Creative Ignorance

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Abstract Much research in creativity proceeds from the hylomorphic model, that is the notion that the creator imposes a preconceived form on inert matter and a detailed plan is followed. In such a model, the unknowability of material engagement is erased to the extent that the creative process is often reduced to the genesis of the creative plan, the spark of insight as it were. This model is being increasingly questioned and there is a steadily growing research literature demonstrating how engagement with an uncertain material and socially rich world shapes and forms cognitive processes and that rather than a linear and rational model, there is a deep knowing-through-doing at the heart of creative thinking. This chapter extends this literature in two complementary ways. First, I shall discuss how material objects in the world serve to scaffold our understanding precisely by revealing our underlying ignorance, an ignorance that cannot be revealed apart from through engagement with the world. This engagement leads to knowing and understanding which reverses the traditional direction of knowledge. I will suggest that this unknowing through doing marks both scientific and artistic creative thinking even if it is often erased in the former. Second, I will make the stronger claim that in the case of artistic creativity, the ignorance which the process of material engagement inspires in the artist is both generative and necessary and, further, constitutes the heart of the creative act.

Keyword Unknowing through doing, creative ignorance, insight, creativity

Introduction

Ignorance has an unusual status. The foundations of epistemological philosophy are concerned with what we know and how we come to know it so that what we do not

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know has only recently come under consideration. Even then, ignorance is viewed as a lack often resulting from epistemic laziness, something which should be fixed and resolved (Meylan 2020). It is viewed as an inherently bad epistemic practice (El Kassar 2018). This attitude reflects an adherence to the rational, fully cognisant individual as the pinnacle of philosophical ambition. Such a position, however, fails to take into account the very nature of being in a world populated with people and things, and in such a world ignorance is not only essential but can support ongoing processes such as social interactions (see the idea of relational ignorance proposed by Copeland, this volume). Under the latter description, ignorance can be seen as something which is desirable from the perspective of an embodied and situated thinker whose aim is not knowledge but rather an ongoing and harmonious interaction with people and things even if ignorance remains undesirable from the rationalist perspective.[1] This chapter goes further and uses the phenomenon of human creativity as a way of illuminating how ignorance is not only necessary but lends value to human experience.

I make two key arguments over the course of the chapter. First, I will examine the nature of research in creative cognition: the investigation of the genesis of a new idea.[2] I shall suggest that mainstream research should consider that creativity is a necessarily situated act which cannot be understood as a decontextualised or disembodied event but rather is an ongoing process which unfolds over time and through a skilled co-ordination of many different embodied and material forms. I shall argue that, especially for moments of creativity, a model which posits cognition as an inherently socio-material practice is more suitable. This necessarily introduces uncertainty and ignorance into the process because of its reliance on the polyphony of shifting personal, material and cultural perspectives. The evidence from qualitative psychological and ethnographic studies suggest that this uncertainty and ignorance is an essential part of working with matter and while they are mitigated often by skill, these things can never be erased. Aligned to this is the idea that creativity as investigated in the laboratory is as much a reflection of this socio-material environment as more "real world" creativity. A key point will be made here that the link between certainty and confidence which characterises creative cognition in the laboratory is not a necessary predicate of creative cognition but rather stems from the tools used to assess it.

Second, the generation of novelty cannot occur without an active embrace of uncertainty and ignorance. This is evidenced by the reports of creative people who actively seek to put themselves in a place of ignorance not because they wish to hide from uncomfortable knowledge but because uncomfortable ignorance supports creative understanding. In this domain, ignorance does not stem from epistemic laziness nor is it a helpful prop, rather is it one of the underlying aims of the creative process. Key to understanding this then is to reframe our assumptions - the aim of the creative process is not to uncover new knowledge, but rather creativity involves uncovering new ignorance and in the case of artistic creativity highlighting that ignorance. I will go further to suggest that it is this indeterminacy and engagement

[1] This is not the place to fully explore the situatedness of the rationalist perspective, for this see Lakoff and Johnson (2010).

[2] See for example Vallée-Tourangeau (2018) for the use of this understanding of insight.

with risk in action that allows us to call something creative or not. Artwork requires risk and unknowing in process and this often results in an ambiguous final form. This ambiguity is further enhanced by the ontologically indeterminate nature of the creative product which relies on multiple, temporally distributed perspectives to be called creative.

Finally, I will combine these two arguments to suggest that there is a form of ignorance that we can call creative ignorance, that is an ignorance that emerges through interaction with the socio-material world, which is valuable to the process of creativity. I will call for the existence of this form of ignorance to add nuance to the idea of ignorance as being in the world rather than merely as a static epistemic state.

1. Creative Cognition from the Perspective of Experimental Psychology

Creativity is an interdisciplinary concern referring to a wide variety of cognitive and material practices. The argument presented here draws heavily from the psychological and ethnographic literature on creativity. It further offers reflections drawn from the view of creativity as a situated and embodied phenomenon which can only be understood in practice. This is not a philosophical approach to understanding ignorance but a psychological one. However, philosophy would do well to support its understanding with observations from the psychological perspective when considering human behaviour and actions.

Let us start with an explanation of the growing field of research on creativity in psychology. In line with the internalist attitude that undergirds most of those disciplines which seek to understand human behaviour, much psychological research on creativity aims to isolate a creative spark; this spark is both momentary and normally considered as something which can be found inside the head of the creative thinker. In other words, this research programme takes as its focus what is *in the head* prior to any material realisation. Psychologists then are interested in which cognitive or psychometric properties of a person have the potential to be creative (although they do so without assessing the realisation of that potential). The underlying cognitive processes take three main forms:[3] divergent thinking (that is generating many ideas), convergent thinking (that is selecting ideas which go together) and moments of creative insight (when an idea strikes with sudden force).[4]

The moment of creative insight is most often associated with folk notions of creativity, especially creative genius. Consider the image of a person struck by a clear thought and sudden access to knowledge as described by Graham Wallas (1926, 46) as "instantaneous and unexpected….this instantaneous flash". Creative insight is

[3] For a clear introduction to the different approaches to creative cognition see (Abraham 2019).

[4] Of course, these processes involve an overlap – often an idea is generated with a feeling of insight and solving a problem will require generating several problem solutions.

commonly described as the spark which precedes and, crucially, determines the creative act. So much so that the manifestation, the act of creating, is rarely considered as part of the psychological process (Glăveanu and Beghetto 2020).[5] It has a very clear link to knowledge because it is associated with the generation of, at the least, a novel perspective on a problem and at best new knowledge itself. However, there is very little focus on the development and transformation of ideas in part because the idea is considered complete once it has been mentally conjured. This reflects an underlying internalism which ignores empirical evidence from process monitoring and other empirical research. Rather, I argue that the idea is simply the start of the creative process. It is for this reason that these tasks should be considered as measure of creative potential rather than creativity per se. Of course, the initial idea is necessary for creativity, but I argue it is not sufficient.

