

CREATIVITY WITHOUT AGENCY: EVOLUTIONARY FLAIR & AESTHETIC ENGAGEMENT

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Common philosophical accounts of creativity align creative products and processes with a particular kind of agency: namely, that deserving of praise or blame. Considering evolutionary examples, we explore two ways of denying that creativity requires forms of agency. First, we argue that decoupling creativity from praiseworthiness comes at little cost: accepting that evolutionary processes are non-agential, they nonetheless exhibit many of the same characteristics and value associated with creativity. Second, we develop a ‘product-first’ account of creativity by which a process is creative just in case it gives rise to products deserving of certain forms of aesthetic engagement.

1. Introduction

The *ceratopsids* were a lineage of quadrupedal dinosaurs famous for sporting a remarkable variety of headgear. Such headgear was built around a common template: an often dramatic nasal horn, sometimes another two horns sprouting from the brow, and a frill from the back of skull. Within this template, a wide variety of forms evolved, from the dramatically splayed horns of *Styracosaurus*, the stubby-horned *Regaliceratops peterhewsi* (or ‘hellboy’), to the iconic *Triceratops* (Sampson & Loewen 2010, see figure 1).

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Figure 1. Ceratopsid skulls arranged into a phylogeny, Natural History Museum of Utah (wikimedia commons)

There is much debate surrounding the evolution of ceratopsid diversity. What is the most likely phylogenetic history for ceratopsid groups? What roles did protection, display, sexual competition and natural selection play in shaping their distinctive morphology? However we answer, it is tempting to say that something valuable about the ceratopsids is their being a product of evolution's creativity.

The intuition that evolution produces creatively is, we think, a common—and motivated—one. The two basic phenomena that evolutionary theory targets are life's diversity and life's adaptedness: there is a bewildering variety of creatures, from single-celled organisms to octopuses to blue whales; and these lineages make their way in the world in often surprising, ingenious ways. Being awe-inspiring, being diverse, being well-suited and being surprising are often associated with creativity. So, the intuition might be motivated, but should it be vindicated: should we consider evolution to be truly creative?

In what follows, we explore two ways of saying yes. First: evolutionary processes are properly-speaking creative because they exhibit things characteristic of creative processes. Second—in part turning this idea on its head—creative processes are properly-speaking creative because their products are worthy of aesthetic engagement. Both of these routes clash with the philosophical majority on creativity.

Standard views on creativity in philosophy take the product of a process to be creative when (1) that product is in some sense original, (2) that product is in some sense valuable and (3) that product is the output of the right kind of pro-

cess, namely, an intentional one (see, for instance Gaut & Kieran 2018).¹ In 1941, The Swiss engineer Georges de Mestral became fascinated by how burrs clung to his trousers and to his dog's fur, and wondered whether some synthetic version could be constructed. Roughly eight years later, he had made two pieces of cotton, one with thousands of tiny hoops and the other with thousands of tiny hooks which, when pressed together, mimicked the assiduous grip of burrs. De Mestral portmanteaued 'velvet' and 'crochet' and a new product was born (Sudath 2010). De Mestral's achievement meets what is required by standard views of creativity. For the first requirement, although Velcro was inspired by nature, it was an original product; for the second requirement, Velcro's success speaks to its value; for the third requirement, de Mestral's inspiration and his hard work demonstrates the purpose, the intentionality, he brought to his creation.

This third requirement appears to clash with claims that the products of evolution, namely life's variability and design-like-properties, are examples of evolution's creativity: after all, modern evolutionary theory has either eliminated or reduced the apparent intentionality of life (Dennett 1996). If evolution isn't intentional, the thought here goes, it cannot be creative. This view is widespread.² Here are a few examples:

... the term 'creative' names a property manifested only by purposeful behaviour and its artifacts; on this view, no matter how novel and worthwhile they may be, non-purposeful natural events and objects cannot be creative. (Livingston 2018: 116)

Primarily, it is the person who is creative, whereas acts and the objects produced are creative insofar as they flow from or are produced by the creative person. (Taliaferro & Varie 2018: 141)

Nature, however beautiful and awesome, exhibits nothing of creative activity until we include in it rational beings, that is, beings who can think, imagine, plan, and execute things of worth, beings who are, in the true sense, originators or creators. (Taylor 1992: 138)

This thought has potential consequences for how we value the natural world. In the traditional view, a creative product's value is intimately related to its being the work of some agent. After all, creative products are generally

1. Simonton (1999: 5) also thinks a necessary condition of creativity is that its products must be adaptive. This seems implausible, since an artwork—say, a poem, or a work of performance art—need not have any particular function.

2. For more examples, see Kieran (2014), Paul and Stokes (2018), Stokes (2014), Audi (2018), Gaut (2003; 2010), Kronfielder (2018).

considered praiseworthy, and praiseworthiness only attaches to the right kind of agent: one who, through intending an outcome, deserves—in some sense *owns*—the good or bad consequences of that outcome (see especially Paul & Stokes 2018; although see Currie 2019a for a non-agential notion of creativity). This suggests a contrast between natural and artificial products: de Mestral’s invention of Velcro counts as creative but the evolutionary processes that gave rise to the ceratopsid frills do not. For evolution there is nowhere to pin medals of praise. The following argument, then, might be tempting:

- (1) A special value attaches to products of creative processes;
- (2) Only intentional processes can be creative;
- (3) Evolutionary processes are not intentional;
- (4) Therefore, evolutionary processes are not creative – from (2) and (3);
- (5) Therefore, whatever value evolutionary products have, it is not creative value – from (1) and (4).

We think such an argument is far too quick, and too quick because of the second premise. It is our aim here to undermine this premise in two ways.

First, we’ll show how—with adjustments—the received philosophical view on creativity renders evolutionary outcomes creative. The short version of the argument is that we can jettison blameworthiness and praiseworthiness while retaining much of the value attached to creativity, and aside from intuitions regarding praise and blame, there is no reason to think that intentionality is necessary for creativity. We’ll further show how that account can nonetheless accommodate intuitions concerning the connection between creativity and praise. We’ll start by establishing evolution’s *prima facie* creativity via a discussion of Boden’s influential view. We’ll then turn to perhaps the most prominent intentional account of creativity—Gaut’s notion of ‘flair’—and construct an evolutionary analogue of this, along the way showing how to jettison praise and blame.

