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**Creativity, Human and Transhuman: The Childhood Factor**

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**Abstract:** Transhumanists, like other elites in modernity, place great value on human creativity, and advances in human enhancement and AI form the basis of their propos- als for boosting it. However, there are problems with this perspective, due to the unique ways in which humans have evolved, procreated and socialized. I first describe how creativity is related to past evolution and developmental aspects in children, stressing pretend play and the ambivalent character of creativity. Then, I outline proposals for enhancing creativity, be it in embodied humans on the way to a superior species, in AI- related beings (virtual reality, robotics), or even in any degree of mixture in human- machine interaction. In the final section, I describe intrinsic limits to these proposals, such as the absence of a good understanding of human psychology by the proponents of enhancement; the lack of interest in the subjective side of creativity (for one’s own sake); delayed maturation and the ambivalence of pretend play in childhood; and the contrariness typical of new human generations. As for the enhancement of creativity, it is argued that creativity in its social context may be the victim of its own past success. On the other hand, an asymmetry between virtual beings and children is described— the latter can behave in a nasty way, it is part of their growth and creativity, whereas the former are not supposed to cause any harm to human beings. In sum, despite impressive progress in several scientific and technological interventions in creativity, philosophical questions emerge that place many constraints on transhumanist dreams of endless creativity.

**Key words:** transhumanism, creativity, childhood, artificial intelligence, enhance- ment, contrariness



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# Introduction

Creativity has become valuable to Westerners due to influences from the Enlight- enment and Romanticism; Westerners relate to the yearning for creative imagina- tion (Runco and Albert 2010).1 In its contemporary meaning, the word “creativity” came into being only in 1875 (Merriam-Webster Dictionary). It has been under- stood both as a gift and a culture, something that education should promote (Craft, Jeffrey, and Leibling 2001, 1). However, fostering creativity is a difficult and uncertain task; thus, many have devised technological means to boost creativity, mitigating or even avoiding the difficulties associated with traditional approaches to establish creativity.

I would like to present transhumanism as a recent and audacious worldview that values advanced developments in science and technology. Transhumanism can be understood as “[t]he intellectual and cultural movement that affirms the possibility and desirability of fundamentally improving the human condition through applied reason, especially by developing and making widely available technologies to eliminate aging and to greatly enhance human intellectual, physi- cal, and psychological capacities” (Bostrom 2003, 4).2 Behind this point of view are a sizeable number of creative technologists working in renowned universities and laboratories, financed by governments and corporations. Among them, I can highlight Max More and Natasha Vita-More, Nick Bostrom, James Hughes, Ben Goertzel and Anders Sandberg.3 The main organization fostering transhumanism is the Los Angeles–based “Humanity plus,” but transhumanism does not represent a homogeneous group of people—transhumanism is more of an umbrella term. The posthumans envisioned by this movement should be closer to perfect and qualitatively different from what we are. As I will show, this proposal for improve- ment on current conditions values creativity.

I broaden the group of scholars who consider themselves transhumanists by including all pro-enhancement individuals that share the same optimistic prospect for the future.

The basic purpose of this paper is to preliminarily assess the efforts of boost- ing creativity in AI and robotics and in transhumanist writing, contrasting them with the evolutionary trajectory of humans, with an emphasis on procreation and childhood. Therefore, I will work with two types of problems: those inherent to any human enhancement and AI, and others related to their appropriation by trans- humanists. I intend to show that it is indeed possible to enhance creativity accord- ing to transhumanist proposals; however, the ultimate outcome of this process will

be contradictory precisely because of the peculiar sources of embodied creativity in humans.

# 1.  Setting the Scene

To engage transhumanist thinking, diverse as it is, I followed two routes; first, I resorted to search mechanisms, using keywords such as “creativity” and “child- hood,” and reliable sources such as the *Journal of Evolution and Technology*, *Humanity+ Magazine*, and a sample of some fifty books favoring transhumanist ideas, whether single authored or edited collections. Second, following a more traditional route, this work involved standard bibliographic research in databases. The first route is certainly less reliable, but it might provide us an overall idea of transhumanist emphases. For the same reason, some assertions below will be somewhat more hypothetical.

With this in mind, I can outline some transhumanist ideals and their relation- ship to creativity, anticipating what will be addressed in sections three and four below. Transhumanists and like-minded people place great emphasis on creativity, although this result occurs within the general label “intelligence.” They follow in this respect ideas in modernity usually linked with scientific progress. As Max More, a leading transhumanist, says:

What is the core content of this philosophy? A simple yet helpful way to grasp its nature is to think of transhumanism as “trans-humanism” plus “transhuman-ism.” “Trans-humanism” emphasizes the philosophy’s roots in Enlightenment humanism. From here comes the emphasis on progress (its possibility and desirability, not its inevitability), on taking personal charge of creating better futures rather than hoping or praying for them to be brought about by supernatural forces, and on reason, technology, scien- tific method, and human creativity rather than faith. (More 2013, 4)

Note that human creativity is associated with a string of other means for a better future, marked by a progress in our condition—that is, human enhancement. What transhumanists understand by the latter is, briefly speaking, the “enhancement of our native human capacities, enabling us to achieve certain effects that would otherwise require more effort or be altogether beyond our power” (Savulescu and Bostrom 2009, 2). This definition is recognizably vague; therefore, the authors seek to interpret it in terms of more concrete situations. Among human capaci- ties to be enhanced, usually included are the extension of lifespan, intellectual capacity, body functionality, sensory modalities, special faculties, and sensibili-

ties—mood, energy, and self-control. The ultimate goal is eventually to become a post-human (Bostrom 2005). Creativity is usually located by these authors in the cognitive realm, so the aspect to be enhanced is mostly the intellect.

Although they seek to popularize the benefits of enhancement, the beneficia- ries in practice are essentially those people in a consumeristic society who seek better health and quality of life in old age and are willing to extend human lifes- pan as far as possible. Indeed, radical life extension is one of the main goals of transhumanism. Moreover, as suggested by Max More’s quotation above, in this account traditional religion (prayer and supernatural forces) has failed miserably to promote healing of the human condition and the improvement of our lot. With their characteristically upbeat mood, transhumanists believe that one of the results of their technological efforts to accomplish human enhancement, is healing and heightening creativity (Goertzel 2015, 612).

According to common sense, aging is related to a decrease in productivity and creativity. Therefore, transhumanists seek to ensure that aging is no longer a problem, so adults could be creative for as long as they wish For example, biolo- gist James T. Bradley, although not himself a transhumanist, is optimistic about biological enhancement. He, too, prizes progress and perfection well beyond the limits of our faulty body, brain and mind. Like some transhumanists, Bradley thinks that adults can proceed with creativity in an extended life free from the bur- den of raising children. However, he is well aware of the limitations and risks of meddling with human nature: “Do you believe creativity in art and science would suffer if human lifespans increased to 150 years and the birthrate halved world- wide? What if lifespans were increased to several hundred years and the birthrate was lowered to maintain zero population growth?” (Bradley 2013, 222) As with most pro-enhancers, he is confident that science, technology, and human prudence will offer a way out of this challenge. Scenarios envisaged by pro-enhancers for the future involve, for example, smart drugs, genetic tinkering, cyborgs, robotics, and AI.

