The Programming Theory of Creativity

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Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University

in partial fulfillment of the requirements for the degree of

Master of Arts

In

Philosophy

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April 29th, 2025

Blacksburg, VA

Keywords: Creativity, intention, novelty, programming theory, refinement model, creative

products

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ABSTRACT

Creativity, as the production of creative products, intuitively requires both intention and novelty. However, these two elements seem to stand in tension: if a product is novel to the creator, it appears they could not have intended it, and if they intended it, it seems it cannot be novel to them. This paper explores and dissolves this apparent tension. I begin by discussing the necessity of both intention and novelty for creativity. I then critique Antonia Peacocke's refinement model of creativity, which seeks to reconcile the requirements of intention and novelty through the concept of a proto-work. I argue that there are creative products that the refinement model fails to recognize as such, including those that result from open-ended creative processes. In response, I propose a programming theory of creativity, which distinguishes between broad planning intentions and more specific implementation intentions. On this view, creative products emerge when planning intentions probabilistically constrain implementation intentions, allowing for novelty within an intentional framework. This model captures a wider range of creative phenomena—such as exploratory research and improvisational art—while preserving the intuitive roles of both intention and novelty in creativity.

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GENERAL AUDIENCE ABSTRACT

We call lots of things creative: paintings, business ideas, inventions, scientific breakthroughs. But what does it *mean* for something to be creative? Many philosophers agree that creative products must at least be both intended and psychologically novel. But how can that be? If I truly intended something, how can it be new to me? And if it's new to me, how could I have intended it?

This puzzle lies at the heart of my project. I explore this tension between intention and novelty and examine an existing philosophical theory—the "refinement model"—that tries to resolve it. According to this view, creative works emerge from refining a vague starting idea, or "proto-work," over time. While that approach fits some cases, I argue it falls short when it comes to more open-ended, improvisational, or exploratory forms of creativity—cases where the creator may not start with a clear idea at all.

To better account for these kinds of creativity, I propose a different model: the programming theory of creativity. On this view, creativity involves two levels of intention. Broad, guiding *planning intentions*—like wanting to explore a theme or investigate a question—and more specific *implementation intentions*, like choosing a brushstroke or testing a chemical. I describe this as "programming for" because the broad intention doesn't spell out exactly what will happen, but it makes certain creative actions more likely and meaningful within the context of the goal. It's like setting a direction for the process, rather than writing a script.

This approach not only helps explain traditional artistic creation but also makes sense of creativity in science, research, design, and beyond. It shows how people can be surprised by their own work, yet still be responsible for it. This model gives us a more realistic and inclusive way to understand what creativity is—and how it actually works in the world.

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I. INTRODUCTION

Suppose for a moment you are at the opening of a brand-new art exhibit and a beautiful painting captures your eye. For a moment, you are enamored by the work and judge it to be creative. The exhibition label reads:

> **Amarillo Geel** (b. 1998)
> ***Attractive Accident**, 2020*
> Oil on canvas
>
> This work resulted from the artist tripping on a drop cloth and spilling a fresh ochre all over a canvas nearby. It was a total accident.

Upon learning the origin of this painting, you revoke your previous judgment; even if beautiful, the work is *not creative*. But why? Because it was an accident; that is, it is not something that the artist intentionally produced. Creativity is something for which agents are said to be more robustly responsible, such that they are *creditworthy*.[1] Beyond this, novelty is also commonly understood to be required for creativity; in particular, philosophers argue that *psychological novelty*, where a product is new *relative to the agent* who created it, is what is minimally required.[2] Even though rather little has been written on creativity within philosophy, there is a near consensus that creativity requires both intention and novelty.[3]

Yet, there is a tension between these requirements. A product is creative in virtue of it (or a feature of it) being novel to the agent. Yet an agent cannot intend to produce such a product (or

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[1] For discussions that suggest the necessity of intention (or agency as it sometimes called) for creativity, see: Brainard (2023, 2024); Carruthers (2011); Kieran (2014); Paul & Stokes (2018); Peacocke (forthcoming); Stokes (2008, 2011, 2018); Wreen (2015). So far, only Currie & Turner (2024) have argued that intention or agency is not required for creativity. Arnheim (2001) gestures at agency being unnecessary as well.

