

Complexity in a complex Europe

Reflections on the cultural genesis of a new science

June 30, 2006 · Philosophy

Damian Popolo

Popolo D. Complexity in a complex Europe: Reflections on the cultural genesis of a new science. Emergence: Complexity and Organization. 2006 Jun 30 [last modified: 2016 Nov 26]. Edition 1. doi: 10.emerg/10.17357.39502c8c1043eb78bc3335fa15b924f6.

Abstract

European Modernity is characterized by a fragmentation of knowledge and the raise of metaphysical methodology embedded in emerging rationalistic Science. Such developments represent some of the facets of the cultural evolution of Europe. In many cases, the triumph of rationalistic and mechanistic thought cannot be dissociated from some of the most tragic events in world history which took place in Europe during the 'short twentieth century'. Complexity, on the other hand, also has its roots in the European intellectual heritage, and as such it should be considered as one of the paths to knowledge opened by the European philosophical tradition — arguably, a path that was lost following the 'victory' of rationalist approaches in the European 'Epistemic Civil War'. As Complexity Science continues to challenge established epistemology and Europe renews its search for a new identity, this article seeks to explore the relationship between 'Scientific Culture' and 'European Identity' in the light of the relatively recent (re-) emergence of Complexity.

Cause and effect: such a duality probably never exists,—in truth we are confronted by a continuum out of which we isolate a couple of pieces, just as we perceive motion only as isolated points and then infer it without ever actually seeing it. The suddenness with which many effects stand out misleads us; actually, it is sudden only for us. In this moment of suddenness there is an infinite number of processes that elude us. An intellect that could see cause and effect as a continuum and a flux and not, as we do, in terms of an arbitrary division and dismemberment—would repudiate the concept of cause and effect and deny all conditionality.

— Nietzsche, The Gay Science, Book III, 112.

Introduction

This article wishes to present three related arguments:

1. Complexity — understood as a set of knowledge practices which rely on a concept of time irreversibility[1] — represents one of the many paths to knowledge embedded in the European intellectual tradition. In a sense, this article wishes to introduce the idea that the approach used by Fritjof Capra in his *Tao of Physics* (1979) can be more usefully applied to Europe. In fact, not only does a particular strand of European philosophy have a lot in common with the ethos of Complexity, but some important research reveals that the precursors of Complexity theory can be found in specific intellectual traditions within European philosophical thought.
2. Given the intellectual origins of Complexity, Complexity has the potential to re-open a traditional European debate regarding the exact role of Reason after the Enlightenment, a debate that saw the Old World fighting what we could call an ‘Epistemic Civil War’. This ‘war’ was eventually won by a particular understanding and interpretation of the Enlightenment, which can be found in classical (Newtonian) scientific epistemology. Complexity is regarded precisely as a set of knowledge practices that challenge the most important features of such epistemology. Interestingly, whereas thinkers such as Foucault (1970) identify a concept of linear temporality as the cornerstone of the modern configuration of knowledge, important exponents of Complexity Science identify the novelty of Complexity in its recognition of time irreversibility (or the ‘arrow of Time’) as a real state of affairs in nature (Prigogine & Stengers, 1997). A detailed analysis of this relationship has been conducted elsewhere (Popolo, 2003).
3. Differing visions on the role of Reason after the Enlightenment have come with related understandings of how polities and societies should be organized. Ultimately, the European ‘Epistemic Civil War’ is what characterizes differing visions on the ‘European Spirit’, and the consequent diverging opinions on the nature of the European project. On the other hand, Complexity is regarded as being reminiscent of arguments presented by a specific camp in this Epistemic Civil War (the ‘loosing’ side, i.e., Natural Philosophy). It follows that the ethos of Complexity has direct implications for our understanding of Europe’s integration process, or lack of thereof. In this context, the Husserlian understanding of the relationship between approaches to knowledge and the formation socio-political organizations is particularly relevant precisely because it tackles the related issues of ‘European crisis’ and European integration.

At first sight, it may appear as though the seemingly extravagant claims outlined above must be beyond the scope of a single article. Perhaps a more concise way of appreciating such claims can emerge by summarizing in this introduction the main seemingly unrelated points (i.e., books) that are joined by the dotted lines represented in this article’s arguments.

The first of these points is James Gleick’s (1998) seminal work, *Chaos*, in which we learn that two of the most prominent pioneers of the new Science were fascinated by outdated paradigms crystallized in Goethe’s Romantic theories on the nature of plants and colors. The second is Eric Hobsbawm’s (2003) *Age of Revolutions*, in which we learn that differences between German Romanticism and Anglo-French rationalistic theories came with very different approaches to policy, governance and political ideology. Furthermore, in the *Age of Extremes*, Hobsbawm (2003) directly links German Natural Philosophy and Romanticism with the emergence of ‘Chaos Theory’. Finally, as stated above, Foucault (1970) argues that the French philosopher Henri Bergson represents the beginning of a new configuration of knowledge by virtue of his new conceptualization of nonlinear time. Incidentally, Prigogine (1997) takes Bergson as a starting point for his enquiry into the ‘arrow of time’ and the ‘end of certainty’. This article constitutes an attempt to link these points in order to present debates regarding the role of Reason before and after the (re-)emergence of Complexity, and to understand what the consequences of such re-emergence may be for the future of European cultures and societies in the context of European integration.

On the intellectual genesis of Complexity

Before embarking on a study of the genesis of Complexity for the purposes of its comparison with 'Newtonian' science, we should bear in mind Michael Dillon's warning: to 'compare' complexity inevitably leads to the temptation of defining it. Dillon (2000), however, reminds us of the Nietzschean belief according to which only things which do not have a history can be defined. Complexity, as a set of loosely defined principles, does have a history, a history which enables us to capture its ethos rather than its precise (and necessarily abstract, for necessarily essentialist) definition. Since a critical assessment of Complexity is becoming more and more urgent, it is equally urgent to give careful consideration to the genesis of Complexity's underpinning ideas, which do shed light on concepts related to European identity, for example.

