Understanding Creativity

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Abstract— We have never seen creativity. More precisely, we have never seen the creative process; what we have seen is the creative individual (ex ante) and the outcome of creativity (ex post). Therefore we try to understand creativity by examining creative individuals and their creations. In this paper we only consider the creation of new knowledge. We draw on a wide variety of backgrounds. We wander into the area of cognitive psychology to investigate who is talented for creativity. We also draw on arts, history and philosophy of science, stories of mystics, some great novels and essays we have read as well as our experience in both working with creatives and creating new knowledge. Based on this shaky foundation we will describe creativity as illumination, through jokes, as a quest for harmony, as being kissed by the muse.

Index Terms— creativity, intuition, tacit knowledge, talent, harmony

FOR this paper we derive the concept of creativity from creation; i.e. creating something that did not exist before. In our previous work (e.g. [1]) we have distinguished between the creation of *ideas* and creation of *values*. First an idea, new knowledge, is created, and then this idea can be used to create a new value. If only the first happens the creative idea will remain unknown; to spread, the idea needs to be carried by a value. Thus the creation of idea is typically associated with creativity and the creation of value with innovation; but we will refrain from using the term innovation due to its widespread overuse and misuse. A similar distinction has been outlined by Csíkszentmihályi [2]; he distinguishes between personal *creativity* (with no capital letter) and *Creativity* (with capital C), which, apart from the personal creativity, also includes the knowledge domain and the field represented by the gatekeepers. Similar to Gardner [3], we use the latter two as the context for personal creativity; but in the

present paper we exclusively focus on the creative accomplishment of individuals. The reason for this is that we believe that any new knowledge can exclusively originate in the mind of a person. Using Einstein's [4: 8-9] words:

"It is clear that all the valuable things, material, spiritual, and moral, which we receive from society can be traced back through countless generations to certain creative individuals. The use of fire, the cultivation of edible plants, the steam engine – each was discovered by one man. Only the individual can think, and thereby create new values for society – nay, even set up new moral standards to which the life of the community conforms. Without creative, independently thinking and judging personalities the upward development of society is as unthinkable as the development of the individual personality without the nourishing soil of the community."

By doing this, we do not want to diminish the importance of the trans-personal dimension of knowledge, however it is not the topic of this present paper (we have addressed this topic in our research on knowledge sharing, see e.g. [5]). For this paper it is sufficient to note that if new knowledge is created in such a knowledge-sharing process, all the participants will 'possess' the new knowledge subsequently, although their personal pictures on the created new knowledge may substantially differ.

We sometimes contrast artists and scientists, meaning that the artists are those who create while scientists do what Kuhn [6] describes as normal science. But if you look at scientists such as Einstein (e.g. [4]) or Poincaré (see e.g. [7]) we see a world much more like that of the artists than the world of normal science. We may try contrasting artists with engineers, and thus dividing scientists into scientists-as-artists and scientists-as-engineers. But then we look at development engineers creating all those engineering beauties (see for instance [8, 9, 10]) and we have to give up this contrast as well. Perhaps the best counter-example to both these contrasts is the maverick inventor Nikola Tesla. He is sometimes classified as engineer, sometimes as scientists; he certainly considered himself as both [11]. And we seem to owe to him most of our present technology, at least, in part. He is definitely never regarded as artist. But, as Hong [12, 13] showed, his thinking is as that of the greatest artists. So, for the moment, we suggest

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contrasting arts and crafts – when one is creating something new, we talk about arts, when (s)he does else, it is crafts.

Trying to understand the essential aspects of creativity we start from the creative individual and explore what (s)he has to be talented for. Along the way we explain the concept of illumination in terms of cognitive psychology. Then we describe various aspect of creativity. Namely, we examine how jokes work; we explore the need for freedom and its consequence, responsibility; we circle around the role of love and beauty to bring nearer what it means to be kissed by the muse. In the conclusion we return to the creative individual just to attempt to beg the teachers of the creatives not to educate their gifted pupils so that would not destroy their gift!

1   WHO CAN BE CREATIVE?

Of course only creative people can be creative – but if the answer was so simple, we would not be asking the question. Most would agree that Dali and Buñuel are creative individuals. But you probably would not ask them for a creative way of performing your eye surgery.[1] What therefore are they missing? The answer is the knowledge in eye surgery. So even the most creative person can only be creative in the domain in which (s)he is knowledgeable. To figure out how much one should know, we need to understand what this 'how much' can mean. For the present discussion we will express the levels of knowledge in terms of cognitive schemata. Using this picture we will also offer a representation of creativity.