[2] For discussions that suggest the necessity of novelty for creativity, see: Beardsley (1965); Blackburn (2014); Boden (2004, 2010); Brainard (2023, 2024); Hills and Bird (2019); Gaut (2010, 2018); Kronfeldner (2009, 2018); Stokes (2008, 2011, 2014). Chung (2022) has offered the only account I know of which does not require novelty.

[3] There are other requirements that have been offered for creativity. For example, that creativity yields value is often regarded as a requirement. Brainard (2024) argues that epistemic value is always yielded by creativity. Halper (1989) thinks creativity itself is inherently valuable. Gaut (2018) says that creativity's value is conditional.

such a feature), else it will not be psychologically novel, since the product (or feature) will have been the object of the agent's intention. Monroe Beardsley (1965), Paisley Livingston (2005), and Nick Zangwill (1995, 2012) have all pointed out something akin to this tension.[4] Joining the ranks, Antonia Peacocke (forthcoming) has introduced what she calls *the problem of creative intention*. The problem as she conceives of it is to explain how an agent who produces creative products can be appropriately credited with doing so, given the novelty requirement.

Peacocke offers a solution in the form of a *refinement model of creativity*, in which intention and novelty coexist through the mechanics of a "proto-work"—a demonstrative concept the artist conceives of and refers to with terms like "this" or "that" (ibid., p. 14). The creative process involves responsive intentions in which the artist meets the "demands" of the proto-work, allowing the final work to be novel since the intentions are not fully specified. Peacocke's account is appealing in some respects but, I argue, ultimately unsatisfying, because it fails to capture some clear instances of creativity.

In response, I offer an alternative account, the programming theory of creativity, which not only solves the problem of creative intention, but also recognizes as creative the sorts of cases the refinement model cannot, and without appeal to the peculiar notion of a proto-work. According to the programming theory, creativity involves broad *planning intentions* that program for–that is, make more probable–more fine-grained *implementation intentions*, which ultimately result in something novel. I argue that the programming theory provides a more general and more attractive solution to the problem of creative intention than Peacocke's refinement model.

In Section 2, I outline the tension between intention and novelty in more detail and suggest that there are at least two problems of creative intention that we might identify: a logical

[4]These are philosophical accounts. For an overview of *psychological* models about creativity, see Gilhooly & Gilhooly (2021).

problem and a creditworthiness problem. In Section 3, I explain how Peacocke's refinement model offers a solution to both problems but fails to capture certain types of intuitive cases of creativity. In Section 4, I offer my alternative programming theory and show that it can handle the cases that trouble Peacocke's account. In Section 5, I consider how various other potentially challenging cases might be analyzed from the perspective of the programming theory. I conclude in Section 6.

II. TWO PROBLEMS OF CREATIVE INTENTION

In this section, I articulate the requirements of intention and novelty more carefully, revealing the tension between them. I then distinguish two problems of creativity suggested by the tension: (1) a logical problem and (2) a creditworthiness problem.

As noted earlier, there is broad agreement among philosophers working on creativity that it involves both intention (or agency) and novelty. That intention is required accords well with our intuition that accidents—like *Attractive Accident*—are not creative products. An intention requirement also accords with the idea that creativity is something for which a person can be creditworthy. For an agent to deserve credit seems to require that the agent be responsible for the creative product in a robust way that goes beyond mere causal responsibility—what Susan Wolf (2016, p. 1) calls a "deep" responsibility that involves the creator as a choice-making agent. In other words, it is in part *because* the product is something that the agent, in some sense, intended to produce, that they can deserve credit for it. We can thus formulate an *intention requirement for creativity*: If a product is creative, then it is not a mere accident; it is something that the creator, in some sense, intended to produce.

A different example will help to motivate a novelty requirement for creativity. Consider the following:

> *Paint-by-numbers:* A person carefully follows a paint-by-number kit, matching each color to its numbered section. They replicate the pre-designed sunset exactly, with no deviations.

