



PURPLE, THUNDER, MUSHROOMS, DESIRE

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As a child I longed for the color purple, not only in the literal pigmentation, but as an abstraction, as a comfort blanket, as a wellspring of fascination. I searched for purple daily, starting each morning by opening my front door, yelling out for purple into a landscape of mostly greens and browns. I opened cupboards, the dishwasher, desk drawers, looking for her. It was an obsession bordering on delusion, but I guess the type of delusion that is accepted as the temporary irrationality of a small child making sense of a chaotic world. Some kids have imaginary friends, I had the purple deity. To me, purple was everything that was good about this world – she was bold, brazen, deep, a bit rare, holding both cool and warm properties. Purple sounded like a heartbeat during a hug, ear to chest. She smelled like the sweet ferment of leaf litter in the fall. She tasted like butter tea. She was yin and yang, the beckoning of adventure and the plushness of a bower. I was a little bowerbird, and purple was the glint in the eyeshine of life.

Bowerbirds are a family of birds, ptilonorhynchidae, with a distribution throughout Australasia. The males of this species are known to craft elaborate, color-coordinated shrines in order to impress potential mates, both female and male. The center of the shrine is a bower, or den, woven with grasses and twigs, taking the male bowerbird years to build. Inside the deep bower is a bed of soft moss, and placed in and around the bower are carefully selected items such as botanicals, fungi, beetles, stones, bones, shells, dung, charcoal, and even human made materials like plastics and cloth. The construction of the bowers as well as the selection of the decorative materials vary based on the individual bird. Some bowerbirds might gravitate towards airy displays of bright orange flowers with matching polypores, others might make a trail of iridescent blue-green beetle wings, others still might amass a moody complex of black rocks and deer dung. Similarly intricate are the selection of songs the males sing, often mimicking calls and sounds of other animals. All of this is done to attract a mate. Typically, the mates are female, but there are records of same-sex courtship as well (MacFarlane et al., 2007). A bowerbird can visit the courtship arenas of numerous birds to find what she likes best. She may hear a unique or enticing call that makes her want to visit a

bower to learn more about a particular bird's aesthetics and capacities. If the design moves her, if her preferences for certain colors, aromas, or moods elicit a nascent desire, she will mate in the bower. Same-sex encounters are likely driven by the same attractions, but perhaps also provide males opportunities to learn artistry from one another.

If I were a bowerbird, any courtship ritual would only be successful if purple was at the heart of the love nest. Sure, I could be enticed by a stage bedecked in emerald, ruby, lapis lazuli, or onyx, but those would not vibrate my senses into resonance as purple would. I would not feel the vagus nerve tremble between my stomach and heart, and my nervous system would not flash with hot profundity in its fibers. I would not choose his gametes, we would not mingle chromosomes. Only a theater of purple love could ensure my commitment. Like some spooky action, the purple deity would be both summoner and summoned, the source of pleasure and the pleasure itself.

As a child, I was transfixed by a perception of purple that went beyond aesthetics but actually mingled with my sense of self and a feeling of unbounded time. The quality of this experience was primordial, elemental. Later in life, similar sensations led me to becoming a professional mycologist. In mushrooms and other fungi, I saw reflecting back at me our shared evolutionary history, the human position in the landscape of beings, and my own queer ambiguousness. We were strangely familiar; our cells probed the limits of the other, finding no resistance. I can compare this feeling to witnessing great art, especially music. Like hearing a genre for the first time and feeling kaleidoscopic refractions of nostalgia and possibility; the paradoxical feeling that a song is, singularly, for you, but also created by someone who understands you. You cannot be taught to recognize that feeling, it simply happens. A bowerbird may never have before seen an iridescent carpet of beetle wings surrounding piles of plump, teal berries, but she knows she loves it when she sees it. Taste can be shaped through exposure and culture, but the origins of this capacity are located in deep evolutionary time, in the pre-human, pre-mammalian world.



Humans like to refer to our capacities for art as evidence of our sophistication and human exceptionalism, but beauty is so incredibly common in the lives of other organisms that Darwin (1860) wrote, “The sight of the feather in a peacock’s tail makes me sick” (Callaway, 2011). This feeling of sickness was because he struggled to understand how adaptations as seemingly superfluous as the morphology of peacock’s feather could be explained by his theory of natural selection. Explanations based on natural selection alone would suppose that all adaptations provide the species with a better chance of overall survival.

