

THE CREATIVE MIND: FROM ALGORITHMS TO EXTENDED SUBJECTS

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SUMMARY: 1. *Introduction*. 2. *Creativity and Algorithms*. 3. *Some Creative Works*. 4. *Creative Subjects*. 5. *Conclusion*.

1. INTRODUCTION

To deal exhaustively with philosophical questions relating to the subject of creativity would be like trying to empty the sea with our hands. Given the limits of space, and of our expertise, what we propose here is therefore a very selective path, guided, for obvious reasons, by our main research interests, which are related to the philosophy of mind. Within these limits, we nonetheless hope to be able to offer interesting and at least partly new insights.¹

The path is divided into three parts. In the first part we offer a way of characterising the notion of creativity itself, emphasising that the existence of creativity does not depend, as one might think, on a non-materialist metaphysics of mind, but on the possibility of products that, in a sense to be specified, are non-algorithmic.

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¹ Readers unfamiliar with the contemporary literature in Philosophy of Mind might perhaps imagine that the question of creativity is central to this field. In fact, this is not the case: while a huge amount of literature is devoted to consciousness, intentionality or physicalism, to name but a few examples, contributions on mind and creativity are comparatively very few. Our contribution is therefore rather exploratory, and indeed we thank «Acta Philosophica» for urging us to clarify some of our ideas on such a fascinating topic. For those who wish to frame these ideas in the current philosophical debate, which, although underdeveloped, does exist, we recommend: M. BODEN, *Dimensions of Creativity*, MIT Press, Cambridge MA 1994; ID., *The Creative Mind: Myths and Mechanisms*, Routledge, London 2005; B. GAUT, *The Philosophy of Creativity*, «Philosophy Compass», 5-12 (2010), pp. 1034-1046; B. GAUT, M. KIERAN (eds.), *Creativity and Philosophy*, Routledge, London 2018; C. KAUFMAN, R. J. STERNBERG (eds.), *The Cambridge Handbook of Creativity*, Cambridge University Press, Cambridge 2019; A. KIND, *Imagination and Creative Thinking*, Cambridge University Press, Cambridge 2022.

On the basis of this characterisation of creativity, in the second part we propose some examples of creative works, selected for their non-obviousness, and in any case linked to certain reflections offered by philosophers of mind in a broad sense.

Having characterised creativity and examined some examples of creative works, in the third and final part we consider the question of the subjects of creativity. With regard to this topic as well, we try to emphasise a relatively unusual aspect, namely what can be called collective creativity. Without denying the – perhaps over-emphasised – existence of solitary creative geniuses, on the basis of recent developments in the philosophy of mind relating to the so-called ‘extended mind’, we would like to suggest the existence, and value, of a widespread communal creativity.

Having outlined the three stages of our journey, let us therefore begin with the first, trying to give a useful characterisation of such a crucial and elusive notion as that of creativity.

2. CREATIVITY AND ALGORITHMS

2. 1. *Creative souls?*

In the fifth part of his *Discourse on the Method*, Descartes imagines talking machines, machines, that is, constructed in such a way as to utter words as the effect of actions that bring about some change in their mechanical ‘organs’. For example, Descartes says, if you touch the machine at one point, the machine itself may ask what you want it to say, or if you touch it at another point, it may shout that you are hurting it, and so on. The point is, however – Descartes continues – that no machine will ever be able to organise its words to respond to the meaning of anything that is said in its presence, as even the most obtuse men are able to do. And what is true for machines, Descartes adds, is also true for animals: none of them are able to speak a language like human ones, which proves that animals are ultimately only ‘biological machines’. Only human beings, whose machine-body is inhabited by the immaterial soul, can, by virtue of the powers of the soul itself, free themselves from mechanical constraint and access the creative use of language.²

These ideas are well-known, and have had a profound influence on our culture at various levels. What we would like to observe in this context is the connection that Descartes establishes between soul possession and creativity: the only creative beings in the proper sense are those endowed with souls, whereas what is material seems destined *per se* to the greyness of mechanical repetition.

² R. DESCARTES, *Discours de la Méthode* (1637), in D. KAMBOUCHNER, J. M. BEYSSADE (eds.), *Ouvres Complètes III: Discours de la Méthode/Dioptriques/Météores/La Géométrie*, Gallimard, Paris 2009.

This is a thought that may still have a hold, despite the fact that the cultural, and metaphysical, coordinates of our world are far removed from Cartesian ones. After all, one might think, at least implicitly, that the soul is (also) a guarantee of creativity – or at least of its possibility –, whereas the material world can only lack ‘creative light’. We want to begin this brief philosophical journey into creativity by suggesting that this way of thinking is not so convincing.