In the standard definitions, this moment of creative "insight" is marked by an almost instantaneous access to knowledge and certainty. The lightbulb flash of insight stands in opposition to the darkness of ignorance. The moment of clarity is often referred to as the "aha" moment as a reflection of the gasp of unexpected understanding. The standard wording to describe an "aha" moment to experimental participants emphasises this clarity and certainty:

> We would like to know whether you experienced a feeling of insight when you solved a magic trick. A feeling of insight is a kind of "Aha!" characterized by suddenness and obviousness. Like an enlightenment. You are relatively confident that your solution is correct without having to check it. In contrast, you experienced no Aha! if the solution occurs to you slowly and stepwise, and if you need to check it by watching the clip once more. As an example, imagine a light bulb that is switched on all at once in contrast to slowly dimming it up. We ask for your subjective rating whether it felt like an Aha! experience or not, there is no right or wrong answer. Just follow your intuition. (Bowden and Jung-Beeman 2003; Danek et al. 2013)

Thus, it would seem that cognitive insight is diametrically opposed to ignorance. It relates to an illumination and a clear certainty that the course of action is correct. This gives rise to the idea of the "insight heuristic", that is the theory that the feeling of insight is a reliable marker of the accuracy of a thought or an idea (Danek and Salvi 2020). From this perspective, insight is the antithesis to ignorance, the light of "aha" chasing away the shadows.

Other approaches to cognition have sought to challenge this model, often by reference to "real world" creativity. Such a position is not neutral: it sets up a clear dichotomy between the "real world" and the unreal world of psychological science which deals in controlled and modularizable entities. The parameters and characteristics of what constitute a real world are rarely explicitly delineated, it is simply enough that it is "other" to the experimental procedure. Thus, the real world can be the classroom, the artist's atelier, the office…. anywhere other than the laboratory. It suffices merely that the "real world" displays complex and uncontrolled explanatory mechanisms. In contrast then, this position takes the view that work in the laboratory is unhelpful because it succeeds in creating a controlled environment so

[5] Although it should be noted that Wallas was clear that verification was an essential part of the process of thinking.

that the manipulated variables can be accorded causal status. In both externalist and internalist conceptions of experimental psychology, the laboratory is a clean space unsullied by the complexities of this "real world" (see e.g. Vallée-Tourangeau and Vallée-Tourangeau 2020 among others).

However, even in the psychologist's laboratory, creativity takes place in a situated environment. This situation is a particular space characterised by a particular and unique set of socio-cultural norms and procedures and furnished with a particular set of properties which are rarely, if ever, acknowledged or examined by the problem-solvers or those who seek to understand their behaviour. When we leave these things out of our understanding of laboratory-based behaviour, I suggest that we are committing the "fallacy of the unsullied lab" and this fallacy constrains quite fundamentally our understanding of how creativity unfolds as a reflection not only of the processes of interest but of the surrounding cognitive ecology. Indeed, I suggest that processes observed in the lab are often nothing more than a function of this highly artificial situation.

To understand this in more depth, let us take as an example a laboratory-based task often used to measure divergent thinking: The Alternative Uses Task. Here participants are given an everyday object such as a brick or a shoe and are asked to generate as many alternatives uses for it as they can in a limited amount of time. This is a measure of divergent thinking, a cognitive process which is commonly accepted to be necessary for creative thought. The suggested uses are not designed to be implemented – they are simply wild and crazy ideas with no material form. However, it is a generative act which takes place against constraints and which I will demonstrate reflects the interaction between the experimental situation, the task, and the underlying cognitive processes.

First, words are formed which shape and constrain the thoughts and ideas which can be generated – uses which have no linguistic counterpart are not "counted" in the final creative output. However, novel uses are often embedded in action rather than in language. In spoken instances of the task, participants have been known to say, "I don't know what you call it". Gestures and movements are not registered as uses. There is a focus on linguistic uses which harks back to the understanding of ideas as carriers of semantic meaning. However, uses are embodied actions in the world much more so than disembodied linguistic concepts.

Second, this task is remarkably sensitive to changes in instructions and these affect the fluency and creativity of the answers generated (Acar, Runco, and Park 2020). This suggests that the research participant is engaging in a dialogue with the experimenter in which she is trying to play the game by the correct rules. Even if the experimenter is absent (the task takes place online for example) it is still a social situation and should be understood as such. The very act is situated, a play in an experimentalist's laboratory which provides its own rules. This, then, in part structures the range of possibilities that are explored by the problem-solver. As Ormerod et al (under review, p. 32), suggest in relation to an insight problem.

> There is nothing in the nine-dot[6] problem statement to preclude ideas that involve chainsaws, aliens, the paranormal, or other eclectic suggestions. Yet, when individuals seek solutions, they limit attempts to those that appear germane to the problem.

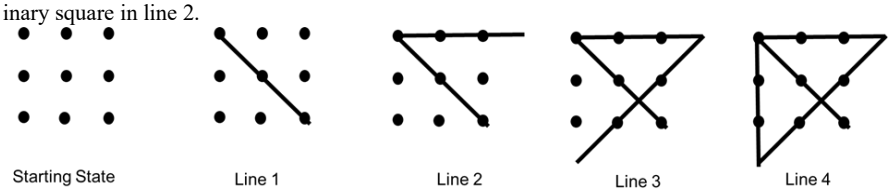
In other words, no participant moves outside the set of normative parameters which is in part determined by the unwritten pragmatics of the experimental situation. These pragmatics are not part of the problem representation but rather reflect the wider socio-cultural situation. They are a learned behaviour. To borrow from Flynn (2018), behaviour in the psychologist's lab requires a certain "habit of mind" which is not universal.

Third, the output is processual: one idea can spark another. Although ideas are often selected out of context for their absolute creativity to be assessed, they often come in a chain as one idea sparks another. There is a fundamental contingency to the nature of the initial spark of ideas – the first idea does not reflect a clear plan. We have demonstrated this in a related task where problem-solvers are asked to generate as many words as they can from a series of lettered tiles (Ross and Vallée-Tourangeau 2021). Notably when analysed from a process perspective, one word would generate another and analysing a word as separate from the flow made little sense. So, the task demonstrates its own rhythm, and each word cannot be understood without reference to the one preceding it, either because it flows naturally from it or because it is surprisingly and creatively different. So, rather than a single moment of creativity, we see a series of moments which cannot be understood in isolation as a "moment" of creativity.