We’ll then turn to our second way of denying the second premise. We’ll suggest that instead of beginning with the processes which exhibit creativity, we can start with our aesthetic regard for certain products—those products which reward aesthetic engagement. We’ll argue that adopting such a view can make sense of the commonality between natural and artificial creative achievements—between ceratopsid frills and Velcro—while opening philosophical enquiry into creativity in fruitful ways. On a product-first conception of creativity, premise (2) in the above argument is unmotivated. In the conclusion we’ll briefly discuss the relationship between these two approaches: although they appear to be very different ways of conceiving of creativity without agency, evolutionary ‘flair’ can provide guidance to understand just what forms of aesthetic engagement should be associated with creativity.

Note that we're not here concerned with the question of *how creativity evolves* (see, for instance, Simonton 1999) but in whether *evolution itself is creative*. Before proceeding, we'll consider some other responses to the above argument that readers might find tempting, but which we will not pursue here.

First, philosophers sympathetic to some form of theistic evolutionism might deny premise (3). Perhaps evolution is God's way of creating living things (e.g., Goodman 2010). On such a view, evolution might count as creative because it involves divine intention. We'll argue that evolution is a creative process even if it isn't theistically interpreted.

Second, there is a strand of evolutionary thinking going back to the work of Donald Campbell (1960) and Karl Popper (1972), and carried forward by Dennett (1996), that treats familiar kinds of human creativity as involving evolutionary processes. According to this view, creative processes, generally speaking, involve blind trial and selective elimination/retention, where the latter need not involve intentionality or agency. A songwriter might keep notes for ideas of hundreds of haphazardly generated song lyrics, most of which will never see the light of day. The artist then chooses some of these to work into a song. The artistic process could thus be a special case of variation and selective retention. On this view, familiar kinds of human creativity can be understood as mechanical evolutionary processes. This might be another way of challenging premise two: what makes intentional processes creative isn't intentionality, but rather the underlying process of generate-and-test.

Finally, you might also worry about the first and second requirement of the received view: that creative products need not be original, or need not be valuable. Simonton (1999: 5) emphasizes the originality requirement for creativity, but there seem to be counterexamples. For instance, it took a lot of creativity on Han van Meegeren's part to produce virtuosic imitations of Vermeer, even though the paintings lacked artistic originality.³ There are interesting discussions to be had—and being had—focusing on those topics, but as it is the third requirement which causes trouble for evolutionary creativity, that will be our focus.

2. Three Kinds of Evolutionary Creativity

In the next three sections we'll develop our first argument against the thought that creative products must be the result of the intentional actions of a praise-

3. Boden (2018) argues that certain kinds of originality are not required for creativity, and see Niu and Sternberg (2006) and Niu (2012) for arguments that originality and value are disconnected in Eastern traditions. Hills and Bird (2018) argue against the idea that creative products must be valuable and there is a long discussion concerning whether immoral creations may be creative (see for instance Novitz 2003 for no, Cropley, Kaufman, & Cropley 2014 for yes).

worthy (or blameworthy!) agent. In this section, we'll draw on Boden's work to provide evolutionary analogues of her account of creative processes. In the next, we'll analyse Gaut's notion of 'flair' and its connection to praiseworthiness. After that we'll construct an evolutionary notion of flair which jettisons the agential features driving Gaut's account. It is worth briefly noting the kind of argument we are making in these three sections. In analytic philosophy of creativity, arguments often proceed by generating an intuition which clashes with some account of creativity, then presenting a dilemma: either modify the account or reject the intuition. By contrast, our argument proceeds by considering the costs and benefits of adopting various views. That is, instead of providing an intuition-driven dilemma for agential notions of creativity, we'll demonstrate how a non-agential conception can be adopted with minimal cost.⁴

Margaret Boden develops a 'computational' account of creativity. The account is centred on *conceptual spaces* (Boden 2004). One way of understanding a conceptual space is via the notion of a *problem space*: some kind of challenge, creating a synthetic burr for example, has a range of possible solutions constrained by different design decisions, materials, and so forth. A creative process is considered creative in virtue of how it interacts with the problem space. Boden identifies three kinds of creativity relating to conceptual spaces. First, there is *combinatorial* creativity. Here, two previous ideas are put together to create a new idea: for example, the idea of a natural burr, combined with human-made materials. Second, creativity can be *exploratory*. This involves searching through a conceptual space—locating new ideas within it. For instance, de Mestral switched from cotton, which tended to wear quickly, to longer-lasting nylon. Third, creativity is sometimes *transformational*. This involves changing a conceptual space. The addition of Velcro opened up a new range of design options for clothing and other items requiring fasteners. Boden has applied these ideas to artificial intelligence (Boden 2009; Boden & Edmonds 2009) and has discussed it in some biological contexts (Boden 2018).⁵ Our purpose here is to show that there are strong biological analogues for each of her kinds of creativity.

4. David Lewis (1995) adopts a similar argumentative strategy, arguing that materialist philosophers of mind should believe in qualia, so long as they reject what he calls the *identification thesis*: the capacity to identify and recognise qualia. Lewis's argument claims that identification thesis is the source of tension between materialist theories of mind and the notion of qualia, and claims that rejecting that thesis doesn't require rejecting "harmless look-alikes. A materialist can and should accept these look-alike theses. That makes his position seem less radical; it softens the blow of rejecting the Identification Thesis in its full-strength, materialistically unacceptable form" (Lewis 1995: 143).

5. In her paper Boden develops her notion of *psychological creativity* (the contrast being historical creativity) to be applicable to biological development. She doesn't directly discuss the relationship between intentionality and evolutionary creativity.