Let us first consider the idea that the soul is in itself a guarantee of the possibility of creative acts. This idea seems to be linked to the contrast between the soul’s freedom and the mechanical repetitiveness of matter: the soul – at least in a generic way, and even by common sense – is associated with qualities such as autonomy, independence, and sovereignty over itself, attributes that would allow it precisely to exercise creative capacity. But although this set of attributes, and the resulting creativity, are commonly associated with entities such as souls, there is nothing in the idea of an immaterial thinking substance that implies its being free and creative. In his *Essays on Theodicy*, for example, Leibniz writes that

[...] it is easy to believe that the soul is a spiritual automaton still more admirable, and that it is through divine preformation that it produces these beautiful ideas, wherein our will has no part and to which our art cannot attain.³

There is no need to subscribe to all aspects of the Leibnizian conception in order to accept the possibility of the soul as a *spiritual automaton* and therefore, it would seem, as an automaton, devoid of any real creative capacity. In itself, then, we suggest, the soul is no guarantee of creativity.

One might think, however, that if the soul is not necessarily associated with the possibility of being creative, certainly the body, and matter in general, are a place where creativity simply cannot exist. In fact, just as the soul is associated with creativity by a widespread opinion, so matter, by an equally widespread – and very Cartesian – opinion, is often still seen as a sort of ‘big clock’, which proceeds according to precise and blind rules (not even quantum physics, with its indeterminism, has shaken this image: the ‘rules’ of nature are in any case blind and precise, albeit of a probabilistic precision). However, just as the soul, in itself, does not guarantee creativity, being material in itself does not imply the negation of creativity itself. A Bergsonian material universe, so to speak, in which living matter develops according to a process of ‘creative evolution’, does indeed seem entirely conceivable. And certain philosophical-scientific tendencies – from certain recent forms of panpsychism to the theory of autopoietic systems – seem to be moving in this direction, without denying the value of physical science.

³ G. W. LEIBNIZ, *Essais de Theodicée* (1710); Eng. trans. *Theodicy*, Open Court, La Salle 1985, § 403.

The immaterial/material distinction, then, does not align with the creative/non-creative distinction, or at least that is what we would like to suggest here. If this is the case, one must then ask in what other terms the question of creativity is to be posed. One possibility, which we explore in the next section, is to think of the creative/non-creative dichotomy in terms of the contrast between non-algorithmic and algorithmic.

2. 2. *Not produced by algorithms*

As it is well known, various, and equivalent, technical definitions of the informal notion of ‘algorithm’ have been offered – in terms of recursive functions, Turing machines, lambda calculus, and so on. For our purposes, however, there is no need to refer to these celebrated mathematical theories, and we shall content ourselves with a rather usual characterisation of the informal notion.

In general, then, an algorithm is a procedure that solves a given problem, and this procedure consists of a finite sequence of elementary steps: a finite number of operations are performed on certain initial data in order to mechanically obtain a certain result. More specifically, the steps of the finite sequence of operations must be elementary, i.e. they must not be further decomposable into component steps; these ‘atomic’ steps must, then, be interpretable in a direct and unambiguous manner by the executor of the operation, and the execution of the operations themselves must lead to a single result, and to the same single result from the same initial data. An algorithm executor, be it a human being or, for example, a computer, thus performs a mechanical procedure.

Having briefly discussed the notion of an algorithm, it seems to us that the following principle is largely non-controversial:

1) If x is the result of an algorithmic procedure, then x is not the result of an act of creativity.

From 1), of course, it follows that not being the result of an algorithmic procedure is a necessary condition for creativity:

2) If x is the result of an act of creativity, then x is not the result of an algorithmic procedure.

In the attempt to characterise what is creative, and to distinguish it from what is not, principle 2) seems to be at least a good starting point. A way of articulating this starting point is as follows. It could be argued that the genuine fruit of a creative act is not only something that has not in fact been achieved by an algorithm, but something that, in principle, *cannot* be achieved by an algorithm. Ultimately, what we consider to be genuine products of creativity are things that cannot be (re)produced mechanically, and not just things that in fact have not been. If this is true, then we can write – and subscribe to – a modified version of 2):

2*) If x is the result of an act of creativity, then x cannot be obtained algorithmically.

Having obtained 2*), a further step is to ask whether the converse of this principle is also true, i.e. to ask whether it is also true that

2*C) If x cannot be obtained algorithmically, then x is the result of an act of creativity.

If, in addition to 2*), 2*C) were also subscribed to, we would have a simple and complete characterisation of what is a result of an act of creativity, i.e. what cannot be obtained by means of an algorithm:

2* + 2*C) x is the result of an act of creativity if and only if x cannot be obtained algorithmically.