The urgency is due to the fact that in recent years there has been an explosion of work concerned with the implications of Complexity Science. There is no subject that has remained unscathed. Within the areas covering International Relations and European Studies, for instance, it seems that everything can be understood in novel ways thanks to the insights of Complexity. We have discovered that Complexity can provide concepts to better understand the dynamics of globalization (Urry, 2002), of war (Alberts & Czerwinski, 2003, Beyerchen, 1992) and even of regional security regimes (Clemens, 2001). Theorists have attempted to construct models of international politics on Complexity-inspired concepts of turbulence (Rosenau, 1992) and system interaction (Jervis, 1999). One way or another, Complexity has fascinated and influenced the work of scholars whose names are well known to the International Relations research community, such as Robert Cox, Janet Abu-Lughod, Immanuel Wallerstein and John Lewis Gaddis. This is not to mention the enormous impact of Complexity on other branches of the social sciences, especially sociology.

Yet, with so much debate over relatively novel terms, there is a serious risk that the term 'Complexity Science', and with it the concept, will eventually be diluted to a set of rather shallow notions. At best, the term would then be considered to be useful only insofar it can provide appealing metaphors for old concepts that one may want to present in original ways. Worse, the term could be adopted to justify rather dubious concepts as having benefited from the latest insights of the new science. It is difficult not to note the inherent similarities between some recent academic publishing on Complexity and the myriad of publications underlined by ideas such as 'improve you sales thanks to the insights of Complexity'!

It is in these contexts that the most simple questions, such as 'what is Complexity Science?', tend to become the most difficult to answer. These are the questions that increase the temptation for a standard, and therefore an inadequate and confusing definition. This is evident in the latest round of the 'Science Wars', in which Sokal (1999: 134-147) attempts to deliver us from the heresy of a humanities-based interpretation of Complexity by stating that Complexity is, contrary to what it may seem, essentially Newtonian. This is of course in contradiction with the arguments of other well-established scientists who, despite disagreeing on what Complexity 'is', agree on what it is not: Newtonian. Sokal's neat definition of Complexity seems to be at odds, for example, with Prigogine and Stengers's (1997).

Moreover, an avalanche of volumes, both in 'popular science' and in academia seek to clearly present Complexity as a set of strictly defined concepts. The creation of a 'Complexity checklist' used to label research as 'Complexity research' is all too evident, for example, in Alberts and Czerwinski's (2003) work. These quests for precise criteria are not only artificial, but contribute to a general failure to critically assess the philosophical, historical and indeed epistemic impact of Complexity. The objective of producing a short genesis of Complexity is not therefore related to the task of 'defining', or 'presenting' the subject, but to capture its inherent ethos.

For the reasons enumerated above the task of contextualizing Complexity science in a broad philosophical framework is becoming increasingly important. There has been some debate recently surrounding the question of whether Complexity could be seen as a manifestation of 'post-modern' science (Morçöl, 2002). Some scholars have sought to underline the similarities between Complexity science and post-structuralist philosophy (Cilliers, 1998; De Landa, 2002; Rasch & Wolfe, 2000; Pearson, 2002). Some others have perceived Complexity as being simply the manifestation of what Lakatos would call a 'progressive paradigm'. In this view, the emergence of notions such as 'deterministic chaos' suggest that Complexity is nothing more than a more sophisticated tool for the understanding of patterns that just happen to appear as being completely random — but that remain patterns nonetheless (Byrne, 1998). Others have suggested that Complexity, in a number of fields, has changed many paradigmatic assumptions to such a point that it can now claim to be a legitimate scientific revolution in the Kuhnian sense (Gleick, 1998). As it will be appreciated by the end of this article, a far more ambitious argument could be put forward. Complexity science quite simply questions a Newtonian understanding of the role of Reason after the Enlightenment. In a nutshell it will be argued that according to this Newtonian vision, Reason was simply regarded as a means to provide certainty and security through the elaboration of metaphysical science[2], whilst a Complexity 'ethic' would regard Reason as that which allows human beings to accept and deal with uncertainty.

A timely reminder of Complexity's origins can be found in the works of Eric Hobsbawm (1999). Hobsbawm rightly asserts that the principles of Complexity did not 'appear' but re-appeared from the European intellectual heritage under the misleading tag of 'chaos theory'. The re-appearance of such ideas was possible thanks to the increasing calculating powers of computers. According to Hobsbawm the re-emergence of 'Complexity' has profound implications for the concept of causality. Such an approach does have the potential to undermine several 'political, economic and social' assumptions (Hobsbawm, 1999: 696-

Apart from thoroughly describing the effects of Complexity in the world of the natural sciences, Hobsbawm proceeds to describe how, drawing on Max Plank, 'scientific' and social, economic and political histories are necessarily intertwined, indeed, many social events are underpinned by the way in which scientific methodology portrays itself as a new path towards certainty in all fields of inquiry. Hobsbawm (1999: 673-717) masterfully demonstrates how modern science, seen as a path to certainty, and the 'Age of Catastrophes' (or the 'short twentieth century') are inherently related. Crucially, Hobsbawm identifies the genesis of Complexity in the truly European 'Epistemic Civil War', which was characterized by two contrasting interpretations of the role of reason after Enlightenment, and therefore of European modernity. The following quote (Hobsbawm, 1999: 756, my translation) is of fundamental importance to critically assess the ethos and origins of Complexity:

“Developments within ‘chaos theory’ in the 1970s and 1980s are not without commonalities with the emergence, in the beginning of the 19th century, of a ‘romantic scientific school’, of which Germany was the primary focus (Naturalphilosophie); that reacted to the dominant ‘classical’ science, essentially represented by practices in France and in Great Britain. It can be interestingly observed that two eminent pioneers of the new science (Feigenbaum and Libchaber) were in fact inspired by Goethe’s — radically anti-Newtonian — theory of colors, and also by Goethe’s treatise On the Transformation of Plants, which can be considered as a precursor of anti-Darwinian and anti-evolutionist theories.”

