THE CONCEPT OF EMERGENCE. A BRIEF HISTORY AND A PHILOSOPHICAL ANALYSIS OF AN ONTOLOGICAL REGULATIVE PRINCIPLE OF ORGANIZATION

Roberto Manzocco

City University of New York
roberto.manzocco@gmail.com
Orbis Idearum, Vol. 6, Issue 2 (2018), pp. 11-32.

ABSTRACT

Emergence is it is a concept that should undergo more careful philosophical analysis. This paper aims to promote the idea that "emergence" should be taken as an ontological regulative principle (rather than a conceptual instrument able to provide a quick empirical answer to many concrete scientific problems). The usefulness of the proposed approach rests in the fact that it could work as an overarching theoretical framework for the ever-growing body of theories and empirical data provided by natural and social sciences; it could also help to overcome (at least partly) the extreme over-specialization that characterizes contemporary knowledge. Furthermore, it could work as a programmatic framework for comparing and combining data and theories belonging to very different fields – from the natural to the social sciences – but related to one single, very complicated entity, that is, Man. So, after a short history of the concept of emergence, an analysis of its ontological nature will follow; then some specific philosophical problems – like the metaphoric aspects of the emergentist approach, or the ontological unification of every kind of emergence – will be discussed. Afterward this paper will provide a few reasons for supporting a regulative approach to emergence and will illustrate its advantages – supplying an example/proposal taken from the debate about free will.

1. INTRODUCTION: EMERGENCE EVERYWHERE

There is a lot of talk about "emergence" going on these days; indeed, it seems that emergence is back, and that this venerable – although controversial – concept is joining other popular buzzwords, such as "system," complexity," "non-summativity," "wholeness," and so forth. In fact, a lot has been written in recent years about the "re-emergence of emergence" (e.g., Clayton and Davies 2006, Bedau 2008).

The vocabulary produced by so-called "system science" has definitely become part of the established scientific background and academic curricu-

lum.

It is possible to find it everywhere, often connected with other philosophical concepts, like "existence." One example of this is the Dutch theoretical physicist Erik Verlinde and his hypothesis of "Entropic Gravity," according to which gravity is not a fundamental interaction, but probabilistically "emerges" from physical systems' spontaneous tendency to increase their level of entropy (Verlinde 2010). Another example – taken from applied research – is systems biology, a collective name for a certain number of trends of contemporary biotechnology and biosciences (e.g., Alon 2006) strongly focused around the goal to discover and produce emergent properties in living systems. Philosopher Craig Callendar (Callendar 2010) writes in «Scientific American» that time and change are illusions, as they "emerge from a universe that, at root, is utterly static," implicitly stating that emergence is the opposite of existence – that is, if something emerges, this means that it does not properly exist – and so endorsing a form of "mereological nihilism." And these are just three examples out of many.

The notion of "emergence" is getting trendy, so it should undergo a more careful philosophical analysis. After a short history of the concept of "emergence," this paper will analyze the proposal that this concept should be taken as an ontological regulative principle of organization (rather than a conceptual instrument able to provide a quick empirical answer to many scientific problems). The usefulness of the proposed approach will be then illustrated (which rests in the fact that it could work as an overarching theoretical framework for the ever-growing body of theories and empirical data produced by natural and social sciences, and could also help to overcome, at least partly, the extreme over-specialization that is characterizes contemporary knowledge). And as one of the central debates about human nature, that is, free will, has arguably reached a "theoretical stalemate," an emergentistic program to set this discussion in motion again will be proposed.

2. BRIEF HISTORY OF A CONTROVERSIAL CONCEPT

In his book Emergent Evolution: Qualitative Novelty and the Levels of Reality, historian and philosopher of science David Blitz writes that the term "emergent" was used for the first time by George Henry Lewes (Blitz 1992). Lewes compares and opposes, in his Problems of Life and Mind (1874-1879), two words, "resultant" and "emergent": the latter indicates an unpredictable trait or effect, which cannot be explained through the mere sum of its components. Lewes was following the idea – coined by John Stuart Mill – of "qualitative novelty," as in the example given by Mill about the properties of water, which cannot be reduced to those of hydrogen and oxygen. In fact,

the first thinker to talk about emerging qualities was Aristotle, who in his Metaphysics characterized composite entities as "having a number of parts where the totality is not a heap but the whole is something besides the parts" (Book H, 1045:10). During the Twenties, emergence and emergentism found several followers, like Samuel Alexander, Roy Wood Sellars, Arthur Lovejoy, the South-African politician Jan Smuts (father of another important systemic concept, "holism"), Charlie Dunbar Broad, and Conwy Lloyd Morgan. The latter published three works on this topic: Emergent Evolution (1923), Life, Spirit and Mind (1926), and The Emergence of Novelty (1933).

In spite of their differences, all these thinkers and theorists have common ground, namely, the idea that the world is built like a ladder, composed of well identifiable strata, paralleled by an analogous stratification of the natural and social sciences. Of course, the fundamental level is the physical one, followed by the chemical, the biological, the psychological, and the social. And of course the disposition of layers follows criteria of growing organisational complexity.

From many points of view emergentism is a monist substitute for an obsolete approach, vitalism, but actually emergentism had, from the beginning, a broader focus: while vitalism regarded only living systems, emergentism aimed to include in its theoretical web the whole of reality. But how did the first emergentists define "emergence"?

Lloyd Morgan said that "Under what I call emergent evolution stress is laid on this incoming of the new. Salient examples are afforded in the advent of life, in the advent of mind, and in the advent of reflective thought" (Lloyd Morgan 1923). Interestingly, Lloyd Morgan's view was not a real scientific theory, but a philosophical one, as it did not introduce specific, concrete causal mechanisms able to explain the phenomenon of emerging properties (Blitz 1992).

In the landmark work The Mind and Its Place in Nature (1925), Broad added a concept strongly tied with the idea of emergence, namely the idea of "level," and introduced a fundamental distinction between "intra-ordinal laws," referring to events and objects belonging to a specific level or order, and "trans-ordinal laws," related to the development of higher-level properties from lower-level ones.