Beauty embodied by an organism that serves no direct benefit to the continuation of that species is considered *arbitrary* beauty. Darwin recognized this to be around us all of the time. Most people may think first of flowers or birds, but also frogs and fish may exemplify this. We have quantified evidence in a variety of species that embodied *arbitrary* beauty found in the plumage, dances, scales, and songs of our fellow life forms offer them little to nothing for direct survival. Instead these flickers of decadence are a decided indulgence in the long shadow of natural selection. Darwin did eventually articulate

this phenomenon in his theory of sexual selection, wherein the perceptions and preferences of individual beings shape mate choice, which in turn shapes reproductive outcomes and phenotypic expression. In other words, the desires of mates can lead to certain individuals being selected for mating over others, gradually changing the traits expressed in a population.

Recognizing *arbitrary* beauty – as a product of preference *for* and *by* non-human organisms – is not without contention within science. While Darwin was keen to recognize not only the possibility, but the likelihood of such phenomena, some contemporaries and successors have found the idea to be improbable if not fully absurd. When we explore the rhizome of the logics employed by those rejecting beauty as a choice, we encounter disturbing subjectivities. That non-human organisms could both perceive and prefer beauty apart of the machinations of natural selection was rejected on the premise that: **1)** only humans were capable of decoupling ourselves from the evolutionary grind in order to act upon feelings more complicated than basic survival; and, **2)** because most of the evidence of *arbitrary* beauty has been predicated on female choice, the entrenched sexism of western science has, at times, resisted the potential power and implications of such an acknowledgement.

St. George Mivart, a respected contemporary of Darwin, squarely rejected that (primarily) female organisms could bring to material existence profound beauty by asserting their preference. He states, “Such is the instability of vicious feminine caprice that no constancy of coloration could be produced by its selective action” (Prum, 2017). Here – as in many other instances in science, society, and culture – *feminine* is defined as irrational, illogical, less-than-human, while also being devoid of the power recognized in animals themselves. In addition to the male supremacy, the enormous contradiction here is that “feelings” are volatile and useless, but so is the distinct realm of that which is human, and that which can produce and enjoy art and beauty. Instead Mivart argues that it is only through brutish battles (between males), competition, and resource scarcity that selection of biological traits plays out. These are all dynamics that impact evolution, but the assertion that it is only through conflict that materials transform carries with it a set of assumptions that have been naturalized within the context of capitalism (Simha et al., 2022). Disproportionate emphasis on conflict can obscure the functions of mutualism, multi-species networks, and the role of beauty and pleasure in creating dynamic ecological systems and evolutionary change.

Rainbow boa (*Epicrates cenchria*) photographed by Patricia Kaishian in the Peruvian Amazon in 2013. Rainbow boas are named after their iridescence, which is caused by structural coloration – nanoscopic structures that interfere with light, as opposed to pigment-based colors. The function of iridescence in this species is not well understood.



Over the past century, evolutionary biologists have amassed a large body of evidence supporting the idea of “female choice” as a substantial driver of evolution (Fisher, 1915; Weatherhead and Raleigh, 1979; Gwinner and Schwabl, 2005; Byers and Waites, 2006). Female choice need not only be overtly behavioral (such as in bowerbirds), but can also be “cryptic”, in which the female biology provides physiologically internalized mechanisms of choice. An example of “cryptic female choice” common throughout the animal kingdom is the ability of females to bias the sperm of certain males over others after insemination. This can be achieved through various mechanisms, from alterations of pH, the production of spermicidal compounds, muscular contraction to discard certain sperm, and more. The decision to bias one male over the other may be informed by the Darwinian conception of fitness, in which a male is perceived to possess genes that would create the greatest likelihood of offspring survivorship. Despite the reasonable logic of this “good genes” hypothesis, attempts to quantify this experimentally have failed in a surprising number of cases. As laid out by evolutionary biologist Michael Ryan in his book *A Taste for the Beautiful*, the preferences of female animals – from moths to monkeys – is frequently driven by perceptions of beauty, whether or not it increases survivorship of offspring.