Moreover, even though these scholars have different views of creativity, they usually understand it as performed by paradigmatic people like scientists/tech- nologists and Western artists, two classes of people that are usually rather creative. As AI expert Bruce F. Katz states:

As a tentative, working definition of creativity, we can say that it involves the ability to produce items that are both novel and useful . . . Given this view, it must be concluded that most of us do not possess this trait in abun-

dance. It is relatively easy to produce something novel, but to create some- thing that is also of great utility is an entirely different matter. (Katz 2008, 75)

From this utilitarian outlook, creativity is represented by an elite class of gifted people in the arts and sciences producing useful novelties. Its enhancement places emphasis on the individual, something that should be expected from those who see continuity between humanist thought and transhumanism. However, be- cause many transhumanists convey democratic concerns, this view of creativity appears contradictory (Hughes 2010).

As I have argued elsewhere, transhumanists view biological evolution as flawed (Cruz 2015, 837). Consequently, many of them consider aspects of biologi- cal evolution that led to present human creativity, through phylogeny and ontog- eny, to be of little account, focusing rather on contemporary, fully-formed human beings and their idealized views on creativity (with due exceptions), with much optimized forms of directed progress. Occasionally, scholars in this community suggest using the very mechanisms of evolution to supplant its limits. However, would not the reading of evolution and the concern with its flaws of these authors block the prospects of increasing creativity? That question is one that I will try to answer in the following sections.

Missing in transhumanist accounts, among other things, are the life-course of individuals in their social environment (with special emphasis on childhood) and the “dark side” of creativity in general, deception being one of its characteristics. As we will see, human beings apparently live on the virtues of their defects.

Thus far, I have highlighted some transhumanist ideas on creativity, as well some problems associated with those ideas. It is now time to engage the current bi- ological substratum of us as a species to better assess the nature of these problems.

# 2.  Creativity and Biological Evolution

If there are problems with “idealized views on creativity” (see above), what could we learn from what has been bequeathed to us by evolution? In this section, I will try to provide a few answers to this question. Our stress will be placed on “everyday creativity,” that is, small-scale creativity that is accessible to everyone, not only to those possessing high intelligence. Small-scale creativity closely fol- lows human development in time; therefore, a special place should be given to childhood, insofar as it is important in itself, as we will see below. Childhood involves caregivers (particularly mothers) and pretend play. Our argument, in the

face of transhumanist ideas, emphasizes the importance of new generations for humankind. We will also see, as suggested above, the unavoidable place of the “dark side” of creativity.

Let us see the role of infancy and juvenility for the creative individual. In- deed, childhood occupies a major portion of one’s life and results from the evo- lutionary development of what is most characteristically human: upright posture; large, plastic brains; premature birth; neoteny; delayed maturity; shared parental care and social complexity, all of which are trade-offs in human adaptation to the environment of the Pleistocene. The result is an extended childhood, something that has surely affected creativity.

## 2.a. Creativity, for Some and for All

The study of creativity involves many different fields and covers a variety of topics. For the sake of space, I must limit myself to a review of some brief and interdisci- plinary attempts at interpretation. I found one of such attempts in the work of phi- losophers Elisabeth Picciuto and Peter Carruthers, among other authors interested in cognitive science; their specific goal is to show that “pretend [fantasy] play is a uniquely human adaptation that functions in part to enhance adult forms of creativity” (Picciuto and Carruthers 2014, 199). To arrive at this conclusion, they initially sketch interpretations of the evolutionary origins of creativity, extend- ing back to other animals (ibid., 205–09).Then, they highlight Margaret Boden’s distinction “between *historical* creativity (where the novelty is relative to an entire society or historical tradition) and *psychological* creativity (where the novelty is relative to a single individual)” (ibid., 199; emphasis in original).

Another way of classifying creativity is by pointing to agency:

Agent-neutral creativity is novelty of ideas, behavior, or products that are valuable in an objective or communally agreed-upon sense, while not ris- ing to the level of historical creativity. Agent-relative creativity, in contrast, would be an idea, behavior, or product that is both novel and valuable from the perspective of the agent alone. (Picciuto and Carruthers 2014, 199)

Because these types of creativity emerge together in evolution, it is to be expected that in practice we have a blend of agencies. These binaries correspond to what psychologists Howard Gardner and Mihaly Csikszentmihalyi call “Big C” and “Small (or Little) c” forms of creativity (for an interesting discussion, see Amabile 2012). Correlated to the small “c,” we also find the concept of “everyday creativ- ity,” which psychologist Ruth Richards understands as follows:

Our concern lies mostly with the benefits and possibilities for us personally, as we go through our day, while discovering how experience can be differ- ent if we live life more openly and innovatively. With everyday creativity, it is not so much what one does as how one does it. (Richards 2007, 5)

Mihaly Csikszentmihalyi thinks of creativity from his own concept of “flow,” which can be understood in the following terms: “Moments [of creativity] such as these provide flashes of intense living against the dull background of everyday life” (Csikszentmihalyi 1997, 46). Flow is a subjective state, a path to creativity, more important than the possible products of a creative act. Everyone can enjoy the results, even when the outward appearance does not appear creative to other people. We cannot predict what triggers an experience of flow. As Csikszentmih- alyi says, “[e]ven the most routine tasks, like washing dishes, dressing, or mowing the lawn, become more rewarding if we approach them with the care it would take to make a work of art” (ibid.,70). He thus acknowledges ambivalence in the process of flow, with pairs such as boredom-arousal, anxiety-relaxation, worry- control, and apathy-flow indicating that creativity is intrinsically connected to the harshness, or dullness, of life (cf. Ruth Richards’s viewpoint, above).

Parenthetically, what has been valued in transhumanist circles is the histori- cal form of creativity. As modern people, we care particularly about the sorts of creativity that result in great art, literature, or science. Psychological and agent- related creativity is somewhat overlooked; it usually does not appear in media headlines. However, it has the advantage of not being restricted to elite circles, and it tells us more about what is advantageous in the human species. Indeed, without this general form of species-wide creativity, those forms of creativity that attract general attention would be without a foundation.

Picciuto and Carruthers (2014, 207) claim that instances of creativity can be divided into two main phases. There is a generative phase, in which novel ideas or hypotheses are created and entertained, and then an exploratory phase in which those ideas or hypotheses are explored, evaluated, and/or implemented. The au- thors also call our attention to modes of thinking involved in creativity—divergent thinking (defocused attention) and convergent thinking, both necessary for achiev- ing results. They draw from the specialized literature “that a kind of defocused attention combined with cognitive control is especially distinctive of creative thought, combining aspects of focused problem solving (cognitive control) with unguided thinking (or ‘mindwandering’)” (ibid., 219).

## 2.b. Creativity, Life-Course and Childhood

Picciuto and Carruthers’s own way to understand the evolution of creativity is to link it to another distinctively human tendency, the disposition of children to engage in pretend play (Picciuto and Carruthers 2014, 208). Inspired by develop- mental and historic-cultural approaches, they conclude that the adaptive function of pretense might be to encourage and enhance adult forms of creativity. They entertain several proposals about evolutionary functions of childhood pretense, which do not concern us here. Needless to say, the literature about pretense (and its relationship with deception) along these lines is rich and varied; see, e.g., Smith 2010.