In the Thirties an emergentist multi-level view of life was advanced by embryologist Joseph Needham (Needham 1937), and in 1940s by Julian Huxley (Huxley and Huxley 1947) and by biologist Alex Novikoff in a well known article published in «Science», The Concept of Integrative Levels in Biology (Novikoff 1945).

During the Fifties, Ludwig von Bertalanffy, an Austrian biologist and philosopher already famous for his works on theoretical biology, inspired the rise of "General Systems Theory," a conceptual umbrella and a movement

which led to the foundation – in 1956 – of the Society for General Systems Research. The meta-scientific and philosophical nature of Bertalanffy's approach is clearly illustrated by his goal to unify all sciences and to provide them with a conceptual framework capable of being for contemporary sciences what Aristotle's logic was for ancient ones . Ambitious as it was, his program of a unification of all sciences was destined to stay programmatic, that is, not to be concretized in any real scientific breakthrough (Bertalanffy 1968).

Anyway, the Society for General Systems Research offered, through its annual publications («General Systems»), the opportunity to work on systemic and emergentist themes to many researchers, such as Anatol Rapoport, Kenneth Boulding, Ralph Gerard, Heinz von Foerster, Russell Ackoff, Donald T. Campbell, Herbert Simon, George Klir, Paul Weiss, James G. Miller and several others.

Among the several other scholars involved with the concepts of emergence and system, we cannot omit Herman Haken – father of "synergetics" – and Ilya Prigogine, with his seminal work on non-equilibrium thermodynamics and open systems – which he called "dissipative structures" (see, e.g., Haken 1977, Prigogine 1980, Nicolis and Prigogine 1977).

Of course, during these decades, emergentism and systemic philosophy did not lack critics, from Bertrand Russell (1927) – who considered emergent qualities merely epiphenomena without scientific significance – to Ernest Nagel (1961) and Carl G. Hempel (1965), who refused to attribute to "emergence" any ontological status, as in their opinion this concept was too imprecise. According to them, emergence was admissible only as an epistemological label, roughly translatable with the expression "so far unexplainable."

3. ONTOLOGY, RATHER THAN EPISTEMOLOGY

Definitions of emergence vary. Lewes writes: "The emergent is unlike its components insofar as these are incommensurable, and it cannot be reduced to their sum or their difference" (Lewes 1875). Jeffrey Goldstein more formally defines emergence as: "the arising of novel and coherent structures, patterns and properties during the process of self-organization in complex systems" (Goldstein 1999). Biologist Peter Corning specifies that systemic laws are merely descriptions or patterns, and so they do not actually "generate" anything and cannot be considered as underlying causal agencies (Corning 2002).

Most researchers and philosophers talk about two different kinds of emergence, namely a "strong emergence" and a "weak emergence." For in-

stance David Chalmers says that

> a high-level phenomenon is strongly emergent with respect to a low-level domain when the high-level phenomenon arises from the low-level domain, but truths concerning that phenomenon are not deducible even in principle from truths in the low-level domain. We can say that a high-level phenomenon is weakly emergent with respect to a low-level domain when the high-level phenomenon arises from the low-level domain, but truths concerning that phenomenon are unexpected given the principles governing the low-level domain (Chalmers 2002).

According to this philosopher in the whole universe there is only one single strongly emergent phenomenon, namely, human consciousness. The definition given by Chalmers is quite clear, even clear-cut: there are two kinds of emergence that can coexist. I have to disagree with Chalmers: his take on emergence – based on the idea of its "uniqueness" – sounds like a kind of miracle and has an anthropocentric slant which looks incompatible with the scientific understanding of the world. Conjecturing a multi-layered ladder of emerging levels makes more sense and sounds philosophically more acceptable. Similarly, Mark A. Bedau raises doubts about strong emergence more broadly, stating that "although (…) logically possible, it is uncomfortably like magic" and that its "mysteriousness will only heighten the traditional worry that emergence entails illegitimately getting something from nothing" (Bedau 1997).

So, who is right? Is emergence only an epistemological, or subjective phenomenon, expressing our (perhaps temporary) ignorance about the facts of the world, or is it an ontological, or objective one? The short answer is: no one can know. Let us consider the long answer. On the epistemological side, it is in fact possible to view "emergence" as an obstacle on the path toward the explanation of a certain phenomenon. I do think it is impossible to say for certain that a certain entity or process is emergent in a strong sense, and this just because one day a reductionist explanation could be found. On the ontological side, it is possible to say (as many philosophers have noticed) that the reductionist program is, well, just a program. In other words, reductionism rests on the faith that one day everything will be reduced to some, so far unknown, elementary entities. When and if this will happen, concepts of emergence and existence will be put on opposite sides, that is, emergence will mean the contrary of existence, and every emerging object or process will not exist in a proper sense.

In the meantime, while waiting for a general reduction of everything to the simplest entities imaginable, and just to keep natural and social sciences active, I believe it is more useful to start with the hypothesis that the objects

they are about do really exist. And so, we should hypothesize that biological organisms do really exist, that human beings do really exist, that even society exists (the latter does not mean to endorse or to thwart any project of building a social ontology like Searle's, a topic too large to be faced here). There is a strong reason for this pragmatic choice: in fact, no one can say what the ultimate, elementary entities, the building blocks of our world, are. So far physical science talks about elementary particles, and sometimes about strings; one day, some new entity – closer to the "bottom" of reality than particles or strings – could appear. Consequently, any coherent hard-line reductionist approach implicitly calls for a suspension of every judgment about existence beyond this unknown, ultimate level of reality.

4. Why emergence should not be taken as a strong Theory of Everything

The ambition to build an "emergentist theory of everything," or a "general theory of emergence," should be carefully avoided. The reasons to follow this precept are basically two: the need not to fall into what I would like to call "systemic hype," which I think is (from a theoretical point of view) hazardous and rather naïve; and a certain number of de facto limitations, which cannot be bypassed anytime soon.