Hobsbawm retrieves this crucial information on Goethe's fundamental influence on the two precursors of Complexity in Gleick's (1998: 163-65) seminal book. Armine (1998) has already pointed out the significance of this passage in Gleick's work.

The genesis of Complexity is therefore to be located in a moment of dislocation between two opposing visions of 'scientific' knowledge, ultimately based upon two different visions regarding the role of reason after the Enlightenment. This article wishes to suggest that the emergence of Complexity may represent the re-introduction of German romanticism in modern science. It is tempting to interpret recent developments within the epistemology of science as the re-introduction of romanticism's ethos, should we say, 'through the back door'. As such, the future of Complexity should be seen in terms of the *longue durée* as one of the possible paths to knowledge opened by the European philosophical heritage.

Existing research in a number of disciplines has pointed to natural philosophy and German romanticism as precursors of Complexity science. Bronowski's (1977) *A Sense of the Future: Essays in Natural Philosophy* tackles the issue at length[3]. As Butz (1997: 5) points out, Capra's (1996) *Web of Life* is a holistic history of systems that goes from Goethe to Lovelock's Gaia hypothesis. Baake (2003: 185) notes how Morowitz stated that "Goethe may be saying that the one emerges from the many, that unity arises out of diversity — an idea found in modern complexity theory." Farnsworth (2001: 216) elucidates the relation between Goethe and Complexity theory in the context of water dynamics whilst Reahard and McCarthy (2001) go a step further and do not hesitate to introduce the notion of "Goethe's complexity theory." In this context, the contribution of Rowland's (2001) monograph *Goethe, Chaos and Complexity* is also significant.

Modes of thought and modes of social organization

The broad intellectual movement referred to as Natural Philosophy is credited as being the main influence on the precursors of Complexity, yet it is important to note that it played an important role in shaping the modern European system of thought and modern European politics and societies. Hobsbawm locates in the 'classicism — romanticism' nexus another battleground for the 'dual Revolution' in the 'Age of Revolutions'. The dual Revolution consisted of economic (industrial revolution) and political (French revolution) developments that re-configured every aspect of thought in the Old World. As such, Hobsbawm interprets the 'classicism — romanticism nexus' as an 'Epistemic Civil War' which takes place during this crucial revolutionary period of European history. All these developments are related to a dramatic re-evaluation of the values of the Enlightenment. Hobsbawm (2003: 335, emphasis added) explains that,

“If developments in the field of the sciences parallel those elsewhere, it is not because each of them can be hooked on to a corresponding aspect of economic or political ones in any simple way. Yet the links are hard to deny. The main currents of general thought in our period have their correspondence in the specialized field of science, and this is what enables us to establish a parallelism between sciences and arts or between both and socio-political attitudes. Thus ‘classicism’ and ‘romanticism’ existed in the sciences, and ... each fitted in with a particular approach to human society. The equation of classicism (or, in intellectual terms, the rationalist, mechanist Newtonian universe of the Enlightenment) with the milieu of bourgeois liberalism, and of romanticism (or, in intellectual terms the so-called ‘Natural Philosophy’) with its opponents, is obviously an over-simplification, and breaks down altogether after 1830. Yet it represents a certain aspect of truth. Until the rise of theories like modern socialism had firmly anchored revolutionary thought in the rationalist past, such sciences as physics, chemistry and astronomy marched with Anglo-French bourgeois liberalism. For instance, the plebeian revolutionaries of the Year II were inspired by Rousseau rather than Voltaire, and suspected Lavoisier (whom they executed) and Laplace not merely because of their connections with the old regime, but for reasons similar to those which led the poet William Blake to excoriate Newton. Conversely, ‘natural history’ was congenial, for it represented the road to the spontaneity

of true and unspoiled nature. The Jacobin dictatorship, which dissolved the French Academy, founded no less than twelve research chairs at the Jardin des Plantes. Similarly, it was in Germany, where classical liberalism was weak, that a rival scientific ideology to the classical was most popular. This was Natural Philosophy...it was speculative and intuitive. It sought for expressions of the world spirit, or life, of the mysterious organic union of all things with each other, and good many other things which resisted precise quantitative measurement or Cartesian clarity.”

Few doubt that in the end it was the “rationalist, mechanist Newtonian universe of the Enlightenment,” and its “particular approach to human society” that prevailed. Some attribute to this triumph the worst crimes of the twentieth century — particularly with regards to the metaphysical essence of this approach. Indeed, Hardt and Negri (2001) see a constant cleavage between metaphysics and philosophies of immanence throughout European history, a cleavage that is also embedded in the ‘classical — romantic science’ nexus. Dupré (1993: 219-244) offers some interesting thoughts about the links between modern metaphysical science and contemporary developments in politics, economics and societies. On the other hand there can be little doubt that the scientific method has been largely determined by broader cultural contexts, which, for example, inform what research questions can or cannot be considered. For instance, it would have been quite impossible for any ‘scientific method’ to emerge in any society that did not possess a particular concept (and word to express the idea of) causality. These are research questions that characterize the discipline of sociology of science (see in particular the very important contributions of Latour, 1988).