Cognitive schemata are by definition the fundamental building blocks of knowledge [14: 84]:

"Cognitive schemata are units meaningful in themselves with independent meanings. They direct perception and thinking actively, while also being modified themselves, depending on the discovered information. Cognitive schemata have very complex inner structures, various pieces of information are organized in them by different relations. The various schemata are organized in a complex way in our brains; in the course of their activities they pass on information to each other and also modify each other continuously."

The complex way in which our schemata are organized we call an ill-structured multileveled hierarchy. This means that, apart from the elementary schemata, we also have meta-schemata, i.e. schemata that consist of other schemata. In this sense they are at a higher level in the hierarchy. However, this hierarchy being ill-structured allows that these schemata may overlap. Similarly, a particular schema A may be in terms of one relation higher in the hierarchy than a particular schema B but in a different relation their position may be reversed. When we complete a task, take a decision or solve a problem, several schemata become organized into an ad-hoc structure. [15: 47-51] If working on the task, the decision, or the problem results in a deeper understanding, a meta-schema is formed, which usually dissolves some of the incorporated schemata though it can re-create them on other occasions. This is how a good mathematician, who 'has forgotten' how to do integrals, can 'learn' it in very short time without any additional input.

The newly formed meta-schema often goes beyond the constituting schemata. This means that on such occasions new knowledge is created. The more schemata we have in a particular domain, the higher the complexity of our schemata (higher level meta-schemata), the 'greater', more complex, and more surprising the newly created knowledge can be. The formation of meta-schemata happens in almost zero time, as if in a flash of 'recognition', and may be accompanied by (sometimes very strong) emotions and feelings. We usually call it illumination.

We can distinguish four levels of knowledge in terms of cognitive schemata: (1) the novice may have a few lots of ten schemata, (2) the advance beginner several hundred, (3) the expert several thousand, and (4) the master some tens of thousands schemata. In our work on knowledge levels [16] we also distinguished a fifth level, the grandmaster, but the grandmaster has the same number of schemata as the master. The difference however is that (s)he also has a super-schema, i.e. a single cognitive schema that is a meta-level of all the schemata in the discipline. This we usually call wisdom. As we do not engage in the relationship of wisdom and creativity in this paper (see e.g. [17] for some views), the four levels are sufficient. It is easy to guess that the master can create more complex new ideas than the expert, who, in turn, will be more creative than the advanced beginner. Yet this is often true but not always. Sometimes the advanced beginner may be more creative than the expert. We will now explain how this is possible.

Illumination, in which the meta-schema is born, is a leap into a more complex knowledge level. Often this will mean that in the creative insight, for example, the expert gets a sneak-peak into the master-level knowledge. This will only happen if the person is talented sufficiently for the next level. Thus, if we have an ad-

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[1] It is an allusion to a scene from their film "An Andalusian Dog" when a cloud passes in front of the moon.

vanced beginner who is talented for the expert level and an expert who is not talented for the master level, it happens that the advanced beginner is more creative. The only problem is that we do not know yet what the talent – or gift – is. We can speak of a talent for a particular discipline when the commonsense knowledge of the gifted is structured in a similar way to the knowledge in that discipline. As a secondary school mathematics teacher beautifully said about a pupil gifted in mathematics: *"It is as if he already had all the mathematical structures in his mind and all I had to do was to attach the appropriate labels."*

But does the gift for the discipline always infer also gift at being creative in that discipline? This question is hard to answer. We have never seen a master who was not creative in her/his discipline, at least in some period(s) of her/his life. But it seems that something else is needed in addition. Creativity is only one of the many types of cognitive processes, and it seems that people are not equally talented in the various types. Although without much evidence, we suggest that the creative person needs to be double-gifted: once for the discipline and once for creativity. And this only works at a reasonably high level of knowledge. A novice, regardless of her/his talent, will almost certainly come up with creative ideas that are simply wrong. The advanced beginner's creative ideas will, almost always, be trivial to the master – or wrong. Moreover even at expert level, the ideas are unlikely to be "great"; it is still often either "OK, so what" for the master or "wrong". And even if the germ of the idea is a germ of a great idea, the expert can rarely pitch it in a way that it would be well received. Usually these ideas are further elaborated only when the expert reaches the master level and becomes able to see the full picture.

The person's knowledge, in itself, cannot account for creativity. The whole personality of the person is involved in it. Gardner [3] examined creativity from a cognitive viewpoint and found numerous factors that may in themselves (or in some combinations) indicate creativity. For instance, a multicultural background seems to go along with creativity, and creative individuals usually also seek to experience different cultural settings. It is not clear, however, whether there is a causal relationship here. Even a more or less comprehensive list of the relevant factors would exceed the length of this paper, so probably it is better to indicate only that the whole personality is involved.