According to many supporters of the "theory of complexity," complex systems emerge because of simple principles of self-organization, and these rules are applicable everywhere, from living beings to human cognition, from atmospheric weather to the ebbs and flows of the stock market. In fact, everything can be explained with a definitive, unifying, grand self-organizing algorithm, which could be around the corner. Does it sound reductive, even reductionist? Of course it does, because, to a certain extent, it is. But this is exactly the approach embodied during the Eighties by one of the main centres working on the theory of complexity, the Santa Fe Institute. Research carried out at this institute since the mid-Eighties by diverse scholars (such as Murray Gell-Mann, Doyne Farmer, Stuart Kauffman, John Casti, Jim Crutchfield and John Holland) brought a lot of theoretical work, many popular books and, to tell the truth, a certain degree of opacity and confusion to the concept of emergence. For instance, Kauffman talks about a brand-new "fourth law of thermodynamics," an immanent organizing principle of the universe that resists entropy and manages to combine a clear reductionist flavour with a vitalistic opacity (Kaufmann 2000). As – without any irony – physicist Doyne Farmer puts it: "It's not magic … but it feels like magic" (Waldrop 1992). In the end, the approach of the Santa Fe Institute tries to canalize into physics many philosophical and meta-scientific topics and to

find a "third way" between holism and reductionism. But, as shown in the case of Kaufmann (among other examples), it fails and it develops a reductionist, non-philosophical interpretation of the concept of emergence.

The history of science and philosophy are filled with examples of attempts to explain everything using a few simple concepts and rules, and past failures should persuade future systemic thinkers to be more careful in theoretically "invading" specific disciplines or in expecting to solve conundrums raised by fields and topics very far from the one they were originally trained in.

But there are more important reasons to avoid any attempt to build a strong, decisive "general theory of emergence," namely, some de facto limitations, which are related with a notion strongly tied with the topic of emergence: the concept of level. The first question I would like to raise is: how many levels are there? We have seen that Chalmers dismisses the whole notion of a hierarchy of "strong-emerging" levels, while systemic philosopher Ervin Laszlo (Laszlo 1972) presents a very articulated model of hierarchy, composed of a main hierarchical system and one local – but the latter is just an example of a potentially infinite series. The first system, which he calls "macro-hierarchy," represents the purely physical reality, distributed on a ladder going from the space-time continuum and elementary particles to galaxy clusters and basically the whole physical universe. The local hierarchy, called "micro-hierarchy," is about the terrestrial ecosystem, from organic molecules to human society. Of course Laszlo admits other potential micro-hierarchies, which – according to his model – seem more or less commensurable with the terrestrial one.

My preference goes to Emmeche, Køppe and Stjernfelt, who identify, as a working hypothesis, a ladder composed of four primary levels: the physical-chemical, the biological, the psychological, and the social. They also add many interesting details:

The ontology of levels we attempted to give was framed in a materialist and evolutionary perspective that implied that the relation between levels was considered to be inclusive, permitting the 'local' existence of different ontologies, all included within the physical level and non-violating physical laws. (…) the biological ontology is local to the extent that different biologies, different organizing principles of life, may emerge on other planets (who knows if life universally takes shape as the natural selection of DNA-coded genotypes?) (Emmeche, Køppe and Stjernfelt 2000).

According to them there is a further point of discussion, one about the degree of sharpness in discriminating levels and sub-levels:

One can argue at length about the number of (and demarcations between) the primary levels. Our choice of the four levels mentioned was in part pragmatical (thus, multicellular life and non-self-conscious psyche are seri-

ous candidates for further primary levels), but what is ontologically important is that such levels of reality can in fact be rationally distinguished (Emmeche, Køppe and Stjernfelt 2000).

In fact, it is always possible that, in the near future, new and finer and clear-cut ontological discriminations will emerge (for example between simple consciousness and self-consciousness), or that the ontological ladder will be completely redefined and redesigned.

Furthermore, "other 'local ontologies' of other higher levels may exist within the global, physical primary level, and we cannot tell beforehand which other initiating condition for mentality or sociality other 'local biologies' may constitute" (Emmeche, Køppe and Stjernfelt 1997).

I believe, then, that in the universe there could be an unknown number of "parallel hierarchies," based on principles very different from the ones founding our own bio-psycho-sociological ladder. Moreover I want to add to Emmeche, Køppe and Stjernfelt's approach one more consideration: these hierarchies could be ontologically non-commensurable to each other; for instance, the number and typology of levels could easily not be in a one-to-one correspondence with the levels of any other hierarchy. Inside the same hierarchy, there is, or there could be, a different kind of emergence for any given level.

All classifications of levels should be taken as preliminary, as further discoveries could force a revision of the number and typology of levels and sub-levels. In the end, although I am not persuaded, I have also to admit the possibility that no ladder exists at all, and the only truly emergent phenomenon could be consciousness. So, my question can be restated as: How many possible parallel ladders are there? Only one? An infinity? A number in between? Is there a ladder at all? No answer is possible right now.

I do however believe that there is a second de facto limitation, which I never found explicitly and exhaustively analyzed in scientific literature: I am talking about the possible emergence of highly speculative, future further levels. This consideration was suggested me by a specific anthropological theory, neoevolutionism. While discarding many concepts of social Darwinism (like the idea of progress), this approach maintains that evolution of human societies can be described objectively and divided into stages, which can be measured using empirical criteria – like the amount of energy used by a certain civilization or the quantity of information produced. A good example of this approach is Leslie White, author of the seminal book The Evolution of Culture: The Development of Civilization to the Fall of Rome (1959).

