

# Explaining creativity

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## Introduction

There is a long tradition in the history of philosophy, art or science that regards creativity as *extraordinary* and in that sense *exceptional*. Looked at closely, the exceptionalist attitude comes in two varieties: creativity as realized by exceptional people or by exceptional cognitive processes. It is often combined with a second attitude, namely that creativity is a mystery that cannot be explained. It is *inexplicable* from a naturalistic point of view. Because of the latter, creativity is often regarded as the ‘last frontier’ of a science of the mind. Consequently, computers are denied the potential to be creative; computers might exhibit cognition, but they are not creative, or so the argument goes. The first attitude assumes (what I call) an *exceptionalist* concept of creativity and the second (what I call) an *obscurantist* concept of creativity. These two attitudes towards creativity are distinct but historically connected.

In this paper, I will directly criticize only the obscurantist concept of creativity. The results, however, shall cast doubt on the exceptionalist concept too. I will defend two claims to demystify creativity: (1) the claim that creativity cannot be explained at all wrongly identifies creativity with what I shall call metaphysical freedom (i.e., libertarian freedom presupposing the falsity of determinism); (2) the Darwinian approach to creativity, a prominent naturalistic account of creativity, fails to give an explanation of creativity because it confuses description (and the concept of creativity which rests on it) with giving an explanation of the respective phenomenon. I will close with some remarks about the philosophical status of and differences in explanations available in contemporary cognitive science.<sup>1</sup>

## Originality and spontaneity as the core aspects of creativity

The phenomenon of creativity is characterized by originality and spontaneity. Originality points to the conceptual assumption that creativity requires that something *new* is produced. As I argued elsewhere (Kronfeldner 2009, 2011), the kind of novelty that is required – in what is usually meant by

the term ‘creativity’ – is of a specific kind, neither anthropological nor historical. If you just create a new bit of culture – something humans *qua* humans (and some animals) do all the time – then you create something new in an anthropological and numerical sense, but you are not creative in the narrow sense of the term. For instance, if you create a new token pot of the kind typical of the culture you participate in, then you are not creative, since you learned to make it the way you do it. You follow a routine. Learning and following a routine is usually conceptually contrasted with creativity.<sup>2</sup> Not all making or fabricating, as Gaut (this volume) calls it, is creative in the narrow sense.

The same conceptual contrast helps explicating why you can be creative even if you are historically *not* the first one doing what you are doing. Historical novelty, as Boden (2004: 43–48) stressed, is not required for creativity in the narrow sense targeted here. What is most interesting from my point of view, as stressed in Kronfeldner (2009), is however not the distinction as such (between historical novelty and what is now called, following Boden, ‘psychological novelty’), but the reason *why historical novelty is not important for explaining creativity* in the narrow sense, even though it is historical novelty that fills the annals of hero-worshipping in science, philosophy or art and creativity ‘in the wild’, as some might say. The reason lies in the *asymmetry* involved, which shows that psychological novelty is more fundamental. The asymmetry is the following: even though every historical novelty must have been a psychological novelty (it entails it, as Gaut in this volume writes), the converse does not hold, since an insight can be psychologically new without being historically new. The asymmetry arises from connecting – and that is the crucial point behind the asymmetry – the novelty criterion back to causal processes and thus to relations; historical novelty points to the existence of an original, but it is not the *existence* of an original that is important for the question of whether an act of production exhibits originality at the psychological level. What is important for that question is rather the kind of process connecting what already exists to what one produces; whether there is a *causal connection* between the alleged ‘original’ and the alleged ‘copy.’ Creativity is compromised only if you copied the original (in whatever sense, via social or individual learning, etc.), i.e., if there is a causal link between the original and what you make. Certainly, in order to have one’s own creativity compromised by an original, there needs to be a historical original, but the fact that there is an original is not sufficient to be compromising. Originality is pointing to a relation, independence of an individual from the rest of the world, and not to occurrences of novelty (as an intrinsic property of the products of creative minds).<sup>3</sup>

Spontaneity points to the phenomenological datum that the individual, if creative, has no control over the creative process. Terms like ‘insight,’

