aposematic (warning) coloration were viewed with more fear than those with more dull, monochromatic colors, meaning humans can accurately interpret the meanings of these color schemes similarly to their natural predators (Prokop & Fančovičová, 2013). Many bugs tend to have this coloring (whether indicative of actual danger or merely mimicry), so humans are likely to be wary of any brightly-colored bug.

By far the most compelling explanation for the widespread fear and disgust toward bugs is the disease avoidance theory. While the vast majority of invertebrates pose no health risks to humans, a few notorious species have ruined the reputations of their harmless cousins. Most human parasites only evolved in the last 11,000 years, when humans started forming groups and living closer together, and raising livestock that could transmit diseases and parasites. Denser human populations likely also led to the concentration of human waste and the invertebrate-borne illnesses associated with poor hygiene (Prokop et al., 2010). Historically, perhaps the most well-known of these diseases was the plague, caused by the bacterium *Yersinia pestis* and spread by the bite of fleas that had fed on infected rodents. Foodborne illnesses such as *E. coli*, typhoid fever, and cholera can be spread by houseflies and cockroaches that have come in contact with contaminated fecal matter and then carry it on their bodies to human food sources (National Museum of Natural History, n.d.-a). Mosquitoes are common disease vectors, spreading a wide variety of parasites and pathogens, including dengue and yellow fever, malaria, encephalitis, Zika, and West Nile fever through their bites. Tick bites are also responsible for causing Lyme disease, Rocky Mountain spotted fever, and tularemia (World Health

Organization, 2020). In the developed world, most of these illnesses are much less common than they once were thanks to medical innovations and better waste management practices (World Health Organization, 2017), but the memories of past illnesses combined with stories of current infections around the world perpetuate the fear of invertebrate-borne diseases.

The research on humans' irrational fears of bugs becomes even more compelling when comparing the prevalence of arachnophobia to fears of slightly more dangerous animals like bees (apiphobia) and wasps (spheksophobia). One reason humans do not seem to fear bees as much as spiders is that bees provide a tangible service in the form of honey. It is possible the cultural transmission of the knowledge of this benefit outweighs the known risks of beekeeping. While spiders do provide many important services (e.g. pest control and food), these benefits are not nearly as obvious and are not likely to eclipse the fear and disgust associated with them (Gerdes et al., 2009). In addition to the benefits of beekeeping, experience with bees might also contribute to the relatively lesser fear of them. Bee and wasp stings occur far more frequently than spider bites (Diaz, 2004), so it is widely understood that bee stings are survivable (excepting those with very severe bee sting allergies) (Marks & Tobeña, 1990). The relative rarity of spider bites, on the other hand, contributes to the perceived unknown nature of spiders and the dangers they do or do not pose to humans. Similarly, the error management theory suggests it is perceived to be safer to avoid all spider encounters (whether each spider is harmful or not) than it is to take a chance and have an encounter with one of the few spiders that is harmful (Haselton & Nettle, 2006); in other words, it is "better safe than sorry" to simply be afraid of *all* spiders. The fact that most people cannot correctly identify medically significant species such as brown recluses (*Loxosceles sp.*) (Vetter, 2008) adds to the fear of encountering any brown-colored spider, which is most of them. Error management could reasonably extend to other species of bugs as well.

Another potential "yuck factor" of bugs is their movement patterns, which are very different from other animals. They are fast, they can fly, and they have more legs than appears reasonable to the human eye. Their unique movement patterns may have something to do with why humans react so strongly to bugs. Research shows that quick, staccato movements can incite fearful responses (Bennett-Levy & Marteau, 1984). This may be due to the perceived lack of control humans have over these unpredictable movements, which could allow the organism to attack or go where it is not wanted (Armfield & Mattiske, 1996).