Combinatorial creativity produces the unfamiliar by conjoining the familiar. By swapping between boxing bouts and timed sequences of chess—and by noting their surprisingly easily consolidated scoring systems—we create *chess-boxing*, a new sport emerging from the combination of two existing ones. In biology there are at least three instances where combination can be a source of the new. First: reproduction. In sexually reproducing species, processes of recombination during meiosis mix two parents' genetic material. Although to an extent this serves to homogenize genetic populations, it also sometimes produces new combinations. Further, one of the more dramatic discoveries of modern biology has been the recognition of rampant horizontal genetic transfer, particularly in single-celled organisms (Jain, Rivera, & Lake 1999). Here, genetic material is mixed-and-matched without the need for sexual combinations, a potentially powerful source of new traits. Second, species themselves can be combined via hybridization: the familiar horse and donkey become the unfamiliar mule. Third, and perhaps less obviously, new combinations of existing phenotypes and existing environments can have surprising effects. Especially in lands with unusual, cut-off evolutionary histories, the introduction of the old properties of invasive species into new environments can lead to runaway upshots—the success of rabbits and possums in New Zealand, for instance, or cane toads in Australia. Transplanted into new environments, these animals not only underwent remarkable demographic changes, but in some cases phenotypic as well. In Cane-Toads, for instance, toads at the forefront of the expansion exhibit a faster-feeding, more active behavioural profile than those in already invaded lands (Brown, Kelehear, & Shine 2013). As the phenotype an organism might exhibit is a function of their inherited features and their environments, combining old inheritance with new environments can generate new traits. Often, then, biological evolution creates new things via combination.

Exploratory creativity involves searching through a possibility space. This is the most familiar kind of evolutionary creativity. To see why, let's briefly consider the notion of an evolutionary process. We can define a *minimally cumulative evolutionary process* (Lewontin 1970; Godfrey-Smith 2009) as one which involves a population with (1) a source of variation—mutation—(2) a process of selection which acts upon that variation, and (3) a process of heredity, that is, a way of establishing similarity between variations in one generation and the next. Within the population, the standing variation changes as mutation adds new morphs, and selection changes the proportion of existing morphs. Over time, the population will become better adapted to the environment it occupies.⁶ This process is

6. We skim over a lot of complexity here: for instance, a referee asks how instances of sexual selection might operate. In cases of sexual selection, it might appear that organisms are selected to be less fit: spending hours digging up a bowl, making and maintaining specific tracks towards it, and then spending all night 'booming' in the typically vain hope that a female might find you,

often conceived of using an evolutionary landscape (Svensson & Calsbeek 2012). Here, genotypes or phenotypes are represented along a 2-dimensional plane—one location on an X , Y axis being a particular ceratopsid skull, say—while a third dimension represents fitness (what selection would select for). The population of organisms, then, will ‘explore’ the evolutionary landscape, ‘hunting’ for the highest points on the landscape. This way of conceiving of evolution is extremely close to Boden’s notion of exploratory creativity. We’ve just swapped out a conceptual space for an evolutionary one.

So, evolution generates novelty through exploration.

What about *transformational* creativity? Can we consider evolutionary biology as being interested in changes to possibility spaces? Certainly: the capacity of evolutionary processes to generate their own idiosyncratic dynamics is a common theme (e.g.: Beatty 1994; Wimsatt 2007; McConwell 2019; Currie 2019b). For one example, theorists interested in *niche construction* often emphasize how a lineage’s manipulation of their environment itself creates conditions advantageous to that lineage’s survival (Odling-Smee, Laland, & Feldman 2003). Another case is work on *Major Transitions* in evolution (Maynard Smith & Szathmary 1997; Calcott & Sterelny 2011; O’Malley & Powell 2016; Currie 2019c). These are traditionally understood as major turning-points in life’s history, where some key change opened up a new range of evolutionary options. The evolution of multicellularity, for instance, enables much larger sizes (as there are physical constraints on how large a single cell may be) and increased evolutionary flexibility due to the capacity to specialize different cells for different tasks. Calcott and Sterelny (2011) go so far as to define major transitions *as* changes to the basic mechanics of evolution. Generally speaking, evolution is cumulative, building upon itself as it goes along, and this can involve the transformation of the spaces open to lineages to evolve into.

You might object here that surely transformation in evolution’s path is rare, and so the analogy with transformative creativity in humans is weak.⁷ Major transitions, for instance, are anything but common occurrences. So, if it happens so rarely, how can we say that transformative creativity is part of evolution? First, something’s being rare doesn’t mean that it isn’t a critical feature or crucially important. Major transitions, although only happening now and then—perhaps even uniquely—are nonetheless distinctive features of evolving systems.

Second, a lot turns on the bar for being ‘transformative’. Niche construction is extremely common. The introduction of earthworms fundamentally

as male Kakapo do, doesn’t seem conducive to survival. However, in cases of sexual selection we consider the reproductive environment—which includes mate-choice—given that, the male kakapo’s behaviour is adapted to its environment (see Prum 2017 for discussion of sexual selection and aesthetics).

7. We thank an anonymous referee for raising this question.

alters the soil, generating new eco-systems able to support a different range of organisms. This doesn't change the fundamental rules of evolution, but does transform that ecosystem. Even regarding major transitions, while originally the focus was on changes to basic evolutionary mechanisms, in the hands of other life scientists and philosophers the range of transitions has expanded to include differences in metabolism (O'Malley & Powell 2016), cultural, cognitive and anatomical innovations in hominin lineages (Foley, Martin, Mirazón Lahr, & Stringer 2016), mass extinctions (Currie 2019b), and even the evolution of pectoral fins (Pieretti, Gehrke, Schneider, Adachi, Nakamura, & Shubin 2015). Another example might be the co-option of previous structures (either adaptive, as in exaptation, or spandrels) to new functions. So, how common we think transformation is in evolution turns on how high we set the bar for being transformative.

This second point leads smoothly to our third: how common is transformative creativity in humans? A synthetic burr transforms our fastening options in a sense, but whether we think this warrants the label 'transformational' is not a question with an obvious answer. Just as evolution is beholden to what went before, so too does human creativity build on genre conventions, engineering know-how, stylistic tropes and so on. Surveying human history, should we identify a few major transformational inventions (agriculture, the printing press, etc. . . .) or should we include multitudes, perhaps even Velcro, on our list? Outside of the artificial confines of Boden's computational problem-spaces, we don't think there is a purely disinterested answer to such questions. As with evolution, if we set a high bar, we find that transformational creativity is rare—but nonetheless crucial—to human life and history; if we set a low bar, we find transformational creativity all over the place. Regardless, it seems to us the analogy holds.