Beyond this, the very tasks are designed to elicit particular processes, so there is an unhelpful circularity. This is linked to the idea of "experimenter's regress". This notion was first introduced in Collins (1975) in which he argued that the enculturation of knowledge is important to scientific experimentation and that knowledge could not be transferred algorithmically. Fundamentally, the only way of knowing that someone had the skills to replicate an experiment would be for them to replicate the experiment successfully. This leads to regress: a tool functions as its own test. The example he gives in a later publication is designing an apparatus to locate gravitational waves to establish their existence:

> What the correct outcome [to the question of the existence or not of gravitational waves] is depends upon whether there are gravity waves hitting the Earth in detectable fluxes. To find this out we must build 'a good gravity wave detector and have a look. 'But we won't know

[6] The nine-dot problem presents participants with a 3 x 3 grid of dots and asks them to find a way to draw four straight lines without taking their pen off the paper in such a way that all the dots are cancelled. The problem requires the problem solver to realise that they can stray beyond the imaginary square in line 2.



> if we have built a good detector until we have tried it and obtained the correct outcome! But we don't know what the correct outcome is until ... and so on ad infinitum.(Collins 1985, 84)

For Collins, the only way out of this is to find a way of fixing the apparatus outside of the experimental situation. This becomes more difficult when we are dealing with psychological traits that have no underlying physical substrate such as creativity and which can only be measured by the behaviours which they are also theorised to explain. Boag (2015, 3) describes this as "verbal magic" where entities are invented to describe behaviours which are then taken as evidence of the invented entity. Boag's target is the research field of personality but Sugarman (2017) makes a similar observation about psychology as a whole. He refers to this as "psychologism". The basic process of psychology that he outlines is that a behaviour is observed, and this behaviour is assumed to have an internal motivation. An instrument is designed to measure that behaviour and in so doing reifies it. In all cases, there is experimenter's regress because there is no validation for the measuring instruments aside from the behaviour and there is no way of measuring the behaviour aside from the instruments. As Sugarman notes, this process is particularly difficult in psychology where the participants are active in their own study so the instruments may create the phenomena they are measuring, trapping the researcher in a bottomless and unproductive regress.

So, however much research in creativity wishes to focus on the traits and states of the creative person, it will only go so far if it assumes that person is disembodied and situated in a vacuum and without examining the underlying assumptions it brings to bear on the task. Further, ideation cannot take shape without realisation even if that realisation is only in an internal monologue. All creativity has a form. The creativity that is measured in the psychologist's laboratory is "laboratory creativity", generated by tasks which have been carefully constructed to elicit the feelings of confidence and certainty. It remains to be seen whether laboratory induced insight is the same as insight that occurs outside the laboratory.

Consequently, this chapter argues instead that creative thinking is not a linear process which can be easily divided into a prior state of ignorance and a following clear state of knowledge pivoting on a moment of insight. Rather, creative work is marked by a form of skilled, creative ignorance which is not only actively embraced but also generated by creative action so that knowing and unknowing become intermingled. This engagement with ignorance and ambiguity is part of what gives the creative work value. Ignorance on this view is a dynamic, processual state revealed by and caused by interaction with things outside of the person who is being creative. I wish to draw attention to the sharp distinction between creative insight which refers to a discovered solution charted by laboratory processes and creative insight which is the start of a long, uncertain process. This state of creative not-knowing is closer to the uncertainty and discomfort described by creative people and is one which is left out of internalist models which are predicated on rationalist conceptions of knowledge Overreliance on the laboratory creativity without a recognisation of its own dependence on the situation has led creativity theorists to ignore the not-knowing in materially engaged creativity.

2. Forms of Generative Ignorance

One noticeable distinction between creativity outside the psychologist's laboratory and experimentally induced moments of creative insight is that the so-called "insight problems" used in experiments have a clear, normatively correct answer. Most of the time this correct answer is also easily identifiable once it has been generated. Take the nine-dot problem described above – it is not possible to generate a false answer to the question with any confidence that it is correct. What this section advances is the idea that outside of the artificial constraints of the experimental psychologist's laboratory, people do not have this same sense of certainty and foreknowledge about their work. Creativity outside of the laboratory does not have a single normative correct answer – the importance of certainty diminishes when the questions are being both asked and answered by the process itself. The reliance on data from experimental psychology to understand other forms of creativity, has led to a link between clarity of ideas and creativity, Resituating these findings as ones which reflect the experimental situation as much as anything else weakens the link between creativity and certainty and invites us to start reflecting on the role of ignorance in the generation and, more importantly, in the verification and enactment of creative ideas.

While divergent and convergent thinking and moments of insight are cognitive processes that are worthy of study in their own right, they do not encompass the whole creative process and an excessive focus on them assumes that the ideas generated through these processes remain unchanged when they are actualised. By considering cognition as formed of discrete modules which can be logically isolated from environmental complexity, there is the not inconsiderable chance that cognitive scientists risk committing the "mereological fallacy" (Bennett and Hacker 2003). Mereology is the study of part/whole relations and this fallacy refers to the ascribing something to a part that is properly only ascribable to a whole. The underlying assumption of mereological composition is that the whole is the sum of its parts and nothing more and that through the process of composition or decomposition the parts remain the same. Rocca and Anjum (2020) compare it to building a model with Lego bricks: There is a logic to an analysis of the bricks as separate items in order to understand the whole model because the bricks remain unchanged throughout the process. In other words, the parts can be understood in isolation without reference to their place in the whole. This same logic underlies the isolation and examination of individual cognitive processes. If, however, the Lego bricks were malleable and changed during the building process, assessing them at the level of the brick would be meaningless because what would be of interest would be the shape and composition during building.

If we resituate the results from experimental psychology from the laboratory environment to one where there are no clear normative answers, then certainty and the illumination assumed to be wrought by insight become reflections not of creativity itself but the overall paradigm that judges insight as having these characteristics before investigating it. Creative cognition has the form it has because the research programme is seeking something of that form and reflects the tools which are used

to elicit that. Even within this paradigm, enacting becomes important. The work from my laboratory (Vallée-Tourangeau et al. 2020; Ross and Vallée-Tourangeau under review) demonstrates that "aha" increases once the answer is clearly seen to be correct so that the verification and illumination stage are collapsed. This points to a pressing need to move beyond the spark of an idea to examine how that certainty is generated.

The role of ignorance has been underplayed in the final product of the creative process because of this excessive focus on certainty and clarity. Once we abandon the notion that pure insight is more than an artifact of an experimental situation,[7] then the skills and the notions of what constitute creativity and what is important to the creative process start to radically shift. All creativity is supported by processes which cannot be easily reduced to a single spark of inspiration. Creating is an action-driven process that unfolds over space and time, shaped by a complex array of factors and forces, many originating outside the creator; creativity is not the product of a stable set of features inherent to the creator (Glăveanu 2020). We currently do not have a clear experimental research paradigm to assess creative cognition this way although work in systemic cognition is moving to assess the whole cognitive ecology in insight (see e.g. Steffensen 2017; Steffensen and Vallée-Tourangeau 2018; Kirsh 2014). However, moving beyond experimental psychology there is increasing evidence from qualitative and ethnographic work that this relationship between internal and external forces is key to understanding creativity (Malafouris 2014; Kimmel and Hristova 2021; Ross and Groves under review).