Even if the painted sunset is pretty, it is not one that we judge to be a creative product. Plausibly, this is in part because it is lacking in novelty; the painter followed a pre-specified design, with the aim of replicating the image shown on the box of the kit. They followed a recipe. We judge similarly for a painter who obsessively mass-produces the same painting: intuitively, are these products creative? No. Among other things, they lack novelty, at least after the first painting.

In the literature, there are usually two types of novelty distinguished: historical novelty (the first time something occurs in history) and psychological novelty (the first time something occurs to the creating agent) (Boden 2004, 2010). That psychological novelty, at least, is required for creativity is supported by the mass-produced painting example; if someone produces a replica of something they have already created (and meant to do so specifically), we do not consider the replica creative. Additionally, Lindsay Brainard (2024, p. 5) offers two compelling reasons to think that historical novelty is too strong. The first is that, when we judge something "creative", our confidence in this attribution often does not depend on knowledge of it being "historically novel". In other words, we *do not know* if it is the first time that something has ever occurred in the history of the universe and yet we identify it as creative. Second, there exist cases where we know that something is very likely *not* historically novel, and yet we find it creative. For example, if a child were to independently have an idea for a joke about 7 eating 9, we would find this product (the idea for the joke) creative.[5] These observations suggest that only psychological

[5] For those unaware: "Why was 6 afraid of 7? Because 7 8 (ate) 9!"

novelty, not historical novelty, is required for creativity. We can thus formulate a *novelty requirement for creativity:* If a product is creative, it must be (or involve some feature that is) psychologically novel to the creator.

The tension comes into view once we consider the implications of the novelty requirement. In particular, if a creative product (or some feature of it) is psychologically novel to the creator, then its production cannot have been intended in advance by the agent; in that case, it would have been the object of the agent's intention and would no longer be psychologically novel.[6] (In fact, where such novelty *comes from* is a mystery in its own right, studied by philosophers and psychologists alike.[7]) Yet the intention requirement for creativity says that a product is creative only if it is something that an agent *did*, in some sense, intend to produce.

At this point, we have articulated two plausible requirements for creativity that seem perilously close to being impossible to jointly satisfy. We are confronted with what might be called the *logical problem of creativity* – the problem of explaining how creativity is possible at all, given the intention and novelty requirements. Put differently, how *is* intention involved in creativity, such that psychologically novel products can still emerge? In addition, there is a closely related but distinct *creditworthiness problem of creativity*, which is concerned with how creators can be aptly credited for their creative products, given that the psychological novelty requirement seems to preclude that creators intend to produce the features that make their products novel. What is needed to solve both problems, then, is an account of how creative intention could work, such that creative products are not only possible, but ones for which creators can deserve credit.

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[6] This is echoed by Stokes' modal component of novelty in creativity (2011, p. 669).

[7] Famously Karl Popper (2002, p. 8), regarding the logic of discovery debate, remarked that "every discovery contains 'an irrational element,' or 'a creative intuition." An example of the psychologcal mechanics of novelty generation, see Matheson et al. 2023.

III. THE LIMITS OF THE REFINEMENT MODEL

Antonia Peacocke (forthcoming) offers one such account. Her refinement model of creativity proposes that, early in the artistic process, an artist is confronted with a "proto-work"—a *demonstrative* representational object initially graspable only through references like "this" or "that" (ibid., p. 14). According to Peacocke, this proto-work makes demands on the artist that are represented in intentions like "I want to do justice to *that*" or "*This* requires that I do such and such." This still allows for novelty to emerge, since the artist never intends to generate a product in full specificity; doing so would "obviate" the need to create in the first place (ibid., p. 15). What is "refined" on the refinement model is the match between the proto-work and the actual work.

The refinement model provides us with a how-possibly account of the interplay between intention and novelty in creativity. It offers a solution to both the logical and creditworthiness problems of creativity, insofar as it provides an account of how there can be product-directed intentions that nevertheless leave room for novelty. A further strength of the model is that it seems to match how artists often talk about creativity. For instance, when Picasso talks about the painting never really changing from start to finish, it is suggestive of there being something like a proto-work.[8] Nevertheless, I think that we have reason to search for another account. This is because there is a whole class of uncontroversial creative products that the refinement model cannot account for because their creation involves nothing like a proto-work.