The visual, auditory, and olfactory sexual aesthetics of animals are rooted in the neurological matrices of the brain-mind, with the brain being the physical apparatus and the mind being consciousness. These aesthetics are not located in discrete portions of the brain, but rather are entangled within multiple domains of awareness and cognition. An animal’s ability to move through the world is based on sensorial input which is rendered into perception and then into action or choice. Bound with animacy itself, Ryan argues, is an innate capacity for desire. Desire is activated by the sensations of being alive – the way a fish scale refracts photons in the dappled light of a kelp forest, the site of túngara frog’s throat inflating during song, a whiff of deer musk. These aesthetics are intrinsic and often latent, meaning that an animal may not know she has this preference until the moment she experiences it. By chance, an individual could develop a mutation that changes his color, produces a modified scent compound, or lengthens his tail. If this random mutation (or rebellion sensu per Brito, 2022) happens to elicit a previously untapped desire in a female, the female may choose this male for sexual recombination, and the genes which encoded for this mutation will be shared with the next generation. This is the evolutionary concept of “sensory exploitation” – innate desires can be activated and doing so can provide reproductive advantages. In this way, beauty, desire, ecstasy and their proximal sensations drive evolution.

In *Syntactic Structures* (1957), Noam Chomsky introduced the argument that human children have the innate, biological capacity for language acquisition. To put it simply, babies learn to speak, but do not learn to learn to speak. Babies hear words and intrinsically understand that they must try and create these words, and have within their neural circuitry an intrinsic understanding of basic language structure. Linguists assert that human language is unique in that it is “generative, hierarchically structured syntax” (Zuberbühler, 2019), compared to other organisms that allegedly have unstructured, non-hierarchical syntax. Like the complexity of language in humans, our capacity to render multidimensional art may also be unique. We can consciously elicit desire in others by experimenting with new combinations of brush strokes, instruments, or written text in layered ways that go beyond an initial register of beauty. The very impulse to do this, however, derives from something that is not unique to humans, something as fundamental as perception itself. To be in ecstasy when witnessing a complex sensorial experience is a phenomenon shared by our co-conspirators in the tree of life.

Our knowledge of animal behavior and desires is still incredibly limited. The field of neuroscience has given us insights into how animal brains function, but we are not much closer to a foundational understanding of consciousness. We have mapped components of the brain, from our tiny neurons to entire brain regions. The mapping of neuronal connections is called the *connectome*, which has been mapped entirely in the famous model organism, the nematode *Caenorhabditis elegans*. Even with this information at hand, we still cannot predict the behavior of *C. elegans*, an organism far less complex than primates (Nemati, 2022). And what about other types of life forms? Scientifically, the conversation about the capacities and perceptions of beauty does not include anything without a recognizable mind-brain, typically some centralized neuronal cluster. What we do know about animal pleasure is best understood as fundamental sensory input – light, smells, vibrations, chemistry. The iridescent sheen of a peacock’s tail gleams in a peahen’s eye, this combination of light is perceived by her brain, she feels a shudder of desire. A fruit fly smells the body of a passing mate, this olfactory chemical compound is perceived by their brain, they, again, feel a shudder of desire. Can a fungus feel desire? If so, can they make choices based on desire?

All life responds to stimuli, be they as simple as a single celled yeast or as complex as the primate body that it lives in. Responses to stimuli can be thought of in two broad categories: attraction and repulsion. Even our simplest relatives are drawn towards certain stimulations and flee others. A bacterium might move along an

oxygen gradient in the ocean, attracted to oxygen rich waters and fleeing oxygen poor waters. When the oxygen levels are just right, what do they feel? Some intrinsic chemical alignment, analogous to the click of an animal synapse?