We will take another path trying to understand something about those cognitive processes that we call creativity. Namely, we will try to understand how *jokes* work.

2 CREATIVITY AS JOKES

Several years ago, starting from Boulding's [18] levels of system complexity, we tried to establish what the specifically human features are in order to understand the nature of the human-level system. Then we found that telling jokes is a uniquely human specialty. Telling and understanding jokes is a very complex process; it requires meta-cognition, abstract thinking, and historic memory. Essentially, it is the same as creativity. To understand this better, we will first have a look at how jokes are, if they are, different from logic.

When we present our ideas, even the most creative ones, we must do this in a logical way, at least if we want to have them accepted. It could be argued that there may be more appropriate ways of presenting creative ideas, for instance by means of metaphors, symbols, poetry, or pictures. (Cf Hong's [19] idea on picture-based reasoning.) The whole idea of academic publications is based on logical presentations [20: 110]:

"Logic is the way of scientists, or other people, who have to present their ideas. Even if a scientific breakthrough came out through hunch or chance it must be presented as if it were the result of logic. Otherwise ideas cannot be accepted."

But logic, in this sense, is definitely not how we tell jokes. This corresponds to the ever hopeless attempt to explain a joke to those who did not understand it. In a similar vein, everyone who ever experienced a creative leap knows that there is no such thing as *method* for being creative or a logical way to produce the creative outcome. (See e.g. [21: 7-9].) The ideas cannot be *produced* but they can be *reproduced* by means of logic. Therefore Simon, at least for most of his life, believed (e.g. [22]) that it was possible to build a General Problem Solver (GPS). Descartesheld a similar idea [23: 92]:

"Descartes, René (1596-1650), great mathematician and philosopher, planned to give a universal method to solve problems but he left unfinished his Rules for the Direction of the Mind."

Descartes and Simon could not do it. The reason is, we believe, that it cannot be done. It seems that creative thinking does not obey rules, cannot be put into an algorithm, and is desperately anti-methodical in Feyerabend's [24] sense. There are no common elements in different creations [25: 281]:

"… the events and results that constitute science have no common structure; there are no elements that occur in every scientific investigation but are missing elsewhere… Successful research does not obey general standards; it

relies now on one trick, now on another, and the moves that advance it are not always known to the movers… scientists will get a feeling for the richness of the historical process they want to transform, they will be encouraged to leave behind childish things such as logical rules and epistemological principles and to start thinking in more complex ways – and this is all we can do because of the nature of the material. A 'theory' of knowledge that intends to do more loses touch with reality."

De Bono calls this non-algorithmic part of thinking, which is responsible for our achievement in seeing things differently, "lateral thinking"[2] [27] and sometimes "parallel thinking" [28], to contrast it to vertical (or convergent) thinking. In good jokes there is a convergent/vertical way of thinking along which the joke-teller takes us. This convergent line, the mainstream, would lead to the obvious conclusion. This is the essence of convergent thinking; there is a single outcome which the thinking converges towards. Then, unexpectedly, the joke-teller leaps out from the convergent mainstream of thinking, into a lateral branch. The elements considered are rearranged to form a new order, and thus to make new sense when we get to the punch line. If there were to be no new order it would not be a joke, it would be something senseless. Nobody would laugh. We laugh because we understand that there is another way of thinking according to which the punch line is perfectly logical. It makes sense – but we would not have thought of it. (Cf also with [29].)

This is the way of thinking needed to create something new. There are two important characteristics. Firstly, the lateral detour is a discontinuity [27: 88]:

"A discontinuity is a change which does not arise as part of the natural development of a situation. Thus, a sudden kink on a graph suggests that the basic situation has changed, that some new factor has come in. A discontinuity also implies that the new factor does not arise from within the situation but from outside. In its extreme sense, discontinuity implies that the factor is not connected at all with the situation under consideration… The word discontinuity is often applied when a connection cannot be seen."

Secondly, the lateral thinking is logical but only with hindsight. While we swim in the main-

stream, the lateral runway cannot be seen; yet once we arrive at the end of the runway and we look back, it can be seen as another mainstream (ibid):

"In hindsight every single insight solution must be obvious. And usually it is the very obviousness of the solution that makes it so infuriating."

However, listing numerous examples, Gladwell [30] warns that we have no evidence that the *ex post* explanation has anything to do with the way how the intuition got to the novelty. We completely agree with this but, fortunately, the role of explanation is not to describe how one arrived at the creative result but to check whether the creative outcome makes sense.