The class I have in mind consists of products yielded by *open-ended* creative activities, both artistic and non-artistic. Brainard (2024), for instance, describes creative products as being produced via an "exploration"—as "charting new territory" or "feeling the topic out" (p. 15). In

[8] Quoted in Peacocke (Forthcoming, p. 13) and quoted in Stolnitz (1960, p. 99)

these instances of creativity, agents are not refining a product to meet the demands of anything like a proto-work. Consider, for example, the testimony of artist Duaiv:

> When I start a painting, there are no rules. Sometimes, I know what I am going to do. Sometimes, I don't know what I'm going to do. I paint always without pictures. I do everything by memory. I don't like to draw, so I put my oil on the canvas. You surprise yourself. You don't know where you are going.[9]

Likewise, the more dramatic Francis Bacon remarks:

> I always think of myself not so much as a painter but as a medium for accident and chance.[10]

These are cases wherein artists give themselves over to the process, so to speak – a process that does not seem to involve anything like a proto-work. There is nothing making demands that the artists *do this instead of that*, and yet they *do this, instead of that.*

Open-ended creative processes are common beyond artistic contexts as well. Peacocke suggests that her model could, in principle, apply beyond artistic domains: "When there is a determinate puzzle to be solved, especially in intellectual cases involving mathematical proof or material engineering, a creator can formulate an intention that specifies pre-determined constraints on the solution to that puzzle" (forthcoming, p. 16). Yet some cases are not like this—they are cases where the puzzle is neither explicit nor determinate. Scientists, philosophers, and other scholars frequently engage in creative exploration where the path and the destination are equally unknown or unclear, rendering the notion of a proto-work seemingly inapplicable.

Consider the distinction between basic and applied research in science. Applied research often targets a specific problem (e.g., developing a pesticide for a particular beetle), but basic

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9 https://www.parkwestgallery.com/10-contemporary-artists-creative-process/
10 https://www.mbartfoundation.com/francis-bacon-the-artist/bacons-quotes/on-his-art/

research is often driven by curiosity without a fixed endpoint. For example, a naturalist might set out to catalog beetle species in her backyard, not to solve a predefined problem but simply to see what she might discover—*to explore*. At first, she might only expect to document common species, but in the process, she stumbles upon an unusual beetle with unexpected markings. This discovery shifts her focus; now, she's investigating whether it's a new species of beetle or a regional variant. Her project evolves, guided by emerging observations rather than a pre-set puzzle. The creative product here is the new knowledge she gains of the species' presence; she obviously did not intend to find this species (it was a discovery).[11] If creative intentions require clearly defined problems or proto-works, then cases like this—where it seems that creative products emerge in the course of a more open-ended exploration—fall outside Peacocke's framework.

These exceptions suggest that creativity is not always a matter of refining an initially vague but demanding referent; sometimes, it arises from relatively unstructured exploration or curiosity. While Peacocke's refinement model successfully captures cases where creative products emerge through responsiveness to a proto-work, it struggles to accommodate creative products of these more open-ended processes. Ideally, our account of creativity would also accommodate cases like these, where novelty emerges without a guiding proto-work. In what follows, I propose such an account—one that captures a wide range of cases and gives an explanation of how the intention and novelty requirements for creativity can be jointly satisfied.

[11] At the same time, it seems clear that the naturalist's exploratory intentions are closely connected to her discovery; it was far from a mere accident that she discovered the unusual beetle. Note, however, that it does not follow that all scientific discoveries are creative. Many large language models are discovering new proteins for drug synthesis, but we might deny that they were guided by intention or curiosity.

IV. THE PROGRAMMING THEORY OF CREATIVITY

The programming theory of creativity involves two sorts of intentions. The first is what I call *planning intentions,* which are broad intentions that "program for" more fine-grained intentions. These more fine-grained intentions are the second sort of intentions, which I call *implementation intentions*.[12] According to the programming theory, during the production of creative products, planning intentions probabilistically "constrain", but do not determine, the features that a product will have. This connection between the agent's intentions and the creative product is what I propose grounds their being credited with their creative achievement.