Often, however, the simplest solutions are also misleading, and this, it seems to us, is one of those cases. Indeed, it is not difficult to realise that 2*C) is actually a very dubious principle. To see the point let us consider the case of a blind process that produces a certain result in a completely random way, a result that cannot be obtained through an algorithm. In this situation we have something that cannot be obtained by algorithmic means, but which we would find it hard to recognise, if not ironically, as the fruit of an act of creativity: creative works are not generated from chaos by blind processes.

However, this observation offers us the opportunity to supplement our characterisation of creativity. First of all, it will be necessary to say that the product of a creative act is the result of a deliberate, non-blind effort. And we will also have to add that this product exhibits a peculiar form of order (it is not a chaotic product), although this order is not traceable to the operations of an algorithm. From these observations derives the characterisation of the notion of creative product that we propose in this article:

3) x is the product of an act of creativity if and only if x is the product of a deliberate action and exhibits a 'non-algorithmic' form of order.

Of course, we are under no illusion that we have thereby provided the 'definitive' definition of such an elusive notion as creativity. But we do think that principle 3) usefully captures some important aspects of what is creative.⁴ That this is the case, we will try to show by considering some examples of creative works, examples to which the next section is devoted.

⁴ Some might perhaps challenge our definition arguing that there are creative algorithms. In what follows, we do not delve into this line of argument, the examination of which would simply force us to write a different article, given the breadth of the debate we would have to consider. We merely observe here that, in our opinion, those who invoke the creativity of algorithms often tend to confuse the fact that the results of some algorithms are *surprising* with the fact that they are the product of creative processes.

3. SOME CREATIVE WORKS

3. 1. *Common sense actions*

Let us consider the completely ordinary case of a person ordering a steak at a restaurant. After ten minutes, the waiter comes out of the kitchen with a plate in his hand and places it on the customer's table as one would expect to happen, and as usually happens in such cases. Nothing strange, and all very simple. However, it should be noted that in placing his order, the customer only uttered a few words such as, for example, "Bring me a steak". Now: even if you never think about it, there is an indefinite number of 'aberrant' ways in which this request can be fulfilled. The waiter could bring a steak two years after the order, delivering it to the customer's home. Or he might bring it after ten minutes, but raw. Or he could bring it, cooked, after ten minutes but slip it into the customer's jacket pocket. Ultimately, the customer just said "Bring me a steak" and all the scenarios just considered, although peculiar, are compatible with his request. And, of course, the ways of fulfilling this request in perverse ways are many more than those just listed, and perhaps even more bizarre. The waiter, for instance, might bring the customer a steak, cooked as it should be, but in the stomach of a large toy dinosaur. Or he could bring him a 20-foot steak and put it on his head. Or bring him the steak by slowly dragging it across the floor, and so on. There is no limit to the possibilities that the waiter excludes – as a matter of fact, and without thinking about it – in performing the customary action of bringing a steak to the customer, an entirely ordinary action to which we are all familiar with.

Before we see why these strange remarks do, in fact, have to do with creativity, let us observe that the case of the waiter and the customer is only one of an infinite number of entirely common cases that can give rise to similar considerations. If, having been invited to a dinner party, I announce to the other diners that I will be absent to wash my hands before eating, this is compatible with my taking the train to the nearest spa town, washing my hands there, and then returning to my host's house to eat the next day. Or if John asks Mary to open the door, Mary can fulfil John's request, *verbatim*, by breaking down the door with a cannon. As said, and as the reader will have realised, the number and whimsy of these examples can be increased at will.

It is now time to see that what has been said actually has to do with creativity. Let us begin by reconsidering the case of the waiter and the customer, and ask ourselves how the waiter himself is able to exclude the infinite number of deviant possibilities, and only implement the correct one. As we mentioned *en passant*, this is a skill enacted without thought: the waiter certainly does not contemplate, with his mind's eye, an endless series of bizarre possibilities, and then deliberately exclude them. It simply happens that he performs

the right actions. One might think, however, that he has an implicit propositional knowledge at his disposal, and that this enormous data-base is in any case exploited unconsciously to select the relevant possibility. On this point, however, we agree with the American philosopher John Searle, according to whom the capacities that enable the correct behaviour of the waiter are only partly propositional, being instead partly constituted by a non-propositional, and non-conceptualisable *background* that constantly guides and supports our actions, making it natural, fluid and mostly appropriate.⁵

That this is the case seems to us to be confirmed by a well-known difficulty in artificial intelligence: while there are intelligent machines capable of formidable games of chess, or of proving theorems of logic, it is equally well known that one is unable to build machines that always act with common sense – the common sense that allows, among other things, the exclusion of those aberrant possibilities that humans do exclude in an obvious and unreflective manner. This limitation of artificial intelligence speaks in favour of the non-propositional background of knowledge theorised by Searle, a background that guides our actions but cannot guide those of the machines because it cannot be reproduced using propositional-knowledge databases, even if they are gigantic.