‘inspiration,’ ‘surprise,’ and ‘eureka!’ point to this aspect. You can raise your arm by the power of your will, but you cannot come up with an idea for a problem that demands a creative solution simply by the command of your will. If you invented your own technique of how to make pots and you make a (numerically) new pot using this technique, you are not performing a creative act in the narrow sense assumed here, since you simply follow a routine, even if it is your very own routine. At that moment, you might be original, but not creative in the narrow sense. There is abundant evidence – from the annals of history as well as from experimental studies of psychologists – that creativity in the narrow sense involves a kind of spontaneity (what psychologists call instantaneous insight) that amounts to a loss of control over the process of creativity. Insight or spontaneity, whichever term we prefer, can thus count as a phenomenological datum of creativity research, part of *what it is like* to be creative. It is thus part of the description of creativity. Consequently, spontaneity has been used as a second conceptual criterion for creativity in the narrow sense. After all, an adequate concept of creativity certainly depends on how we describe the occurrences thereof.

Yet, that creativity is characterized by spontaneity does *not* mean that there is no goal-directedness involved. Even though creativity can happen without any goal (i.e., a problem to solve in mind), as in cases of so-called true serendipity, there are also cases of so-called pseudo-serendipity and cases of true creative trial-and-error problem-solving. In cases of true serendipity, one is not looking for a solution to a problem. One only recognizes something *as* a solution to a problem, i.e., one takes something to be a problem to be solved at the moment one sees the solution to it. In cases of pseudo-serendipity, there is a perceived problem, but there is no active search for a solution, e.g., by producing trials. One does not produce a trial in pseudo-serendipity; one simply comes across a solution while looking for it. Only in cases of trial-and-error are you intentionally producing trials, even though this goal-orientedness is not sufficient for finding the solution, since there are cases of trial-and-error that are truly creative, i.e., involving originality and spontaneity. Spontaneity thus amounts to the absence of foresight and the absence of control over the process of generating a solution to a goal and not to a denial of goal-orientedness.<sup>4</sup>

To summarize the results so far: creativity is opposed to routine production and technique in this sense (i.e., method). It involves originality and spontaneity. Both criteria, i.e., originality and spontaneity, can be fulfilled in degrees. Therefore, creativity comes in *degrees* too. This is of utmost importance, since I will show that the kind of independence (i.e., the kind of freedom) that originality and spontaneity incorporate is only a *partial* one.

## The obscurantist and exceptionalist tradition

Plato (most prominently in the *Ion*, but also in the *Phaidros* and the *Menon*) already recognized that creativity is characterized by the two aspects originality and spontaneity. Yet, it is mainly because of spontaneity that Plato regarded it as *extraordinary*; only a few (for instance Homer but no other poets) exhibit it, according to him. The few who are creative are endowed with supra-natural powers, kissed by the muses, literally ‘out of their mind’, while others just produce novelty with knowledge and routine method (see *Ion*, 532c–534d). This is the origin, not just of connecting creativity to madness, but also of the more general exceptionalist and obscurantist attitudes towards creativity, which is sometimes also called ‘romantic’.

Along such lines, Kant (in his *Critique of Judgment*) excluded scientists as well as philosophers from being truly creative. They are merely great heads (*große Köpfe*) and not geniuses, i.e., the only ones who are truly creative. The difference between them is not a difference in degree of excellence but a difference in kind; one is creative and the other is very intelligent. For Kant, the difference stems from the fact that geniuses create with the help of imagination and cannot tell how they do it. By contrast, scientists (like Newton) can, according to Kant, tell how they arrive at new insights. They have and use methods. Anybody can in principle learn these methods, which is why creativity (being a genius) is so exceptional and obscurantist for Kant. Kant’s account is certainly different from Plato’s but both assume that creativity is extraordinary and constitutes a case of inexplicable cognition. The tradition of such exceptionalist and obscurantist attitudes towards creativity is long and, if looked at closely, complicated – involving lots of variations of the same basic obscurantist *cum* exceptionalist schema.<sup>5</sup>

## A strategy to criticize the obscurantist *cum* exceptionalist schema

I will criticize this obscurantist *cum* exceptionalist schema from a systematic point of view, by picking out some recurring threads. The first thread is the claim that originality and spontaneity involve an opposition to causal determination, the second thread is the claim that producing real novelty amounts to a certain kind of blindness and the third thread is the claim that spontaneity points to a special, extraordinary cognitive process. The first claim, if successful, makes explaining creativity (whatever kind of explanation offered) impossible, while the second and third claim exclude, if successful, certain kinds of explanation. The second does so via a conceptual argument, while the third does it via an actual empirical, explanatory claim.