This section will demonstrate how a model based on certainty is inadequate precisely because it leaves ignorance out of the experience of creativity. I will consider this further and will make the case that dismissing ignorance frustrates our understanding of the creative experience. Indeed, ignorance and its embrace are often reflected upon as being a profound part of the artistic experience drawing on Keats' idea of negative capability which he coined in a letter to a friend:

> I mean Negative Capability, that is when a man is capable of being in uncertainties, Mysteries, doubts, without any irritable reaching after fact & reason

This for Keats was the epitome of the Romantic's call to centre the imagination over the Enlightenment focus on rationality. For Keats, great artistic creativity[8] came not from the erasing of doubt and uncertainty but its embrace. The mark of a great artist is to not seek to resolve ignorance but to accept its ubiquity. The aim of the Enlightenment plan to literally "shed light" on the darkness of ignorance is misguided not only because it will be unsuccessful (the "fallibilist argument") but precisely because it is through ignorance that human life finds meaning. Keats uses the

[7] I would like to emphasise that this does not mean that such research should stop but rather a self-reflexive understanding of the nature of the situation is necessary for the findings of this research programme to be appropriately understood and its limitations explored.

[8] The focus of the majority of this chapter will be on the idea of artistic creativity. This is in part laziness on the part of the author, the evidence to support the argument is so clearly presented across empirical and theoretical literature that selecting it has been easy. However, the case can also be made that this form of ignorance, this embracing of not knowing, is a key part of any discovery of new knowledge in the sciences as well as the discovery of novel forms in the arts.

word “capability” here to make clear the importance of this skill; the skill of negotiating and accepting our own ignorance. In sum, the relationship between ignorance and creativity may be closer than the flash of illumination commonly used to describe creativity make them seem. I turn now to address the two ways that ignorance and creativity interact: through ambiguity and material uncertainty.

2.1 The Importance of Ambiguity

The model of certainty which underlies approaches to creativity which are reliant on insight is accompanied by a model which assumes that the human agents have full control and move with intention. In other words, moves and processes which are associated with the creative insight are considered to be intentional and this leads to them being endowed with post hoc meaning. Indeed, many researchers in creative cognition assess insight as being a preference or a choice (see e.g. Salvi et al. 2016). Moving beyond the laboratory, something creative has meaning and that meaning stems from the conscious, internal design of the creative person. Indeed, in the case of conceptual art this “meaning” has become the art work itself (March 2019). Thus, the meaning of the thing is fixed by the internal thought processes of the producer generated before the piece. This model collapses when the process is considered from a socially embedded and distributed perspective – the maker is no longer the sole arbiter of a creative piece’s meaning. The creator is at once erased and conjured into being with every viewing or reading. She becomes an actor and the object becomes an artifact (Glăveanu 2013)– that is something which exists in dialogue with the surrounding socio-cultural environment. The audience is therefore involved in the generation of the final[9] creative form. To borrow from Barthes, the relations between reader and author become such that the author and the author’s intentions are distanced and the “death of the author is the birth of the reader” (p.). Importantly for the relationship between ignorance and creativity, it means that the meaning of the creative piece is constantly recreated in the space between the creator and the audience and is unstable; it is impossible to pin down a definitive meaning of any piece and ambiguity is built into the very process of creativity.

This instability extends to the status of the piece as creative or not creative – the value attributed to something is done so by the audience not the creator and so that status is able to be revised. At first, this many seem like an argument about creativity judgements rather than creativity in itself but creativity and what is judged as creative cannot be disentangled. The standard definition of creativity is something which is “novel and useful” (Runco and Jaeger 2012) but both novelty and usefulness are relational terms. Creativity does not reside in the object or the process but in the space between the artifact, the action and the audience. A process or object cannot be creative in itself, it must be granted that creativity by the surrounding

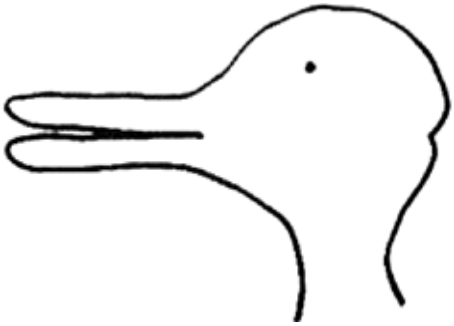
[9] Indeed, the use of the word final here is perhaps ill advised as it is not clear at what point a creative piece can be considered finished.

audience. Thus, there is an essential and deep ambiguity at the heart of the creative process. In ethnographic work conducted with a wood turner who creates wooden bowls both novel and useful in form, we noted that the projected audience for the work was woven into every decision and yet was always unknowable (Ross and Groves under review).

This relationship between the individual and the surrounding environment has been most succinctly explored in Csikszentmihalyi's (1998; 2014) systems theory: "Therefore it follows that what we call creativity is a phenomenon that is constructed through an interaction between producer and audience." (Csikszentmihalyi 2014, 314). This leads to a fundamental and unresolvable ambiguity at the heart of all creative things. The complexity of this relational aspect at the very heart of creativity can provoke profound anxiety in commentators who wish to pin down the reasons why there is a difference between a poem written by a poet and a schizophrenic's "word salad" (Weisberg 2010, 237). In form they may be identical, but intention and meaning are ascribed to the former. However, such judgements about intentions rely on an agent centric model of creativity, perhaps rather, the solution is to accept that ambiguity and instability at the very centre of that which we call creative.

Ambiguity is an essential but often overlooked part of ignorance. It relates to when we cannot know what the answer is simply because there is no correct answer. It is related to fallibilism but moves beyond this to suggest that in some cases it is not possible to know a single meaning because there are multiple plausible meanings which are mutually exclusive. Take for example, the example of the duck and the rabbit made popular by Wittgenstein (1953; Figure 1). This disrupts stable ideas of knowledge because it points to those moments during which the final arbiter of the form is not the person who drew it but the person who is viewing it.

Fig 1. Rabbit/Duck illusion (Wittgenstein 1953)



Horton writes that "ambiguity…is not only desirable for drawing but …a necessary condition for visual culture "(Horton 2015, 1). Ambiguity is relational – it exists not in the objects itself for the object just *is*, rather ambiguity exists in the relationship between the object and the person viewing it. It is part of the meaning-making which we engage in through the process of interaction with the world. It is for this reason that the idea of art is so hard to pin down: the shifting category is not

a property of anything other than the relationship between the viewer and the viewed. The simple fact is that there is often no answer to the question so that knowledge here can only be knowledge that the meaning making is provisional and apt to shift.