Transformative creativity, then, is a hallmark of cumulative evolution.

Importantly for our argument downstream, note the apparent *spontaneity* of these creative processes. New traits may arise due to random mutations, or due to new combinations of genes, or due to new genotype-environment matches. Although these changes often—but not always—involve gradual accumulation, they are not pre-planned and occur due to the contingent coming-together of various forces. They are not literally spontaneous in the mysterious sense of spontaneous generation—but neither should we expect to find such a thing in beings like ourselves.

So, considering biological evolution, it is easy to find powerful analogues of Boden's three kinds of creativity. And yet, standard philosophical views of evolution sit uncomfortably (to say the least) with the notion of evolution's outputs being creative; we might be tempted to say that evolution is *metaphorically* creative, but cannot literally be so. It is time to examine why.

3. Flair & Praiseworthiness

Many philosophers associate true creativity with highly agential features, such as the exercise of agency, purposeful attention, and so forth (see references above). Matthew Kieran, for example, argues that the very motivation to be creative is “itself a *praiseworthy* achievement of character” (2014: 132). Connections between creativity and agency are typically driven by intuitions about the role of, for instance, randomness in generating new, original products, and by the importance of creativity in human thriving. Our arguments below will not deny the intuitions such thought experiments generate, but rather claim that (1) very little is given up by jettisoning agency from creativity and (2) such intuitions can be accommodated regardless.

One of the most developed versions of creative agency is Berys Gaut’s notion of *flair* (Gaut 2003; 2010; 2018). Here are Paul and Stokes (2018) explaining the concept:

[to act with flair] The agent must proceed with purpose (accidental processes will not result in creativity); she must possess and execute genuine understanding of the domain (by contrast to a rote or mechanical use of information in that domain); she must execute judgement sensitive to the domain, for example if the application of rules or constraints is appropriate; and she must employ a capacity for evaluating the process as she undergoes it, knowing when to continue, change, or stop the process altogether. (Paul & Stokes 2018: 197)

In developing Velcro, de Mestral worked towards a specific aim; the process was no accident. He didn’t simply mechanically try out options when developing Velcro, but used his understanding of the materials and their relationship to guide his exploration. De Mestral made the leap from cotton to nylon by judging the appropriateness of that material to the task at hand. De Mestral’s task was long—nearly eight years—and knowing when his task was done required understanding. We can summarize Gaut’s notion as follows: ‘flair’ involves the undertaking of a task using the understanding required to make sensitive judgements as you proceed.

An often neglected aspect of flair, important for our argument, is the connection between flair and *inquiry*. Our being struck by de Mestral’s achievement likely leads us to ask after it: how did he do it? What were the processes he undertook? What challenges and resources did he have? There is a strong link between the surprise from some creative achievements and inquiry into the processes leading to that achievement. In the philosophy of science, for instance, there is a long discussion examining the generation of ideas. To pick up a single

thread, William Whewell argued that a central process of scientific discovery involves a ‘happy thought’, typically from the mind of some creative genius, which was then articulated and made testable (Whewell 1840/1996). Subsequent discussion questioned both whether ‘happy thoughts’ require genius, whether they are truly the source of new ideas in science, and whether the connection between such thoughts and their being articulated should be included in the context of discovery (see Schickore 2018 for an excellent summary). Here, a scientist’s exercise of flair generates and leads inquiry: we articulate features and surrounding context to explain their achievement.

Flair, then, involves the generation of new valuable products via sensitive understanding; it underwrites the agent being praiseworthy; it is closely tied to enquiry after the processes leading to the product. Why think that flair is necessary for creativity? By and large, the motivation is to do with praise and blame, as Paul and Stokes put it: “. . . creativity is a praise concept. We praise individuals when they have been creative or produced creativity. And praise is not appropriately given to subjects who lack responsibility for their actions” (2018: 197). Only agents are deserving of praise, creativity is a praise-concept, evolution is not agential, and thus is not deserving of praise, and thus cannot be creative. As Gaut puts it:

If all that were required to be creative were a disposition to produce new things that are valuable of their kind, then the oyster that produces a new pearl, the tree that produces an elegant and distinctive canopy of leaves, and the tectonic movements that produce valuable and unique diamonds would count as creative. But none of these things is creative. And this is because none of them is an agent. Creativity is something whose exercise we praise, and we do not praise anything other than agents and their products. (Gaut 2018: 129–30)

The idea that creativity deserves praise has a lot of intuitive force. Arguments in favour of coupling creativity and praise typically appeal to linguistic use and thought experiments. A product might be original, surprising—deserving of aesthetic appraisal—but nonetheless be generated by the wrong kind of process. If you simply spilled some paint, not intending to create a painting, and nonetheless generate beautiful patterns, you’d be making a mistake to claim praise for the act. This is because you didn’t intend the production, because the production was random, and so forth. It is precisely to capture this kind of thought that Gaut developed his notion of flair. Another argument points to the critical importance of creativity in human flourishing (Kieran 2014; 2018). We might think that a creative life is part of a good life: a life worth enculturating; one deserving of praise. Insofar as we connect creativity with flourishing, it is tempting to connect it to praiseworthiness.

However, we argue it is consistent with creativity playing such a role for agents like us, for praiseworthiness (and thus agenthood) to be nonetheless inessential for creativity. As we'll see, we can deny praiseworthiness and still accommodate the intuitions generated by the argument above. To see how, let's take a quick tangent into imagination.

You might object to non-agential notions of creativity by arguing that true creativity requires the application of the imagination (Audi 2018)—and natural selection just can't be imaginative. This is another way of capturing what was missing from the spilled-paint example: you weren't exercising imagination, thus were not being truly creative. However, as Gaut points out (2003), we mustn't conflate a *vehicle* of creativity with a *source* of creativity. For him, imagination might be a vehicle, one might use imagination to be creative, but it doesn't follow from this that imagination is necessary, or that it is one of creativity's sources. In agents like us, imagination is often a vehicle for creativity, by exercising our imaginative faculties we sometimes act with flair. But being a vehicle is not the same as being a source, that is, being essential to the creative act.