Let's begin with planning intentions. In simple terms, these are the sorts of intentions that are broadly aim-guiding. That is, they set a general direction or objective without specifying precise steps or methods for achieving it. The objective might involve problem-solving ("I want to make a new lithium-ion battery that charges faster than the current options"), or it could be aspirational ("I want to see what these solutions do when I combine them", "I want to see what happens when I paint with my eyes closed."). The planning intention indicates that there is something the agent wishes to accomplish, bring about, create, etc., but it does not fully specify how the agent will bring about the achievement nor what achieving it would consist of.

Implementation intentions are typically much more specific, often having known objects as part of their content. For example, an agent may have the intention, "Place an orange paint stroke *here*" or "Connect up this wire on the lithium-ion battery *there.*" Although these implementation intentions are much more specific than the planning intentions, it should be

[12]I use "implementation intention" in a similar way that it is used in the psychology of action. There, implementation intentions are conceived of as connecting wishes or goals with action by setting up "conditional" intentions (Gollwitzer and Sheeran 2006). For example, the wish *to exercise more* may be followed with an implementation intention like "If it is an odd numbered day of the month, then I will go on a 30-minute jog." These are said to be important for self-regulating activity toward goals. My model differs in the nature of the "program for" relationship that I discuss in more detail below.

noted that they need not be (and likely are not) fundamentally different in *kind*. The difference is in their degree of specificity.

In addition, there is a special relationship between them: planning intentions *program for* implementation intentions. By "program for", I mean something similar to what Frank Jackson and Philip Pettit (1990) had in mind. They were concerned with how to make sense of psychological states being "causes" for physical states, when neurophysiological states seem to do enough causal work alone. Their program theory suggests that even if the neurophysiological states are what proximally cause physical states (e.g. lifting a finger), it was some mental state (i.e., "I want to lift my finger") that *programmed for* the neurophysiological state in the first place. "Programming for" then is when a higher-order property ensures that some lower-order state is *suitably probable* (Jackson & Pettit 1990: p. 114). As the two philosophers put it: "... [a] higher-order, inefficacious property is causally relevant to the event produced, because its realization programs for the realization of a lower-order efficacious property and, in the circumstances, for the occurrence of the event in question" (pp. 114-115).[13]

I suggest that planning intentions and implementation intentions have a similar (albeit weaker) programming relationship.[14] *Planning intentions program for—make suitably probable—some sets of implementation intentions and not other sets.* In this way, the planning intentions limit which implementation intentions – and thus product features – are relatively likely to arise and which are not.[15] It is not the case, however, that they *necessitate* particular

[13] This apparent "inefficacious"-ness of higher-order states also has an analogue in the case of creativity. In particular, one need not fulfill their planning intention to be creative, even especially so, as discussed below in Section 5.
[14] This theory of creative intention shares some mechanics with Bratman's (1987) planning theory of intention, but I do not commit myself to his theory in full or claim that my theory is comprehensive (i.e., beyond creative processes).
[15] For some processes, we might also think of the planning intention as related to what Jane Friedman (2020) calls the zetetic instrumental principle: "If one wants to figure out Q, then one ought to take the necessary means to figuring out Q" (p. 503). Similarly, if you want to make a new painting, one of your implementation intentions should not be cranking up the table saw and getting the woodworking supplies out.

implementation intentions or sets of them. It is *possible* for particular implementation intentions (or sets of them) to arise with or without any particular planning intention. If I form a planning intention to create a 30-foot-tall wooden sculpture, this makes it more likely I would then have intentions to cut up wood, glue wood, paint wood, etc. It would make much less sense (although it would not be impossible) for me to form intentions to bend metals, add paint to canvas, twist wires, sing lyrics, etc. I contend that what planning intentions do—what this "programming for" relationship consists of—is to make it significantly more probable, to constrain in some sense, that some sets of implementation intentions occur and other sets do not occur, and thus that some product features are produced and others are not.