This shifting and relational ontology means that ignorance is a fundamental part of creativity. Creativity is not an objective attribute that can be tied down to a clear set of processes or forms. What is novel and what is useful are relational terms which will always be unclear. The object just *is*, the process just *is*, the person just *is*.

2.2 The Ignorance of Material Engagement

Creativity is necessarily the manifestation of something and that something necessarily has a material form. This is trivially true. There is no experience of creativity without the act of creating even if that act is simply articulating sub-verbally an idea which has been growing in the head. Moreover, creative thoughts dissipate without being realised and sometimes even in the act of realisation become intangible. Once we resituate even the simplest creative and generative task, then we are forced to reconsider the nature of more obviously engaged creativity and that requires taking the material world seriously. The socio-material world in which creativity takes places is marked by ongoing and dynamic interactions with people and thing. In this section, I wish to address the fundamental unknowability of interacting with materials.

These interactions are marked by uncertainty. Uncertainty is closely linked to ignorance; it describes a profound unknowing which is consciously experienced through the course of engaging with the world. It is often uncomfortable. Beghetto (2020) suggests that there are two forms of uncertainty people can face – first, where the uncertainty is unexpected and habitual ways of acting are no longer good guides to future actions. In this case, the aim is to resolve this uncertainty. The second way is deliberately designing situations which generate uncertainty in an effort to increase the full range of possibilities that are available. Material engagement generates both types of uncertainty. This section looks first at the way that interaction with material generates the first form of uncertainty, that is the uncertainty which means that habitual gestures are not a clear guide to how to progress. This uncertainty comes from an ignorance about the nature of the materials which transcends the skill required to mitigate that uncertainty. Skilled engagement requires not erasing the uncertainty but learning to mitigate it.

Rich empirical data from semi-structured interviews or case studies provide supporting evidence for a model in which the material environment is not accepted as a passive scaffold for creativity but actively shapes the process (Malafouris 2013). This involvement in the creative process lends the material a form of agency which elsewhere has been called material agency. For some scholars, agency cannot be decoupled from intentionality, but there is an increasing move to decouple the sense

of agency from the act of agency itself. As Pickering (1995, p. 51) writes with reference to Glaser's bubble chambers:

> Now I can clarify my sense of material agency. It is simply the sense that Glaser's detectors did things-boiling explosively or along the lines of tracks or whatever-and that these doings were importantly separate from Glaser.

When material engagement is viewed as a dynamic process, the objects involved do things which are outside of the control of the person and this doing, this process of blending material and human intentionalities is an important aspect of creativity. All creativity has a form and when that form is a material one, the artist cedes some agency to the material which she works (see Ross and Vallée-Tourangeau 2020 for a longer discussion of this distributed agency).

For instance, the work of Glăveanu et al. (2013) challenges the person-centred notion of creative agency across a broad range of creative domains: artists, designers, scientists, writers and musicians. What emerges from the results of their series of interviews is a productive tension between human and material agency. For example, the artists interviewed suggest that "objects resist the intentions of the artist. All of a sudden, objects "ask a question" and very often "change the original plan," being "stronger" than the creator, "imposing their rules"." (p. 5). Designers spoke of a collaborative relationship with the materials "from the need to explore materials, to "test their limits", to the frustrations one experiences when not "feeling" the fabric" (p. 7). Even the chemist (not a domain traditionally associated with material play) described their creative process in terms of a "game with matter" (p. 8).

Although there have been several calls to recentre the material in our understanding of human behaviour and cognition (Barad 2003; Orlikowski 2007), it is perhaps particularly surprising that the relationships with the material is under-emphasised in creativity research (Tanggaard and Beghetto 2015) where there is a *necessary* entanglement with material. To create is to produce something concrete, the ephemerality of a novel thought moves from imagination to creativity when it is enacted and not before. The argument in this chapter, therefore, suggests that creative processes are constituted not by internal computations over mental representations of the artist's materials but through and by those materials (Bardt 2019; Wheeler 2018). This is not to suggest that internal processes are erased but rather that they are manifest through the act of creating and it is this act which is necessarily engaged with material.

Importantly, if we allow this form of material agency then we also invite uncertainty into the creative process and undermine the idea that creativity involves certainty so often required in the laboratory definition. Rather, if we take seriously the recentring of the creative act away from the person and towards the interaction which emerges from the process of engagement, then we are required to embrace material uncertainty and ignorance. While it is clearer that interactions with people will always involve a negotiation with a lack of knowledge and certainty, it may not be so clear with materials which are seen as being fixed and immutable. However, this creative uncertainty can be traced through the very matter which constitutes the creative material;there is a fundamental ignorance at the heart of working with

material. This can lead to risk such as that described by Schwalbe (2010, p.107) coming from the sheer unknowability of a block of wood:

> There is also the risk of investing hours in turning a piece only to discover rot and cracking that can't be worked around. There is the risk of misorienting the raw wood and failing to make the best use of a grain pattern that is revealed only as a piece is cut. There is the risk of severe cracking during the months it takes a roughed-out piece to dry prior to final turning and finishing. Skill reduces these risks but can't eliminate them.

A similar point is made by Baber et al. (2014) who go on to emphasise the lack of determinacy in this form of materially engaged workmanship much like the discussion on uncertainty discussed above. In this sort of work, the outcome is not guaranteed and the sketchy plan that may be present in the mind of the craftsperson (in this case a jewellery maker) is one "which crystalizes through the developing interaction between craftworker, tools, and materials being worked" (p.6).

Thus, in embodied and situated creativity, it is more helpful to consider ignorance as multiple and taking place across multiple scales each with an attached level of granularity driven, in part, by the properties of the material which are unknowable in advance but instead reveal themselves in action. This material unknowability undermines a hylomorphic model of creativity which assumes that the material is a passive recipient of the ideas of the maker (Ingold 2010).

2.3 Skills for Ignorance

Once we accept that the role of the materials is key to understanding the generation of a novel thought and that creativity as a category is meaningless without consideration of its manifestation, then the focus of empirical research shifts from underlying psychological traits or cognitive states to understanding the ongoing unfolding of creative action. This decentring of the human means that sciences that wish to only focus on the human would need to consider skills beyond the ones that have been the traditional area of focus. Cognitive skills become aligned with skills of action and interaction because cognition is action and interaction. Understanding creativity no longer requires strict focus on the skills that are often measured in the laboratory, and which develop from the underlying belief that things are bound in the head, but rather creative cognition can be understood as emergent from the complex and heteroscalar relationship between maker and material.