Taking our cue from Gaut's argument, we suggest agential flair is best understood as a vehicle rather than a source of creativity. Undoubtedly, flair in Gaut's sense is used by agents like us in being creative (just as agents like us sometimes use imagination). But it doesn't follow from this that flair is a source—is essential for—creativity. Particularly, the aspects of flair that connect it to praiseworthiness can be jettisoned, which we'll now demonstrate by developing an evolutionary notion of flair.

4. Evolutionary Flair

Flair involves the generation of ideas or the solving of problems using sensitive understanding of the materials being worked with and the aims at hand; it leads us to inquire after the processes that generated those creative products. Gaut connects flair and praiseworthiness: insofar as de Mestral should be celebrated for discovering Velcro, it is because of the flair he exercised. We've suggested that the agential aspects of flair (those attached to praiseworthiness) should be considered non-essential to creativity by analogy with Gaut's arguments concerning imagination. But this in itself isn't satisfying without an alternative account: under what conditions is a process creative, then? What is going wrong in the spilled paint example? In this section we'll discharge that obligation by developing a notion of non-agential 'evolutionary flair'. Evolution, we agree, does not deserve praise or blame—it is just the wrong sort of thing. But there are

a range of other aesthetic attitudes that are appropriate to it, and indeed there are non-agential analogues of flair with which evolution works. In seeing this, we see how little is lost in attributing creativity to evolution while jettisoning praise and blame.

Let's begin with a naïve objection to evolution's creativity: its apparent blindness. Because mutation is random, and merely random processes cannot be creative, evolution cannot be creative.⁸ There is an analogy here between your spilling paint and evolution. This is mistaken because although mutation might be random (although, it seems, it often isn't) evolution is not. Selection funnels those variants and biases the direction of evolution towards suitability for the environment the lineage occupies. Selective processes, then, are *sensitive* to environments, sensitivity being an important aspect of flair. Evolution is also highly path-dependent: the basic ceratopsid *bauplan* provided a set of evolutionary constraints and capacities which selection explores. This leads to particular—potentially unique—outcomes. Further, these surprising outcomes of evolution guide inquiry. As we touched on in the introduction, palaeontologists spend a lot of time trying to figure out how and why the ceratopsids ended up with such a diverse array of headgear. Both de Mestral's achievement and evolution's surprising products demand explanation, and in similar ways.

We've identified a set of features of creativity—and flair—which are present in evolutionary processes. First, there are clear evolutionary versions of Boden's creative processes: evolution generates novelty via recombination, exploration and transformation. Second, evolution can be *sensitive*, *unique* and *spontaneous* (Kronfelder 2018). One non-agential way to think about spontaneity here is to connect it with the unpredictability of evolutionary outcomes. The stunning variety of ceratopsid skulls would have been difficult to predict if we only had access to the ancestral form. Third, evolution can be *surprising* (Boden 2004), and moreover guide inquiry. But evolution's 'achievement' differs from de Mestral's as it lacks *understanding* and does not work towards a *specific goal*. Thus, it doesn't meet Gaut's criteria and at best could be thought of as metaphorically acting with flair. That is, unless we should reject those aspects of the notion of flair.

What do 'understanding' and 'goal-orientation' bring us in terms of value? It seems plausible that these are important for praiseworthiness—it is in virtue of purpose and understanding that we might point at de Mestral with praise. But we might also point towards the products of evolution with aesthetic approval, surprise and awe, without being committed to praising evolution. Much of the value of creativity may be had without the requirement to then praise or blame the creative act.

8. See Kronfelder (2018) for discussion.

Although evolution doesn't possess agential flair, since it lacks understanding and goal orientation, it nonetheless has a flair of its own. How evolution shapes lineages is highly sensitive to a range of factors. Beyond the simple phenotype-environment matches emphasized by traditional adaptationism—which nonetheless are often ingenious—how lineages evolve is critically linked to their ecological and environmental contexts, as well as the developmental resources bequeathed by their ancestry. These various sensitivities generate unique evolutionary outcomes, the remarkable variability of ceratopsid headgear being only a single example. Evolution moreover has a kind of spontaneity, the surprise of mutation or how a lineage reacts when faced with a new environment. The idiosyncrasy of evolutionary outcomes, how evolutionary paths carve their own peculiar rules (Currie 2019a), is endlessly surprising, original, and valuable. This doesn't mean we should praise evolution—again, evolution has nowhere to pin medals of praise—but the aesthetic and epistemic value we should feel towards its products are so close so as to be indistinguishable from those values associated with creativity; the surprise, the provoking of inquiry, the aesthetic appreciation, and so forth.

Evolution, then, is a paradigm case of non-agential creativity, and moreover the philosophical cost for accepting evolution's being creative is easy to pay. To see this, recall our co-option of Gaut's distinction between creative vehicles and sources. Understanding and goals are often crucial aspects of how original and valuable products are generated, but this is how flair operates in *agents like us*, just as the imaginative faculties are often used. In non-agential processes like evolution, original and valuable products are generated by sensitive, exploratory, combinatory and transformative cycles of mutation, birth and death, and so forth. When we appeal to intuitions about creativity's connection to praiseworthiness or its importance for flourishing human lives, we mistake a vehicle for a source. As such, our view accommodates those intuitions.

At this point a thought might be gnawing: why not go pluralist? We've identified a notion of non-agential flair connected to evolution's capacity to generate astounding originality, diversity and adaptedness. Gaut identifies an agential notion of flair which, in addition to non-agential flair, also includes *goals* and *understanding*, thus connecting it to praiseworthiness. These are two distinct concepts; so why insist that our conception of creativity is *the* conception? We're attracted to this idea, but want to highlight that a single conception can be had, and insofar as unity is a desideratum, this speaks in favour of monism.