It is impossible not to consider the intrinsically German nature of these events. Heidegger related the triumph of mechanistic, metaphysical epistemology to his contemporary political situation. Heidegger (Inwood, 2000: 6) always linked political events to ‘the Forgetfulness of Being’ and to technology. Indeed, “The willful construction of a world empire to last four millennia shows, he argued, a preference for quantity over quality that is alien to genuine creators like the Greeks. *Empire-building stems not primarily from dictators and authoritarian states, but from the metaphysical essence of modernity.*” This ‘verdict’ on Nazism was “delivered in the summer of 1941, when Hitler’s power was at its height.”

Heidegger was not the only German thinker who attempted to conceptualize the links between modes of knowledge (in particular metaphysics) and his contemporary political context (in Heidegger’s case, this attempt would lead to dramatic consequences). Edmund Husserl’s insights on the nature of European approaches to knowledge and the related issue of European crisis are fundamental if we wish to understand how knowledge practices and modes of social organization interact, and how Complexity — understood as a knowledge practice — could influence the future evolution of European polities.

As Europe was descending into the abyss of the Holocaust, Husserl (1965) delivered a lecture in Vienna in 1935 on ‘Philosophy and the Crisis of European Man’. Husserl started the lecture by reflecting on the nature of the humanistic sciences (*Geisteswissenschaften*). Husserl described such sciences as being concerned with life as “purposeful living, manifesting spiritual creativity — in the broadest sense, creating culture within historical continuity” (Husserl, 1965: 150). Yet, despite the evidence of sickness afflicting purposeful living in all European nations, Husserl lamented that the “so luxuriantly developed humanistic sciences here fail to perform the service that in their own sphere the natural sciences perform so competently” (Husserl, 1965: 151). Much to Husserl’s concern, the humanistic sciences had not developed a “medical science concerned with nations and with international communities” (Husserl, 1965: 150).

The methodological difference between the humanistic and natural sciences, which is responsible for this lack of humanistic medical practice, consists in the latter’s possibility to abstract and on the impossibility of the former to do so. According to Husserl (1965: 152) mathematical exact sciences can abstract and operate metaphysically,

“but only nature can be handled as a self-contained world; only natural science can with complete consistency abstract from all that is spirit and consider nature purely as nature. On the other side such a consistent abstraction from nature does not, for the practitioner of humanistic science who is interested purely in the spiritual, lead to a self-contained ‘world’, a world whose interrelationships are purely spiritual, that could be the theme of a pure and universal humanistic science, parallel to pure natural science.”

Husserl maintains that it is therefore “understandable that the practitioner of humanistic science, interested solely on the spiritual as such, gets no further than the descriptive, than a historical record of spirit, and this remains tied to intuitive finitudes.” This has been a recurring argument in philosophy of science before Husserl and ever since. For example, Bergson (Gutting, 2001: 50), Foucault (1970), Kuhn (1970: 24), and more recently Dupré (1993); have all pointed to the metaphysical nature of natural science (the ‘self-contained’ world, or ‘paradigm’) as a requisite for its progression. However, Husserl (1965: 153) admitted that this way of thinking may rest on “fatal prejudices”:

“What is to be said, then, if the whole mode of thought that reveals itself in this presentation rests on fatal prejudices and is in its results partly responsible for Europe’s sickness? I am convinced that this is the case, and in this way I hope to make understandable that herein lies an essential source for the conviction which the modern scientist has that the possibility of grounding a purely self-contained and universal science of spirit is not even worth mentioning, with the result that he flatly rejects it.”

The fatal prejudice is the belief according to which only ‘self-contained’ and universal sciences are capable of grounding knowledge, thus the modern scientist flatly rejects the idea that a “universal science of the spirit can be created.” On the contrary, Husserl sees in the creation of philosophy understood as a “science of the whole” the original manifestation of what he calls “Spiritual Europe.” The parallelism with Complexity Science is striking: in a sense Complexity’s drive towards anti-reductionism is itself an attack on ‘self-contained’ sciences. In Complexity’s inherent multidisciplinary one can detect the embryos of what Husserl calls “philosophy,” that is, a science of the whole. And here lies the original phenomenon of ‘Spiritual Europe’. In other words, Europe’s sickness is a consequence of a ‘fatal prejudice’ which regards the construction of ‘self-contained’ worlds as a legitimate approach to knowledge.

Husserl’s thinking and subsequent attempt of delineating a pure science of the spirit touches on some of the most contemporary issues regarding European policy and identity as well as on recent developments in scientific epistemology embedded in Complexity. Indeed, the effort of creating a spiritual medical practice is not only meant to prevent Europe from facing the abyss once again, but also to create a truly European union, beyond the realm of national interests. Such a practice, however, requires a radical transformation in the way we perceive — and attain — knowledge, in the way we think of ‘disciplines’ or even ‘interdisciplinarity’. This is about re-inventing knowledge itself, or, as Foucault would put it, transforming the modern episteme. Indeed, according to Husserl’s (1965: 159) vision,

“[Philosophy], correctly translated, in its original sense, this bespeaks nothing but universal science, science of the world as a whole, of the universal unity of all being ... in the emergence of philosophy in this sense, a sense, that is, which includes all sciences, I see — no matter how paradoxical this may seem — the original phenomenon of spiritual Europe.”