What I assume in the following is that, from an analytic point of view, originality and spontaneity can both be regarded as two kinds of *partial* independence:

- (a) Originality amounts to partial independence from the causal influence of an original (direct or via a human person from whom one learns how to produce an item). The assumed contrast is with learning and copying.
- (b) Spontaneity amounts to partial independence from the causal influence of previously acquired knowledge. The assumed contrast is with method and routine.

The qualifier ‘partial’ is very important, since there is nothing in the concept of creativity that prevents us from taking into account that those who are creative use what they learned and usually stand on the proverbial ‘shoulders of giants.’ Creativity transcends the already acquired knowledge of others (originality) and of the individual whose creativity is at issue (spontaneity), but at the same time it builds on this already acquired knowledge of others and of the creative individual, and is thus partially constrained by it.<sup>6</sup>

### **Creativity as defying any naturalistic explanation**

In accordance with what I assume above, Carl R. Hausman (1984: ix, 9-18) writes that “genuine novelty” must be “unpredicted [...] unaccounted for by antecedents and available knowledge, and is thus disconnected with the past.” Yet, he combines this with a contrast to causal determination as such and writes the following: “A causal view of explanation sets a framework for ways of denying that there is anything new under the sun.” According to this view, if determinism is true, there cannot be anything genuinely new and, consequently, no genuine creativity. Whatever novelty there is, it can be reduced to and derived from what was previously available. An imagined demon (or ‘God’) could have known it all along, so it wouldn’t be genuinely new. To be genuinely new, the novelty needs to transcend causal determination, it must be created *ex nihilo*. Such a perspective assumes that causal determination conflicts with creativity. There must be an independence from causal influences, a metaphysical freedom, involved in order to speak of genuine creativity. ‘Being creative’ is equated with ‘being free’ (in the metaphysical sense) and creativity is regarded as naturalistically inexplicable.

In principle, there are three possible replies to such an inexplicability claim: one could point to non-naturalistic kinds of explanations, or one could point to in-deterministic causation as sufficient for explaining

creativity. Finally, one could resolve the alleged conflict between naturalistic explanation and creativity. This paper only discusses the third option.<sup>7</sup>

The obscurantist perspective actually leads to a paradox of (in-)explicability (cf. Kronfeldner 2009: 582); if an allegedly creative act is a true creative act, it is not explainable, and if it is naturalistically explainable, then it is not a true creative act. Either it is inexplicable, or what we explained is not creative. This paradox of (in-)explicability is established by pure stipulation, by equating creativity with metaphysical freedom. The problem is that this conceptual equation runs into a dilemma:

If naturalism is correct (humans with all their actions are part of 'Nature' and thus we can in principle explain what they do), then *nobody is creative*. The problem with this horn of the dilemma is that it is *too narrow*. After all, there seems to be agreement that there are at least some truly creative people.

Yet, this horn of the dilemma would not be chosen by the obscurantist anyway, since the obscurantist reasoning is implicitly driven by anti-naturalist leanings.

However, if naturalism is wrong (as the obscurantist would assume), then unfortunately, *everybody is creative*. Why? Since the view equates creativity with metaphysical freedom. But metaphysical freedom – as usually conceived – holds either for all humans (with their mind, etc.) or for none. Thus, everybody is creative and in the same sense. The problem with this horn, evidently, is that it is *too broad*. It is too broad especially for those who believe in creativity as being exceptionalist (different in kind). It is still a problem for those who believe in a more gradual picture; the exceptionalist usually has only a few people exhibiting the extraordinary 'gift'. Finally, even the non-exceptionalist assumes that some people are more and some are less creative. But it is not standard to assume that *metaphysically* some people are more and some people are less free, even if each human might be *practically* more or less free (to think or do this or that).

In the following, I will show that metaphysical freedom is neither sufficient nor necessary for creativity. What is sufficient and necessary rather is a psychological freedom – a kind of freedom that is compatible with naturalism and thus in principle explainable.

*Metaphysical freedom is not sufficient*. If it were sufficient, then, as mentioned above, everybody or every allegedly 'free' act would count as creative, even a person voting for party XYZ in an election. It would be quite a stretch to call an act like this – even if we assume

it to be metaphysically free – creative. It has neither originality nor spontaneity in the relevant sense.