Therefore, creativity is about seeing things differently, but not in *any* different way! In other words it must be in a way that makes sense, except that no one has seen it before. Hadamard [31] investigated how new results are born in the domain of mathematics, which is usually thought of as being completely logical. His investigation confirmed both of the previous characteristics, i.e. that a previous deep knowledge is essential, and that the novelty is born in a flash of intuition. According to Hadamard, the first phase is the conscious hard work of trying to solve some problem. Then follows a forgetting phase, which may mean a continuation of the work unconsciously. Next comes the sudden insight accompanied by a sense of certainty. This is followed by another conscious phase of putting on paper and proving (in mathematics!) the result.

We now have a reasonably solid explanation why there can be no methods for being creative: The creative jump cannot be seen ex ante, only ex post. An algorithm cannot go into a place that cannot be seen. Only imagination can. Only intuition. Not a machine, only a human.

In his various books de Bono brilliantly describes this non-algorithmic, anti-methodical nature of creativity and then, quite surprisingly, he gives a series of methods for lateral thinking: the "PO" [32], the "Six Thinking Hats" [33], the "Aims, Goals and Objectives" (AGO), the "Consider All Factors" (CAF), the "Other People's Views" (OPV), the "Alternatives, Possibilities and Choices" (APC), the "First Important Priorities" (FIP), the "Consequence and Sequel" (C&S), the "Plus, Minus and Interesting" (PMI). [20: 63-150] Is this not infuriating? Why would someone who obviously understands the essence of creativity offer methods for it? We have found the answer for this well *beyond* the scope of science:

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[2] The term lateral thinking is used here in de Bono's original sense (to make a contrast to convergent thinking, as described above). Unfortunately the same term is also used to indicate the techniques developed to stimulate thinking outside the box (many of them also by de Bono); but while these may stimulate intuiting by means of diverting attention from the 'usual', they are by no means intuiting or part of it. [cf 26: C2]

Coelho[3] went to the desert to find his guardian angel and he had a series of steps to perform. One of these is called the ritual that destroys rituals. The explanation is that the magus gradually becomes the slave of his own rituals; therefore occasionally, he has to undergo a process of purification to get rid of them. The purpose of the ritual that destroys rituals is to help him to step out. De Bono's methods can be understood in the same way. He created methods to help stepping out of our rituals. Methods that destroy methods.

This leads us to the next aspect of creativity; the creative must be free to create. Few would dispute this statement – but being free is not as simple as it sounds.

3   CREATIVITY AS FREEDOM AND RESPONSIBILITY

Freedom is the opposite of slavery. Of course, one may argue that there is no slavery in the world today but there are other views as well; e.g. Marcuse [34: 36] asserts that:

"The slaves of developed industrial civilization are sublimated slaves, but they are slaves, for slavery is determined neither by obedience nor by hardness of labor but by the status of being a mere instrument, and the reduction of man to the state of a thing."

Freedom can be fully understood only if examined in relation to the complete personality. [35: viii] Fromm (ibid: 26) distinguishes two kinds of freedom: the negative, or *"freedom from"* as well as the positive or *"freedom to"*. We are free from the bonds of the pre-individualistic society; but we are also left without the safety it guaranteed; we are left in isolation. There are two responses to this situation; either we seek new dependences and submissions or we advance to a realization of positive freedom based on uniqueness and individuality. Which way to chose is answered by Szondi's [36] fate-analysis.

According to Szondi we have several possible fates for ourselves. These are determined by our genome and instincts (ontogenetic and philogenetic heritage) on the one hand, and by our socio-cultural environment on the other. Nobody can choose a fate that (s)he has not seen or does not have built-in. The (positively) free person can choose from the available ones; but the others live a constraint-fate. Therefore we also call the positively free people *"self-strong"*, the others are *"self-weak"* or *"fate-ill"* people. Szondi claims that only people who can choose their destiny can be happy. So who can be free? According to Szondi the answer lies in the children's room. The children's room

is not necessarily a separate room but a place where the child can express herself/himself. To have a children's room makes the difference between being raised for freedom instead of obedience. The famous Hungarian architect Imre Makovecz said in an interview that he only accepts an apprentice who could look up to her/his father (dominant parent) instead of fearing him. If one was trained for obedience, it takes hard work to make one free [34: 44]:

"… it must first enable its slaves to learn and see and think before they know what is going on and what they themselves can do to change it. And, to the degree to which the slaves have been preconditioned to exist as slaves and be content in that role, their liberation necessarily appears to come from without and from above. They must be 'forced to be free', to 'see objects as they are, and sometimes as they ought to appear', they must be shown the 'good road' they are in search of."