Without endorsing all the precepts and ideas of this approach to the social sciences, I would like to stress the similarities between White's ideas and the so-called Kardashev Scale, developed in 1964 by the Russian astrophysicist Nikolai Kardashev (Kardashev 1964). Highly speculative, the Kardashev

Scale measures the level of technological and scientific advancement reached by a hypothetical extraterrestrial civilization. The scale includes three levels, labelled Type I, Type II and Type III, in accordance with the amount of energy a civilization has at its disposal (that is, the energy of its planet, of its stellar system, or of its home galaxy). The Kardashev Scale has been extended by other researchers, like Zoltan Galantai (Galantai 2003) and Michio Kaku (Kaku 2004), who talk about a Type IV civilisation; furthermore, Carl Sagan (Sagan 1973) proposed to add to this classification another dimension, related not to the energy available but to the information produced. An obvious objection to this classification is that, as we are talking about a civilisation more advanced than ours, it is impossible to guess its true nature and predict its behavior. But from my point of view, the implications are nevertheless clear: we can easily try to interpret Kardashev's classification from an emergentistic viewpoint, that is, to read the types as possible levels. Which can possibly lead to even more speculative – maybe far-fetched, but surely interesting – questions, which quite probably it will prove impossible to answer. For example: How many upper levels of complexity are admissible? Is there an upper limit to the levels of complexity? So we have a problem: As we are talking about levels of development beyond ours – which could definitely include new emerging properties – how can we plan to reach a complete, decisive, and coherent "general theory of emergence" any time soon?

5. UPPER LEVELS: METAPHORICALLY CLASHING AGAINST A WALL

The topic of upper levels is so interesting that it deserves further analysis to underline few other related problems.

First of all, let us go back to the problem concerning the number of possible upper levels, and let us ask again: is their number finite, or could it be infinite? I am not the only one here to suggest the possibility of the existence of an infinite number of levels, or alternatively, an infinite degree of complexity. For instance, in a different but related field, communication theory, Paul Watzlawick, Janet H. Beavin and Don D. Jackson suggest a similar possibility in reference to human cognitive self-perception – namely, our ability to "frame" and "read" our own surrounding reality and our self-interpretation by encapsulating it in higher and higher conceptual frames, on a cognitive ladder which is potentially infinite (Watzlawick, Beavin and Jackson 1967).

Secondly, about "cognitively transcending" upper levels: even if we can recognize their possible existence, we cannot say much more about them. Being, by definition, these upper levels beyond our own, I would say that, in

the very same moment we try to conceptualize them, or even only to think about them, we get "pushed back" to our own level of emergence, which inescapably "frames" our cognition. To put it in other terms: we can think of them because we have at our disposal a metaphoric ladder, on which every level is represented by a rung. And so we can see, touch, and analyze the rung we are on and the ones below it; in the case of upper rungs, we can imagine their existence, but we cannot really reach for them, just because we don't have either the conceptual tools, or the metaphorical ones, to climb the ladder beyond our own actual level. Some philosophers think that human knowledge is intrinsically metaphoric. From the emergentistic perspective it could be useful to take a look at the work of George Lakoff and Mark Johnson on cognitive metaphors. In their seminal book they skillfully showed how our knowledge and even our everyday language is packed with metaphors of every kind (Lakoff and Johnson 1980); their work could be very useful because, besides some aspects of Bertalanffy's analysis, systemic and emergentistic schools of thought never tried to explicitly understand the "metaphors they live by" – and this could be a very interesting topic to work on in the future.

Put in other terms: according to Ludwig von Bertalanffy (Bertalanffy 1968) scientific investigation is developing toward a "progressive demetaphorisation", which means that, step by step, our scientific interpretation of the world is getting rid of every trait specifically related to the human experience. So for example, as our understanding of reality seems visual-based, quantum mechanics managed to get over it, developing a scientific worldview which is inherently "unvisualizable." Together with the development of new technological tools for observation, this process pushed us far beyond our daily, visual-based, metaphoric interpretation of the world. All this allowed us to eliminate the many limits of our sensory experience – at least if we philosophically support a world-view based on scientific realism, and not, say, on empiricism or idealism.

Let us keep in mind that this erasure process already "cleaned" scientific investigation of many perceptual traits – colours, smells, sounds – and other features (and metaphors) might be cancelled in the future. So, one could ask: how far can we get with this process, before being compelled to get rid of emergence's main metaphor, that is, the "ladder"? Will the "ladder" still stand? Could it withstand this (alleged) demetaphorization process?

A related question I would like to raise is the following. There are no real ladders, here, we know that, but so far this concept has been very useful – together with many other metaphors we live by. So now we should ask ourselves: is this concept forcing our hand? Maybe the idea of an infinite hierarchy is only an unintended and mistaken consequence of a metaphor (the ladder) taken too far.

Maybe it is even possible that, at a potential level beyond ours, the ladder metaphor does not hold; that from the upper level viewpoint there are no ladders at all. So one could wonder: while climbing this ladder composed of emerging levels of complexity, and trying to reach for the upper rungs, are we metaphorically clashing against a wall?

6. THE PLATONIC WAREHOUSE

Let us now look at a different order of problems connected with the concept of emergence and not yet solved, maybe because they coincide with the broadest and deepest problems of philosophy at large (and poorly analyzed and understood by many classic emergentistic thinkers). Let us ask: what is the ontological "source" of emergence? As I said before, it is possible that every level has its own way to emerge from the lower level. In spite of this, we aim to find a general theory of emergence, which should conceptualize every trait the different kinds of emergence have in common.

We need an ontogenetic source; so a unifying theory of emergence should be really unifying. That is: if there are different kinds of emergence at any level and on any possible ladder, they all should be explained through a deeper and more general form of emergence, in other words, a theoretic "source" of all emergence. And not only that: a general theory of emergence which aims to be general in the widest possible sense, should even explain itself, namely, explain how emergence emerged in the first place, and how it can generally emerge. Of course to expect this question to be answered is like expecting an ultimate, complete answer to all the main problems posed by theoretic philosophy. Nevertheless, in the fields of systems theory and complexity theory, there have been some attempts, but – in my opinion – rather naïve or incomplete.