*Metaphysical freedom is not necessary.* To establish originality and spontaneity, all that is required is an independence from very specific causal factors (creative freedom) and not from causal determination as such (metaphysical freedom).

The kind of freedom that is necessary and sufficient is *creative freedom*, the combination of the two core aspects of creativity:

- (a) *Originality*: partial independence from the causal influence of an original (direct or via a model) (opposition: learning, copying).
- (b) *Spontaneity*: partial independence from the causal influence of previously acquired knowledge (opposition: routine, method).

A well-known example from the annals of the history of science is that of Friedrich A. Kekulé, which illustrates the difference between creative freedom (partial independence from certain causal influences) and metaphysical freedom. Kekulé searched for the molecular structure of the benzene molecule and he reported that he fell asleep and had the following dream:

I turned my chair to the fire and dozed [...] Again the atoms were gambling before my eyes. This time the smaller groups kept modestly in the background. My mental eye, rendered more acute by repeated visions of this kind, could now distinguish larger structures, of manifold conformation; long rows, sometimes more closely fitted together; all twining and twisting in snake-like motion. But look! What was that? One of the snakes had seized hold of its own tail, and the form whirled mockingly before my eyes. As if by a flash of lightning I awoke.<sup>8</sup>

If the report is correct, then this dream was Kekulé's moment of insight.<sup>9</sup> What kind of independence do we encounter in this paradigmatic example of an original and spontaneous insight? There is no evidence for or against metaphysical freedom, but there is evidence that Kekulé was skilled in visual imagination, which might have been influenced by the fact that he studied architecture before he became a chemist. In addition, Kekulé might have been subject to some visual impacts (e.g., visiting a zoo, visiting a dance performance) that influenced him when he visualized benzene in the way he reports. Yet, these causal influences do not make him less creative, i.e., they do not take away originality and spontaneity. How come? *Because these influences have nothing to do with the benzene molecule.* As I said elsewhere (2009: 585–587), even though his idea does not come *out of nothing*, his visual imagination is very likely influenced by factors that come *from outside the context*. Kekulé's previous knowledge and his goal-orientedness to find a solution to the problem of the

structure of the benzene molecule made it likely that he would find the solution, but the previous knowledge and the goal-orientation were not sufficient for him to find it. He needed some inspiration from *out of context* – out of nothing not metaphysically, but rather relative to the problem-space he was dealing with.

Such a relativized ‘out of nothing’ can account for the psychological originality and spontaneity involved. Given standard philosophical terminology, the causal influences that were involved in the emergence of his idea about benzene as forming a ring are so-called *coincidental* influences. Coincidences account for surprise and practical unpredictability, but they do not conflict with determinism. In a naturalistic account of creativity, coincidences replace metaphysical freedom.

### Creativity as excluding certain kinds of explanations

A naturalistic account – by definition – cannot claim that a phenomenon is in principle inexplicable. Yet, it can – via respective conceptual assumptions about the respective phenomenon – exclude *certain kinds of explanation*. If we take into account the instances of partial independence that originality and spontaneity require, this entails that explanations that reduce creativity to the influence of already acquired knowledge must fail. By necessity (i.e., by conceptual assumption), creativity requires to transcend any already acquired knowledge.

This conceptual exclusion of certain kinds of explanation also stands behind claims that are part of a tradition of explaining creativity which has been called ‘Darwinian,’ since it refers to a process of ‘blind variation’ and consequent selection. Novelty in culture is understood as produced in an analogous manner, as novelty in nature is produced by a proverbial ‘blind watchmaker,’ producing lots of errors and ‘waste,’ tinkering with what is contingently at hand rather than designing things from scratch.<sup>10</sup> The novelty produced then gets evaluated at various levels; the individual as well as the social one.