Picciuto and Carruthers (2014, 210) argue that pretense has a causal role in optimal child development. Together with accompanying behaviors such as breast- feeding, touch, and alloparenting, play might illustrate the difference between adaptive and optimal development. According to psychologists Tracy R. Gleason and Darcia F. Narvaez, “[e]arly life context has implications for all manner of later outcomes, including the management of aggression . . . brain development . . . participation in relationships . . . and mental health” (Gleason and Narvaez 2014, 335). However, there is a caveat: this optimality must be thought of within the lim- its of cultural evolution rather than on a biological level. As every teacher knows, the outcome of one’s effort to educate a child is unpredictable, and for every new child, the process will start all over again. This point will be important for our argument later on. Moreover, pretense also has a dark side, linked to deception and self-deception, which will also be explored further in the last part of this article.

Psychologist David F. Bjorklund, treading the same path, would only add that play is not only a rehearsal for adult behavior; rather, it is an end in itself. He thinks in terms of deferred (toward adulthood) and immediate (for the children) benefits of play, in both the social and cognitive realms (Bjorklund 2007, 141). He also believes that these benefits have evolutionary advantages, because play is a part of the biological fabric of human childhood (ibid.,143). Following this argument, the author writes, “[p]lay also teaches children *how* to learn, how to generate solutions to novel problems, and provides a means for discovery. These skills are not only useful in adulthood, but also during childhood” (ibid., 147). Play can provide children with important insights and discoveries that might not be as easily acquired through formal instruction (ibid.,159). I would add also that this process is very democratic because it occurs in all cultures and because it is not directly related to standard measures of intelligence.

Bjorklund also raises an important point for our argument: because of the youthful tendency toward play and curiosity in animals, it is likely that innova- tions, intrinsically tied to delayed maturity, will be introduced by the young rather than by adults (Bjorklund 2007, 158). Finally, he argues that play might not be strictly necessary to learn all that adulthood requires, but it helps significantly, particularly because children enjoy playing. Picciuto and Carruthers second this opinion: “human infants are innately disposed to begin engaging in pretense, and

. . . they find these episodes somehow intrinsically rewarding” (Picciuto and Car- ruthers 2014, 209). Recall, however, that these “rewards” might not be so reward- ing for the child’s companions. Pretense and play generate both joy and sorrow.

Anthropologist David F. Lancy has a different perspective on play as a cause of development. He gathers ethnographic data from many cultures and argues, “I have endeavored to weave together various strands of evidence to make a case that children learn their culture via informal processes, largely at their own pace and initiative” (Lancy 2016, 193). More than other authors, Lancy hints at the source of novelty—real creativity comes when standard models of cultural transmission do not “produce” the child, because the outcome is unique for each, and there is much room for resilience.

As we can draw from what has been said to this point, play is associated with the mother-child dyad (allowing for other caregivers), an important (and early in life) step toward creativity (Cameron and Garcia 2013, 143, 145). Mothers (mostly) are also storytellers for their infants, starting from simple communication to full-crafted stories. Sociologists Benjamin G. Gibbs and Renata Forste (2014,

492) point to an early influence of storytelling, indicating that cognitive develop- ment follows an increase in the frequency of reading with a child, particularly when connected with breastfeeding. More could be said about the effects of the mother-child relationship, storytelling, and untutored play on creativity and learn- ing. Scholarly opinions diverge, particularly because these issues can be addressed from a variety of perspectives. Psychologists see a direct correlation between ad- equate mother (or other caregiver)-child relationships and children flourishing. Anthropologists acknowledge that this correlation might exist in the West, but situations in other cultures might vary significantly (Lancy 2007). Regardless, evolutionary influences should be considered.

Anthropologists Kathryn Coe and Craig T. Palmer and scholar Nancy E. Aiken write: “[i]t is at least possible that traditional stories may have become part of our species-typical adaptations as a means of parenting our very slow-maturing offspring” (Coe, Aiken, and Palmer 2006, 36). Evolutionary anthropologists seek

human universals, and draw distinctions between adaptiveness and optimal growth for the child. All of them agree, to a greater or lesser degree, that life-course has a major effect on individual behavioral traits, including creativity. Childhood, again, is an integral part of what humanity is all about.

Related to universals and childhood, there is still room for one more evolu- tionary trait, neoteny, understood as features or characteristics present in imma- ture or juvenile organisms in ancestors that become retained during adulthood in descendants. As a consequence, infantile features tend to elicit strong feelings in adult humans, being as well a device of female sexual attraction. Anthropologist Ashley Montagu, who was one of the main exponents of the study of neoteny, indicated that “[p]lay, imagination, make-believe, reverie, and fantasy are funda- mental neotenous traits which are precursors of creativity in young adults and later life” (Montagu 1989, 139; see also Smith 1997, 31). In addition to being related to creativity, neoteny is also related to extended childhood (Bjorklund 2007, 44ff.).

In summary, the process of growing up within one’s life-course has important consequences for the development of creativity. Traits usually associated with this period, such as premature birth, mother-child relationship, storytelling, pretend play and delayed maturity (related to neoteny), become important for a specifi- cally human sort of creativity. However, the focus is not on creativity as related to a few bright individuals but on something endowed to all individuals in various forms and shapes.

On the other hand, it is important to highlight what has been only hinted at above: that, due to the somewhat erratic nature of human evolution, creativity is never only positive. Evolution has a history, despite its blind variations and selection, and humans label what is good and evil in it. Consider, for example, psychologist Arthur J. Cropley (2010). He initially describes the bright side of creativity, which in his view deserves most of the scholarly attention, including the attention of AI experts and pro-enhancers. The dark side, if there is one, has a moral character—the misuse of what is meant for the good; “malevolent” cre- ativity, as it were. Another problem with this type of creativity is acknowledged by critics of transhumanism:4 Cropley, again, writes that “[u]nfortunately, even creativity intended to be entirely benevolent may have a dark side in the form of unintended or unforeseen negative consequences” (Cropley 2010, 5). This propa- gation of unintended problems has accompanied progress since the beginning of humankind (Tenner 1996).

Moreover, for Cropley, following psychologist Mark Runco, “creative pro- cesses are neither inherently good nor inherently bad” (Cropley 2010, 6); thus, the

dark side is also simply there, previous to any moral concerns. However, the “bad” can work also for the good (cf. Kim and Kipper 2016). Another important point made by Goncalo, Vincent, and Audia (2010) concerning creative processes is that past creativity can actually block further creativity due to the very same process of social acceptance of what is creative and what is not. In other words, creativ- ity can be trapped by its own success. Although not directly related to biological evolution, this issue has important consequences for the transhumanist dreams of never-ending creativity.

It is now time to describe some proposals on the enhancement of creativity (mostly the fruit of cognitive enhancement), based both on biological and virtual/ robotic substrata.

# 3.  Transhumanism and Creativity: From Aiding to Replacing

To back their claims on creativity, transhumanists rely upon developments in two main areas: first, artificial intelligence and robotics, which aim at coming closer and closer to human behavior, emotions and thinking, including creativity; and second, advances in pharmacology and genetic engineering, which lead to en- hancement in creativity within the bounds of biology (Sandberg and Bostrom, 2006). The purpose of this section is to present some of these developments and how transhumanist thought relates to them.