I would like to mention just a couple of them, the "morphic field" of Rupert Sheldrake and the so-called "digital philosophy" promoted by Gregory Chaitin, Edward Fredkin, Konrad Zuse and Stephen Wolfram. According to the latter scholars – mostly mathematicians and theoretical physicists – everything that exists – space, time, thought, consciousness – is a consequence of a huge, unitary process of computation (Zuse 1969, Fredkin 1992, Wolfram 2002). The whole universe should be seen as a computer of unimaginable size. This self-proclaimed "digital philosophy" reflects the spreading of the idea that the process of computation could be everywhere, and actually the computational processes performed by human-made computers could be seen as a smaller, primitive version – or even a simple manifestation – of this huge all-encompassing universal process of computation. As digital philosophers put it, "computation is one," that is, a single "computational stream"

divided in many sub-streams. I do not think this approach is really persuasive, let alone satisfactorily complete, as it does not even try to answer the most fundamental question of all: who or what "computes" our reality? According to Friedkin, this "pan-computational" process is carried out by a not-better-defined "Other," whose nature we do not know. Another universe or dimension? A "meta-universe"? No answer is forthcoming.

The concept of morphic field was coined by British biologist Rupert Sheldrake to indicate an alleged "field of information" which acts as "database" as well as "development drive" for both organic and abstract forms – a collective "library" and an ontological and emergentistic "source" (Sheldrake 1981). I would say that Sheldrake's approach is vitalism, plain and simple, while digital philosophy's is reductionist. But at least someone – inside the variegated complex systems community – is trying to answer the following question, which I never saw explicitly stated: where are the levels of complexity we see around us from? Are they totally, genuinely "new"? and if so, what is the source of this "novelty"? Can it be conceptualized like the age-old idea of creatio ex nihilo? On the contrary, if those levels of emergence are not really "new", but already implicitly existent, "where" are they before coming into existence? Are these upper or alternate, not-yet-existent levels stored in a kind of "Platonic warehouse" or in a Popperian "World 3"? What really matters here is the fact that the problem of origin or source of emergence looks very far from being solved.

7. WHY EMERGENCE SHOULD BE TAKEN AS A REGULATIVE PRINCIPLE INSTEAD

My partial conclusion is: there is so much philosophy in emergentism and theory of complexity, and so little recognized. This "elephant in the room," these unaddressed philosophical problems, make me state the following: If "emergence" has to be interpreted as an ontological concept, this implicitly means that it cannot be taken as a simple scientific concept with immediate utility. As mentioned above, one of the accusations flung at Bertalanffy's General Systems Theory was about its programmaticity. And what if this programmaticity could be turned into something positive, that is, into a virtue?

Let us make a digression and try to set things right about the systemic approach and the related currents (General Systems Theory, Theory of Chaos, Theory of Complexity, and so on). In spite of many naiveties and few results, their philosophical intentions are more than noble: to allow, or even foster communication among disciplines; to favor the positive interchange of concepts and ideas among different fields; in the end, to be a building block

for something we have not heard of for a while, namely, a kind of "philosophy of nature." Like Bertalanffy, and like his more famous forerunners (such as Alfred North Whitehead), the contemporary systemic approaches aim to go beyond the present separation among disciplines or between Snow's "two cultures," and rebuild (maybe unrealistically, maybe not) a kind of renaissance mentality.

Although very ambitious, the goal to revive such a typology of philosophical stances is definitely easier to achieve than the construction of an ultimate general theory of emergence. Instead, philosophy, and in particular systemic thinking, could focus on the creation of a general emergentistic "draft" in which to insert (little by little) all the small pieces of data and discoveries about reality that natural and social sciences will find in the near and far future. It should be a flexible map, a map able to accommodate "reductionist" discoveries and new, "emergent" processes, and consequently to change on demand; furthermore, is should push us to reflect on our emergentistic framework, philosophically asking again and again the question of the ontological source of the emergence and the metaphoric nature of the concepts it uses.

The pragmatic approach advocated here – that is, the interpretation of emergence as an ontological or meta-scientific framework – could rightly be called an ontological "regulative principle of organization," more or less in the same sense that Kant used for the concepts of "soul," "world," and "God."

8. ADVANTAGES OF THE PROPOSED APPROACH

Now a new question arises: What is the point in pursuing this "light" version of a general theory of emergence? Why cannot the special sciences keep doing what they have done so far with great results, without caring about other disciplines? Is there some advantage in talking about systems, emergence, levels of reality, and so forth?

First of all, as shown above, this approach authorizes from an ontological point of view natural and social sciences to talk about their own objects without waiting for the discovery of the "bottom" of reality – if it is possible to find that at all. To put it in another way: I believe it allows – at least in principle – the foundation of every discipline iuxta propria principia (that is, according to their own principles).

Secondly, it could help to reconcile (if this is the goal) the perceptual world (that is, the world naively perceived) with the comprehensive worldview offered by scientific realism. In other words this emergentistic approach could help by ontologically and epistemologically accommodating

both the data coming from human ordinary perception and the theories and data provided by all the different disciplines working on this topic (psychology of perception, cognitive neurosciences, and so on).

Thirdly, it could repair one of the main defects of the classic systemic approaches. In fact, the picture built by those has many gaps, whether from the viewpoint of logic, mathematics, or metaphysics. In other words, while General Systems Theory was meant to be a truly all-inclusive philosophy of nature, many of the contemporary theorists of emergence (although with a certain number of exceptions) seem to focus mostly on physics, biology, and philosophy of mind, and omit that a "general theory of emergence" should be really general, and so should include every kind of system, even the more abstract ones.

Last but not the least, such an approach does foster communication among disciplines, and it can definitely help to find a way out of the overspecialization that plagues contemporary knowledge, by providing philosophers, natural scientists, and social scientists with at least a common ideal goal.

And now let us just try to offer an example of the usefulness of this proposal.

9. A PRACTICAL EXAMPLE: DOWNWARD CAUSATION, FREE WILL, AND A NEW PHILOSOPHICAL ANTHROPOLOGY

Inside the theory of emergence the concept of downward causation exerts a function as important as the one of level; actually we can say that, from many points of view, they are one and the same.

The concept of downward causation implies that events or phenomena belonging to a certain level can act upon events and phenomena of the lower levels; this specific inter-level relationship, together with its opposite – that is, upward causation, which illustrates how some entities at a certain level produce other related entities at a higher level – are basically the core of any emergentistic philosophy.