Notably, this fits with a commonsense view of intention and action. It is often the case that we have broad plans that include goals, and our having these goals makes it more likely that we then form more specific intentions that we hope will help us achieve the goals.[16] Importantly, we often do not know all of the details of how exactly our actions will achieve the goals. Consider, for example, a food scientist. She forms a planning intention like: "I want to find a new scaffolding biomaterial for cell-cultured meat."[17] There will be many other more specific intentions required for her to eventually find such a biomaterial, such as: "Order some petri dishes."; "Pour solution Y into a test tube."; "Clean bioreactor 103." These implementation intentions are all programmed for by the original planning intention of finding a new biomaterial.

For a second example, consider Chris the novelist. Chris intends to write a sci-fi novel about society and climate change, including in the novel a space colonization theme (i.e., he has a broad planning intention to do this). His implementation intentions include researching current climate models, developing characters with complex motivations, and outlining a narrative

[16] This is the main similarity between my view and "implementation intentions" as discussed in the psychology literature (see footnote 12).
[17] For more on biomaterial scaffolds in cell cultured meat see: Fasciano et al. (2024)

structure about planetary migration. While developing his plot about space colonization, he also encounters some op-ed pieces about depopulation as a solution to climate change, and he suddenly conceives a sinister twist: *the space journey is actually a massive depopulation effort with no real destination.* This twist feels like inspiration but clearly results from his intentional process. A new (and in this case surprising) narrative feature emerges through his implementation intentions, but it is fundamentally connected to his original intention of writing a novel that explores the social dynamics of climate change.

Creativity does not have to be quite so surprising or dramatic, however. Consider Maria, a graphic designer known for her work creating brand-driven typefaces. She is making a new typeface for an eco-friendly company. Driven by a planning intention to develop a typeface that is easy to read and aligns with the brand's identity, she develops implementation intentions to study particular competitor typefaces, carefully examine the brand's media kit, and test various sizes and color options. While developing the lowercase "o" for the typeface, Maria tries incorporating different natural shapes and comes up with a letter that is leaf-like while still being easily recognized as an "o." This small change creates an overall impression of environmental-friendliness that the brand wanted. Even though the inclusion of the leaf shape, and the exact shape chosen, was novel, it emerged through a process that was constrained by the planning intention and executed by the implementation intentions.

The programming theory solves the logical problem of creativity, insofar as it explains how intention is involved in creativity such that psychologically novel products can still emerge. It also solves the creditworthiness problem of creativity, because the creative product is connected in a robust way to the agent's intentions, such that the agent can deserve credit for the products. In particular, creative products emerge from implementation intentions that are programmed for by planning intentions that kick off the (intentional) process. While planning intentions alone may be too broad to properly link the creator to the product in a way that justifies giving them credit, implementation intentions serve as a crucial connection. They, along with the planning intentions, allow us to say that the product is something the agent, in some meaningful sense, intended to produce—making it appropriate to credit them for it.

Chris the novelist and Maria the graphic designer are cases accounted for by the programming theory, but they are also likely captured by Peacocke's refinement model (or some version of it). Perhaps the very rough idea for the novel or the graphic design can be considered proto-works. But the programming theory also handles the more open-ended cases of creativity that I argued are not captured by the refinement model.

Here is an example from the artistic domain. Surrealist Automatism is a type of art technique that is alleged to open up the subconscious. It is, in effect, a type of improv for visual artists. Its products are often judged uncontroversially creative. An artist will move about the page with something like a pen or pencil and give themselves over to the process. There is clearly no proto-work here. Yet, there are plausibly at least some planning and implementation intentions. For example, perhaps the planning intention has the content of undertaking this free-flowing technique in order to produce a drawing. This planning intention makes more probable (relative to a situation in which no such planning intention was formed) the various implementation intentions that ensued: move pencil here, move pencil there, etc. Though the planning intentions may be somewhat thin, and may place looser constraints on implementation intentions than in other cases of creativity, it seems that many cases of artistic improv can be accommodated by the programming theory.