At this point we have all the elements to highlight the presence of a whole sphere of human creative activities, omnipresent yet usually unnoticed. According to the characterisation we have proposed, something is a product of creativity when it results from deliberate action and exhibits a form of ‘non-algorithmic’ order. Now, our actions, including an indefinite number of mundane, everyday actions, are evidently deliberately produced, and are ‘ordered’ in the sense that they are (in the vast majority of cases) appropriate to different situations: we know how to open a door, serve a steak, or wash our hands in the required manner without even having to think about it. But while we are able to navigate the everyday world smoothly and fluently, simply using common sense, machines are not able to do so, at least not with our versatility and flexibility. Therefore, those ordered and deliberate products that are our everyday actions are not algorithmically obtainable products, but are to be considered works of creativity. It is, admittedly, a humble type of creativity that is within the reach of all of us, and which, for that very reason, remains unseen. In fact, however, creativity with a capital letter, so to speak, presupposes and is born on the terrain of humble, all-pervasive everyday creativity.

3. 2. *Language*

A specific case of the everyday creativity to which we have just drawn attention is that of the use of language in ordinary conversations and dialogues.

⁵ J. R. SEARLE, *The Rediscovery of the Mind*, MIT Press, Cambridge MA 1992.

It is, however, such a relevant case that we consider it appropriate to devote specific attention to it. (§ 3.2.1). On the other hand, language not only offers a particularly effective exemplification of what was outlined in section 3.1 but, seen from another angle, also allows us to articulate the discourse on creative works in a different direction (§ 3.2.2).

3. 2. 1. Human and artificial conversations

As is well known, in 1950 Alan Turing, reflecting on the notion of artificial intelligence, proposed the following idea: a machine can be considered intelligent if it is capable of answering a human being's questions without being recognised as a machine – or at any rate as a non-human entity – by the human being with whom it is having the conversation.⁶ Therefore, the ability to converse, i.e. to use language in the way any human being uses it in many ordinary situations, would be a sign of the possession of a mind quite similar to the human one.

What interests us here about Turing's idea is to consider briefly what the state of the art is regarding the actual construction of talking – or rather, dialoguing – machines, and to draw a moral from this for the question of creativity.

First, then, let us consider the situation regarding the construction of talking machines in Turing's sense. Despite the optimism of Turing himself, and of many others after him, the reality of the facts is that from 1950 to the present day – years studded with intensive studies and huge investments in the field of A.I. – no machine still has the slightest capacity to conduct 'human' conversations. The following exchange, for example, dates back to 2014:

Human being – The car couldn't fit into the parking space because it was too small. What was too small?

Computer – I believe the car could fit to park. I believe a car could fit really small. I don't know what small was.

The machine in question was taking part in the *Loebner Prize*, an annual artificial intelligence competition that, since 1990, has rewarded the 'artificial conversationalists' most similar to humans. As we read on a web page dedicated to the recent results of the prize,⁷ artificial conversationalists are so easily discovered that, in recent editions, it has been decided not to even try to 'hide' the machines: the prize simply goes to those machines that give the most appreciable results in imitating human conversations. But as the dialogue above suggests – and many others that can be freely consulted online – we are still a long way from an effective imitation of the human.

⁶ A. M. TURING, *Computing Machinery and Intelligence*, «Mind», 59/236 (1950), pp. 433-460.

⁷ <https://artistdetective.wordpress.com/category/turing-test/>.

Why is this happening? Our idea is that, again, the crucial issue is human 'background' skills. Those background skills that – as already mentioned – allow us in general to move naturally in the world of everyday life, are also the basis of our conversational activities in particular: they enable us to select the right words to smoothly conduct the many conversations that punctuate our ordinary lives. The crucial aspect of these background skills – as we have said – is that they are skills that cannot be reduced to a propositional format and, therefore, cannot be imitated by the huge databases of information with which a machine can be equipped.

If this is the case, then not only do machines have, in fact, difficulty in conducting human conversations, but this ability would be precluded to them in principle. Although the point is of course controversial, we suggest that the current enormous difficulties in programming human-speaking machines is at least a clue to drawing this conclusion. And if one subscribes to this conclusion, it follows directly from our characterisation of creative work that the ordinary practice of conducting human conversations is, in fact, a continuous production of works of creativity: a dialogue between human beings, produced by deliberate actions and endowed with an evident order, would not be achievable through the algorithms of a machine.

3. 2. 2. Language and the animal kingdom

There is (at least) another aspect that links the human use of language to the dimension of creativity. To introduce this aspect, we can again refer to Descartes' ideas with which we opened this article. As one will recall, Descartes imagined that one could build machines that, given certain environmental stimuli, would generate as output certain phrases or 'mechanical screams' or the like. And, Descartes added, this is in fact how animal 'language' works. This last point seems worthy of further articulation.