Creativity in such a picture is nothing but variation and selection, where chance favours the prepared mind. The Darwinian model of naturalizing creativity was most famously defended by Donald Campbell. He wrote, for instance:

Real gains must have been the products of explorations going beyond the limits of *foresight* or *prescience*, and in this sense blind. (Campbell 1960: 92; emphasis added)

[I]n going beyond what is already known, one cannot but go blindly. If one can go wisely, this indicates already achieved wisdom of some general sort. (Campbell [1974] 1987b: 57)

This and similar remarks by others (e.g., Popper) amount to a *conceptual* argument about creativity; real gains *must* have been “blind” by definition. Gaut (this volume) calls it the “Ignorance Principle”. If creativity is *defined* as going beyond what is already known, that is, defined as bringing about something *new* (‘real gains’), then creativity excludes foresight, since foresight is defined as knowing something already. There must be some ignorance for there to be creativity. As Plato already stressed in his paradox of search in the *Meno*: if we know something, we cannot look for it, since we know it already; if we, however, do *not* know it, we cannot even look for it, since we do not know what we are looking for. That is why we cannot bring about something new by will and foresight. And that is why we make errors. A perfect God-like creator can thus not be creative, since a perfect being would have foresight and could thus prevent errors before making them. But for a God-like creator, there is no need to be creative in the narrow sense; this creator knows everything already – a truly superior but uncreative being.

Such a conceptual argument assumes a certain concept of ‘blind’ as opposed to foresight, which is not the same as saying that we produce things at random or in an undirected manner. Neither creative ideas, nor biological mutations are produced *randomly* (in the sense that they are equally likely). Yet, biological mutations are produced in an *undirected* manner. Undirected variation can be defined in the following way: the occurrence of a variant  $X^*$  is undirected, if and only if the occurrence of  $X^*$  is not made *more likely* through the environment to which the organism with  $X$  has to adapt. If the occurrence is made more likely through the environment, there is a coupling between originating and selecting factors. For instance, if the occurrence of a longer neck ( $X^*$ ) in a giraffe is made more likely through the environment (e.g., tall trees) to which the neck ( $X$ ) of the giraffe has to adapt, then the occurrence of the longer neck ( $X^*$ ) is directed.<sup>11</sup>

While genetic variation is still believed to be *only* produced in an *undirected* manner, ideas are normally conceived as being produced in a directed one. In human cognition, already acquired knowledge usually influences not only the production of new ideas but also the selection thereof. So, selective factors are often simultaneously producing ones, which makes the production of the ideas *guided* (i.e., directed in the above-defined sense). Thus, if ‘blind’ means ‘undirected’, then the Darwinian model is wrong in explaining creativity.<sup>12</sup>

There is however a third meaning of ‘blind’ that saves the analogy between how novelty in nature and how novelty in culture is produced; in both cases, there is *no guarantee* that the novelty that is produced is adequate. The novelty is *unjustified* by origin. Even though the creative system works with previously acquired knowledge, it works without foresight and

can thus not prevent errors. Humans clearly produce inadequate ideas. We make errors and are indeed quite often ‘blind’ in that sense.

If ‘blind’ only means ‘error-prone’, then the Darwinian model is evidently correct. However, it does *not explain creativity*, either. It just reformulates what is part of the phenomenon in an abstract manner, namely that originality and spontaneity are involved. It excludes certain kinds of explanation (via learning, method and perfect foresight), but it does not itself give an explanation of how creative ideas are produced. It just repeats the description and is explanatorily trivial. Claiming that the Darwinian model (if interpreted as claiming that ideas are produced based on a process of variation and selection) explains creativity would be analogous to claiming that an alleged *virtus dormitiva* of opium explains why opium makes you sleep. The account just repeats what is already assumed.<sup>13</sup>

Yet, this is not the end of the story of explaining creativity with reference to a Darwinian ‘blind variation’ principle. ‘Blind’ can be taken to mean more than that there are errors involved. It can be taken to refer to an unconscious, special cognitive process – a hidden chaos – that happens as part of a guided, i.e., directed production of novelty.

### **Creativity as practically inaccessible**

The assumption of a hidden chaos beneath the apparent guidedness of creative problem-solving has been defended by Dean K. Simonton (1988, 1995).<sup>14</sup> The claim is that there is a special chance-configuration process, a special cognitive process that is in and of itself practically inexplicable, since it is unconscious, hard to access and built on randomness (or at least undirectedness). If it could be shown that there is such a cognitive process, then the Darwinian model would gain some explanatory power, since it would point to an actual causal cognitive process that explains the occurrence of creativity.