According to Emmeche, Køppe and Stjernfelt, it is possible to hypothesize at least three kinds of downward causation: a strong downward causation, a medium one, and a weak one, all the three defined by the strength of their influence on their lower levels (Emmeche, Køppe and Stjernfelt 2000). These scholars discriminate three different kinds of downward causation:

> The idea of strong downward causality may be briefly described as follows: a given entity or process on a given level may causally inflict changes or effects on entities or processes on a lower level. (…) (It) introduces a non-

> scientific, that is, irrational principle, and violates the assumption of the inclusivity of levels. (…) Medium downward causation can be defined as follows: an entity on a higher level comes into being through a realization of one amongst several possible states on the lower level -- with the previous states of the higher level as the factor of selection. This idea can be made more precise with the aid of an interpretation of the concept of "boundary condition." ...[In the case of weak downward causation] the higher level is conceived as an organizational level, characterized by the organization, the whole, the pattern, the structure, in short the form into which the constituents are arranged. […] it must not be identified with physical or mechanical reductionism; the forms of the higher level are supposed to be non-reducible. In contrast to medium downward causation it is characterized by not admitting the special interpretation of boundary conditions as constraining conditions, and hence it does not allow the possibility that several higher level phenomena correspond to one and the same lower level phenomenon.

Emmeche, Køppe and Stjernfelt opt for the third kind, although I believe that developments in future scientific investigation could make the first or the second one more palatable. Anyway, no matter which kind of downward causation one decides to choose, this concept could be a good starting point to unify the bulk of knowledge about human beings that natural and social sciences – from neurosciences to genetics, from psychology to anthropology, to linguistics, to sociology, and so forth – are collecting. This goal could be achieved by offering to those disciplines a common vocabulary and a common web of concepts. A similar attempt was already pursued in the first half of the Twentieth Century by the school of philosophical anthropology (Scheler 1928, Plessner 1928, Gehlen 1940, Cassirer 1944), and maybe the time for a new, perhaps less pretentious attempt is coming – and actually some attempts in this direction are already underway (see for example Murphy, Ellis and O'Connor 2009). From this viewpoint, I would like to suggest that a philosophical problem worthy to be read within this emergentistic mainframe could be that of free will.

Almost as old as philosophy itself, the debate about existence and nature of free will – which continental philosophy sometimes perceives as something belonging to the Middle Ages and out of fashion – is alive and vital on the analytic side of philosophical speculation. And, among the many philosophical problems faced by contemporary thought, free will is one of the most interdisciplinary – as it probably lies at the heart of the debate on human nature (nature versus nurture, genetics versus environment and so forth). And in fact this theme can be approached at least from two, maybe three sides.

Fist of all, we can discuss the existence and nature of free will from a general point of view, asking if it exists at all, if it is permitted by a deter-

ministic worldview, if it is indeterminist in its nature, and so on. Related with this approach, we have the problem of moral responsibility, or, put in other terms, the compatibility of this or that idea of free will with our social and ethical habit to keep human beings accountable for their actions. This approach produced a great number of different positions (from compatibilism to incompatibilism, from hard determinism to metaphysical libertarianism, all interwoven in many ways), and involves too many thinkers to name here.

Secondly, we can investigate different scientific fields – like neurosciences, evolutionary biology, cognitive psychology, just to name a few – to verify if free will really exists. And actually some researchers, like Benjamin Libet, cast doubt not only on the existence of free will, but even on the real extent of our self-awareness (Libet, Gleason, Wright, & Pearl 1983; Libet 2004).

Thirdly, some stimulating research is being done – through the tools of contemporary psychological investigation – concerning what regular people think about themselves in terms of free will, self-agency, self-efficacy and so on (see for example: Baumeister, Crescioni, and Alquist 2009).

Although the problem of the nature and coherence of free will, and the problem of real existence of free will, are and should be treated as separate problems, I think there are a few topics and arguments inside one or the other battlefield which are interdisciplinary in nature. For instance, at a certain point the supporters of an incompatibilist and libertarian take on free will tried to provide some evidence to their view quoting quantum physics' indeterminism as a possible source of our free volition. The main proponent of this approach – which is indeed fascinating – is Robert Kane, who in his book Free Will and Values talked about "probability bubbles" at the roots of human volition (see Kane 1985). Far from being satisfied by Kane's view, some philosophers criticized the alleged usefulness of quantum indeterminism in this debate. According to Derk Pereboom neither determinism nor indeterminism account for free will (Pereboom 2001), and criticism toward the quantum interpretation of the latter is expressed also by J. J. C. Smart, who, in a famous passage, notes that: "Indeterminism does not confer freedom on us: I would feel that my freedom was impaired if I thought that a quantum mechanical trigger in my brain might cause me to leap into the garden and eat a slug" (Smart 2003).

In my opinion what matters here is not these quantum physics interpretations' soundness, but rather the fact that they utilize concepts and ideas belonging to a completely different field, without much discussion about the relationship between quantum phenomena and bio-neurological ones – which is exactly what an emergentist worldview would and should do. In fact, if one decides to endorse a general theory of emergence and to support,

say, a strong view of downward causation, any interpretation of free will in the light of quantum mechanics indeterminacy would sound reductionist at least, and then should be dropped or revised. In other words, here is my proposal: the emergentist model could work as a tool to test free will not in itself, but against the natural order as we know it (the whole body of physical laws, the emergentist ladder, and so on).