The language of human beings appears to be largely unbound by the environment, in the sense that the utterances of human language, in very many cases, are produced without responding to environmental stimuli. To give just one example, in the middle of a business lunch, while talking about future investments, someone might suddenly talk about Christmas, or football, without responding, in so doing, to any specific environmental stimuli.

This aspect of our conversations is an entirely obvious feature of human linguistic practices, yet its apparent obviousness becomes very surprising when considered against the backdrop of the linguistic practices of non-human animals. Birds, in fact, sing when there is a certain light, or because they sense a potential partner nearby; a dog, in turn, yelps because it has been injured, or barks in the presence of a threat; and so on. What can be called animal language appears, then, as a response to environmental stim-

uli, just as Descartes imagined the language of machines – and of animals themselves – to be.

How can this difference between humans and non-human animals be accounted for? An interesting and persuasive explanation is the one offered by Chomsky and Berwick, according to whom the acquisition of the (astonishing) ability to hierarchically assemble syntactic structure, exclusive to us humans, would have occurred in order to have an internal tool for thinking, and not out of necessity for communication – considered by the two scholars as insufficient to exert adequate selective pressure.⁸

If this is so, then our language (and only ours) is not a communicative response to environmental stimuli, but an internal faculty of thought, later externalised through the sense-motor system. And this would explain the observed freedom and creativity of our language compared to that of other animals. For it is precisely creativity that we seem to be dealing with. While, in fact, the response to environmental stimuli is fixed and ultimately algorithmic, the unpredictable production of sentences, without specific external stimuli, does not appear to be algorithmic at all, although it is certainly deliberate and ordered. And the orderliness of a deliberate, non-algorithmic product is the sign of an act of creativity.

3. 2. 3. Theorems

Up to this point, we have considered cases of entirely ordinary creative works, and for this very reason, perhaps, surprising in their being creative. With our last example of works of creativity, we want instead to turn to the realm of intellectual work proper. If one wants to go in this direction, the first idea that comes to mind is to consider the areas of literature and art in general, areas with which creativity is most obviously, and rightly, associated. Although this is an entirely natural choice, here we would, however, prefer to consider an area of intellectual activity of which it may be doubted that it ultimately requires genuine forms of creativity: the area of mathematics and logic.

In 1956, Allen Newell, Herbert Simon and Cliff Shaw created the famous computer programme *Logic Theorist*, the first artificial intelligence programme deliberately designed for automatic reasoning. In particular, *Logic Theorist*'s first achievement was to prove certain mathematical theorems like those used by Russell and Whitehead in their *Principia Mathematica*.

Faced with a computer demonstrating mathematical theorems, one might be led to think that mathematics itself, and specifically the ability to recognise certain statements as theorems, is in principle mechanisable and therefore ul-

⁸ R. C. BERWICK, N. CHOMSKY, *Why Only Us: Language and Evolution*, MIT Press, Cambridge MA 2017.

timately non-creative. This hypothesis, although it may seem reasonable in the light of certain A.I. results, is, however, demonstrably false, and this can be asserted on the basis of important results obtained precisely in the field of mathematical logic. Although providing all the (complicated) technical details of these results is out of place here, we would at least like to indicate in general terms what these results are, as we believe the cultural value of these very results has not been sufficiently appreciated.⁹

Let us begin by considering arithmetic, a mathematical theory of which everyone has some knowledge. A famous statement of arithmetic is Fermat's Conjecture about which, in the absence of a proof, the question has long been raised as to whether or not it is really a theorem of arithmetic. Now: could there not exist, in principle, a machine that, given any statement of arithmetic, would tell us whether or not this statement is a theorem of arithmetic itself (perhaps producing a proof, if one exists)? This is, of course, a legitimate and interesting question, and what is even more interesting is that for this question we have a clear and definitive answer: the machine in question cannot exist. Let us briefly see why.

One can define in a mathematically rigorous way a certain set of functions, the recursive functions, which, according to the so-called 'Church-Turing Thesis', formalise in a precise way the intuitive notion of algorithm: if there exists an algorithm to solve a certain problem, says the Church-Turing Thesis, then there will exist, as its formal counterpart, a recursive function that solves the same problem; and, therefore, *if there is no recursive function that solves that problem, then there will not be an algorithm capable of doing so either.*

We then say that the property 'being a theorem of arithmetic' is recursively decidable if and only if there exists a recursive function that, given a certain arithmetic statement *S* as argument, gives as value 'yes' or 'no' depending on whether *S* itself is a theorem of arithmetic or not.