According to such vision, only such a spiritual form of Europe can be responsible for the emergence of a “supernationality of a completely new kind,” a transformation of Europe, which is “no longer a number of different nations bordering on each other, influencing each other only by commercial competition and war. Rather a new spirit stemming from philosophy and the sciences based on it, a spirit of free criticism providing norms for infinite tasks, dominates man, creating new, infinite ideals” (Husserl, 1965: 177). This Husserlian vision calls for a humanistic understanding of knowledge as a whole (universal science, emergency of philosophy as a science of the whole, etc.). But how does this Husserlian approach relate to Complexity? Recent research aims to show how a humanities-based understanding of Complexity reveals the extent to which Complexity represents a particular tradition of thought and understanding of societies (Jackson, 2003). Moreover it can be argued that the issues which Husserl identifies as problematic (reductionism, essentialism or naturalism, and so on) are precisely the notions that Complexity seek to overcome. More importantly, the arrow of time in Complexity is what allows an understanding of indeterminism in nature, which is *precisely* what allows us to accept novelty in a critical way. It is in the acceptance of this indeterminacy that Prigogine & Stengers (1997) envisage a new concept of ‘freedom’ and the production of novelty in nature. This is precisely what Husserl calls the “production of new, infinite ideals.” Such ideals are produced as we revert to the original phenomenon of Spiritual Europe (i.e., philosophy as a science of the world as a whole) and abandon the concept of ‘self-contained worlds’.

Therefore according to Husserl, the production of new, infinite ideals (i.e., novelty) is a medicine. This has to be prescribed when the major danger facing modern European man appears to the surface: intellectual weariness. It is not, however, the weariness of knowledge, but rather the laziness created by a quest for certain knowledge that fails to consider the creative novelty of nature, and man’s role in it. It is the laziness arising from the technicalization of science, which, according to Husserl, is the product of an excessive ‘mathematization’ of knowledge. Such technicalization of science leads to naturalism, which is the *causa prima* of Europe’s sickness: “The crisis of European existence can end in only one of two ways: in the ruin of a Europe alienated from its rational sense of life, fallen into a barbarian hatred of spirit; or in the rebirth of Europe from the spirit of philosophy, through a heroism of reason that will definitely overcome naturalism. Europe’s greatest danger is weariness” (Husserl, 1965: 192).

The future of knowledge and the future of Europe

Husserl’s remarks on the intimacy between modes of knowledge and European crises did not emerge in a vacuum. In this context, Husserl’s predecessors’ main motivation for understanding the nature of modern science was precisely related to a desire to understand their contemporary socio-political situation. Antimo Negri (1994) focuses on this Husserlian concept of European crisis as he discusses the important relation between Nietzsche’s philosophy and modern science. Negri (1994: 27) elucidates how Nietzsche’s concept of ‘living dangerously’ influenced the Husserlian fear of intellectual weariness:

“The meaning of the Nietzschean concept of ‘living dangerously’ is evident: it is not possible to live ‘resolutely’, ‘dangerously’, if one does not fight with a ‘vigorous spiritual disposition’ the extreme danger embodied in the weariness resulting from an exceedingly mathematized science, which gives the illusion of providing firm foundations to knowledge — those which the Newtonians call principia mathematica in philosophia naturalis — robust and definitive. The true danger is to believe or to lead other people to believe that such foundations exist. The ‘resolute’ and ‘dangerous’ task that Nietzsche undertakes consists in destroying such belief.”

It should be clear that we are dealing with the recurring theme of western metaphysics. The technicalization of science — a necessary component in the quest of developing certain knowledge — is a product of western metaphysics, the metaphysics that Heidegger and Husserl, largely inspired by Nietzsche, sought to overcome. It should be clear now that the main feature of the metaphysical approach consists in the creation of ‘self-contained’ worlds, or what Kuhn would call paradigmatic science.

Nietzsche’s philosophy and its implication for the concept of ‘Europe’ has been explored in some length by Stefan Elbe (2003). Yet, Elbe’s effort ignores the fundamental role that considerations over the nature of modern science played in Nietzsche’s philosophy in general and in Nietzsche’s treatment of the ‘good European’ in particular. Reviewing the book, Strong (2004) writes that Elbe “notes both Nietzsche’s and Max Weber’s argument (in *Science as a Vocation*) that whatever science can provide, it will not provide meaning to its or any other enterprise.”

This is not helpful: the real tragedy, according to Nietzsche, is that despite his conviction that modern metaphysical science cannot replace God, men are bound to force the belief in the infallibility of reason — embedded in mathematical logic and modern science — into God’s empty throne. That is why Nietzsche exhorts men of science to build their foundations on the Vesuvius in a letter to Jakob Burckhardt (Negri, 1994: 3). The Vesuvius is of course a volcano, and the idea is that men of science should be ready to accept that the foundations of their knowledge ought to be disintegrated from time to time. It is why, in the same gist, Heidegger (Negri, 1994: 26) maintains that “under the power of the pretences advanced by the principle of reason we find the fundamental traits of actual human existence, which works ad infinitum to obtain certainty and security.” It is thus the forced triumph of rationalistic scientific reason after the death of God that is responsible for Europe’s sickness — this is Nietzsche as an obvious precursor of Adorno’s and Horckheimer’s *Dialectic of Enlightenment*. Nietzsche, in this light, should also be seen as the epicenter of later developments including Foucault and Deleuze. That great lover of Goethe’s Natural Philosophy, Nietzsche, is the kernel that unites French ‘Philosophy of Freedom’[4] and the intrinsically German critical experience of modern rationalistic thought.

We have plenty of evidence indicating that Nietzsche perceived this role of modern science as one of the main causes of the hecatombs to come. One of the most pertinent passages in *The Gay Science* laments the deification of nature through science. Paragraph 108 (book III) illustrates the idea that God’s shadows are still around[5], while paragraph 109 reveals where such shadows are[6]. It is however difficult to put it as clearly as Keith Ansell Pearson (1994: 36) does: “One of the consequences of humanity’s faith in morality is the cultivation of truthfulness, of a *will* to truth (think of the Christian confession, for example). Over time this will to truth in Christianity is transmuted into the intellectual conscience which underlies modern scientific inquiry.”