Another interesting point is the following. Social sciences and psychology provided us with a rich amount of data about many different topics apparently not related to the problem of free will, which actually are connected with it in various degrees: for example, we could talk about the nature and existence of introspection (which could be seen as a tool to process free decisions), the related topic of meta-cognition, long term planning and – more broadly speaking – a theme underlying every specifically human trait, that is, abstract symbolic language. I think that an emergentist model offers a framework in which we can distribute and accommodate all the growing interdisciplinary knowledge relative to free will provided by social and natural sciences. Let us put it in other terms. Neurosciences are providing their own take on free will, and some researchers are actually denying it or even suggesting that our thought is mostly unconscious – and therefore outside free will's reach. This is exemplified by the case of Benjamin Libet's work on readiness potential quoted above. So, one could provocatively ask: what's the point in defending, say, a libertarian version of free will if – in the meantime – some neuroscientists basically state that it is just an illusion? That is why trying to have different fields talking to each other through an emergentistic common ground could be a good and fruitful thing.

A third point is related to the idea of "degrees of freedom". One could think that free will is not about "all-or-nothing", that there can be many diversified constraints which compel us to talk about "degrees of freedom". This approach is known as "restrictivism": the idea that only a small number of human actions is really "free". For example Kane talks about "self-forming actions", related to moral, all-important decisions difficult to evaluate and take (Kane 2007). Imagining these really "free" actions existing along with or fighting against other non-free actions and thoughts could help to make sense of an age-old philosophical topic, the problem of the "weakness of the will," that is, actions taken against our best judgment. And so I believe that the emergentist view could allow us to unravel the different causes of human actions, partitioning them according to the field and the emergent level they belong to, correctly connecting them to each other and tidying up this whole topic. Another example could be Harry Frankfurt's hierarchy of desires (Frankfurt 1971), which could be easily accommodated in an emergentist view of the mind.

Fourthly, if one supports a radical version of the libertarian approach (an-

ti-deterministic, but also anti-indeterministic), one could find in emergence a good setting to locate this apparently counter-intuitive position. Usually the inexistence of a third quid between necessity and randomness is taken for granted, but some philosophers would like to find a "third way" between determinism and pure chance, in order to save both moral responsibility and real freedom, establishing human nature as something completely autonomous (causa sui). Easier said than done, but if there is even a small chance to achieve this goal, it probably lies in an emergentistic model (incidentally, I like this controversial idea of a possible "third way" to free will, although I think that, at least for the time being, it retains a certain degree of opacity).

More generally speaking, we could easily institute a parallelism between free will conceptions and downward causation conceptions, to see how many different kinds of downward causation are possible with emergentism; if they can fruitfully accommodate different takes on free will; and which of the latter are compatible with what it is scientifically established about human beings.

In the end, what can a theory of emergence do for free will? An emergentist model could provide a frame of reference to systematize all the interdisciplinary knowledge about free will, in what can be seen as a program of cross-fertilization. It is just a program, but isn't emergentism intrinsically programmatic?

10. CONCLUSIONS

Summarizing all the ideas expressed in this paper:

1. Emergence is back, and this concept can be found in many different disciplines.
2. Although it could seem mainly a scientific notion, it is a philosophical one, with a long history.
3. That is why it should undergo again and again a careful philosophical analysis.
4. It should be considered an ontological notion rather than an epistemological one, just because pragmatically speaking it confers ontological autonomy to every discipline.
5. Emergence should not be taken as an ultimate, even arrogant "Theory of Everything," because such an attempt would face many de facto obstacles, like the factual impossibility of knowing precisely how many levels of reality there are, how many there could be, and how many different local ontologies exist.
6. There are many philosophical problems related to a theory of emergence still to be adequately answered, such as the nature and possible num-

ber of upper levels, the implicitly metaphoric nature of some emergentist concepts – like the "ladder" – and the ontological source and status of existing and future levels of complexity.

7. Emergence should be taken as an ontological and meta-scientific regulative principle of organization, because it is a flexible approach and could help philosophy, natural science and social sciences to systematize and organize the data they are discovering and the theories they are developing little by little. Furthermore, this approach could satisfy – first of all, by recognizing it – the "human, too human" ambition and burning desire to know the truth in its entirety, or at least to come closer and closer to it, and certainly to talk about it.

8. A core concept of the emergentist worldview, downward causation, could be useful in accommodating our ever-growing body of knowledge about Man; it could also foster interdisciplinary cross-fertilization, accommodate many different positions on existence and nature of free will, and test them against what we know so far about the nature of life and the physical laws of the universe.

Although the final destination is beyond our grasp, this is a road worth traveling.

BIBLIOGRAPHY

Alon, U. 2006. *An Introduction to Systems Biology: Design Principles of Biological Circuits*. London: Chapman & Hall.

Aristotle, *Metaphysics*, http://classics.mit.edu/Aristotle/metaphysics.html.

Baumeister, R., Crescioni, A. W., and J. Alquist, J. 2009. *Free will as advanced action control for human social life and culture*, Neuroethics 4(1):1-11.

Bedau, M. and Humphreys, P. (eds.). 2008. *Emergence: Contemporary Readings in Philosophy and Science*. Cambridge MA: The MIT Press.

Bedau, M. 1997. *Weak Emergence*, Philosophical Perspectives 11: 375–399.

Bertalanffy, L. v. 1968. *General System Theory: Foundations, Development, Applications*. New York: George Braziller.

Blitz, D. 1992. *Emergent Evolution. Qualitative Novelty and the Levels of Reality*. Dordrecht: Kluwer Academic Publishers.

Broad, C. D. 1925. *The Mind and Its Place in Nature*. London: Routledge & Kegan Paul.

Bunge, M. 2003. *Emergence and Convergence: Qualitative Novelty and the Unity of Knowledge*. Toronto: University of Toronto Press.

Callendar, C. 2010. *Is Time an Illusion?*, Scientific American, 302(6): 58-65.

Cassirer, E. 1944. *An Essay on Man*, New Haven: Yale University Press.

Chalmers, D. 2002. *Strong and Weak Emergence*, republished in: Clayton and Davies, 2006.