The problem with this way out for the Darwinian account is that the chance-configuration process is made so ‘hidden’ that it becomes hard to assess the claim that it exists. It reaches its explanatory power only at the price of extreme unobservability and thus evidential inaccessibility. This entails that the claim about the actual cognitive process which accounts for the phenomenology of creativity is hard to test. In addition, there is evidence from cognitive studies, producing the most direct (even though still indirect) evidence on unconscious cognitive processes, which seems not to speak in favour of Simonton’s chance-configuration hypothesis.<sup>15</sup> However, since the empirical evidence might well change, the philosophical point that can be derived from this is quite limited but decisive nonetheless; as long as there is

no conclusive evidence from cognitive science about the hidden chaos, the Darwinian model has not succeeded in providing any convincing explanatory information on creativity.

To sum up, the core issue about the Darwinian model applied to the cognitive level is: despite its naturalistic orientation, it assumes a special, extraordinary cognitive process. In addition, this is a cognitive process hypothesized especially for creativity, which is in danger of being *ad hoc*. The account gains explanatory power, but only at the price of keeping the cognitive process ‘hidden’ and ‘special’, which amounts to practical inexplicability.

If we take the previous section and this one together, the argument is that the Darwinian model fails to explain creativity either because it confuses description with explanation (if blind means error-prone), or because it falls victim to left-overs from the long philosophical tradition of regarding creativity as inexplicable and extraordinary. It postulates an extra creative cognitive process that is so hidden that it is practically inaccessible as well as inexplicable.

Finally, it is unlikely that the model supports a view where creativity is a matter of more or less. Creativity is still conceived as extraordinary – even though now predominantly at the level of kinds of cognitive processes rather than at the level of kinds of people. The model does not preclude that individuals exhibit the hidden cognitive process more or less. After all, Campbell (and later Dennett and others) applied their model even to all living creatures. There is a cascade of variation-and-selection processes culminating in humans, but despite this graduality, the model postulates a special kind of cognitive process accounting for novelty – in nature, mind or culture. There is thus a smack of extraordinariness left – and still no explanation reached.

### **The ordinary process view: an alternative?**

In the meantime, some theorists in creativity research have given up searching for an extraordinary process underlying creativity (or insight, as psychologists prefer to call the core of creativity in the narrow sense discussed here). They point towards *ordinary* cognitive processes. According to this *ordinary-process view*, creativity can be *demystified* as ordinary cognition. Some of these ordinary processes might well be unconscious and more specific for problems that show the characteristic spontaneous ‘Aha’ experience, but others are not. For instance, the representational-change theory, defended by Knoblich et al. (1999, 2001), focuses on unconscious processes of changing the representation of a problem, while the progress-monitoring theory, defended e.g., MacGregor et al. (2001), stresses conscious heuristics that monitor progress in problem-solving.<sup>16</sup>

In addition, the assumption is sometimes that the *many* cognitive processes involved operate – in the case of insight – at their highest efficiency and in a complex manner. The ordinary processes assumed to make up creativity are, for instance perception, visual imagery, diverse cognitive heuristics such as distortion, repetition, omission and mixing parts of concepts and images, constraint relaxation, chunk decomposition, associational linkage, conceptual combination, analogical reasoning, abstraction, use of metaphors, conceptual expansion, memory retrieval, spreading activation, opportunistic assimilation and so on.

In a nutshell, the ordinary-process view claims that to explain creativity one does not require a special process of chance-configuration. The more radical ordinary-process view perspectives even hold that there is no particular mental operation that *only* creative people and *nobody else* can perform. As Bowden et al. (2005: 323) write: “there are multiple ways in which an insight can be produced”. There will then be evidence for all of the diverse cognitive processes discussed as part of the overarching ordinary-process view without one cognitive process ‘being the winner that takes it all.’<sup>17</sup> In addition, these multiple cognitive processes can interact in complex but highly efficient ways, and at the moment of insight at quite a high speed, and some of them (e.g., perception) on auto-pilot (i.e., not consciously monitored). These aspects – multiplicity, speed, complexity, auto-pilot – and not a hidden unconscious chaos explain why creative agents act spontaneously, and with that they explain why these creative agents often cannot report or reconstruct *how* they came up with their ideas and why it is so hard to predict the occurrence of creativity.

[C]reative thought is not a simple, uniform process. Instead, multiple processes, strategies, and mental operations may be involved, applied by different people, in different ways, at different points in a creative effort.