Science is the new metaphysics after the death of God: such is Nietzsche’s diagnosis. To be sure, Nietzsche believes that European philosophy (and society?) since Plato has been infected by metaphysics — however, its recent evolution into ‘science’ is particularly cunning. On such basis Michel Foucault proceeded to analyze modern modes of metaphysical knowledge: an analysis of the importance of such research for the philosophy of Complexity has been conducted elsewhere (see Popolo, 2003). Any genealogy of modernity which inquired into the Genesis of Complexity would establish that Complexity’s ethos, since its origins, has been profoundly anti-metaphysical. It is not a coincidence if we cannot imagine the birth of science proper outside of Christianity (see, for example, 2`1, 2003 on the spiritual drives behind Newton) or if Complexity is intimately linked with ‘philosophies of immanence’ (De Landa, 2002; Deleuze, 2001; Pearson, 2002). Finally, it should be noted that Dillon’s (1996) research into the origins of the security paradigm in political thought reveals an intimate connection between metaphysical approaches to knowledge and the provision of physical and intellectual certainty. As he puts it (Dillon, 1996: 13, emphasis added),

“Metaphysics first allows security to impress itself upon political thought as a self-evident condition for the very existence of life... [S]ecurity thereby became the value which modern understandings of the political and modern practices of politics have come to put beyond question, precisely because they derived its very requirement from the requirements of metaphysical truth itself.”

These are philosophical preoccupations for the social-political implications of transcendental philosophies embedded in modern science, preoccupations that find Goethe, Natural Philosophy and German Romanticism (which heavily influenced some important precursors of Complexity) as their starting point. They represent a fear that humans may come to be governed by fear, a fear and an intellectual laziness founded on a naïve trust of the certainty provided by metaphysical knowledge — of any kind. This is a concern that should be revived, urgently, today. For example, apart from Negri's contribution and a study related to quantum physics (Planck, 2002), there does not seem to be a coordinated effort to research Nietzsche's reflections on the nature of knowledge practices in general, of modern science in particular and of the socio-political implications of these.

Europe must accept Husserl's challenge of producing "new, infinite ideals" to counter the comfort provided by metaphysical knowledge. Complexity, viewed not merely as a 'scientific approach', or paradigm; but as an *ethos*, should be understood as an intellectual background capable of producing such ideals. The established links between Complexity and Continental philosophies of immanence (see De Landa, 2002; Pearson, 2002), which, for the most part, find their roots in Nietzsche; could and should reinvent the concept of 'freedom'[7]. Despite considerable progress in addressing questions related to identity formation and other humanities-related research in European Union (EU) programmes, there is still room for improvement.

For example, the EU's programme on Science and Society could be of fundamental importance for the diffusion of Complexity's ethos in the European public domain. As a programme interested by the interaction between science and society, this is a great opportunity to readdress the simplistic vision of 'science' that is still being adopted in all too many sectors of public life. Science could be presented precisely as the production of infinite ideals, as an endeavour that seeks to understand an evolving process of becoming, rather than a static reality of being. Thus the message will reinforce the idea that all our concepts are built on volcanoes, that men and women of knowledge understand that a pursuit of true understanding must entail 'living dangerously'. Such an understanding of the world would inform a new concept of freedom in the terms of how Prigogine envisaged it: the absence of certainty is in itself a tremendous opportunity for humankind to come to terms with the consequences of its actions and not an excuse to fall into the bottom-less pit of nihilism.

It is only by ensuring that the next generation of Europeans generate and deploy knowledge through a Complexity-informed ethos (holism, anti-reductionism, immanence, and so on) that the Husserlian vision of Spiritual Europe will be realized. One needs to look just how many recent developments related to European integration have been undermined by the absolute failure to deal with uncertainty — the vision of French voters refusing a Constitution partially due to fear of Polish plumbers proves the point. Everywhere it seems that fear of change motivates European attitudes towards further integration. Amongst the arguments that were presented against the Constitution we find this idea that by halting the integration process, the credentials of Turkey as a new Member State would have been debilitated. Turkey as the unfamiliar, (therefore uncertain) 'other', fellow Europeans see as a threat for job security; these are issues that gain prominence on the basis that certainty ought to be the basis for all things. Unfortunately, this may well be due to the assumption that certainty is what characterizes the natural world 'out there'. This is far from the best approach to life in general given the rapidly changing environment in which we find ourselves. To re-inverse a famous Massimo D'Azeleglio quote ("now that we have created Italy we must create Italians") one could say that now that we have created a complex world we need to create Complex Europeans. If the Husserlian vision according to which the "original phenomenon of spiritual Europe" lies on its understanding of knowledge as knowledge of the whole, it follows that what characterizes most Europeans is the way in which they approach knowledge. The defining periods of history in which approaches to knowledge were established were truly European in the sense that these knew of no national boundaries. If Europe is to be forged through common understandings of knowledge, the creation of a common European Research Council, for example, is probably more significant than most aspects of European integration.

This is akin to Nietzsche's attempt to overcome metaphysics without falling into the despair that must necessarily follow the death of God; pessimism and nihilism must be overcome with the creation of art and culture understood as modes of knowledge that accept the tragic reality of this world: uncertainty. Europe must disseminate its 'post-modern' ethos in order to combat apathy and a simplistic approach to life — more importantly, to combat a predisposition to seek security, in all its forms; at any cost. Complexity, as an immanent but anti-reductionist ethos for knowledge would thus correspond to Husserl's "universal science, science of the world as a whole." Complexity's ethos is indeed at the heart of a re-invention of naturalism as that which produces novelty and uncertainty: Complexity's naturalism is anti-mechanistic. Under complexity, nature can no longer be handled in a 'self contained world'.