To begin, I think transhumanists would agree with the following notion of creativity, given by neuroscientist Martin Dresler (2013, 61): “Creativity is the ability to intentionally produce work that is novel, valuable and appropriate. Cre- ativity is often thought of as the human capacity most pivotal for progress in sci- ence, art, engineering and economics; it is a non-trainable gift of rare geniuses” (cf. Katz’s definition above). Despite being unevenly distributed, creativity can be enhanced by several procedures, some more traditional, some novel, with the latter being favored by transhumanists. Regardless, here the emphasis is on historical, “Big C” creativity. It is related to what is “novel, valuable and appropriate,” some- thing that involves a communal evaluation—both expert and non-expert—and a shared set of values.

## 3.a. AI and Creativity

Let us initially present some developments from the field of AI, which has a broader understanding of creativity. Much impressive interdisciplinary work has been done in the effort to understand and mimic human forms of creativity. The

pioneering work of Margaret Boden5  on AI and creativity should be highlighted. Even Picciuto and Carruthers drew on her ideas, as we saw above.

Boden (2014), after reviewing definitions of creativity and its traits, states two different propositions: a) many behaviors and thoughts that we usually assign to a creative person can be simulated by computers today and efficiency is likely to increase with the passage of time; b) there are no agreed-upon understandings of these traits, making the discussion more philosophical than technological. She criticizes two facile conclusions available in the literature, one, that “computers *possess* some specific property which prevents them from being creative”; and second, that “they *lack* some specific property/ies that humans have, and which is/ are necessarily involved in genuine creativity” (Boden 2014, 225). She says that we should judge capabilities of creativity in computers not only as they currently stand but also in terms of future trends. Even today, with qualifications, comput- ers carry traits that display creativity, such as autonomy, intentionality, valuation, emotion, and (a form of) consciousness.6

Boden has recently commented on this point, in a short Q&A piece posted on the Oxford University Press blog, concerning her *AI: Its Nature and Future* (Boden 2016a). These comments somehow add nuance to the statements described in the previous section. To the question, “Could AI even equal human intelligence?” she answers in this way: “Yes, in principle. In practice, however, it probably won’t. The project is too difficult, and also too expensive” (Boden 2016b). However, her strongest line is: “Truly human-level AI would require a complete theoretical un- derstanding of all aspects of human psychology.” This claim immediately brings us back to the disciplines involved in human enhancement—the neurosciences, psychology, the cognitive sciences, and related disciplines. These disciplines are riddled with controversies and are not fully developed—the ends of these contro- versies (if there are any) are nowhere on the horizon.

Conversely, Boden’s response to the question “Could a computer be ‘con- scious’?” was: “No one knows, because the concept of consciousness isn’t well understood.” She suggests that consciousness be divided into two major levels: “functional” consciousness, which in principle can be modeled in AI, and “phe- nomenal” consciousness, ontologically different from the first.7 It is related to what philosophers call “qualia,” the subjective experiences that correspond to what can be seen, measured and described from the outside (Boden 2016b; see also Boden 2016a, chap. 6). “Historical” creativity relates more to the first level, and “psycho- logical” (or agent-relative, or little “c”) creativity, as described in the first section, corresponds to the second level. Moreover, all of the traits in children’s lives that

elicit creativity—also described above (mother-child relationship, storytelling, and pretense play)—also reveal these two levels of consciousness.

Computer scientist Dan Ventura follows Boden’s lead in the development of computational creativity and he also follows the five steps of creativity proposed by Mihaly Csikszentmihalyi, namely: preparation, incubation, insight, evalua- tion, and preparation (Ventura 2014). Despite discussing subjective actions and thoughts, Ventura’s eventual concern is with historical creativity and what excels in the human.

These advances are enabled by an awareness of the literature in develop- mental psychology (see section 2 above), leading to a new interdisciplinary field called “developmental [or epigenetic] robotics” (Asada et al. 2009; Cangelosi and Schlesinger 2015). This new field aims at a hypothesized development model of human cognitive functions, from body representation (“physical embodiment”) to social behavior. Indeed, more recent AI has focused on human behavior and evolutionary traits. Boden speaks of an interesting starting point: “situated robot- ics,” understood as the study of robots embedded in complex, often dynamically changing environments—although she does not appear to have much concern with child development. Others speak of “social robotics,” focusing on interactions and communication with humans or other autonomous physical agents by following social behaviors and rules. Several authors in these fields are influenced by theo- ries of cognitive development (Cangelosi and Schlesinger 2015, 4). Cangelosi and Schlesinger also work with the idea of neoteny in a narrower sense, namely, that of “Heterochronic changes” (ibid.,10).

Pretend play involving children and robots is an active topic of research in AI (Zook, Magerko, and Riedl 2011; Kahn et al. 2007, to reappear below). Even humor, that ambiguous, whimsical, and tricky trait of human beings, has been of interest to AI experts (Raskin and Taylor 2012). Certainly, questions are raised about the humanness of AI-based behavior, actions, emotions, and thinking. Is it only emulation, or, ontologically speaking, have we created another being in- distinguishable from us? Boden herself deems this question a philosophical one; progress in simulating humans is boundless, but no one can say whether an actual human being is represented.

I should at this point introduce the words of Maciamo Hay, a life science researcher who also happens to be a friend of transhumanism. In his 2014 essay “Could a Machine or an AI Ever Feel Human-Like Emotions?,” he engages in the task of seriously evaluating advances in AI, while at the same time arguing that AI agents will not match human beings. However, this lack of match is not due to

our excellence in many realms; the problem is that we are bound to our biological bodies. The salient point appears to be that “[s]ince machines do not have a diges- tive system nor hormones, it would be downright nonsensical to try to emulate” feelings such as thirst, hunger, or sleepiness (Hay 2014). Physiological needs are the main dividing line between humans and machines. Among these needs, we find those related to digestion (with the Vagus nerve connecting the guts to the brain), and sexual desire, and to the need to sleep, to dream, to “do nothing.” As social beings, we seek mutual approval, we gossip, we have a beer with friends.

For our purposes, Hay’s most important remarks are that machines do not need maternal warmth, do not grow from babyhood to adulthood, and do not feel the emotions related to the process of growing up. Machines also do not experi- ence hormonal changes related to age, diet, and environment. Therefore, if “we are heading toward a society in which intelligent and sentient robots will live among humans,” (Hay 2014) these machines would be very good at being companions and helpers to human beings, but would not replace them.

Until now, I have spoken of AI agents mimicking human behaviors but not of enhancement. But transhumanist proposals deal precisely with enhancement, so this will be my focus in what follows.