We now come to the fundamental logico-mathematical result we wish to discuss: it has been proved, in a mathematically rigorous manner, that the property 'being a theorem of arithmetic' is not recursively decidable. This means that there is no recursive function that, given a certain arithmetic statement *S* as an argument, gives the value 'yes' or 'no' depending on whether *S* itself is an arithmetic theorem or not. But according to the Church-Turing Thesis, if this function does not exist, then neither will there be an algorithm capable of telling us whether a given arithmetic statement is or is not an arithmetic theorem. And this means that, in principle, there can be no machine that decides arithmetical 'theoremhood'.

⁹ For details see P. SMITH, *An Introduction to Gödel's Theorems*, Cambridge University Press, Cambridge 2007, chapters 30 and 31.

This, it seems to us, is a result of great cultural importance, and one that immediately relates to the subject of mathematical creativity. Recognising that a certain statement is a theorem is, of course, a deliberate and orderly action; if we add to this the fact that there are cases in which this recognition cannot be the product of an algorithm, it follows that there can be cases of mathematical creativity, and that mathematics, in principle, is not only the sphere of the mechanical application of rules of calculation.

4. CREATIVE SUBJECTS

After having considered some relatively unusual examples of creative works, as the last stage of our journey we propose a reflection no longer on the works but on the subjects of creativity – and here too, we believe, following a road little travelled.

When reflecting on creative subjectivity, be it ordinary people talking to each other or, as is usually the case, great artists or scientists, the focus is almost always on the individual. Without denying that individual creativity exists and is to be recognised, here, however, we want to emphasise how the dimension of creativity itself can also include non-individual subjects or, at least, subjects ‘extended’ beyond their bodies.

In order to clarify these ideas that, barely mentioned, inevitably sound a little obscure, it is necessary to refer to a debate that, for more than twenty years, has constituted one of the main areas of research in the philosophy of mind and cognitive sciences: that of the extended mind or extended cognition.

4. 1. *The extended mind*

“Where does the mind stop and the rest of the world begin?”. With this question begins the article *The Extended Mind* by philosophers Andy Clark and David Chalmers,¹⁰ in which the idea of the extended mind is explicitly presented. The paper defends the thesis that the boundary represented by ‘skin-and-skull’, traditionally accepted as the border between mind and world, should be challenged. Interactions between agent and environment would sometimes be so intimate, continuous and relevant as to configure the possibility that cognitive and mental states, habitually attributed to the subject, literally extend beyond the organism. Not a metaphor, then, but a true extension of the mental sphere to physical and social reality (as we shall see, this is referred to as ‘socially extended mind’). Anyone who thinks otherwise would be the victim of an internalist prejudice that makes us lean towards accepting the epidermal boundary as the inalienable frontier between mind and world.

¹⁰ A. CLARK, D. CHALMERS, *The Extended Mind*, «Analysis», 58/1 (1998), pp. 7-19.

Clark and Chalmers' argumentative strategy is based on an innovative re-interpretation of many aspects of contemporary cognitive science,¹¹ but also employs ingenious thought experiments, on the whole aimed at reforming – if not revolutionising – the usual use of terms such as 'cognitive' and 'mental'.

To begin with, we can start with a well-known thought experiment featuring Otto and Inga. Otto suffers from Alzheimer's disease and in order to overcome the memory deficits related to this pathology, he always carries a notebook with him, which serves as a support for his now compromised biological memory. For example, Otto jots down the address of the Museum of Modern Art in his notebook. Thus, when one day he hears about a very interesting exhibition at the museum, he relies on the notebook to retrieve the address and travel to his destination. In this case, the notebook plays the causal role of his damaged biological memory. A biological memory that is instead perfectly in order in the second protagonist of our story, Inga. Inga also hears about the exhibition and, thanks to her memory, retrieves the address of the exhibition, which enables her to reach the museum.

Now: it seems obvious that thanks to her memory Inga possesses a belief about the address of the museum. But what about Otto? If it was written in the notebook that the museum was in Piazza Duomo, can we say that Otto believed it was there? Can we say that the notebook is the seat of dispositional (non-occurring) beliefs of Otto? For Clark and Chalmers, the answer is positive:

[...] insofar as beliefs and desires are characterised by their explanatory roles, Otto's and Inga's cases seem to be on a par: the essential causal dynamics of the two cases mirror each other precisely.¹²

The reference to causal dynamics shows how underlying the idea of the extended mind is a *functionalist* conception of the mind, according to which, what defines a mental state is the functional role it plays. From this perspective, it becomes natural to state that

there is nothing sacred about skull and skin. What makes some information count as a belief is the role it plays, and there is no reason why the relevant role can only be played from inside the body.¹³

In addition to thought experiments, contributing to the extended mind hypothesis is the growing awareness of the pervasiveness of interactions between human beings and tools and technologies, which foster and enhance our thinking capabilities. To convince oneself of this, one only has to ask what would become of us without our smartphones, tablets, satnavs and comput-

¹¹ See also, for example: A. CLARK, *Being There: Putting Brain, Body, and World Together Again*, Bradford, Cambridge MA 1997.