We argue that only free people can be creative. They need both negative freedom, so that being creative is allowed by the authorities, and also positive freedom, which means that they can handle their own creativity [35: 208]:

"We are proud that we are not subject to any external authority, that we are free to express our thoughts and feelings… The right to express our thoughts, however, means something only if we are able to have thoughts of our own: freedom from external authority is a lasting gain only if the inner psychological conditions are such that we are able to establish our own individuality."

Why would one remain a slave if one can be free? Presumably this is because freedom has its price – a high price. First, freedom always goes together with responsibility. If one is told what to do or how to make one's choices – one is not responsible. But if one is free to choose from existing solutions or to create a new one then one is responsible for one's choices and creations [25: 284]:

"… an absence of «objective» standards does not mean less work; it means that scientists have to check all ingredients of their trade and not only those which philosophers and establishment scientists regard as characteristically scientific. Scientists can thus no longer say: we already have the correct methods and standards of research – all we need to do is to apply them. For according to the view of science that was defended by Mach, Boltzmann, Einstein and Bohr, and which I restated in AM,[4] scientists are not only responsible for the correct application of standards they have imported from elsewhere, they are re-

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[3] Coelho, Paulo (1995) The Valkyries, Harper Collins, London.

[4] The acronym reads "Against Method" which is another book of the author.

sponsible for the standards themselves.*"*

Second, being free is scary. Being a slave is secure, as it is known. Of course, for the one who is free, being a slave sounds scary – but actually it is pretty simple to realize that slavery is secure. This makes the tie between freedom and creativity even more obvious: creating something that did not exist before is a leap into the unknown. We need to give up the known and secure for the unknown and dangerous. What incredible intellectual courage Einstein must have needed to give up the only two certain things that make the foundation of physics, the time and the space!? (quoted by [37: 66]):

"It was as if the ground had been pulled out from under one, with no firm foundation to be seen anywhere, upon which one could have built."

This is what it takes to be creative. And then, you have your intellectual child, your creative result and you are responsible also for how it affects the lives of others. If you make a medicine, that is great. But if one starts killing people with it? The same creative accomplishment can be used to build a power plant and to make a bomb…

4 CREATIVITY AS LOVE AND BEAUTY

Creation is often described by creatives as an act of love. This is in perfect harmony with being responsible for what you create. You also love it. The one does not exist with the other; the Hungarian poet Tibor Déry said: *"To love is to take responsibility."* It seems promising to explore the conception of love in order to heighten our understanding of creativity.

Fromm [38], investigating the role of love in our lives, explained that essentially love is a capability of a person, not something that happens to her/him (ibid: 36):

"Love is not primarily a relationship to a specific person; it is an attitude, an orientation of character which determines the relatedness of a person to the world as a whole, not towards one 'object' of love."

Fromm identifies five objects of love and five types of love accordingly: brotherly love, motherly love, erotic love, self-love and love of God. The following categorization largely follows Fromm's description but Lewis's [39] inquiry is also considered. The different types of love have different essential characteristics; thus, understanding the types of love will help understand the essence of love. This will, at the end, lead us to understand what the muse is.

Philos, the brotherly love, is the most essential type of love; the other types do not exist without it. Philos is our sense of responsibility and care, our curiosity to know about other people and our respect towards others. It is the capacity to love. It is love between equals, which does not imply that we are the *same* but that we are *one*. The culmination of Philos is the friendship in its greatest and noblest sense. Philos is not exclusive; moreover, two is not even the best number for it. Using Lewis' [39: 74] example, if *A*, *B*, and *C* are friends, and *A* dies *C* does not only lose *A* but also *A*'s part in *B*; e.g. how *B* used to laugh on *A*'s jokes. Self-love also belongs to Philos. Self-love emerges from emotional maturity: we cannot love others without loving ourselves, and thus self-love actually defines the brotherly love: *"love thy neighbour as thyself"*.

Eros, the erotic love, is much more than sexuality; sexuality, *Venus*, belongs to physiological needs. Though all kinds of love make us become one with other people, the total union is Eros. This is a complete fusion with another person. As we are not capable of total fusion with all other people, the erotic love is exclusive; a union with a single other person. The phenomenon of oneness and individuality that we can see on a personal plain is repeated in erotic love – one loves all the people but loves someone in a special, individual way. Eros, like Philos, is love of equals. Eros without Philos is only passion.

Storge, the motherly love, seems to be somehow a mixture of the previous ones; it is unconditional as Philos, exclusive as Eros and non-equal as Agape (see next). However, Storge is not examined in this paper.