## 3.b. The Brain, Transhumanism, and Creativity

I now briefly consider the topic of enhancement of existing human embodiment, not necessarily involving AI or post-humans. The distance between human en- hancement and AI has been shrinking due to all sorts of human-machine interac- tions mediated by powerful software (Romportl, Zackova, and Kelemen 2015). For didactical purposes, however, this distinction is held in this paper. What pur- pose does enhancement serve? Surely there are at present many technologies that work to boost creativity in humans (e.g., Runco 2010, 431–33), but they are not intended to change *Homo sapiens* substantially. On the other hand, neuroscientist Steve M. Potter (2013) points to the reason why transhumanist proposals initially appeared: the charge that our tribal brains are maladaptive today. Thus, the pur- pose of enhancement would be to change human nature itself, that is, to bring about cognitive enhancement through neuroengineering, which would allow us to be better adapted to the modern world.

I view the description of heightened creativity of leading transhumanists An- ders Sandberg and Nick Bostrom (2006) as indicative of transhumanist thinking on this matter. Aiming at cognitive enhancement, which encompasses creativity, they offer smart drugs, transcranial magnetic stimulation and other biotechnolo-

gies, cognitive technologies (education), mental training, computer-human symbi- osis, collaborative enhancement, and nanotechnology. According to Sandberg and Bostrom, the convergence of these technologies, despite risks, promotes progress in creativity. To this point, transhumans are still not in sight, but humans are on the right path.

James Hughes, agreeing with Sandberg and Bostrom, lists four types of en- hancement technologies (external software/hardware, internal software/hardware) that “effect a range of cognitive abilities, from memory and learning to mood, creativity and empathy” (Hughes 2007, 944). He focuses on the fourth type, namely advances that affect the brain in procedures such as the taking of smart drugs, brain prostheses and stimulation, and a variety of implants. Concerning creativity, which he addresses briefly, Hughes points to advances coming from a better understanding of neurophysiology—particularly the identification of brain areas relating to creativity, and the use of transcranial magnetic stimulation. The purpose of it all is to increase the capacity for novelties, so the focus is on agent- neutral, not agent-relative creativity.

When we relate creativity to the biological body, questions can be raised about temporal constraints for enhancement of the mind. Bruce Katz acknowl- edges, “Life has a kind of fullness to it. Nature, it would seem, has providentially provided just the right lifespan for those lucky enough to escape early disease or death by accident” (Katz 2008, 365). Nevertheless, he suggests subverting the constraints of the typical lifespan. For Katz, geniuses are slow to mature, and it is unfortunate that they die so soon. We should focus on the virtues of enhancement, particularly augmented cognition leading to the increase in one’s intellectual and creative capacity. Everyone with access to the appropriate technology might also be extraordinary, and a much extended lifespan would be required to fulfill one’s potential (ibid., 366).

## 3.c.  New Technologies, the Designer Stance and Children

Due to the limits and inefficiency of biologically based enhancement, the scholars just mentioned and other pro-enhancers (e.g., Mordacci 2014) increasingly favor cyborgs (Warwick 2015) and body and brain emulation, which takes us back to AI and robotics, but now en route to the posthuman. For these scholars, after all, when we follow the principles of cybernetics, “[i]nformation processing is the same whether a brain or a computer does it” (Sandberg and Bostrom 2006, 215).

Insofar as the brain works with information-processing mechanisms, the ar- gument proceeds, it can be studied and simulated to any depth. That is the stance

taken by Katz (2008). He seeks to demonstrate how brain processes can be simu- lated by algorithms and machines to the point that the biological substrate can be completely overcome (ibid., 77). In his analysis, creativity (eureka-style) is also considered. A similar approach is taken by philosopher and AI expert Aaron Slo- man (2009), although he himself is not a transhumanist. On the one hand, Sloman appears to highlight the importance of learning more about the processes of evolu- tion to harness them in favor of human enhancement. On the other hand, when approaching evolution, he adopts the stance of an engineer (“designer stance”8), not the stance of developmental psychologists and other scholars who work with evolutionary biology. This approach enables him to understand the body and the mind in terms of machines (reverse engineering) and thus frame the possibility of replication of the self in non-biological terms.

Regardless, what is at stake is the capability of control, following the pre- cepts of cybernetics and Turing machines. AI pioneer Marvin Minsky (2006, 278) links creativity to how effectively creative agents can select new ideas to develop. AI seeks to create algorithms that will enable agents to reach such levels of intel- ligence, but is the computational aspect of creativity the most important one? (see Fetzer, 2001, particularly chapters 5 and 7).

Returning now to non-transhumanist authors, I refer again to psychologist Peter H. Kahn, Jr., and colleagues. They raise interesting questions about the de- velopment of android robots that display increasing resemblance to human thought and behavior and questions about how androids relate to their human counterparts. For example, they describe how robots interact with children in pretend play, aim- ing at creativity (Kahn et al. 2007, 377ff.). Their central point relates to the ques- tion of the benchmark for human-robot interaction—“whether people will interact with robots as partners in a joint creative enterprise” (ibid., 378). The authors claim that what we are as humans is best discovered when confronting otherness. Throughout evolutionary history, the “others” remained human beings, perhaps with strikingly different cultures.

But now robots are also acting as others, and in understanding their pro- cesses, we can learn more about ourselves. However, the measure of success of human-robot interaction might indicate an intrinsic limitation, the restriction of the human to what is empirically available. The authors define “psychological benchmarks” as “categories of interaction that capture conceptually fundamental aspects of human life [e.g., creativity], specified abstractly enough so as to resist their identity as a mere psychological instrument (e.g., as in a measurement scale), but capable of being translated into testable empirical propositions” (ibid., 366).

These compromises, necessary to the controlled study of human-robot interac- tions, might hinder the understanding of actual human situations.

“Joint creative enterprises” are on the agenda of most AI researchers. Al- though there are no limits to how closely robotic behavior can approach human behavior (keeping Turing’s test in mind), the purpose of this agenda remains to use robots as aids for humans in their endeavors (for a description of pretend play robots as aids for children, see Belpaeme et al. 2013; for personalized, life- long robot companions, see Dautenhahn 2004). For this purpose, robots should be friendly to people, even to the point of helping children and the elderly to comply with standard protocols of behavior (Ramachandran and Scassellati 2016). This is certainly a noble purpose, but transhumanists want more; after using robots (or virtual beings, or cyborgs) as partners, the next logical step is to eventually replace intrinsically flawed human beings with the aforementioned helpers, capable of further perfection as they are (see, e.g., Katz 2008, 378).

Future scenarios require, therefore, “nice” AI. Transhumanists Ben Goertzel and Joel Pitt, for example, suggest “nine ways to bias open-source AGI [Artifi- cial General Intelligence] toward friendliness” (Goertzel and Pitt 2014, 61). For Goertzl and Pitt, “AGI could help individual humans grow in a variety of direc- tions, even beyond our biological legacy, leading to massive diversity in human experience and hopefully a simultaneous enhanced capacity for open mindedness and empathy” (ibid., 61). Therefore, a “friendly AI” should promote individual and collective human joy and growth but respect human autonomy (ibid., 62), an ideal that reminds us of Asimov’s laws for robots. The goal is to promote enhance- ment to reach a stage in which all that is negative in human behavior and society can be removed by technological means (see also Goertzel 2011).

The point to be emphasized now is that, although much is occurring in AI and robotics with respect to creativity, particularly in children (Cangelosi and Schlesinger 2015), these efforts are not focused on enhancement. Concerning pro- posals of human enhancement, research on developmental AI does not appear to be of significant interest to transhumanists or like-minded people; childhood and life-course are unlikely to be at the forefront of their proposals.