(Mumford 1999: 344)

What distinguishes the highly creative individual from the only modestly creative one is the confluence of multiple factors, rather than extremely high levels of any particular factor or even the possession of a distinctive trait.

(Sternberg and Sternberg 2016: 434)<sup>18</sup>

What is extraordinary about creativity is multiple and gradual: multiplicity, speed, complexity and the degree of auto-piloting of the ordinary cognitive processes involved vary depending on the amount of training and skill developed. There is no one talent or skill. There is only a network of trained abilities.<sup>19</sup>

This ordinary-process view still regards creativity to be practically hard to access. After all, complexity is often just another word for ‘*hard to access*.’ Nonetheless, the ordinary-process view is an important step forward

towards explaining creativity. The view does not start with the assumption that there is a special cognitive process involved. It is thus remotest from the philosophical tradition with respect to exceptionalist assumptions, since not only does it get rid of the attitude that only few of us can be creative, but it also discards the residuals of the paradigm, namely that there is something extraordinary about creativity, in the person or in the cognitive processes involved.

Why is this good? If we are not biased towards the exceptionalist concept, parsimony tells us to try first to go with ordinary processes only. To put it into an evolutionary argument: why should a special cognitive process for creativity evolve if combining and speeding up normal cognitive processes would do it? For the purpose of explanation, the ordinary process view is less laden with philosophical background assumptions and there is at least direct evidence that these processes exist, even though it is still hard to explain how – in their complex interaction and speed – they can account for actual occurrences of creativity.

### **Summary on the prospects of explaining creativity**

Creativity is hard to explain, like the weather. As science has made progress with the latter, it will make progress with the former as well. Complexity is a practical, transient obstacle, not an in-principle one. It is also likely, given the ordinary-process view, that creativity is not an ability that only few of us have. This holds despite differences in degree with respect to the ‘outstanding’ results produced by specific individuals. Not everyone is a creative storm that changes the intellectual landscape. Yet, as we learned from the early Greek philosophers who started to emancipate philosophy from religion, even a storm operates on natural principles; these are the same principles that account for a mild, refreshing wind on a normal day. No exceptionalities or mysteries are needed to account for either of them. The same holds for creativity. No special process, no exceptionalities are needed to explain any of its occurrences, be it wild or mild.

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## Notes

- 1 This paper integrates arguments that were developed in detail in Kronfeldner (2009, 2010, 2011). In this paper, the focus is on reviewing the situation on whether or not creativity is explainable and if so, in which sense it is.
- 2 See Gaut (2009) for more details on this contrast and on how to distinguish routine learning (following algorithms) from skill (which includes rules of thumb). Only routine, a ‘mechanical’ process is incompatible with creativity.
- 3 See Kronfeldner (2009: 580–581) for more details.
- 4 I take the distinction between true and pseudo-serendipity from Roberts (1989); see Kronfeldner (2011: 38–41) for details and examples. Gaut (2009) also stresses that creativity does not exclude goal-orientedness. I agree.
- 5 A complete in-depth history of theorizing about creativity is, to the best of my knowledge, not yet available. See, however, for instance: Blumenberg (1957) and Mahrenholz (2010), who covered many important aspects from ‘Plato to Nato’. The concept of genius has gotten some in-depth coverage, e.g., in the two volumes of Schmidt (1985) for the period between the years 1750–1945, or in the analysis of the Vienna circle member Edgar Zilsel (1918, 1926).
- 6 This also signals that creativity happens in the minds of people, but it is not reducible to that level of analysis. It is as much social as it is individual. For the social level, see Amabile (1996) or Wheeler (this volume).
- 7 Dealing with non-naturalistic kinds of explanation would lead us too far away, into the muddy waters of the philosophy of explanation, which already struggles to include non-causal naturalistic explanations in a common frame with causal explanation (see Reutlinger, forthcoming). With respect to the second option, I assume, without having the space to argue for it here, that reducing creativity to in-deterministic causation does not capture the core aspects of originality and spontaneity.
- 8 For background on his case and the quotation, see Findlay (1968: 34–41, 39).
- 9 Historians have accumulated some evidence that the report is not correct. See Wotiz and Rudofsky (1984) as well as Rudofsky and Wotiz (1988). Rudofsky and Wotiz criticize using the example as evidence for insight in historical and psychological scholarship. I agree with their criticism, but I still think that we can treat the case as an illustrative example, as a hypothetical paradigmatic example of what we mean when we talk about creativity. It is a usage common in conceptual analysis (see also note 13 below) that certainly does not allow to explain creativity via the example, or to take the example as evidence for one or another scientific theory of creativity.
- 10 There are similar models of trials and error prior to or independent of the Darwinian model. In the mid-nineteenth century, Alexander Bain (1855) formulated a theory of learning based on trial- and-error, a principle that was a mathematical tool, the so-called “Rule of False” before it became incorporated as a theoretical principle in psychology and evolutionary thinking. See Cowles (2015) on that history. Later, Poincaré (1908), a famous mathematician, tried to naturalize creativity by comparing it to a random dance of gas molecules of which some match the ‘hooks’ of the human mind and become conscious. See Boden (this volume) for further aspects of comparing creativity in nature with creativity in minds.
- 11 See Kronfeldner (2010, 2011: 17–22) for a detailed analysis of the different options to interpret ‘blind’ in claims about creativity, offering a formal analysis of undirectedness in the biological sense. Simonton (2013) builds on this and offers an even more formal reconstruction of ‘blind’ along the lines of the above definition of blind as undirectedness, stressing that creativity and sightedness are mathematically inversely related and that directedness (sightedness) comes in degrees. This gives me the chance to comment on his interpretation of my account, since it involves a misinterpretation: I claimed that undirectedness *cannot* have degrees, while directness comes in degrees. “[D]irectedness is a matter of degree, whereas undirectedness is simply the absence or negation of any directness and thus (logically) not a matter of degree.” (Kronfeldner 2010: 196) I went on distinguishing between complete coupling and partial coupling (i.e., complete and partial directedness). Simonton interpreted me as saying that neither undirectedness nor directedness can come in degrees.