Recently, Samantha Copeland (forthcoming) suggested that we understand this form of engagement through the lens of metis or "cunning wisdom". Contrasting metis with the classical forms of reasoning of techne and episteme, she argues that the skill aligned to metis is the skill of responsiveness rather than that of knowledge-based preparedness or material engagement. Rather metis represents a combination, an interaction of both other forms of reasoning, requiring a dynamic and real-world engagement which is familiar and comfortable with uncertainty and ambiguity. Metis in this sense is a clearer way of describing the interplay of human and material

agency as it unfolds in the process of a reciprocal engagement. This allows moments of enacted luck and chance to emerge from the creative process because it relies not on the way the plan is designed in the mind of the designer but rather on the way that the plan is enacted. Too often we view knowledge states as static yet the flow of ideas in the world requires a more pragmatist perspective on knowledge in which thought and understanding arises from indeterminate situations and is constructed in the process of resolving the doubt caused by those situations which mark the continual and unceasing experience of moving through the world (Dewey 1910).

This is important from a psychological perspective. Psychology tends to focus on static properties of an individual or situation. These psychometric properties are designed to fix what is a dynamic process and reduce it to facilitate a clear examination of the component parts. However, as outlined above, this carries the problematic assumption that the parts remain the same when fixed as when in motion, but we need to move away from fixed and static conceptualisations. As outlined above, without a consideration of the realisation of material form then current research in psychology can only clearly claim to be researching creative potential. Yet potential itself is unstable, searching forward as it does for a wide range of possibilities. Rather, we need a more forward thinking and dynamic approach to both creativity and cognition. Our very understanding of creativity needs to embrace the ignorance which is central to all interactions with an uncertain future.

2.4 Seeking Uncertainty: Ignorance Niches

I have proposed that the interaction with materials generates a form of ignorance which skill can mitigate and while this is under 15heorized in the literature on creativity, it is not entirely unanticipated as can be seen by the range of evidence. What this following section will argue turns on the second of Beghetto's forms of uncertainty: That is an uncertainty or ignorance which is not intended to be resolved but one which sits at the heart of the creative act and is essential to it. This form of creative ignorance is less intuitive and is a stronger argument against applying rationalist forms of knowledge to the creative process. This ignorance is marked by two things. First, that the creative person seeks out uncomfortable states of ignorance not to be resolved but as an end state in themselves. Second, that creativity emerges from the paradox of comfort with discomfort.

It is not only Keats who suggested that tolerance of ignorance is key to understanding creativity, interviews with creative professionals suggest that they actively seek out moments of discomfort and epistemic darkness not with the aim of reducing them but of embracing them. Often this translates itself to a need to both embrace and create those things which are ambiguous in final form, other times it is concerned with the role of uncertainty. At all times, it is concerned with an unknowing of the final form. Creative people create patterns and use strategies that actively force them into a state of ignorance in relation to their surrounding world and environment. Stephann Makri and colleagues (2014) looking at the role of serendipity

in creativity explicitly documented the strategies employed by creative professionals to increase moments of serendipity. Of these, the first was an acceptance of ignorance, as he writes: "The visual artist explained that "creative practice is always moving into the darkness."

Contrast this with the traditional image of creativity addressed above as marking an illumination. What is key is that this is also an intentional state that is sought after by creative people despite its discomfort: Creative people work hard to generate moments of darkness and of unknowing. These creative "cognitive niches" (Clark 2008) exist not so that creativity can be sparked from the resolution of the unknowing, but in full awareness that the unknowing is a constant state. Ignorance in these moments is the aim rather than a resolution of that ignorance. This is not a comfortable process. Paul March (2019, 140) clearly outlines the discomfort associated with this loss of agency and reminds us that "art […] replaces certainty with doubt".

The point I wish to make here is that while rational and linear process of creative thought argues that the aim of creativity and innovation would be to shed light on this darkness, the practice of creative professionals suggest that such light shedding would frustrate the very practice that they are aiming to shed light on. In other words, the idea of creativity as a light bulb illuminating the dark does not map onto what creativity is when it is considered in coordination with the world. Creativity is rather familiarisation and comfort with the dark and with the uncertain. Creative professionals build ignorance niches that deliberately destabilise their knowing not in order to resolve that state but to live in it. They are not seeking the comfort of clarity but rather the generative uncertainty of the shadows.

3. Creative Ignorance

I have outlined a series of characteristics of creativity and its interaction with ignorance. First, I suggest that the "light bulb" moment of a new idea is also an artifact of the experimental situation rather than intrinsic to creativity itself, and I have suggested instead that we replace this with the notion of a shadowing. Crucially, I make the argument that this shadowing is essential to creativity. First, by describing how ambiguity is at the heart of the creative act both conceptually and when it is part of the experience of engaging with the material realisation of creative ideas. Second, I have shown how creative people actively seek out moments of ignorance and doubt not to resolve them but to live in that moment.

Such a relationship between ignorance and creativity requires us to rethink some of our existing categorisations of ignorance. Has and Vogt (p.17) offer us a taxonomy of ignorance:

> Suppose Socrates knows nothing about fashion. Indeed, he could not care less about it. Call this attitude Preferred Ignorance. Suppose further that he understands the concept atom, namely, smallest indivisible component of the physical universe, but he does not take himself to be in a position to assess whether such components exist. He also has some ideas

about the nature of value. But as he tries to articulate what precisely it is that he takes the good to be, he must admit that he does not know. In both cases, we may speak of Investigative Ignorance. Socrates's ignorance motivates him to take an interest in physics, though he leaves investigation in this field to others. And his ignorance fuels his thinking about value. Other cases are such that one is unaware of one's ignorance. Suppose Socrates holds firmly that a divine being corresponds with him, though he is deluded about this; or, say, he affirms that there is a wolf approaching, though it is his neighbor's dog. Call this Presumed Knowledge. There could also be a kind of ignorance where one does not hold any attitude to that which one is ignorant about. Perhaps Socrates has never even heard of dinosaurs, or more generally, of beings that once existed but are extinct. This is a kind of Complete Ignorance.

For each of these the state of ignorance is one which is either not recognised (for Presumed Knowledge and Complete Ignorance) not desired (Investigative Ignorance) or not important (Preferred Ignorance). Although the category of Investigative Ignorance is closest to the form of ignorance discussed to date because it is an ignorance which is revealed in action, it does not capture either the deliberate elicitation of the ignorance state nor the accepting of this discomfort without desire to resolve. For this, a novel category, that of "creative ignorance", is required to fully understand how creativity and ignorance are entangled in process.

Creative ignorance describes a form of ignorance as yet uncharted in the literature which has four key features. It is a knowing ignorance. That is, the people experiencing ignorance are aware that they are experiencing moments of ignorance and doubt. This ignorance and doubt can cause discomfort. Despite this, it is a welcome ignorance. That is, it is both sought out and tolerated, in this instance awareness of the ignorance does not lead to the need or desire to resolve it despite the discomfort it entails. It is a necessary ignorance. That is, without it the creative act would not be creative. Finally, it is an irresolvable ignorance. That is, because creativity is emergent from the interaction of people and things across different temporal time frames the creative product is unstable and unknowable.