With this type of limit in mind, I now proceed to some comparisons between human creativity as a product of evolution, including the place of children in it, and robots and enhanced post-humans that result from expert engineering.

# 4.  What Difference, then, between Human and (Possible) Transhuman Creativity?

## 4.a. Evolution and Enhancement

In the first section, when I examined biological evolution, we learned that stud- ies about creativity seek to relate analysis of the final product in synchronic and heterochronic terms. Developmental and life-course concerns, therefore, are at the forefront of this research.

Although we should not be deterred by the “is” of evolution (as opposed to the “ought”), and we acknowledge that our inheritance is corrected by cultural progress, we should not forget everlasting evolutionary lessons. One of the main lessons is that evolution is not directed (teleological) and is symmetrical to our notions of good and evil. Evolution is about procreation and adaptation, and not about making one happy and fulfilled. For the latter purpose, we try in our lives to remove everything that is negative (e.g., suffering, illness, vices, and selfishness) and foster what we have learned to be positive (e.g., flow, virtues, health, and altruism). From the very beginning, science and technology helped to serve this purpose. However, the wheat does not come without the chaff—the negative and the positive serve some grand purpose (evolution?), and we both duet and duel with it.

As I outlined in the second section, besides a deflationary view of good and evil, the study of human evolution also highlights the great importance of the slow maturation of new humans. Melvin Konner (2010, 744), for example, supplements our former description with what he calls “five great innovations in human ontog- eny”: lengthening of development; the prosocial phase of neonatal life; mainte- nance of pre-natal brain growth for a year after birth; emergence of language and appreciation of other minds, and lengthening of middle childhood. All of these are related to childhood. Considered from this perspective, creativity carries a sense of incompleteness; it follows the development of the brain, including genetic, epi- genetic, and cultural factors. Despite common rules for human creativity, each new being will be creative in his/her own way, subject to the vagaries of the his- torical course; thus, the tempo of maturation is of great importance (Harris 2007). With this outlook in mind, let us initially engage proposals for human en- hancement, remaining within the bounds of biological beings. There are at least two main problems with enhancement projects. First, they view creativity accord- ing to specific Western standards of a creative person,9 insofar as transhumanism is the continuation, as we saw above, of the Enlightenment and modern Humanism

(Hughes 2010). These projects are associated with ideal notions of perfection, and technology has helped us to conform to these notions. However, when we engage the trajectory that human beings have followed up to this point, many ide- als can be viewed from a different perspective. Evolutionary studies of creativity, for example, do not necessarily match our current inclinations on how to educate children.10

Second, however enhanced we might be, our ambivalent character remains unabated. It is not only a matter of distorted uses of creativity; it is more about the human condition, particularly in relational terms, in which the good that one seeks might have a negative outcome. We can return to Csikszentmihalyi’s pairs described above—boredom-arousal, anxiety-relaxation, worry-control, and apa- thy-flow; one does not come without its opposite. Therefore, neuroengineering (or any other enhancement tool), although thoroughly successful, might result in a creative person who is also sorrowful and nasty. One is reminded of the recent ani- mated movie *Inside Out* (Disney Studios, 2015), in which Joy, although the smart- est and most creative of the emotions, might destroy her best purposes and the self-realization of Riley without her continuous engagement with her nasty com- panions, Fear, Disgust, Anger, and, particularly, Sadness. Living in bliss through some enhancement project might lead to a hell-like life with no technological fix. Once again, creativity is a product of evolution but is not as such either ben- eficial or harmful to individual lives. Every attempt on the path to sublimity must recapitulate our entire history, evolutionary and personal. Every generation must learn again its way to accomplish human goals and must avoid pitfalls en route to

pro-social behavior.

## 4.b. AI, Contrariness, and Childhood

Now I turn to AI, which is also appropriated by transhumanists. Indeed, without the possibility of AI progressing to a stage in which robots and virtual beings match and override humans, transhumanist dreams would not be fulfilled. How- ever, this possibility faces philosophical conundrums, as we saw when presenting Boden’s remarks above. Paramount among them is how dependent these develop- ments are upon the current knowledge of many different sciences, all of which are riddled with controversies. Therefore, if these more basic sciences, well developed though they might be, are filled with uncertainties, so much more are the more specialized fields in the sciences and technologies derived from them. Of course, one could argue that AI has been in fact aiding in the development of human sci- ences, offering simulations that are heuristic devices for further research, but this

cooperation still falls within the bounds of Boden’s comment. Next, recalling the mix of emotions from the movie *Inside Out*, it must be acknowledged that emo- tions are of great concern for AI experts in their attempts to arrive at more human- like machines. Concerning “bad” emotions, the main purpose of these experts is to understand human moods and to convey emotional expressions in robots. However, no one intends, except for experimentation, to develop ill-tempered (“naughty”) machines (Reynolds and Ishikawa 2006). For an example, there cur- rently are robots that engage in storytelling with actual children, or soothe them in case of suffering provoked by bad emotions, but are they capable of recognizing and withstanding the ambiguous balance of positive and negative emotions?11 I can recall Maciamo Hay’s remarks above about human and robotic emotions, but this question is ultimately a philosophical one that no amount of technological progress can answer.

Now I can speak a little of the long time a child takes to mature. We can see a difference between the designer stance (Sloman) and the developmental. The designer stance is based on Cybernetics, which implies learning by experience in the intercourse with the environment. In successive loops, by trial and error, accomplished novelties come to stay. The information accrued through time, inde- pendent as it is from the medium (brain or computer), can be entirely transferred to some other medium. Suppose a robot learns something by interaction with human companions. What is learned remains, precisely because of the positive traits of this medium, e.g., faithfully retrievable memory—if the robot fails beyond repair, it can be replaced by another without loss.

As indicated above, each child, upon coming into the world, enters the pro- cess of learning, a very long—and to a certain extent, uncertain—one. Mothers (and/or other caregivers) play a fundamental role in this process (Stern 2004). Educators cannot transfer their knowledge to the child at will, and the child herself improves on their knowledge in a unique way. Moreover, a specialized, creative task requires rehearsal, repetition, hard work and so on. A learned robot can reach a similar stage in a very short time, based on previous experience. After all, who would buy a robot that takes twenty years to learn something useful? What differ- ence would it make to a robot to lack the appropriate and lengthy care that a child usually receives? As Maciamo Hay (2014) says, “it may not be useful to create a robot that matures like us.”