If love governs us towards unity with other people, than *Agape*, the love of God, governs us to embrace the whole of nature, the whole universe. In purest form it can be observed in saints who go among people to help them and hermits who leave the world of people to be united with the general force of life. Another pure type is the inspired enthusiasm of a person doing… well, doing anything. What is characteristic for all three versions, is that the person experiencing Agape is consumed by it. The last version of Agape is the same as the flow experience of Csíkszentmihályi [40] and the peak-experience of Maslow [41]. We need to describe this Agapean inspiration that is so typical to creatives [42: 101]:

"The term peak experiences is a generalization for the best moments of the human being, for the happiest moments of life, for experiences of ecstasy, rapture, bliss, of the greatest joy. I found that such experiences came from profound aesthetic experiences such as creative ecstasies, moments of mature love, perfect sexual experiences, parental love, experiences of natural childbirth, and many oth-

ers. *I use the one term – peak experiences – as a kind of generalized and abstract concept because I discovered that all of these ecstatic experiences had some characteristics in common. Indeed, I found that it was possible to make a generalized, abstract schema or model which could describe their common characteristics. The word enables me to speak of all or any of these experiences in the same moment."*

Csíkszentmihályi (ibid: 71) portrayed the flow experience in activities (such as work) as a state in which:

"Concentration is so intense that there is no attention left over to think about anything irrelevant, or to worry about problems."

Now we can understand the well-known phrase of *being kissed by the muse*. The inspired state of flow requires Agape but Agape is not readily available; it is easier to get dissolved in it if accompanied by Eros. After all, it was Eros who was characterized by the strongest sense of unity. The inspiration is brought by the Muse, who is actually a form of love herself/himself: Muse=Eros+Agape.

The flow state is the perfect state; more precisely one of the two perfect states. Besides the peak experience, which corresponds to creativity, Maslow in his journals [43] also describes the *plateau experience*, which corresponds to wisdom. We do not investigate the conception of wisdom in the present paper, but it is interesting to note that the two are related. (See [17] for more details.) The flow state also means establishing a complete harmony with ourselves, with our discipline, with the world, and with the whole universe. The flow state is harmony realized in the mind of a person. When in such state, we also search for harmony, and the creative idea is also the embodiment of harmony. Or indeed it is beauty, as harmony and beauty is just an aspect of harmony. So creativity is also often perceived as the achievement of harmony or beauty.

The conceptualization of harmony can be traced back as far as to the ancient Greece, and probably further. It is notable that Heraclitus, whose writings seem to be the earliest written discussions of harmony in the Western philosophical tradition, derives the conceptualization of harmony from music. [44] It is notable because music appears to be the very source in which we experience harmony as a dynamic phenomenon. [45] As creativity brings about a new harmony, we certainly need a dynamic picture of harmony. There are various characteristics of harmony, the proper discussion of which is beyond the scope of this paper. However, it is worth noting that harmony is frequently regarded as an essential intrinsic feature of the nature and, as such, it transcends the objective-subjective dichotomy. (Cf [46]) It is often related to truth [47] in the sense that something is true as it is harmonious (although we prefer to avoid the true-false dichotomy as we believe that there are many possible truths), it is also understood as transcendence [48]. All of these features are essential to perceive creativity as the creation of a new harmony.

When James Clark Maxwell invented his famous four differential equations describing the electromagnetic fields, in the first version he included all the facts he knew, all experimental results. But he was not satisfied. He argued that the equations are not beautiful. He added a new component to make them more beautiful, although there was absolutely nothing that would require that new component. However, years later, the new component (today we call it the *magnetic shift*) was proven to be right. Maxwell sensed the lack of harmony and he also sensed where the deeper harmony laid. We still use the second form of Maxwell's equations today. Leonardo is often quoted as recognizing that a machine did not work as it was not beautiful. Because of its lack of harmony. For all creation, whether belonging to arts, science, or engineering, delivers a new harmony that was not seen before. Using the words of Heraclitus (quoted by [44]): *"The hidden harmony is better than the obvious."*

CONCLUSIONS

In this paper we have managed to cover only a few aspects of creativity, though important ones. We talked about knowledge, in which the creative should achieve high levels before becoming able to achieve significant creative results. In relation to this, we examined what it means to be 'gifted' and saw that the creative needs to be talented in the *discipline* as well as in *creativity*. This led us to query the creative thinking process, and we have found that it should be lateral, the same way as in jokes. We have realized that to be able to think laterally, the creative needs to be free; but this also means that (s)he has to take responsibility. Responsibility, in turn, leads us into the area of love and understanding of how the Muse works; that (s)he is Eros and Agape together. Finally we identified the inspired state, when the creative is 'kissed by the Muse', with the concept of harmony and beauty and so, due to that, the creative process with the quest for harmony/beauty.