Next, recall the bug hunt case. The naturalist wanted to investigate the beetle species in her backyard. She intentionally set out on this inquiry and reasonably expected to learn things about the beetles in her yard. In the course of her exploration, however, she discovered an unexpected beetle. Was she meeting the demands of a proto-work? It certainly does not seem so. But, we can make sense of this case using the programming theory. The naturalist's curiosity set up the planning intention, "I want to investigate the beetle species in my backyard." This, in turn, programmed for implementation intentions such as: "Get a shovel." "Put on gloves." "Grab a glass jar to put the bugs in." The exploration leads to the discovery of an interesting beetle with striking markings. Thus, in each of these cases, the programming theory provides a plausible account of how creative products are produced—the drawing in the first and the knowledge of the interesting beetle in the second.

In addition, the programming theory readily handles cases of accidental production. It not only appropriately classifies accidental products like *Attractive Accident* as non-creative, but it also provides a nice account of why they are not creative. The problem is that the painting is not connected to the artist's intentions in the right sort of way; the actions of tripping and spilling are not the result of implementation intentions made more probable by a planning intention. Indeed, there is *no sense in which* the artist intended to produce the accidental painting. Accidental products instead result from what Nick Zangwill (1995, p. 309) calls "deviant causal chains."[18] They are produced when things go "off script," rendering the agent causally responsible but not robustly responsible for them.[19]

[18] In particular, Zangwill (1995) thinks that accidents are of course the causal result of agents, but are not of the right kind that would justify creators being credited with them. Accidents are a serious issue, generally, in action theory. Since this is a broader issue not specific to creativity, I do not say more than this.

[19] There is an important distinction between unintentional acts and accidents. It was no accident that I moved my arm when I was in pain, but it was unintentional. One way to differentiate the two is to say that unintentional acts are those which do cohere (albeit outside of conscious intent) with a planning intention. This is so with Bratman's example of wearing down shoe tread: one intends to run a marathon, but one did not intend to wear the tread of their shoes down. A treatment of this distinction is outside the scope of this paper.

The programming theory of creativity thus has a number of virtues. First, it solves the logical and creditworthiness problems identified in Section 2. Moreover, it does so in a way that is more general than Peacocke's refinement model. The programming theory readily accommodates a wide range of artistic and non-artistic creative products, including those that result from "open-ended" processes. It does not preclude the possibility of proto-works (or planning intentions predicated on objects like proto-works), but it does not require them either. Lastly, the theory provides a straightforward explanation of why accidents do not count as creative.

V. MORE CHALLENGING CASES FOR THE PROGRAMMING THEORY

Although the programming theory explains many instances of creativity, a critic might point to several cases that appear to pose a greater challenge. In this section, I present some of these cases and consider how the programming theory could handle them.

The first case concerns creativity which occurs when the planning intention is not fulfilled. For example, an architect may try to design a bridge to solve some engineering problem. That planning intention will program for implementation intentions. At some point in the process, some creative product–perhaps a new idea for aesthetic features of the bridge–has been produced by the architect. But, still, at this point in the process, he might not have solved the engineering problem. Suppose the architect is soon hired by another firm, and thus leaves the project, never solving the engineering problem. Does the programming theory give the incorrect verdict in this case, namely, that nothing creative occurred, since the planning intention was left unfulfilled?

It does not. Nothing in the programming theory requires that a planning intention must be *fulfilled* for creativity to occur, nor that it is *only* when such an intention is fulfilled that creativity occurs. Creative products typically emerge from a process that is *guided by* a planning intention that often includes some domain-specific goal, but the programming theory does not tie creative accomplishment to the achievement of that goal. Because of this, the theory allows that "failed inventors", "bad artists", and "unsuccessful entrepreneurs" can all be creative (insofar as their products are intentional and novel in the right way).[20] This is actually a strength of the programming theory: it separates creativity as an achievement from the success conditions of a specific domain.[21] A writer would plausibly need to have completed a novel to be a novelist, but an incomplete novel could certainly be a creative product.