On the account suggested thus far, some process can be creative when it has the capacity to act with 'flair', where by flair we mean a process which (1) uses Boden's creative processes, (2) is sensitive to context, (3) is spontaneous, (4) prompts inquiry. In agents like us, (1)–(4) are generated by goal-orientation and understanding, and thus deserve praise. But in other processes (we've high-

lighted evolution) 1–4 are generated without those agential features, so are not the proper targets of praise and blame. The pluralist suggestion is that in *agential creativity* we include goals and understanding, and jettison them for non-agential creativity. Whether we ought to be conceptual lumpers or splitters in this case is, we readily admit, in part a matter of taste. However, it is worth noting that the unified account is well-positioned to explain and accommodate the bountiful similarities between evolutionary and agential creativity, and taking agent-based flair (the exercise of understanding towards achieving goals) as a vehicle by which creativity is expressed also explains our intuitions regarding its role in flourishing and praiseworthiness. These, in addition to unity as a desideratum, we think, speak weakly in favour of monism.

Regardless, given the focus on agenthood in the creativity literature, we think pluralism is a major concession. In addition to ‘intentional-creativity’ we should also recognise a very closely related notion of ‘non-intentional creativity’ which carries much of the same aesthetic and epistemic value.

Although we’ve not time to develop the thought here, other aspects of biology (and as we’ll shortly discuss, nature more generally!) beyond evolution likely act with flair as well. The plasticity of development, the capacity of organisms to adapt to shifting contexts through ontogeny, can be a remarkable source of diversity and sensitivity. Termites building a complex and impressive mound might exhibit non-agential creative flair. Also, of course, one might ask after non-agential flair in non-natural contexts, sophisticated artificial intelligences being the obvious candidates.

Our discussion thus far has had little to say about the role of the observer as opposed to the generating process. As Beardsley argued long ago “The true locus of creativity is not the genetic process prior to the work but the work itself as it lives in the experience of the beholder” (Beardsley 1965: 302). In the next section, we show how this insight from Beardsley can serve as the basis for a further-reaching argument about creativity and value.

5. Process-First vs. Product-First Accounts of Creativity

Recall our main goal, challenging the following premise:

- (2) Only intentional processes can be creative.

We’ve argued that evolutionary processes have many of the features associated with creative processes, even though evolution is neither agential nor intentional. In this section, we sketch another line of critique. In doing so, we’ll connect our discussion so far with larger questions about aesthetic engagement with nature,

and with the products of natural processes, such as the ceratopsids' frills. This will ultimately lead us to explore a quite different approach to creativity, which nonetheless leans crucially on our non-agential notion of flair.

On the one hand, it might be quite tempting to say that a product—say, an artwork—has what aesthetic value it does because it is the outcome of creative processes. On this view, the creativity of the processes is the *source* of aesthetic value. According to this *process-first view*, the aesthetic value of the product derives from the creativity of the process that produced it.

An alternative *product-first* view holds that what makes certain processes creative is just that their products have aesthetic value of the right kind. Along these lines, we could say that what makes certain processes creative is that their products are appropriate foci of certain forms of *aesthetic engagement*. As Thi Nguyen has recently put it, aesthetic engagement involves those “processes of engagement involved in forming aesthetic judgments” (2020: 516). Coming to an aesthetic judgement involves both high level and low level forms of engagement: perception, appreciation, imagination, and much else. According to a *product-first view*, what makes a process creative is just that it leads to a product worthy of the relevant aesthetic engagement. Note that we take a broad view on what counts as aesthetic judgment. Aesthetic judgments are not merely attributions of beauty. Rather, any judgment that deploys aesthetic concepts could be an aesthetic judgment. And we similarly take a broad view of aesthetic concepts. For example, even the concept of a frill, as applied to ceratopsid skulls, is a concept with aesthetic connotations. Moreover, we shouldn't assume a sharp demarcation between aesthetic judgments and other sorts of judgments.

Although many philosophers interested in creativity favour process-first views, we think product-first views have more going for them than is usually recognised. It is crucial to note that the product-first view differs fundamentally from how philosophers of creativity have tended to frame the issues. As we saw in the introduction, creative products are identified as being novel and valuable, and intuitions about the sufficiency of novelty and value for praise or blame are drawn upon to motivate notions like 'flair'. In contrast, our 'product-first' account turns on how aesthetic agents interact with the object of regard: is it something worth aesthetic engagement? If so, then the process that generated it was a creative one. This is product-first in a significantly richer, and more relational, way than accounts merely appealing to the originality or value of products.

Premise two is partially motivated by process-first views. These require an account of what makes processes creative. First you explain what makes certain processes creative, and only then do you define a creative product—a product worthy of aesthetic engagement—as products resulting from that sort of process. Of course, premise two adds the specific requirement that creative pro-

cesses be intentional or agential. In earlier sections, we pushed back against that specific requirement. But things might be even worse for premise two if process-first approaches should be rejected whole-cloth. Appreciating this deeper problem opens the door to new ways of thinking about creativity and aesthetic value in nature.

6. Product-First Creativity

A product-first view begins by identifying things in nature that are worth engaging with aesthetically. This might include individual plants and animals, landscapes, places, events (like volcanic eruptions), phenomena (like the sounds of a forest), and fossils. There's an immediate objection here: given that plausibly anything can be an object of aesthetic engagement, does this over-generate creativity? For example, New Mexico's Valles Caldera is a beautiful and fascinating landscape, with grassy meadows inside an ancient volcanic crater. Because the landscape is worth engaging with, aesthetically, a product-first view of creativity would imply that the geological processes that shaped the land were creative. An ephemeral mud puddle might seem less worth engaging with, and so it might seem less appropriate to call the processes that formed it "creative". There is no simple story to tell about what might make one thing more or less worthy of aesthetic engagement than another. This has to do with our cultural practices, with familiarity, temporal and spatial scale, background knowledge, our own interests and concerns, and many other contextual considerations. It is possible to imagine contexts in which something mundane like a mud puddle might be well worth engaging with, in which case it might make good sense to think of the processes that formed it as creative. We'll return to the apparent free-for-all in the conclusion, where we'll connect our product-first account with evolutionary flair, thus providing a mixed process-and-product view. However, we can appeal to our actions and behaviours—our role in generating what we'll call "aesthetic things"—to explain why not all objects count as worthy of aesthetic engagement by this account.