¹² A. CLARK, D. CHALMERS, *The Extended Mind*, cit., p. 13.

¹³ *Ibidem*, p. 14.

ers. We would feel lost, to say the least. In a way, we would no longer be the same. And things would get drastically worse if we suddenly found ourselves unable to read, write, interpret the public representations our world is dotted with, from maps to street signs, from house numbers to astronomical calendars and so on. The intensity and pervasiveness of the relationship between the biological mind and what has been called cognitive scaffolding opens the way to the thesis of a real extension of the physical basis of our mind:

when our technologies actively, automatically, and continually tailor themselves to us just as we do to them, then the line between tool and user becomes flimsy indeed. Such technologies will be less like tools and more like part of the mental apparatus of the person. They will remain tools in only the thin and ultimately paradoxical sense in which my own unconsciously operating neural structures (my hippocampus, my posterior parietal cortex) are tools.¹⁴

As one can easily imagine, such a controversial thesis has triggered a vast and lively debate.¹⁵ The point we are concerned with here, however, is circumscribed and concerns the impact this hypothesis may have on our conception of ourselves, our intelligence and, ultimately, our creative abilities. Before doing so, however, we at least want to give an insight into a further stage of philosophical reflection on the extended mind, that of the possible social extension of the mind itself.

4. 2. *The socially extended mind*

The original idea of the extended mind emerged in the last years of the 20th century. However, in recent times, the initial proposal has been joined by a new and even more radical idea of mind-extension, which goes far beyond the initial 'moderate' extensions and ends up hypothesising an environmental and cultural scaffolding of cognitive activities. This is the position that has been called 'socially extended mind', according to which our cognitive capacities can literally extend by exploiting various social practices and institutions.

According to Shaun Gallagher, a leading exponent of the idea of the socially extended mind, legal systems, research practices and cultural institutions, such as museums

are at least enabling conditions, and on the most liberal reading, constitutive [of mind extension].¹⁶ [...] Just as a notebook or a hand-held piece of technology may be viewed as affording a way to enhance or extend our mental possibilities, so our

¹⁴ A. CLARK, *Natural-Born Cyborgs*, Oxford University Press, Oxford 2003, p. 7.

¹⁵ See, for example, R. MENARY (ed.), *The Extended Mind*, MIT Press, Cambridge MA 2010, and M. DI FRANCESCO, G. PIREDDA, *La mente estesa*, Mondadori, Milano 2012.

¹⁶ S. GALLAGHER, *The Socially Extended Mind*, «Cognitive Systems Research», 25-26 (2013), pp. 4-12: 6.

encounters with others, especially in the context of various institutional procedures and social practices may offer structures that support and extend our cognitive abilities.¹⁷

For Gallagher, in order to extend the mind, we should not look for functional similarities between internal and external processes, but rather look for ‘social affordances’ that enable a social extension of the mind. The process would involve things like legal systems, research practices and cultural institutions. Gallagher is quite radical here. From the fact that without social institutions certain cognitive processes enabled by them would no longer exist, he concludes that those institutions are constituents (i.e., parts) of the mental processes involved. This is certainly a very controversial idea, but also a fascinating one that recalls some important theses of the philosophical tradition:

We propose to extend Clark and Chalmer’s concept of the extended mind to consider the possibility that social institutions (e.g., legal systems, museums) may operate in ways similar to the hand-held conveniences (notebooks, calculators) that are often used as examples of extended mind. The inspiration for this suggestion can be found in the writings of Hegel on “objective spirit”, which involves the mind in a constant process of externalizing and internalizing.¹⁸

4. 3. *Extended creativity*

As we have just seen, the extended mind proposal has first and foremost a metaphysical aspect: the external supports that cooperate with our cognitive activities are genuine extensions, constituent parts of the material basis of our mind. There is, however, the possibility of understanding the extended mind thesis also in a weaker sense, which we might call ‘epistemological’: that is, it can be argued that there are entities that, although not part of the mind proper, nevertheless provide the enabling conditions for a series of new thinking capacities.

The first option, the metaphysical one, is highly controversial and still the subject of heated specialist discussions that need not be considered here.¹⁹ And it is not necessary to do so because, for the present purposes, it is sufficient to stick to the second interpretation of the extended mind (without wishing to exclude the first) which, in itself, opens up interesting anthropological reflections linked to the theme that interests us here, that of creativity. In particular, we would like to briefly consider three aspects of creativity that take on a new light when viewed from the perspective of the extended mind.