- 12 For details, see Kronfeldner (2010, 2011: 53–74). Even true serendipity is guided, i.e., directed in the sense of cognitive coupling of producing and selecting factors (*ibid.* 56–58).
- 13 See Kronfeldner (2011: 10–12) for details on the concept of explanatory triviality assumed here. It contrasts with heuristic triviality. In brief: heuristic triviality is not saying anything new; explanatory triviality is not saying anything explanatory. Thus, adding something to the description of a phenomenon, in a way that enters any serious conceptual analysis, is certainly not heuristically trivial, but it might well be explanatorily trivial, depending on the kind of information added. Only some information about a phenomenon is explanatory. The claim made here is thus compatible with Berys Gaut's remarks about spontaneity, analyticity and triviality (this volume, section on spontaneity, footnote). Whether or not a formal, mathematical reconstruction of the concept of creativity adds empirical, descriptive content, as Simonton (2013: 262) assumes, is another matter that I cannot discuss here. Yet, in any case, it does not explain creativity in the causal sense assumed in the criterion of explanatory triviality.
- 14 Simonton has since published further works and not all of them rely on the claim of a special cognitive process. Stein and Lipton (1989: 39f) also defend such compatibility and use the term "hidden chaos", but in a different sense than Simonton on whom I will concentrate here. For a critique of Stein and Lipton, see Kronfeldner (2010, 2011: 61–63).
- 15 See Kronfeldner (2011: 65–71) for a review of the indirect evidence up to a certain point.
- 16 For a comparison between the two see also: Öllinger et al. (2013). Bowden et al. (2005: 322), in reviewing the differences between representational-change theory and progress-monitoring theory, call the first the "special process" view and the second the "business as usual" view. The difference between his terminology and mine is this: the representational-change theory is also an ordinary-process view in my terminology, even though it is a "special process" view in theirs, referring to a process that is of special importance to understanding certain aspects of insight and thus creativity, but otherwise perfectly ordinary and accessible by the means of cognitive science.
- 17 Öllinger et al (2013) take such an integrative stance, for instance. They treat representational-change theory and progress-monitoring theory as addressing different aspects of insight.
- 18 See also: Weisberg (1993), Ward et al. (1999: 190–191) and Boden (2004: 260ff). The accounts of these authors certainly differ, but not in ways that matter for the point under discussion here.
- 19 With the term 'ability' I want to stay neutral with respect to the distinction between creativity as a disposition or capacity (Gaut, this volume). An ability, in my terminology, can be a disposition or a capacity in Gaut's terminology.

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