We know a few other things about creatives and their creations. We know, for instance, that the creatives are often not the most pleasant people to work with. There is no single typical personality that we have seen in all creatives.

Some are lonely wolves and others have active social lives. They often have many friends but they can never fit into the anxious world of mediocrity, it is not rare that they lead a louche life. If one examined life stories of great creatives, one would find that many, if not most, of them had problems in school. Based on the discussion above we come nearer to understanding why. Our schools do not support looking at things differently (lateral thinking), they are about control rather than freedom. If harmony or beauty are mentioned at all, it will be in the 'less important' classes which are typically not even graded. And it is quite rightly so, because we can only mark what we can unambiguously check against a predefined set of expectations. We teach pupils, and even our students, that there is a single right answer or, at least, that they can get to the right result by applying certain existing tools/methods. In our Western schools only the convergent thinking is nurtured; creativity is in the best case tolerated and most often persecuted. The only type of teaching-learning that does not work against creativity, at least the only one we know of, is the master-apprentice relationship in the Polanyian [49] sense.

We conclude with words of John W. Gardner (quoted by [50: 313]):

"When Alexander the Great visited Diogenes and asked whether he could do anything for the famed teacher, Diogenes replied: 'Only stand out of my light.' Perhaps someday we shall know how to heighten creativity. Until then, one of the best things we can do for creative men and women is to stand out of their light."

REFERENCES

[1]   Z. Baracskai, V. Dörfler, and J. Velencei, "Business Creativity: An Evolutionary Approach."

[2]   M. Csíkszentmihályi, *Creativity: Flow and the Psychology of Discovery and Invention*, New York, NY: HarperCollins, 1997.

[3]   H. Gardner, *Creating Minds: An Anatomy of Creativity Seen through the Lives of Freud, Einstein, Picasso, Stravinsky, Eliot, Graham, and Gandhi*, New York, NY: Basic Books, 1993.

[4]   A. Einstein, *The World As I See It*, New York, NY: Kensington Publishing, 1956.

[5]   Z. Baracskai, V. Dörfler, and J. Velencei, "Knowledge Restaurants at the End of the Paradigm."

[6]   T. S. Kuhn, *The Structure of Scientific Revolutions*, 3rd ed., Chicago, IL: The University of Chicago Press, 1962.

[7]   W. Heisenberg, *Physics and Philosophy: The Revolution in Modern Science*, London: Penguin Books, 1962.

[8]   M. J. Flynn, *Computer Architecture: Pipelined and Parallel Processor Design*, Boston, MA: Jones & Bartlett publishers, 1995.

[9]   V. Milutinović, *Surviving the Design of a 200 MHz RISC Microprocessor: Lessons Learned*, Los Alamitos, California: IEEE CS Press, 1996.

[10] V. Milutinović, *Surviving the Design of a 16 MPs Multiprocessor System: Lessons Learned*, Los Alamitos, California: IEEE CS Press, 1997.

[11] N. Tesla, *My Inventions: The Autobiography of Nikola Tesla*, Milton Keynes: Filiquarian Publishing, 1919.

[12] F. Hong, "Tesla Composed Like Mozart," *Celebration of the 150th anniversary of the birth of Nikola Tesla*, http://www.med.wayne.edu/physiology/facultyprofile/hong/PDF%20files/Tesla_Composed_Like_Mozart.pdf, 2006].

[13] F. Hong, "The enigma of human creativity: Hidden messages from Nikola Tesla's Moji Pronalasci," *Naš Tesla (Our Tesla), Technical Science Monograph No. 18*, R. J. Halaši, I. P. Ćosić and T. J. Halaši, eds., pp. 127-176, Novi Sad, Serbia: University of Novi Sad Faculty of Technical Science, and Society for the Promotion of Science Novi Sad, 2006.

[14] L. Mérő, *Ways of Thinking: The Limits of Rational Thought and Artificial Intelligence*, New Jersey, NJ: World Scientific, 1990.

[15] Z. Baracskai, *A profi vezető nem használ szakácskönyvet*, Nyíregyháza, Hungary: "Szabolcs-Szatmár-Bereg megyei Könyvtárak" Egyesülés, 1999.

[16] V. Dörfler, Z. Baracskai, and J. Velencei, "Knowledge Levels: 3-D Model of the Levels of Expertise," in The Sixty-eighth Annual Meeting of the Academy of Management, Chicago, IL, 2009.