¹⁷ *Ibidem*, p. 4.

¹⁸ A. CRISAFI, S. GALLAGHER, *Mental Institutions*, «Topoi», 28/1 (2009), pp. 45-51, p. 50.

¹⁹ See, for example: M. DI FRANCESCO, A. TOMASETTA, *A Not-So-Extended Mind*, «Reti, Saperi, Linguaggi», 12 (2017), pp. 261-273.

First of all, it can be observed that highlighting the existence of (epistemologically) extended subjectivities allows us to place the figure of the creative genius in a light that, in our opinion, is more in keeping with reality. As is well known, in the Romantic era, the creative subject was seen as an individual of genius who, with his or her own forces alone, creates his or her works almost from nothing. Now, apart from the obvious exaggerations contained in this stereotype, it is a fact that, generally speaking, the subject of creativity is still conceived along these lines. Against this assumption, we would like to suggest that the romantic view is in fact a very partial conception of creative subjectivity. The extension of the mind to other objects, and its participation/immersion in the complex of institutions, indicates that the acts of creative subjects are never acts of isolated minds. Creative subjects are not 'monadic' entities, but always emerge, and depend in a necessary way, on a vast mental-environmental network of which each individual mind is a node. Even without denying that some of these 'nodes' have particular creative merits, it must be emphasised that 'romantic' creative genius can only arise against the backdrop of a collective, subjective-objective mind, of which genius itself is (at least epistemologically) a necessary part.

There is another aspect of creative subjectivity that the idea of the extended mind allows us to highlight, and it is the following. As mentioned earlier, there are 'everyday' creative works such as holding a conversation, or serving a steak in the right way. In the light of the extended mind, this type of creativity appears more distinctly for what it is: a common, everyday, *shared* creative endeavour, enacted by minds that are constantly networked. Our everyday life itself, thus, appears as a gigantic creative work enacted by an extended macro-mind.

A final aspect we would like to emphasise of the relationship between creative subjectivity and the extended mind has to do with the reflection on the cognitive enhancement of the biological brain that has accompanied the debate on the extended mind itself. From the perspective of the extended mind, in fact, it becomes visible how our nature as subjects endowed with mind is (in our cultural systems) enhanced by our relations with cognitive artefacts and social institutions:

Our mature mental routines are not merely self-engineered: they are massively, overwhelmingly, almost unimaginably self-engineered. The linguistic scaffoldings that surround us, and that we ourselves create, are both cognition enhancing in their own right and help provide the tools we use to discover and build the myriad other props and scaffoldings whose cumulative effect is to press minds like ours from the biological flux.²⁰

²⁰ A. CLARK, *Supersizing the Mind*, Oxford University Press, Oxford 2010, p. 60.

The idea is that we are not Pleistocene minds trapped in the 21st century technological environment, but rather that we are 21st century minds still largely implemented by a Pleistocene brain. If this is the case, the ever-increasing presence in our social and cultural environment of various cognitive scaffolds that are or will be part of the material basis of human thought opens the way for hyper-extended brains/minds and the possible emergence of new forms of thinking. That is, humans appear as *natural-born cyborgs*,²¹ endowed with an extendible and upgradable mind, and one wonders how far this extension-related enhancement can go. The model of extended cognition, therefore, at least allows one to imagine the future existence of unprecedented forms of creativity – realised not in the isolated mind of the individual creator, but in the exploitation of the potential emerging from the interaction between mind, body, and physical and cultural environment.

5. CONCLUSION

Reflecting philosophically on creativity, as the reader has been able to see, leads to dealing with many different issues. These certainly include issues of aesthetics and philosophy of art, which are, indeed, among the first that come to mind when speaking of creative acts. We have preferred to follow a perhaps less usual path, highlighting hidden realms of widespread creativity or areas of creativity that are not always the focus of attention. This choice – due to our preferences, as well as our expertise – is inevitably partial, given the boundless field a philosopher of creativity can deal with. But we believe and hope that, however partial, our contribution may fuel further, and creative, reflections on this fascinating and elusive topic.

ABSTRACT · We propose a journey into creativity in three stages, all three of which are inspired by our main research interests, which are primarily related to the philosophy of mind. 1) We characterise the notion of creativity in terms of non-algorithmicity – and not in terms of the metaphysics of mind. 2) Based on point 1, we give relatively unusual examples of creative works. 3) Among the possible subjects of creativity, we emphasise ‘extended subjects’, referring to ideas from the recent ‘extended mind’ debate.

KEYWORDS · Creativity, Algorithm, Common Sense, Language, Mathematics, Mind Extension.

²¹ A. CLARK, *Natural-Born Cyborgs*, cit.