A second challenging case concerns agents who just *want to be creative.* Suppose they form an intention like, "I want to make something creative." What can the programming theory make of cases like these? If the theory has trouble here, it is only insofar as it is not clear what sorts of implementation intentions would be made suitably probable, just given an intention to be creative, especially since creativity is not limited to any one domain.[22] Perhaps such very broad intentions – intentions to "make something creative" – program for a set of more specific (but still relatively broad) intentions that can serve as what I referred to earlier as planning intentions. Alternatively, we might think that "I want to create" really only conveys a quasi-intention, as it does little in the way of aim-guiding; the objective aimed at seems neither problem-solving nor exploratory in the ways previously described.

[20] Even those who think the value of creativity is conditional do not necessarily make the value conditional on a domain specific metric. For example, Gaut (2018) only conditions creativity's value to 'good' kinds of things since he wants to avoid the conclusion that evil acts can be creative. Brainard (2024) has argued against this.
[21] The details of whether creativity does occur depends on what else is required beyond intention and novelty. In any case, it is intuitive to think of creativity as an "accomplishment" which is a type of activity that has a terminus, or end point (Vendler 1957, p.147). Creative accomplishments can complete sooner than accomplishments relative to a particular domain.
[22] Livingston (2005) makes the same point (p. 43).

A third potentially challenging case is so-called serendipitous creativity. These are cases where there seems to be no planning intention formed, but something novel (and often amazingly so) is yielded. Sometimes, it appears, we are just struck with insight when we were not being directed by any planning intention at all.[23] These are tough cases, especially since many examples that are hailed as exceptionally creative, especially in the sciences and invention, are like this. Famously, for example, French Chemist August Kekulé was struck with the insight that benzene had a ring structure while staring at a fire and imagining a serpent eating its tail (Kronfelder 2009, 2018).

I have two responses to cases like these. One option is just to reject that they (the idea of benzene's ring structure in the present case) are examples of creative products. The thought here is that these cases too closely approximate accidents, and accidents are not creative, no matter how cool, inventive, or world-shattering they are. This response, however, does not seem intuitively right for some cases; it does seem like Kekulé was creative (i.e., generated a creative product). The other response is to argue that these sorts of cases can be made sense of with the programming theory if we accept that a creative process can extend over long periods and involve conscious breaks before yielding a creative product. For instance, a process sometimes might include what psychologists call an "incubation period" (Ritter & Dijksterhuis 2014, pp. 2-4). This is the period after being introduced to a particular problem in which the brain continues to work behind the scenes. Sometimes, what seems like a random "aha! moment" is just the result of an incubating subconscious. In the case of Kekulé, he had been trying to solve the structure for a while and, after some extended period of time, he figured it out.

[23] For example, a survey of European patent holders … "found that an incredible 50 percent of patents resulted from what could be described as a serendipitous process. Thousands of survey respondents reported that their idea evolved when they were working on an unrelated project — and often when they weren't even trying to invent anything" (Kennedy 2016).

VI. CONCLUSION

Creativity poses a general philosophical problem: how can something be psychologically novel and be produced intentionally? Showing how this is possible at all addresses the logical problem of creativity. But we also think that creativity is something for which agents can be aptly credited, which requires that intention and novelty be connected in some appropriate sense; this is the creditworthiness problem of creativity. Solving the creditworthiness problem requires solving the logical problem, but it requires more than this.

Peacocke (forthcoming) has offered the refinement model of creativity as a solution to the creditworthiness problem. On her view, the artist can deserve credit for their novel product since it results from their intentional efforts to meet the demands of a demonstrative proto-work. The refinement model, however, fails to capture creative products generated through open-ended processes in the arts and elsewhere, which do not seem to involve anything like a proto-work.

I have offered an alternative theory of creativity that solves the creditworthiness problem of creativity in a more general way that encompasses open-ended creative processes as well as more objective-directed ones (including ones that involve something like Peacocke's proto-work). According to this programming theory, two different sorts of intentions—planning intentions that "program for" implementation intentions—are present in the creative process. In successful creative acts, as the actor seeks to fulfill a planning intention, at some point one of her implementation intentions brings about the relevant sort of novelty as a feature of the product. The planning theory ensures that creators can be credited for their work by grounding creativity in an intentional process that is appropriately connected (via intentional constraint) to the creative product. It can handle a wide range of cases of creativity, from more structured scientific/invention problem-solving to the sorts of curious explorations that are found in all domains.

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