[17] A. Craft, H. Gardner, and G. Claxton, *Creativity, Wisdom, and Trusteeship: Exploring the Role of Education*, Thousand Oaks, CA: Corwin Press, 2008.

[18] K. E. Boulding, "General Systems Theory: The Skeleton of Science," *Management Science,* vol. 2, no. 3, pp. 197-208, 1956.

[19] F. Hong, "A survival guide to cope with information explosion in the 21st century: picture-based vs. rule-based learning," *21st Webzine,* vol. 3, no. 4, 1998.

[20] E. de Bono, *Teach Your Child How to Think*, London: Penguin Books, 1993.

[21] K. R. Popper, *The Logic of Scientific Discovery*, 2nd ed., London: Routledge, 1968.

[22] A. Newell, and H. A. Simon, *Human Problem Solving*, Englewood Cliffs, NJ: Prentice Hall, 1972.

[23] G. Pólya, *How to Solve It: A New Aspect of Mathematical Method*, 2nd ed., London: Penguin Books, 1957.

[24] P. K. Feyerabend, *Against Method*, 3rd ed., London: Verso, 1993.

[25] P. K. Feyerabend, *Farewell to Reason*, New York, NY: Verso, 1987.

[26] E. Sadler-Smith, and E. Shefy, "Developing Intuition: 'Becoming Smarter by Thinking Less'," *Academy of Management Proceedings*, pp. C1-C6, 2004.

[27] E. de Bono, *Lateral Thinking for Management: A Handbook*, London: McGraw-Hill, 1971.

[28] E. de Bono, *Parallel Thinking: From Socratic to De Bono Thinking*, London: Viking, Penguin Group, 1994.

[29] A. Koestler, *The Act of Creation*, Danube ed., London: Pan Books, 1971.

[30] M. Gladwell, *Blink: The Power of Thinking without Thinking*, London: Penguin Books, 2005.

[31] J. Hadamard, *The Psychology of Invention in the Mathematical Field*, New York, NY: Dover Publications, 1954.

[32] E. de Bono, *Po: Beyond Yes and No*, London: Penguin Books, 1973.

[33] E. de Bono, *Six Thinking Hats*, London: Penguin Books, 1990.

[34] H. Marcuse, *One-Dimensional Man: Studies in the Ideology of Advanced Industrial Society*, 2nd ed., London: Routledge, 1964.

[35] E. Fromm, *The Fear of Freedom*, London: Routledge, 1942.

[36] L. Szondi, *Ember és sors: Három tanulmány*, Budapest, Hungary: Kossuth Könyvkiadó, 1954.

[37] F. Capra, *The Turning Point: Science, Society, and the Rising Culture*, London: Flamingo, 1982.

[38] E. Fromm, *The Art of Loving*, London: Harper Collins, 1957.

[39] C. S. Lewis, *The Four Loves*, London: Harper Collins, 1960.

[40] M. Csíkszentmihályi, *Flow: The Psychology of Optimal Experience*, 2nd ed., London: Rider, 2002.

[41] A. H. Maslow, *Religions, Values, and Peak-Experiences*, New York, NY: Penguin, 1970.

[42] A. H. Maslow, *The Farther Reaches of Human Nature*, London: Penguin Compass, 1971.

[43] Author ed.^eds., "The Journals of Abraham Maslow," abridged ed., Lexington, MA: Lewis Publishing, 1982, p.^pp. Pages.

[44] C. Y. Cheng, "On Harmony as Transformation: Paradigms for the I Ching," *Journal of Chinese Philosophy,* vol. 16, no. 2, pp. 125-158, 1989.

[45] G. Bateson, *Mind and Nature: A Necessary Unity*, New York, NY: Bantam Books, 1980.

[46] M. Polanyi, *Personal Knowledge: Towards a Post-Critical Philosophy*, London: Routledge, 1962.

[47] G. Rudebusch, "Harmony as Truth: A Greek View," *Journal of Chinese Philosophy,* vol. 16, no. 2, pp. 159-175, 1989.

[48] S. W. Laycock, "Harmony as Transcendence: A Phenomenological View," *Journal of Chinese Philosophy,* vol. 16, no. 2, pp. 177-201, 1989.

[49] M. Polanyi, "The Republic of Science: Its Political and Economic Theory," *Minerva,* vol. 1, pp. 54-74, 1962.

[50] B. Cramond, "Developing Creative Thinking," *Methods and Materials for Teaching the Gifted*, F. A. Karnes and S. M. Bean, eds., pp. 313-351: Prufrock Press Inc., 2005.

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