Conclusion

European modernity has been characterized by a fragmentation of knowledge which produced a vast array of different 'sciences'. Perhaps this is due to the death of God, to the death of a belief in a unitary explanation for the world. However, thinkers such as Nietzsche, Husserl, Heidegger and others have warned about the fragmentation and technicalization of knowledge, foreseeing the consequences of such developments for Europe. At the heart of the problem, according to Nietzsche, lies a predisposition for 'truthfulness' or security created by nearly two millennia of Christianity, and the replacement of God with a new type of metaphysics embedded in modern scientific methodology.

Complexity has its roots, on the other hand, on the epistemic civil war that shocked Europe in the 'age of Revolutions'. Arguably, the precursors of Complexity were in the losing camp, defeated by emerging visions of rationalistic and mechanistic thought.

Nonetheless, the political dimension of Complexity and precursors of philosophies of immanence have had important insights about European identity. For example, Husserl's vision of a spiritual Europe emerging from the concepts of "science of the world as a whole," as a destruction of the belief in a "self contained natural world" and the consequent mechanistic view of nature is a crucial one. Not too long ago the former President of the European Commission convened a research group on the 'Spiritual and Cultural Dimension of Europe'. Debates surrounding the future identity of the Union cannot afford to ignore important developments embedded in the ethos of Complexity, as these find their roots in a common European intellectual heritage and now revolutionize, also through concrete results and scientific discovery, the way we look at the world. For these reasons, European institutions must ensure that this understanding of Complexity's ethos is shared across all strata of European societies, and that a 'Complexity approach' to knowledge is inculcated in young generations of Europeans from the earliest stages of their curricula.

Notes

[1] It would be impossible to summarize in this article what is meant exactly by this 'definition' of Complexity. Arguments supporting this interpretation of Complexity have been presented in detail elsewhere (Popolo, 2003). Suffice it to say that this article adopts a highly 'Prigoginian' understanding of Complexity as a set of knowledge practices that accept the concept of time irreversibility. Arguments explaining why this feature ought to be considered as the defining characteristic of Complexity are presented elsewhere (Popolo, 2003). In a nutshell, this 'definition' of Complexity is useful insofar substantial research in the philosophy and history of science point at temporal linearity as the defining characteristic of modern scientific epistemology, and it is precisely in this context that Complexity's opposed approach represents an important change.

[2] Arguments surrounding the metaphysical nature of modern science have been explored at length. In a nutshell, this article defines the concept of 'metaphysical' as an approach to knowledge that relies on essentialism, reductionism and determinism. References are made throughout the article to works that better capture this definition of metaphysics. The differences between scientific metaphysics and Complexity Science have been presented elsewhere (see Popolo, 2003).

[3] See chapter 13, New concepts in the evolution of complexity

[4] The influence of Nietzsche on Foucault, Derrida and Deleuze is undeniable. See Gutting (2001). Tiles (2005: 173-4) equally reveals how the French tradition of philosophy of science, particularly the writings of Bachelard, anticipates in striking manner many of the intellectual dilemmas presented by Complexity. In this context it is worth remembering that Foucault's own work on intellectual history was heavily influenced by Canguilhem's and Bachelard's (Gutting, 2001).

[5] "God is dead; but given the way people are, there may still for millennia be caves in which they show his shadow. – And we – we must still defeat his shadow as well!"

[6] "Let us beware of saying that there are laws in nature. There are only necessities: there is no one who commands, no one who obeys, no one who transgresses. Once you know that there are no purposes, you also know that there are no accidents; for only against a world of purposes does the word 'accident' have any meaning...when will all these shadows of God no longer darken us? When will we complete our de-deification of nature? This quote is particularly revealing as Nietzsche insinuates that the scientific effort to attribute human concepts to nature (i.e., law) are in reality reminiscent of a Christian heritage which was precisely informed by a 'will to truth'. In other words, Nietzsche is here suggesting that science has replaced religion as the provider of certainty to which modern Europeans had become accustomed, and in this sense one can understand the Nietzschean remark according to which scientists had become the new priests.

[7] For Prigogine and Stengers's concept of freedom after Epicurus's Dilemma see *The End of Certainty* (1997).

References

1. Alberts, D. and Czerwinski, T. (eds.) (2003). *Complexity, Global Politics and National Security*, Washington, DC: National Defense University Press, ISBN 1579060463.
2. Armine, F. (1998). "The metamorphosis of the scientist," in D. Seamon and A. Zajonc, *Goethe's Way of Science: A Phenomenology of Nature*, Albany, NY: SUNY Press, ISBN 0585090629.
3. Baake, K. (2003). *Metaphor and Knowledge: The Challenge of Writing Science*, Albany, NY: SUNY Press, ISBN 0791457435.
4. Beyerchen, A. (1992). "Clausewitz, nonlinearity and the unpredictability of war," *International Security*, ISSN 0162-2889, Online ISSN 1531-4804, 17(3): 59-90.
5. Bronowski, J. (1977). *A Sense of the Future: Essays in Natural Philosophy*, Cambridge, MA: MIT Press, ISBN 0262021285.
6. Byrne, D. S. (1998). *Complexity Theory and the Social Sciences: An Introduction*, London, England: Routledge, ISBN

0415162955.