Unfortunately, the medical community has not helped the public image of bugs as largely harmless organisms. Perhaps the greatest debate in the United States between physicians and entomologists is the severity of spider bites, particularly the brown recluse spider (*Loxosceles reclusa*) and other spiders in the genus *Loxosceles*. Starting around the 1960s, both media coverage of brown recluse spiders and diagnoses of their bites skyrocketed following the release of some USDA state records containing spider population data. Physicians began diagnosing cases of small necrotic wounds as brown recluse bites, regardless of the actual etiology of the wound nor the lack of visual confirmation of what (if anything) bit the patient. Case studies of recluse bites started popping up in regions without any endemic *Loxosceles* populations. Even medical schools began teaching students the leading cause of necrotic wounds was *Loxosceles* bites, even though the more likely culprit was a bacterial infection such as methicillin-resistant *Staphylococcus aureus* (MRSA). The myth of necrotic arachnidism (tissue death caused by spider bites) became so ingrained in the medical world that brown recluse bites are still highly overdiagnosed by both physicians and lay people today, even after case studies were reviewed by arachnologists who deemed it was nigh impossible they were genuine spider bites (Vetter, 2008). Ultimately, the tale of overcoming a “deadly spider bite” is also much more palatable to recount to others than, say, the tale of a persistent bacterial skin infection. People wear their spider bite claim like a war medal, and tell their harrowing tale to others, which only helps spread the myth of necrotic arachnidism further (DiFonzo & Bordia, 2007).

Why Should We Care About Bugs?

Imagine a world devoid of all plants and crops, the planet’s surface littered with putrid decaying matter and completely unable to support life beyond a few intrepid microbes. This is, nonhyperbolically, our planet without bugs, and it is a future we can look forward to if we cannot halt the rapid decline of invertebrates due to climate change, pesticide overuse, and other anthropogenic pressures. Aside from pollination, bugs also play a huge role in nutrient cycling, biological pest control, food, medicine, research, culture, tourism, and recreation. The crucial ecosystem services provided by bugs are vastly underrecognized and underestimated by both the general public and conservationists.

Nutrient Cycling

Many people look at bugs like dung beetles, termites, and maggots as dirty and disgusting. However, these and many other soil-dwelling bugs are essential to terrestrial hygiene. In forests, saproxylic arthropods (those that are reliant on dead wood) such as termites and beetle larvae fulfill the important role of breaking down fallen trees and returning their vital nutrients to the soil (Takamura, 2001). While these bugs burrow, tunnel, and create their nests, they are also aerating the soil and allowing plant roots better access to nutrients (Evans et al., 2011).

Many beetle and fly species provide the service of removing feces, carrion, and other waste from the soil surface. In natural environments, the burial and breakdown of this waste returns nitrogen to the soil and surrounding plants, and keeps vegetation clean for herbivores to eat. While this service is certainly important in the wild, it is also vital to the beef cattle industry. The presence of dung beetles in beef cattle pasture saves approximately 244 million kg of meat per year (worth about $122 million) by keeping grass clean and free of pathogens that the cows would otherwise consume (Losey & Vaughan, 2006).

There are also ways that we can use insects to reduce the biological waste in landfills. Methane released by decaying food and other organic matter in landfills constitutes 90% of the world's waste emissions (Bogner et al., 2008). One way to reduce these emissions is by using fly larvae (usually black soldier fly larvae, *Hermetia illucens*) to quickly consume and compost food waste. The larvae can reduce the weight of biowaste by 50 to 80% (Lohri et al., 2017). It also has the added advantage of producing both a soil conditioner in the form of insect droppings (aka "frass") and a source of protein for animal feed (larvae that may be harvested in 14 days) (Mertenat, Diener, & Zurbrügg, 2019). This process not only greatly reduces greenhouse gas emissions, it also creates valuable products from waste that would have otherwise simply taken up real estate in a landfill.