In this way, the notion of creative ignorance proposes that when we track interaction in the world, when ignorance is recast from a state characterised by a lack of knowledge to a process where knowledge is unstable and updating and the relationship between ignorance and knowledge is recursive and unclear, then ignorance is a way of engaging with the world which is generative and does not require resolution. Creative ignorance describes the manner of generating novelty from uncertainty while not seeking to erase that uncertainty. The discomfort characterises creative processes and the ambiguity of the resultant forms cannot resolve because of its dependency on multiple contradictory perspectives.

Thus, creative ignorance moves beyond the idea of an isolated thinker who examines and draws on rational processes to resolve this uncomfortable state and generate an immutable novel idea which then takes form, to draw from evidence concerning the nature of the process of interaction with the world. Under this framework, the idea does not precede the form, rather form and idea co-emerge and co-respond and so states of either ignorance or knowledge are entangled. Ignorance is often represented as a state rather than a process, but creative ignorance is not a solid or stable state, rather it is a dynamic interplay between knowing and unknowing which

crucially does not aim at or require resolution. Creativity emerges from that dynamic.

4. Conclusion

This argument in this chapter had a dual purpose. First, to challenge the idea that laboratory-based conceptions of creativity reflect creativity as it unfolds in the real world rather than being a reflection of the tools and tasks used to elicit creative states. This demonstrates that the tight link between certainty and creativity is not a necessary link but is rather an artefact of the experimental situation.

I have used creativity over the course of this chapter as a way of understanding the way in which the rational approach to knowledge, as a linear progression from darkness to light which is valorised by enlightenment approaches to knowledge, may be disconnected from human experience. The value of ignorance is precisely in its stimulatory properties which are required to be experienced not with hope of resolution but as generative in itself. Creative ignorance is a special form of ignorance which is both embraced by creative people and revealed and sustained through interactions with the material and social world. It is heavily reliant on the skilled elicitation and exploitation of the unknowing wrought by engagement with the socio-material world. However, I contend that this model can extend to other forms of knowledge once we move from viewing knowledge as something that either graces or not a static state and rather is something which is part of a process of engagement with an uncertain world.

References

Abraham, Anna. 2019. The Neuroscience of Creativity. Cambridge Fundamentals of Neuroscience in Psychology. Cambridge, United Kingdom ; New York, NY: Cambridge University Press.

Acar, Selcuk, Mark A. Runco, and Hyeri Park. 2020. 'What Should People Be Told When They Take a Divergent Thinking Test? A Meta-Analytic Review of Explicit Instructions for Divergent Thinking.' Psychology of Aesthetics, Creativity, and the Arts 14 (1): 39–49. https://doi.org/10/ggkdb5.

Baber, Chris, Manish Parekh, and Tulin G. Cengiz. 2014. 'Tool Use as Distributed Cognition: How Tools Help, Hinder and Define Manual Skill'. Frontiers in Psychology 5. https://doi.org/10.3389/fpsyg.2014.00116.

Barad, Karen. 2003. 'Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter'. Signs: Journal of Women in Culture and Society 28 (3): 801–31. https://doi.org/10.1086/345321.

Bardt, Christopher. 2019. Material and Mind. Cambridge, MA: The MIT Press.

Beghetto, Ronald A. 2020. 'Uncertainty'. In The Palgrave Encylopedia of the Possible, edited by Vlad P. Glăveanu. Palgrave MacMillan.

Bennett, M. R., and P. M. S. Hacker. 2003. Philosophical Foundations of Neuroscience. Malden, MA: Blackwell.

Boag, Simon. 2015. 'Personality Assessment, "Construct Validity", and the Significance of Theory'. Personality and Individual Differences 84 (October): 36–44. https://doi.org/10.1016/j.paid.2014.12.039.

Bowden, Edward M., and Mark Jung-Beeman. 2003. 'Aha! Insight Experience Correlates with Solution Activation in the Right Hemisphere'. Psychonomic Bulletin & Review 10 (3): 730–37. https://doi.org/10.3758/BF03196539.

Clark, Andy. 2008. Supersizing the Mind: Embodiment, Action, and Cognitive Extension. Philosophy of Mind. Oxford ; New York: Oxford University Press.

Collins, H. M. 1975. 'The Seven Sexes: A Study in the Sociology of a Phenomenon, or the Replication of Experiments in Physics'. Sociology 9 (2): 205–24. https://doi.org/10.1177/003803857500900202.

———. 1985. Changing Order: Replication and Induction in Scientific Practice. London ; Beverly Hills: Sage Publications.

Copeland, Samantha. forthcoming. 'Metis and the Art of Serendipity'. In The Art of Serendipity, edited by Wendy Ross and Samantha Copeland. Palgrave MacMillan.

Csikszentmihalyi, Mihalyi. 1998. 'Implications of a Systems Perspective for the Study of Creativity'. In Handbook of Creativity, edited by Robert J. Sternberg, 313–36. Cambridge University Press. https://www.cambridge.org/core/product/identifier/CBO9780511807916A027/type/book_part.

———. 2014. 'Society, Culture, and Person: A Systems View of Creativity.' In The Systems Model of Creativity, 47–61. Dordrecht: Springer.

Danek, Amory H., Thomas Fraps, Albrecht von Müller, Benedikt Grothe, and Michael Öllinger. 2013. 'Aha! Experiences Leave a Mark: Facilitated Recall of Insight Solutions'. Psychological Research 77 (5): 659–69. https://doi.org/10.1007/s00426-012-0454-8.

Danek, Amory H., and Carola Salvi. 2020. 'Moment of Truth: Why Aha! Experiences Are Correct'. The Journal of Creative Behavior 54 (2): 484–86. https://doi.org/10.1002/jocb.380.

Dewey, John. 1910. How We Think. Lexington, KY.: Renaissance Classics.

El Kassar, Nadja. 2018. 'What Ignorance Really Is. Examining the Foundations of Epistemology of Ignorance'. Social Epistemology 32 (5): 300–310. https://doi.org/10/ghqkr5.

Flynn, James R. 2018. 'Reflections about Intelligence over 40 Years'. Intelligence 70 (September): 73–83. https://doi.org/10/gfb43g.

Glăveanu, Vlad P. 2013. 'Rewriting the Language of Creativity: The Five A's Framework'. Review of General Psychology 17 (1): 69–81. https://doi.org/10.1037/a0029528.

———. 2020. 'A Sociocultural Theory of Creativity: Bridging the Social, the Material, and the Psychological'. Review of General Psychology, September, 108926802096176. https://doi.org/10.1177/1089268020961763.