A different sort of worry about the product-first proposal is that there might be examples of products that are not (at least, not very) worthy of aesthetic engagement, but which we would nevertheless consider to be products of creative processes. There might be cases, in other words, where the products have appreciable value that isn't really aesthetic.⁹ One such example might be Velcro: while it's obviously valuable on account of its usefulness, it's not entirely clear whether Velcro is a good candidate for being an "aesthetic thing," or an appro-

9. We thank an anonymous referee for raising this interesting possibility.

priate target of aesthetic appreciation. One response to this worry would be to suggest that aesthetic engagement is just one species of engagement or appreciation. A proponent of the product-first view might say that any product worthy of engagement or appreciation is the result of creative processes, where we might think of “engagement or appreciation” more broadly to include, say, appreciation of something’s usefulness or functionality. However, it might turn out to be more difficult than it seems to distinguish (a) appreciation of Velcro’s functionality, from (b) aesthetic engagement with it. Parsons and Carlson (2012) argue that there is an important strand of thought in Western aesthetics that equates beauty with functionality and good design (see, for instance, Ivanova in press’s emphasis on aesthetics and design in experiments). As seen from the perspective of this tradition, appreciating something’s usefulness or functionality—as in the case of Velcro—just is a way of engaging with it aesthetically. And the judgment that something is well-tailored for some end might simply turn out to be a type of aesthetic judgment. On a broad understanding of aesthetic engagement, something like Velcro does turn out to be worthy of aesthetic engagement.

Perhaps, then, what makes evolution a creative process is that it generates things like the ceratopsid frills—things worthy of aesthetic engagement. Paleontologists scarcely know how to describe ceratopsid skull morphology without deploying aesthetic concepts. Museum exhibits such as that pictured in Figure 1 explicitly treat the skulls as what Turner (2019) calls *aesthetic things*, to be appreciated by both specialists and the general public. We argue that any process that produces products *like that* is a creative one. The ceratopsid frills with which we began are certainly worthy of aesthetic engagement. Even the casual museum-goer can appreciate that they are, in a sense, variations upon a morphological theme, not unlike different artists’ interpretations of the same song, or Monet’s paintings of the same haystacks across varying contexts with different light. The unfamiliarity of the ceratopsid skulls might jolt us, leaving us with questions, and with the desire to see more fossils. Thus, they might well have a kind of transformative aesthetic value, a power to transform our aesthetic preferences and to motivate inquiry (Sarkar 2005; Turner 2019: ch. 4). The fossils might induce an experience of the sublime, an appreciation of something fearsome from the safe distance of tens of millions of years (Havstad 2019). These aesthetic responses are so central to our encounters with dinosaur fossils that they sometimes get woven into nomenclature—think *Triceratops horridus*. Or think of the “hellboy” skull whose official designation is *Regaliceratops*, in recognition of its frill’s similarity to a medieval crown. Fossils can also evoke other sorts of aesthetic and emotional responses, such as nostalgia for an imagined prehistoric milieu that we can never visit (Boym 2002; Turner 2017).

The ceratopsid skulls are appropriate objects of aesthetic engagement, but we should not suppose that aesthetic engagement is merely a matter of passive

appreciation and perception. On the contrary, the ceratopsid skulls on display in Figure 1 are not just the products of evolution, but also the products of extensive material engagement by scientists (e.g., those who made the initial collection decisions in the field) and fossil preparators. Fossil collection and preparation are very much forms of active, embodied aesthetic engagement. Caitlin Wylie (2009; 2015; 2021) has shown that fossil preparators often have training in the arts and often think of their work as involving aesthetic decisions. For example, deciding when a fossil is sufficiently prepared for display often turns on whether it looks good enough. In short, aesthetic engagement with fossils like the ceratopsid skulls takes many different forms, and can happen in many different ways. Preparators treat them as material for artistic work. Paleontologists in the field might base collection decisions in part on aesthetic considerations (how good would it look on display?). Paleoartists might treat them as source material for two-dimensional renderings of prehistoric life. Museum-goers might contemplate them in the same way that they would contemplate a sculpture or a painting.

So, ceratopsid skulls are “aesthetic things” (Turner 2019: ch. 7) as well as data for paleontological research. The prepared skulls are indeed partly the products of human artistic work, but the fossil preparators are not solely responsible for turning them into aesthetic things. What makes them aesthetic things is the role they play in our practices of scientific collection, study, and display. They are enmeshed in a complex system of practices that involve many different kinds of aesthetic engagement. On product-first views, however, it is not evolutionary history, nor the subsequent histories of fossilization and preservation, nor their being prepared and put on display (although these involve aesthetic judgements) that have made them aesthetic things (or appropriate foci of aesthetic engagement). Their being aesthetic things is a matter of their relationship to our complex practices of aesthetic engagement. But the processes of aesthetic engagement they elicit lead us towards their history, as well as their structure and form. Aesthetic engagement often (although not always) leads to asking after the processes which lead to those products—hence, coming to judgements regarding the surprising features of ceratopsid morphology underwrite examinations of their evolutionary pasts. In short, aesthetic engagement with ceratopsid fossils leads us to ask after the evolutionary flair which generated them.

The interrelation between aesthetic engagement and inquiries after generating processes gives us a rather different, product-first way of thinking about creativity. We might say that a process is creative just in case its products are aesthetic things, things well worth engaging with, where learning about the processes that produced them deepens and enhances that aesthetic engagement. This product-first view of creativity is far more liberal and inclusive than views which make agenthood or intention (in the creative process) necessary for creativity. The product-first view has no problem with works of art: they are

obviously aesthetic things, and hence are the results of creativity. But as noted above, lots of relatively more natural items are aesthetic things too. Things not produced by human agents at all—say, wild plants and animals—can still be (indeed sometimes are) aesthetic things. And in virtue of that, we might say that the processes that produced them were creative ones. Thus, the product-first view fits squarely in the tradition of environmental aesthetics that sees aesthetic engagement with nature as having much in common with our engagement with works of art (see, e.g., Carlson 1977; Parsons 2008).