In my study of mycology, I seek “to remediate our relationship with fungi and all organisms – thereby queerness – by collapsing and myceliating the emotional space between human and nonhuman” (Kaishian and Djoulakian, 2020). The inherent queerness of fungi is apparent on many levels, such as their ability to defy standardization, quantification, and control. Mushrooms are the sexual reproductive organ of some fungi which develop from the vegetative body—the mycelium – in order to disperse its spores by wind, water, or animal facilitation. The spores contain the genetic instructions for a new individual. Mushrooms are often ephemeral structures that need rain due to their fast growing, high water content structures. Some fungi produce their mushrooms in a very predictable manner, following consistent annual phenological events, such as temperature changes. Others seem to produce them sporadically with no apparent pattern, but presumably a cascade of cues from the environment. Traditional knowledge tells us that some mushrooms emerge after a thunderstorm rolls through a habitat, as if the claps of thunder sonically massage the fruiting bodies up and out of the soil. A fungus can live most of its life in the mycelial form. The mycelium travels through substrates, seeks nutrients, and performs sex. Sex occurs when two individual fungi find each other chemically, using pheromones and chemical sensation. What happens when they chemically perceive each other? How do they choose with whom they will mingle? Biologically we know that they experience somatic chemical responses to the perception of others, and hormones are released. Logically we know that pheromones in sexually reproducing fungi have evolved gradually, like everything else. Were changes in pheromone structure or dosage mediated by desire? Did a particular molecule elicit a tingle, a vibration of some innate pining? Can we wrest *desire* from the exclusive grip of animal experience?

Consider also the mycorrhizal networks formed between fungi and approximately 90% of terrestrial plants. These mutualistic dynamics involve a fungus supplying nutrients such as phosphorus and nitrogen to the plant partner, which in turn supplies carbon from photosynthesis. These arrangements are globally ubiquitous and integral to life on Earth. Do these exchanges simply operate as dispassionate transactions, or even, as some may characterize them, as reciprocal parasitism? Through this lens, the two partners could be seen as held in a

Three fruiting bodies of *Rubroboletus satanas* photographed by Patricia Kaishian in a coniferous forest in Armenia in 2021. Like other boletes, this species forms mycorrhizal WITH trees.

Figure 4.



nervous tension, one supplying the other only with the life-or-death expectation of immediate returns. There is logic to this, but as demonstrated in numerous experiments exploring animal preferences, what is “logical is not always biological” (Ryan, 2018).

As described by Simha et al. (2022), competition-based frameworks in ecological studies of biodiversity have dominated the field for decades. That species experience competition and competition drives evolution has been verified quantitatively in numerous ways and systems, but this framework also has pronounced limitations that have been largely overlooked. Placing competition as the principal dynamic in most ecological networks has led to what is called the “diversity paradox”, in which ubiquitous examples of stable coexistence are shoehorned as a deviation from the norm. Championed by numerous scientists with explicit capitalistic and eugenicist agendas (see Hardin 1960, 1971, 1974, 1994), the logic of competitive exclusion was explicitly drawn from the market economics of capitalism, and became deeply entrenched as a paradigm of ecological theory (Kaishian and Djoulakian, 2020; Simha, 2022). Scientifically, proving the intrinsic nature of mycorrhizal relationships with experimentation would be difficult. There is, however, a growing body of quantified evidence showing cooperation between trees and mycorrhizal networks. This has been dubbed the “wood wide web” (Simard et al. 1997; Simard, 2021). I argue that this research still needs more evidence, but points us in an intriguing direction that should be pursued with full consideration.

The frameworks of sterilized fitness and competition, while not categorically untrue, have failed to hold enough water to justify their supremacy. These logics do not deliver satisfactory explanations for

the world’s abounding beauty and mutualistic interactions. They posit a world constructed entirely around pain and exploitation; a human exceptionalist world in which the thrill of vitality is limited to our biased form of intelligence. For a better understanding of evolution, it seems fruitful to turn towards frameworks rooted in mutual aid, gift economies (Kimmerer, 2013), queer ecologies, rebellion, and—more fundamentally—perception, pleasure, and desire. In this way, I think of my childhood purple deity as a symbol of earth’s vital mystery. Like a roll of thunder across a myceliated landscape, purple was swollen with potential energy. I knew little of the world, but I knew I was full of desire. I saw that the capacity for pleasure and joy is fundamental to being alive. Now, as a mycologist in tune with and guided by these experiences, I see evidence for resonant cellular pleasure as a mechanism of evolution.

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