7. Butz, M. R. (1997). *Chaos and Complexity*, Taylor & Francis Publishing, ISBN 1560324198.
8. Capra, F. (1979). *The Tao of Physics*, London, England: Fontana Publications, ISBN 0006357075.
9. Capra, F. (1996). *The Web of Life*, New York, NY: Anchor Books, ISBN 0385476752.
10. Cilliers, P. (1998). *Complexity and Postmodernism: Understanding Complex Systems*, New York, NY: Routledge, ISBN 0415152860.
11. Clemens, W (ed.) (2001). *The Baltic Transformed: Complexity Theory and European Security*, Lanham: Row- man and Littlefield Publishers, ISBN 0847698580.
12. De Landa, M. (2002). *Intensive Science and Virtual Philosophy*, London, England: Continuum, ISBN 0826456227.
13. Deleuze, G. (2001). *Pure Immanence: Essays on a Life*, Cambridge, MA: MIT Press, ISBN 1890951242.
14. Dillon, M. (1996). *The Politics of Security*, London, England: Routledge, ISBN 0415129605.
15. Dillon, M. (2000). "Post-structuralism, complexity and poetics," *Theory, Culture & Society*, ISSN 0263-2764, 17(5).
16. Dupré, J. (1993). *The Disorder of Things: Metaphysical Foundations of the Disunity of Science*, Cambridge, MA: Harvard University Press, ISBN 0674212606.
17. Elbe, S. (2003). *Europe: A Nietzschean Perspective*, London, England: Routledge, ISBN 0415369754.
18. Farnsworth, R. (2001). *Mediating Order and Chaos*, Rodopi Publishing, ISBN 904201427X.
19. Foucault, M. (1970). *The Order of Things: An Archaeology of the Human Sciences*, London, England: Tavistock Publications, ISBN 0422718904.
20. Gleick, J. (1998). *Chaos*, London, England: Vintage, ISBN 0749386061.
21. Gleick, J. (2003). *Isaac Newton*, New York, NY: Pantheon Books, ISBN 0375422331.
22. Gutting, G. (2001). *French Philosophy in the Twentieth Century*, Cambridge, England: Cambridge University Press, ISBN 0521665590.
23. Hardt, M. and Negri, A. (2001). *Empire*, Cambridge, MA: Harvard University Press, ISBN 0674006712.
24. Hobsbawm, E. (1999). *Lage des extremes*, Bruxelles: Editions Complexes, ISBN 2870279922.
25. Hobsbawm, E. (2003). *The Age of Revolutions*, London, England: Abacus, ISBN 0349104840.
26. Husserl, E. (1965). "Philosophy and the crisis of European man", in *Phenomenology and the Crisis of Philosophy*, Q. Lauer (trans.), New York, NY: Harper Torchbooks, ISBN 0061311707.
27. Inwood, M. (2000). *Heidegger: A Very Short Introduction*, Oxford: Oxford University Press, ISBN: 0192854100
28. Latour, B. (1988). *Science in Action*, Cambridge, MA: Harvard University Press, ISBN 0674792912.
29. Jackson, W (2003). *Heaven's Fractal Net: Retrieving Lost Visions in the Humanities*, Bloomington, IN: Indiana University Press, ISBN 0253216206.
30. Jervis, R. (1999). *System Effects: Complexity in political and Social Life*, Princeton, NJ: Princeton University Press, ISBN 0691005303.
31. Kuhn, T. (1970). *The Structure of Scientific Revolutions*, Chicago, IL: University of Chicago Press, ISBN 0226458083 (1996).
32. Morçöl, G. (2002). "What is complexity science? Postmodernist or postpositivist?," *Emergence*, ISSN 1521-3250, 3(1): 104-119.
33. Negri, A. (1994). *Nietzsche: La Scienza sul Vesuvio*, Bari: Laterza, ISBN 8842044431.
34. Pearson, K. A. (1994). *An Introduction to Nietzsche as a Political Thinker*, Cambridge, England: Cambridge University Press, ISBN 0521417228.
35. Pearson, K. A. (2002). *Philosophy and the Adventure of the Virtual: Bergson and the Time of Life*. London, England: Routledge, ISBN 0415237270.
36. Planck, W. (2002). *The Quantum Nietzsche: The Will to Power and the Nature of Dissipative Systems*, Writers Club Press,

ISBN 0595209521.

37. Popolo, D. (2003). "French philosophy, complexity, and scientific epistemology: Moving beyond the modern 'episteme'" *Emergence*, ISSN 1521-3250, 5(1): 77-98.
38. Prigogine, I. and Stengers, I. (1997). *The End of Certainty: Time, Chaos, and the New Laws of Nature*, New York, NY: Free Press, ISBN 0684837056.
39. Rasch, W and Wolfe C. (eds.) (2000). *Observing Complexity: Systems Theory and the Postmodern Episteme*, Minneapolis, MN: University of Minnesota Press, ISBN 0816632987.
40. Reahard, J. and McCarthy, A (eds.) (2001). *On Chaos and Order in the Enlightenment*, Amsterdam, Holland: Rodopi Publishing, ISBN 9042005505.
41. Rowland, H. (2001). *Goethe, Chaos and Complexity*, Amsterdam, Holland: Rodopi Publishing, ISBN 9042015667.
42. Rosenau, J. (1992). *Turbulence in World Politics, a Theory of Change and Continuity*, Princeton, NJ: Princeton University Press, ISBN 0691023085.
43. Sokal, A (1999). *Fashionable Nonsense: Postmodern Intellectuals' Abuse of Science*, New York, NY: Picador, ISBN 0312204078.
44. Strong, T. (2004). "Europe: A Nietzschean perspective," *Notre Dame Philosophical Reviews*, <http://ndpr.nd.edu/review.cfm?id=1398>.
45. Tiles, M. (2005). "Technology, science and inexact knowledge: Bachelard's non-Cartesian epistemology," in G. Gutting (ed.), *Continental Philosophy of Science*, Oxford, England: Blackwell Publishing, ISBN 0631236104.
46. Tomasello, M. (2003). *The Cultural Origins of Human Cognition*, Cambridge, England: Harvard University Press, ISBN 0674005821.
47. Urry, J. (2002). *Global Complexity*, Cambridge, England: Polity Press, ISBN 0745628184.