As we've noted, one potential worry about the product-first view is its permissiveness. It certainly does imply that evolutionary processes are creative. However, since pretty much anything could be an "aesthetic thing," the view seems to imply that pretty much any processes could be creative. We see three possible responses to this worry. One response is to point out that although pretty much anything in nature *could* be an aesthetic thing, not everything *is*. This is because our complex practices of aesthetic engagement focus on some things but not others. We collect and prepare dinosaur skulls for exhibit in museums, but (for a variety of complex reasons) we don't give everything in nature the same treatment. For example, we do not typically treat mud puddles as very worthy of attention. A second response to the worry is to suggest that permissiveness might just be right. There are lots of aesthetic things that are not actually products of evolution—think of the gemstones and meteorites on display in so many natural history museums. Those, too, are aesthetic things, and on the product-first view of creativity, we should say that they are the products of creative geological and astronomical processes. Once we give up on an agential requirement for creativity, it's hard to see why we should insist on any biological requirement—that is, why we should say that biological processes such as evolution are creative while geological processes are not. Indeed, a fossil such as a permineralized ceratopsid skull is more like the result of an 'artistic collaboration' between evolution and geochemistry. The third option is to consider how to restrict creativity to certain forms of aesthetic engagement, or to processes acting with 'flair', a view which we'll consider briefly in the conclusion.

Another kind of objection draws on intuitions regarding creativity. We might consider thought experiments where objects which were considered to be human-created turn out to be made by nature, and point out the aesthetic shift in our appreciation. We've discussed these already: A classic is Gaut's example of someone being locked in a dark room full of paint and, upon thrashing about, creating a brilliant piece of abstract painting. Gaut explains the intuition that the painting is not creative by appealing to a lack of intention. However, presumably product-first views commit us to saying that as the resulting painting is an aesthetic object, the random process through which it was generated *was* creative. We think this can be easily answered by appealing to an earlier argument.

We should, in fact, think that the process of generating the painting was creative, and for exactly the reason the product-first defender would claim. However, as the process was not intentional, then praise is not owed to the act—the shift in aesthetic judgment is related to praise, not creativity *per se*. And as we've already seen, decoupling praise and creativity comes at a small philosophical cost.

To take stock: We've distinguished between two approaches to creativity: *process-first* and *product-first*. According to the former, what makes something an "aesthetic thing" worth engaging with is its being the result of a creative process. According to the latter, what makes something a creative process is that it gives rise to "aesthetic things" worth engaging with. We've tried to motivate a product-first view, and have shown how a product-first view opens up space for thinking of evolution and other non-agential processes as creative. Not only that, but a product-first view coheres especially well with neighbouring ideas in environmental aesthetics and the aesthetics of scientific practice (Turner 2019; Currie in press). An attractive way of denying the necessity of agency in creativity is to embrace a product-first view of creativity.

7. Conclusion: Flair & Aesthetic Things

Many philosophers interested in creativity tie it to agency, typically motivated by appeal to the apparent blameworthiness or praiseworthiness of creativity attributions. In this paper, we've introduced two ways of denying that forms of agency are necessary conditions on creativity.

The first argument claimed that one gives up little by denying that praise- and blame-worthiness are necessary for creativity. No doubt, for those agents who are deserving of praise or otherwise, creativity might be something we praise them for. But this is a far cry from claiming that such agency is required for creativity. Moreover, natural processes like evolution can generate many of the same kinds of products and processes associated with creativity. They combine, explore and transform; moreover, they create with something like 'flair': they are spontaneous, sensitive, and demand explanation.

The second argument goes further, suggesting instead that it is an object's appropriateness for aesthetic engagement that makes it a creative product: what makes a process creative is that it gives rise to aesthetic things worth engaging with. This more radical move shifts the question philosophers ask regarding creativity. Instead of providing a conceptual analysis which identifies creative products by singling out the relevant processes, we ask instead after aesthetic engagement, processes of coming to aesthetic judgements. This observer-side, product-first approach potentially opens the door to a wider and dynamic philosophy of creativity.

Although these two arguments lead to views which might be in tension—the former retains a process-first creativity, while the other embraces product-first creativity—we think their interaction is nonetheless a fruitful one.

Both lines of argument we have developed show that intentionality is not necessary for creativity. This consequence clearly follows from a product-first view of creativity. But it also follows from the argument that some non-intentional processes, like evolution, exhibit the most important aspects of creative flair. The ceratopsid frills with which we began afford a helpful example of how these two lines of argument might interact. On the one hand, from a product-first perspective, the frills are aesthetic things, well worth engaging with. And so (on the product-first view) we should say that the evolutionary processes that generated them were creative. But there is no need to stop there, for we can also say more about those evolutionary processes, as we did in Sections 2 through 4. One thing that makes evolutionary processes such a rich source of aesthetic things is that they exhibit creative flair. That understanding of the process can further contribute to our sense that the ceratopsid frills are worth engaging with *qua* aesthetic things. On the other hand, our deepened aesthetic interest in the frills, informed now by the sense that they are products of evolution's creative flair, can lead us to investigate finer-grained questions about the processes that gave rise to them. This interplay of process considerations with product considerations is a sure sign of creativity; no intentionality is required.

As mentioned above, it is an open question whether just any form of aesthetic engagement might be appropriate for creativity-attributions, or whether there are restrictions (or some objects are more suitable than others). Perhaps that someone is appreciating the beauty of a landscape *need not* thereby mean that the forces that shaped the landscape were creative. Our discussion of evolutionary flair potentially provides hints as to where the restrictions might lie: forms of aesthetic engagement that lead us to wonder at, and inquire after, the processes which could generate such an object, are likely forms which target creativity. Evolutionary flair is sensitive, spontaneous and generative. Perhaps when we ask after *properties like that* in our aesthetic appreciation—and indeed find these—we are considering a creative product. Moreover, part of the explanation of why evolutionary processes are deserving of aesthetic regard is their flair: their often-surprising, transformative nature. Perhaps a more fruitful philosophical conversation asks not where the fundamental locus of creativity is, but instead asks after the relationship between our aesthetic engagement, judgements and appreciation, and the products and processes which elicit that engagement, judgement and appreciation.

Admitting the importance of praise in how we attribute creativity to the relevant agents doesn't require that such praiseworthiness is necessary for something to be creative. Giving it up allows us to see how natural processes such as

evolution generate value in much the same way as human creativity does, and opens the door to product-first notions of creativity which, we think, deserve much more attention than they've been paid.

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