Pest Control

Pest insects are a major concern for farmers, ranchers, and the public. They devour crops and bite mammals (including humans) to feast on their blood. Despite advances in pesticide technologies, some agricultural pests remain resistant or immune to chemicals and can only be effectively reduced by natural predators. Predatory bugs are currently saving farmers approximately $4.5 billion annually (Losey & Vaughan, 2006). The larval stages of pollinators such as hoverflies and wasps are voracious predators of crop pests like aphids and caterpillars (Cross et al., 2015). Dung beetles also deter pests by clearing moist dung pats that make ideal habitat for intestinal parasites and pest flies among herds of cattle (Fincher, 1981). In addition, saproxylic arthropods prevent pest outbreaks either by clearing away the fallen trees that would host pest larvae, or by parasitizing these pest species directly (Stokland, Siitonen, & Jonsson, 2012).

Food

Bugs are actually a large part of many human diets. Crabs, shrimp, and lobster— aquatic cousins of terrestrial arthropods— are even considered delicacies. In some parts of the world, insects are eaten as a main or supplemental source of protein. For instance, fried honeybees are a delicacy in China, and in Mexico, cochineal bugs are farmed and crushed to create red food dye. Insects from nearly every order are edible and important parts of many global diets (Patel et al., 2019).

Humans are not the only consumers of bugs; they comprise the lower levels of nearly all food webs, and many animals rely on bugs as either their sole source of food or at least a large proportion of their diet. Of particular importance to humans, game fowl such as quail, grouse, and pheasant rely almost entirely on insects for food. It is estimated that bugs are worth about $1.48 billion in small game hunting expenditures, plus an additional $0.56 billion for migratory bird hunting (Losey & Vaughan, 2006).

In addition, bugs are a staple of fish diets, both wild-caught and farmed species. Of wild-caught species, at least 25 rely on bugs for food, amounting to $225 million worth of fish caught each year (Losey & Vaughan, 2006). Needless to say, the loss of bugs would have dire consequences for any human or animal that relies on them for sustenance.

Medicine

Bugs have been used in medicine for centuries. Dried Mylabris beetles have been used to treat a variety of illnesses in traditional Chinese medicine for at least 2,000 years, including cancer, skin diseases (Efferth et al., 2005), ulcers, and tuberculosis (Wang, 1989). Hippocrates also described cantharidin from mylabris beetles in the treatment of dropsy (Cheng, Lee, Shum, & Yip, 1990). In more recent studies, cantharidin—along with compounds found in scorpion, spider, centipede, bee, wasp, and caterpillar venom—have been investigated for their inherent anti-cancer qualities or ability to deliver traditional cancer treatments to dozens of different types of cancer cells (El-Tantawy, 2015). Krill oil has long been an important dietary supplement of omega-3 fatty acids (Patel, Suleria, & Rauf, 2019).

Many bug venoms are used in the treatment of pain and inflammation, despite the association of bug bites and stings with those very symptoms. Compounds found in the venom of South American tree ants (*Pseudomyrmex sp.*) and some centipedes can have analgesic and anti-arthritis effects (El-Tantawy, 2015). Substances found in brown recluse spider (*Loxoceles sp.*) venom and bee venom have been shown to increase the absorption of traditional pain medications (Etesse, Beaudroit, Deleuze, Nouvellon, & Ripart, 2009; Darwish, El-Bakly, Arafa, & El-Demerdash, 2013). There are also many bug venoms that have antimicrobial properties, such as the venom of giant silk moth (*Hyalophora cecropia*) caterpillars (Andreu, Merrifield, Steiner, & Boman, 1985), tiger wandering spiders (*Cupiennius salei*), Venezuelan scorpion (*Tityus discrepans*) (Borges et al. 2006), and bees, which have been examined as a treatment for acne (Han, Lee, & Pak, 2013).