Clayton, P. and Davies, P. (eds.). 2006. *Re-Emergence of Emergence: The Emer-*

gentist Hypothesis from Science to Religion. New York: Oxford University Press.
Corning, P. 2002. *The Re-Emergence of 'Emergence': A Venerable Concept in Search of a Theory*, in: Complexity, 7 (6): 18–30.
Crutchfield, J. P. 1994. *The Calculi of Emergence: Computation, Dynamics, and Induction*, Special issue on the Proceedings of the Oji International Seminar: Complex Systems — from Complex Dynamics to Artificial Reality, Physica D.
Emmeche, C., Køppe, S., and Stjernfelt, F. 1997. *Explaining emergence – towards an ontology of levels*, in: Journal for General Philosophy of Science 28: 83-119.
Emmeche, C., Køppe, S., and Stjernfelt, F. Levels, *Emergence, and Three Versions of Downward Causation*, in: Andersen, P. B., Emmeche, C., Finnemann, N. O., and Voetmann C. P., (eds.). 2000. *Downward Causation. Minds, Bodies and Matter*. Aarhus: Aarhus University Press.
Frankfurt, H. 1971. *Freedom of the Will and the Concept of a Person*, in: Journal of Philosophy 68 (1): 5-20.
Fredkin, E. 1992. *Finite Nature*, Proceedings of the XXVIIth Rencotre de Moriond.
Galantai, Z. 2004. *Long Futures and Type IV Civilizations*, Periodica Polytechnica Social and Management Sciences 12 (1): 83–89
Gehlen, A. 1988 (1940). *Man, His Nature and Place in the World*. New York: Columbia University Press.
Gell-Man, M., 1994. *The Quark and the Jaguar*, New York: W.H. Freeman.
Goldstein, J. 1999. *Emergence as a Construct: History and Issues*, Emergence: Complexity and Organization 1 (1): 49–72.
Haken, H. 1977. *Synergetics*. Berlin: Springer-Verlag.
Hempel, C. G. 1965. *Aspects of Scientific Explanation*. New York: Free Press.
Huxley, J. and Huxley, T. 1947. *Evolution and Ethics: 1893-1943*. London: The Pilot Press.
Kaku, M. 2004. *Parallel Worlds: The Science of Alternative Universes and Our Future in the Cosmos*. London: Allen Lane.
Kane, R. *Libertarianism*, in: Kane, R.; Fischer, J. M.; Pereboom, D.; Vargas, M., 2007. *Four Views on Free Will*. Oxford: Blackwell.
Kane, R., 1985. *Free Will and Values*. Albany: State University of New York Press.
Kardashev, N., 1964. *Transmission of Information by Extraterrestrial Civilizations*, Soviet Astronomy 8: 217.
Kauffman, S. 1995. *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity*. New York: Oxford University Press.
Kaufmann, S. 1995. *Investigations*. New York: Oxford University Press.
Kim, J. 1993. *Supervenience and Mind*. Cambridge: Cambridge University Press.
Lakoff G. and Johnson, M. 1980. *Metaphors we live by*. Chicago: University of Chicago Press.
Laszlo, E. 1972. *The systems view of the world*. New York: George Brazillier.
Lewes, G. H. 1874-75. *Problems of Life and Mind*. London: Truebner and Co.
Libet, B., Gleason, C.A., Wright, E.W., and Pearl, D.K, 1983. *Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential). The unconscious initiation of a freely voluntary act*. Brain 106 (3): 623–642.
Libet, B. 2004. *Mind time: The temporal factor in consciousness*. Cambridge: Har-

vard University Press.
Lloyd Morgan, C. 1923. *Emergent Evolution*. London: Williams and Norgate.
Lloyd Morgan, C. 1926. *Life, Mind and Spirit*. London: Williams and Norgate.
Lloyd Morgan, C. 1933. *The Emergence of Novelty*. New York: Henry Holt and Co.
Murphy, N., Ellis, G. F. R. and O'Connor, T. (eds.). 2009. *Downward Causation and the Neurobiology of Free Will*. New York: Springer.
Nagel, E. 1961. *The Structure of Science*. New York: Harcourt, Brace and World.
Needham, J. 1937. *Integrative Levels: A Reevaluation of the Idea of Progress*. Oxford: Clarendon Press.
Nicolis, G. and Prigogine, I. 1977. *Self-Organization in Nonequilibrium Systems*. New York: John Wiley.
Novikoff, A. 1945. *The Concept of Integrative Levels in Biology*, in: Science 101: 209-215.
Pereboom, D. 2001. *Living Without Free Will*. Cambridge: Cambridge University Press, p. xviii.
Plessner, H. 1975 (1928). *Die Stufen des Organischen und der Mensch. Einleitung in die philosophische Anthropologie*. Berlin: De Gruyter.
Prigogine, I. 1980. *From Being to Becoming: Time and Complexity in the Physical Sciences*. San Francisco: W. H. Freeman.
Russell, B. 1927. *The Analysis of Matter*. London: Allen and Unwin.
Sagan, C. 2000 (1973). *Cosmic Connection: An Extraterrestrial Perspective*. Cambridge: Cambridge University Press.
Scheler, M., 2009 (1928). *The Human Place in the Cosmos*, Evanston: Northwestern University Press.
Sheldrake, R. 1981. *A New Science of Life: the hypothesis of formative causation*. Los Angeles: J.P. Tarcher.
Smart, J. J. C. 2003. *Atheism and Theism*, Hoboken: Wiley-Blackwell, p.63.
Smuts, J. C. 1926. *Holism and Evolution*. New York: Macmillan Co.
Verlinde, E. 2011. *On the Origin of Gravity and the Laws of Newton*, Journal of High Energy Physics, 1104: 29.
Waldrop, M. 1992. *Complexity: The Emerging Science at the Edge of Order and Chaos*. New York: Touchstone Simon & Schuster.
Watzlawick, P., Beavin, J. H., and Jackson, D. D. 1967. *Pragmatics of Human Communication*, New York: W. W. Norton & Company.
White, L. 2007 (1959). *The Evolution of Culture: The Development of Civilization to the Fall of Rome*. Walnut Creek: Left Coast Press.
Wolfram, S. 2002. *A New Kind of Science*. Champaign: Wolfram Media, Inc.
Zuse, K. 1969. *Rechnender Raum*. Braunschweig: Friedrich Vieweg & Sohn.