One difference between them and us is that robots can keep all of the memo- ries of occurring events. However, alas, forgetting is part of humanity. To forget (and forgive) contributes to each child’s unique identity. Twenty years of having

all sorts of embodied experiences leads to subjective reactions that must be differ- ent from the reactions of a being that has experienced the environment for a only a short time. It is true that there are prospects for robots being life-long companions, as we saw above but, as Sloman has said, to have artificial companions “is harder thank you think” (Sloman 2010, 179). Questions can also be raised about whether they can actually be tamed to avoid harm to the individual (Dautenhahn 2004, 22). AI and robotics follow the ideal of accumulative progress, typical of mo- dernity, a very different process from the vagaries of the biological evolution of creativity. Progress might lead to a paradox, that of decreasing creativity, some- thing we should expand on. A robot that has played with one child carries all of the experience acquired in the process to the next being, robot or child. Extrapolating from this situation, a machine that has learned to be creative with a Mozart expert will start to compose having this experience as part of its database. This base of in- formation can then be forwarded integrally to another robot. Eventually we would have “perfect Mozart” (or other outstanding creative person) robots at will (for the case of Bach in computer-aided composition, see Cope 2001, 57). However, success in music is subject to very human influences, such as taste, iconoclasm, and boredom; creativity, in the sense of exploring novelties, might be the result of painful experiences by the composer. To suppress all negative experiences would mean the end of creativity. For children, growing up is also subject to these very human influences. Briefly, it is precisely the virtues of perfected (or increasingly

perfectible) beings that might harm creativity.

Human beings suffer less from this paradox precisely because of their limits, as was hinted at in the case of music. I mentioned the reaction of the crowd of listeners, but it can work the other way around. Let us quote Cropley:

The essence of creativity is going against the crowd. The development of an individual identity by each person also involves becoming different from the crowd by “creating” an individual self and a unique identity. . . . [T]his fight [may be called] “defying the crowd” and labeled the tendency of cer- tain individuals to resist society’s pressure to conform “contrarianism.” (Cropley 2010, 8)

Creativity is driven not by perfection but rather by the labor pains of novelty; going against the crowd can cause as much good as harm—both permanence and novelty require each other, in constant tension. This point is emphasized by busi- ness management experts Goncalo, Vincent, and Audia, already cited above. They write: “early creativity may constrain future achievement as people buckle under

the weight of their past success” (Goncalo, Vincent, and Audia 2010, 114). In eight propositions related to cognitive, affective, and social aspects of creativity, they seek to show that creativity is a double-edged sword, both in historical and psychological terms.

Perhaps these propositions relate to human childhood being so important for creativity. As shown previously, creativity has many different sources, including pretend play. Children play by themselves and with their peers, implicating in intrinsically rewarding activities. I added to the list other activities, for example, mother child-interaction and storytelling. None of these activities is optimal in itself. Children can misbehave, stories can be scary (e.g., fairy tales), and mother- child interactions might not conform to Western, idealized models (Lancy 2015).

Thus, I can resume our considerations about the “dark side” of creativity. New generations come to be contrary to current idealized models. When engaging in pretend play, or any play with other children for that matter, children can be the agents or recipients of bullying and rough-and-tumble play—playing is not necessarily a happy experience.12 The experience of parents and teachers shows the difficulty of addressing the refractory character of children and juveniles, who do not conform to current wisdom, knowledge and common sense. No amount of qualifications (children being stubborn, defiant, naughty, incompliant, rebel- lious, unruly, and so on) can comprehend all of the possibilities of misbehavior. When one generation accumulates reliable information on how to be happy and fulfilled, the following one will behave iconoclastically. The nasty side of creativ- ity is the pre-condition to its bright side. Even with all this difficulty, children are sufficiently resilient and can continue to be creative even under rebellion and harsh conditions (Konner 2010, 537–63). Perhaps a good representation of this ambivalence would be Mark Twain’s Tom Sawyer. For a delightful assessment of this naughty character, see Li (2013).

Proposals of both AI simulations and human enhancement fight this contrari- ness. They choose to focus only on the bright side, and necessarily so. The follow- ing statement by Dan Ventura seems ironic:

[I]ndeed, most of human intelligence, if held to the strict standards of the current theory of computability, is a failure. That is not to say that efforts at computationally simulating it are failures but rather that humans them- selves fail to ‘compute’ by such strict standards. (Ventura 2014, 216)

He then adds that computational systems will have an advantage over human traits that would hinder our creativity, because these systems lack, for example, fatigue,

distraction or boredom. Once again, we can compare with Csikszentmihalyi’s pairs (page 7, above) and question whether this advantage over human traits might not lead to its opposite.

Another example of how human beings are faulty comes from AI pioneer John McCarthy (2008, 2012). He, like Ventura, devised a “well-designed child” imagin- ing a baby learning from the designer stance. “Let’s take the designer stance,” he writes. “It would be good if the notions of conservation law were innate, and experience taught which domains it applied to. Alas, we aren’t built that well” (McCarthy 2008, 2012). That statement is certainly true, but I should reiterate that only the poor engineering provided by the processes of evolution gave humans their advantage in terms of self-fulfillment (perhaps neoteny should be an example of this apparent deficiency). But it is precisely the argument of poor engineering that moves H+ proposals to overcome biological evolution, and this standpoint might harm transhumanist understanding of children’s place in creativity.

Stressing the point once again (see p. 177 above), who would possibly want “naughty” robots? Robots might suffer bullying from children (Nomura et al. 2015), but the other way around would not be appropriate. Moreover, what good are well-designed children that are not only disease-free, have blue eyes and a high IQ, but are also well-behaved and compliant? That would be “the dream come true” in a consumeristic society, but it can be a curse for any parent, psychologist or educator, because any degree of freedom for the children would be denied. Mel- vin Konner’s remark (2010, 753) hints at the artificiality of this dream: “Parent- hood may seem at times a comedy of errors and kids a bunch of wacky creatures on the precipice, but there are underlying, ancient, biological forces that guide their stumbling, as well as ours.” Some people want to cut off these forces to avoid this “comedy of errors,” but, again, they might reach the nightmare of dystopia.

## 4.c.  Back to Basics: Creativity and Procreation

Now I return to Margaret Boden’s statement at the beginning of the second sec- tion: “[AI entities] *lack* some specific property/ies that humans have, and which is/are necessarily involved in genuine creativity.” There is no reason to disagree with Boden on the subject of the ideal models of creativity. Indeed, any specific property involved in novelty (including storytelling and pretend play) might be emulated by AI, today or tomorrow. Thus, AI follows the old saying that “technol- ogy is the extension of man.”

However, we should not focus on positive properties that would make us more intelligent and smarter than AI-driven beings, but rather on those properties

that do not conform to ideals of perfection (similar remarks could be made with respect to enhanced humans). AI-driven beings lack, first, our evolutionary history and all of the contingencies and the trade-offs that came with it. Second, they lack the “genuine human creativity” that also includes destructivity and all that we consider negative and regrettable. Third, such beings lack what we saw above, Boden’s concept of “phenomenal consciousness,” the subjective side of many contradictory feelings slowly chiseled into individuals during a lengthy process of maturation.

The essential point of “little c” creativity, as mentioned above, is its meaning for the agent (process and product—Boden’s phenomenal consciousness); thus, the result of the creative act and its impact in terms of arts and science is of lesser importance. People feel creative when raising children, establishing social con- nections, making peace, and giving care and hope, activities that usually require abnegation. These actions are in the end gratifying even when there is (or precisely because there is—see Cruz 2015) a degree of sacrifice.