Perhaps the most well-known use of bugs in medicine is the use of maggots for the cleaning and disinfection of necrotic wounds. While this method fell out of favor once antibiotics became more readily available, it has made a resurgence in recent years to combat antibiotic-resistant infections (Sherman, Hall, & Thomas, 2000). Because maggots only eat necrotic flesh, they can safely be used to remove infected tissue while leaving healthy tissue alone (El-Tantawy, 2015). In addition, maggots produce secretions that can fight drug-resistant *Staphylococcus* infections (Bexfield, Nigam, Thomas, & Ratcliffe, 2004), as well as large amounts of ammonia, which creates a more neutral or alkaline wound environment that is not conducive to the growth of bacteria (Mumcuoglu, 2001). Maggot therapy is approved by the FDA, relatively inexpensive, all-natural, and free of side-effects, making it an ideal treatment for chronic wounds (Heitkamp, Peck, & Kirkup, 2012).

Improving the Public Image of Bugs

In order to overcome both the public and research bias against bugs, we first need to give their public image a makeover, which means more inclusion of bugs in education. While many wildlife education programs are directed at children, adult education is equally important. Because children often learn their fears from their adult family members, it is crucial to educate adults about not only the irrationality of their fear of bugs, but also how their fearful reactions affect their children (Isbister, 2004). Both children and adults need sources of accurate information and positive representation of bugs, which is currently somewhat lacking in our culture. Nature magazines, wildlife education shows, and nature education programs are the main players in this arena, and are crucial to spreading awareness of the wonders and importance of bugs to the public (Martín-López et al., 2007).

Which bugs we choose to present in educational efforts and how we display them can affect public perception of bugs. Even though aposematic bugs signal danger with their colors, studies show support for the conservation of these more colorful animals is greater than support for duller, more monochromatic animals (Prokop & Fančovičová, 2013). A good example of this phenomenon is the immense push for monarch butterfly conservation; while ecologically, monarchs may not be one of the most crucial pollinators to environmental health, their vivid orange color, stunning migration, and cultural importance makes them a favorite among the general public.

One of the more popular topics in conservation behavior is the idea of helping the general public build emotional affinity with nature, or "biophilia." Kristie Reddick of The Bug Chicks described this idea in a lecture on common backyard bugs: "Fear and fascination are two sides of the same coin," and as an educator, she felt it was her job to flip that coin for people still looking only at the "fear" side (Reddick, 2019). A South Korean study explored this concept by implementing a school program for third-graders where students learned about honeybees and their role in the environment. By the end of the program, measures of fear toward bees were reduced, and measures of biophilia increased from the baseline data taken before the start of the program (Cho & Lee, 2017).

One aspect of biophilia that has been proven time and time again to be important in all conservation efforts is empathy. Studies show empathy is a major motivator of conservation behavior (Kals & Maes, 2002). In particular, empathy and other emotional factors seem to be more strongly correlated with conservation behavior for the average person who might not have much prior scientific knowledge of an organism (Martín-López et al., 2007). In order to feel connected to nature, one must be able to empathize with the many living things around us, from the largest, most majestic mammals, to the tiniest invertebrates, to the most common garden weeds. When fear is the central cause of negligence toward nature, empathy can be particularly helpful in allowing people to understand the organism they fear by "walking in their shoes," thereby eliminating the unknown qualities that inspired the fear in the first place (Ward, 2020). In contrast, individuals with more scientific knowledge of conservation and ecology may be more moved to conserve invertebrates by appeals to scientific reasoning and ecological importance of an organism (Martín-López et al., 2007).

The Bottom Line

While the general public has a hand in funding and spreading awareness about conservation, it is ultimately up to scientists and educators to represent bugs in a more positive light in order to secure support for their conservation. As scientists, we know the data showing the immense importance of bugs to the continued survival of all life on our planet, and yet we still spend the majority of our time and funding on large vertebrates. As educators, we have the opportunity and responsibility to shine a spotlight on bugs in our curricula, but other, more charismatic animals take center stage. Because most bugs we are exposed to are harmless and beneficial, we have nothing to lose by supporting them and confronting our fears but our pride. If we want people to feel empathy toward “the little things that run the world,” we must first demonstrate that empathy ourselves as we help people develop a sense of connectedness with all of nature.

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