Glăveanu, Vlad P., and Ronald A. Beghetto. 2020. 'Creative Experience: A Non-Standard Definition of Creativity'. Creativity Research Journal, October, 1–6. https://doi.org/10.1080/10400419.2020.1827606.

Glăveanu, Vlad P., Todd Lubart, Nathalie Bonnardel, Marion Botella, Pierre-Marc de Biaisi, Myriam Desainte-Catherine, Asta Georgsdottir, et al. 2013. 'Creativity as Action: Findings from Five Creative Domains'. Frontiers in Psychology 4. https://doi.org/10.3389/fpsyg.2013.00176.

Horton, Derek. 2015. 'Introduction'. In Drawing Ambiguity: Beside the Lines of Contemporary Art, edited by Phil Sawdon and Russell Marshall, 1–6. London: I.B. Tauris.

Ingold, T. 2010. ‘The Textility of Making’. Cambridge Journal of Economics 34 (1): 91–102. https://doi.org/10.1093/cje/bep042.

Kimmel, Michael, and Dayana Hristova. 2021. ‘The Micro-Genesis of Improvisational Co-Creation’. Creativity Research Journal, August, 1–29. https://doi.org/10/gmjc99.

Kirsh, David. 2014. ‘The Importance of Chance and Interactivity in Creativity’. Pragmatics & Cognition 22 (1): 5–26. https://doi.org/10.1075/pc.22.1.01kir.

Lakoff, George, and Mark Johnson. 2010. Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought. New York, NY: Basic Books.

Malafouris, Lambros. 2013. How Things Shape the Mind: A Theory of Material Engagement. Cambridge, Massachusetts: MIT Press.

———. 2014. ‘Creative Thinging: The Feeling of and for Clay.’ Pragmatics & Cognition 22 (1): 140–58. https://doi.org/10.1075/pc.22.1.08mal.

March, Paul L. 2019. ‘Playing with Clay and the Uncertainty of Agency. A Material Engagement Theory Perspective’. Phenomenology and the Cognitive Sciences 18 (1): 133–51. https://doi.org/10.1007/s11097-017-9552-9.

Meylan, Anne. 2020. ‘Ignorance and Its Disvalue’. Grazer Philosophische Studien 97 (3): 433–47. https://doi.org/10/gm3qr6.

Orlikowski, Wanda J. 2007. ‘Sociomaterial Practices: Exploring Technology at Work’. Organization Studies 28 (9): 1435–48. https://doi.org/10.1177/0170840607081138.

Pickering, Andrew. 1995. The Mangle of Practice: Time, Agency, and Science. Chicago: University of Chicago Press.

Rocca, Elena, and Rani Lill Anjum. 2020. ‘Complexity, Reductionism and the Biomedical Model’. In Rethinking Causality, Complexity and Evidence for the Unique Patient a CauseHealth Resource for Healthcare Professionals and the Clinical Encounter, edited by Rani Lill Anjum, Samantha Copeland, and Elena Rocca. Cham: Springer Open.

Ross, Wendy, and Mike Groves. under review. ‘Let’s Just See What Happens: Risk and Uncertainty in the Creative Process’. Psychology of Aesthetics, Creativity, and the Arts.

Ross, Wendy, and Frédéric Vallée-Tourangeau. 2020. ‘Microserendipity in the Creative Process’. Journal of Creative Behavior.

———. 2021. ‘Catch That Word: Interactivity, Serendipity and Verbal Fluency in a Word Production Task’. Psychological Research 85 (2): 842–56. https://doi.org/10.1007/s00426-019-01279-y.

———. under review. ‘I’ve Got a Good Feeling about This: Subjective Correctness More Important for Affective “Aha” than Objective Correctness’. Thinking Skills and Creativity.

Runco, Mark A., and Garrett J. Jaeger. 2012. ‘The Standard Definition of Creativity’. Creativity Research Journal 24 (January): 92–96. https://doi.org/10.1080/10400419.2012.650092.

Salvi, Carola, Emanuela Bricolo, John Kounios, Edward Bowden, and Mark Beeman. 2016. ‘Insight Solutions Are Correct More Often than Analytic Solutions’. Thinking & Reasoning 22 (4): 443–60. https://doi.org/10.1080/13546783.2016.1141798.

Schwalbe, Michael. 2010. ‘In Search of Craft’. Social Psychology Quarterly 73 (2): 107–11. https://doi.org/10.1177/0190272510369086.

Steffensen, Sune Vork. 2017. ‘Human Interactivity: Problem-Solving, Solution-Probing, and Verbal Patterns in the Wild.’ In Cognition beyond the Brain, edited by S.J Cowley and Frédéric Vallée-Tourangeau, 85–113. Cham: Springer. https://doi.org/10.1007/978-3-319-49115-8.

Steffensen, Sune Vork, and Frédéric Vallée-Tourangeau. 2018. ‘An Ecological Perspective on Insight Problem Solving.’ In Insight: On the Origins of New Ideas, edited by Frédéric Vallée-Tourangeau, 169–90. London: Routledge.

Sugarman, Jeff. 2017. 'Psychologism as a Style of Reasoning and the Study of Persons'. New Ideas in Psychology 44 (January): 21–27. https://doi.org/10.1016/j.newideapsych.2016.11.008.

Tanggaard, Lene, and Ronald A. Beghetto. 2015. 'Ideational Pathways: Toward a New Approach for Studying the Life of Ideas'. Creativity. Theories – Research - Applications 2 (2): 129–44. https://doi.org/10.1515/ctra-2015-0017.

Vallée-Tourangeau, Frédéric, ed. 2018. Insight: On the Origins of New Ideas. New York, NY: Routledge.

Vallée-Tourangeau, Frédéric, Wendy Ross, Renata Ruffatto Rech, and Gaëlle Vallée-Tourangeau. 2020. 'Insight as Discovery'. Journal of Cognitive Psychology, September, 1–20. https://doi.org/10.1080/20445911.2020.1822367.

Vallée-Tourangeau, Frédéric, and Gaëlle Vallée-Tourangeau. 2020. 'Mapping Systemic Resources in Problem Solving'. New Ideas in Psychology. https://doi.org/10.1016/j.newideapsych.2020.100812.

Wallas, G. 1926. The Art of Thought. Jonathan Cape.

Weisberg, Robert. 2010. 'The Study of Creativity: From Genius to Cognitive Science'. International Journal of Cultural Policy 16 (3): 235–53. https://doi.org/10.1080/10286630903111639.

Wheeler, Michael. 2018. 'Talking about More than Heads: The Embodied, Embedded and Extended Creative Mind.' In Creativity and Philosophy, edited by Berys Nigel Gaut and Matthew Kieran, 230–50. New York: Routledge.

Wittgenstein, Ludwig. 1953. Philosophical Investigations. Oxford: Blackwell Publishing.