Before relating creativity to childhood, children must be born in the first place. As we saw above, evolution is associated with procreation. Is procreating a creative act, and if so, how basic is this act? I do not think that the answer can be provided solely by evolutionary biology; the question is more a philosophical one. This question might be answered by women themselves. Indeed, many fe- male thinkers place high value on procreation as a radical form of creativity for women. For example, obstetrician Sandra Morano and psychoanalyst Anna M. Risso have recently engaged in a conversation relating childbirth and creativity. They argue that the work of giving birth is the most fundamental form of creativ- ity and, by an extension of meaning, women can be as creative by giving birth to, for example, poems and books (Morano and Risso 2014, 112). Medicalization of childbirth might disempower women and take away from them this very elemen- tary act of creation. This same move sees the pain in labor as something entirely negative, together with all of the blood and dirt that comes with the baby. Morano, in one moment of her dialogue, asks “But why do we identify this supreme expres- sion of creativity above all *with* pain and *in* pain?” (ibid., 113). Risso’s answer is that any creative enterprise involves risk and separation (here, the mother from her child, upon delivery), and that risk and separation are pathways to psychological maturity. From another perspective, gynecologist Michael Pawson (2003) speaks of an “urge to procreate,” which he argues might be the most radical experience of creativity for most women. I would add that this experience is very democratic and may benefit any women, even those who do not seem very creative in other

respects. Finally, philosopher Sigridur Thorgeirsdottir says, echoing Hannah Ar- endt, “[a]s a form of creativity, birth is not a product of calculation in accord with deterministic laws of nature” (Thorgeirsdottir 2006, 203).

This perspective does not appear to fit transhumanist proposals. In addition to the childlessness proposed by some (Aubrey de Grey) and “well-designed chil- dren” by others (McCarthy 2008), there are proposals of postgenderism (Dvorsky and Hughes 2008) and ectogenesis (Olson and Pellisier 2011)—none of which considers the experience of bringing a new generation into the world a primal experience of creativity.

In summary, it is our contention that, in addition to other sources, *human* cre- ativity is only meaningful because of the peculiar mode of procreation in our spe- cies, childhood, and the need to move children beyond their immediate impulses.

# Conclusion

I started our argument with remarks on the evolutionary role of infancy and juve- nility for creativity, highlighting neoteny and the length of the human maturation period and the place of parental care, pretend play, and storytelling in it. Next, I presented aspects of creativity, outlining the difference between historical and psychological, and between “Big C” and “Little c” forms of creativity. Finally, I spoke a little about the “dark side” of creativity (related, e.g., to deception), which causes so much concern when we speak about the enhancement of creativity.

In the second section, I described proposals for human enhancement both within the bounds of biology and those relating to AI (virtual life and robotics). I emphasized that a friendly AI is developed to provide aid for human beings. Some of the transhumanist proposals that build on those of AI are described, indicating their thrust to eventually replace human beings instead of just improving their creativity.

In the final section, I asked whether these proposals could be truly human, since they miss the importance of developmental aspects in children. I also men- tioned the concept of phenomenal consciousness advanced by Margaret Boden, and compared it with the concept of functional consciousness, which can be rep- licated by AI. I outlined the intrinsic limits of using both AI and bodily enhance- ment to achieve transhumanist goals, namely: (1) We lack full grasp of our reality in all the sciences of the human; (2) qualia are developed in humans through long maturation and pretend play, which do not aim only at bringing one to adulthood but rather at being rewarding for one’s own sake and sociality; (3) agent-relative (everyday) creativity is paramount to avoid undermining more explicit forms of

creativity; (4) subjective experience thus evolved includes both positive and nega- tive feelings; and (5) creativity in humans requires contrariness, which is typical of new generations. I also added that concepts of perfection associated with trans- humanist dreams face the challenge of the dark side of humans; juveniles behave in an unruly way, and humans are unfriendly, in a way that robots and posthumans are expected not to be. However, this negative side is what enables truly human creativity. Finally, I argued in favor of procreation as a primal form of creativity that is very democratic and that benefits primarily women. All of the above points to the importance of life-course, which is associated with human embodiment, and therefore challenges proposals of radical changes in human nature.

Transhumanists claim that biological production and transmission of infor- mation is no different, in principle, from artificial ways of transmitting informa- tion; thus, a “designer” stance would be the best venue for enhancement. However, I have shown that, although there are many artificial ways to improve on creativity, they are constrained by evolutionary history and developmental processes which depend on a lengthy childhood. The limits of embodiment are at the same time the pre-condition for creativity. AI agents might parallel human excellence, but the purpose of AI is to help human beings, not to replace them. Novelty might be achieved by conscious efforts of highly gifted people, but the most widespread and democratic form of creativity is the one that matters to humans engaged in it, namely, agent-related creativity. Conversely, what matters to us is intrinsically related to our life-course, in which childhood has a major place, and which is intrinsically related to caregivers, particularly mothers. It is difficult to speak in terms of the human when procreation (“natality,” in Hannah Arendt’s terms) and the succession of generations are ignored or downplayed, as in the case of trans- humanist discourse.

# Notes

I would like to express my gratitude to two anonymous reviewers for their suggestions, and Michael Poznic and Hanna Herdegen for their careful revision of the typescript.

1.     It is certainly not implied that creativity exists only in the West. For example, there is an extensive literature comparing creativity in the East and the West, but there is no need to engage it for the purposes of this paper.

2.     A more recent version of this FAQ did not change this statement—http:// humanityplus.org/philosophy/transhumanist-faq/.

3.     For a more complete list, see [http://whatistranshumanism.org/.](http://whatistranshumanism.org/)

4.     Transhumanists do acknowledge this dark side, but they draw different les- sons from it. Whereas critics say their dreams are untenable, transhumanists translate it into problems to be solved in due time; see, e.g., Goertzel 2011.

5.     She is herself a critic of Transhumanism.

6.     As a renowned figure in the AI community, Margaret Boden is also the focus of some criticism. Pearce (2010) discusses several opinions around Boden’s concept of Computer creativity, but none of the criticisms appears to impinge on our argument.

7.     This distinction has been object of a spirited discussion in the AI community; see, e.g., Torrance 2012. Although many appear to understand this type of conscious- ness as awareness, much of the inner feelings of humans are uncertain, contradictory and hardly clear in one’s mind.

8.     This stance works with questions such as, how could that work? What else can the mechanisms do? How do they do it?

9.     Thus, the following assertion by Nick Bostrom, which otherwise appears to be so reasonable and sensible, can suggest that less value is placed on people “less than perfect,” an idea that has been subject to criticism:

“The life of a person who dies from a painful illness at age 15 after having lived in extreme poverty and social isolation is typically worse and has less value than that of a person who has an eighty-year-long life full of joy, creativity, worthwhile achieve- ments, friendships, and love” (Bostrom 2013, 31). However, living this type of blissful life, if enabled by natural processes, always occurs together with cases that we view as sorrowful.

10.     A promising path to understand this issue is what some call “evolutionary mismatch theory” (Montgomery 2016).

11.     Transhumanists usually follow Marvin Minsky’s lead that subjective states are in principle reducible to artificial emulation (Minsky 2006, 326–29). However, most AI experts are apparently skeptical about the possibility and do not see the point of meddling in one’s subjective feelings.

12.     A child plays because doing so is fun and rewarding. However, because play is a subjective state, it may not be fun for other children. Humor is another example of a trait having a dark side that is difficult to manage with AI; see Simon 2012, 87.

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