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# 'Figuring out' in science and the humanities

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The detail of the pattern is movement
(T.S. Eliot, *Four Quartets*)

The following argument bases on the premise that our experience happens at multiple levels and areas, and develops along different phases, which imperceptibly flow into each other and bear at times barely decipherable traces of the events that have constituted them. This is to say that between such levels and phases there are always discontinuities, as both energy and information are transferred between them in the form of *wave packets* (I am here using the term intentionally in the sense adopted in quantum physics). These are configured according to a "morphological differential", which in the case of transmitted energy can be understood as the + or – sign of the electric charge, in that of transferred information as the binary bit code 0/1. In other words, this differential is a sort of *informational either/or* beyond which no form can possibly be perceived within the field given. The latter is defined by tension lines, which draw boundaries and possibilities analogous to those assigned to the various arts by the grammars of the media in which they operate. There is in fact no substantial difference between the *experimental field* prepared by scientific instrumentation and the *artistic field* predisposed by a given medium, as both are technologically prefigured spaces. The difference between science and art rather consists in the ways in which the history of a given discipline can be reabsorbed by its own theory, functioning as it were as both code and message for the structure of the given field of knowledge. This major difference can ultimately be traced back to the use of one of the two great symbolic systems of human culture: that of numbers and that of verbal language. The distinction between the disciplines of knowledge depends then on how the absolute contingency of single events

can be translated into a symbolic form, that is a meaningful set of signs that point to – and guard the traces of – the drama (rite, artwork, experiment) out of which they have emerged. In individual as well as collective mnemonic processes each event gets in fact registered through a series of figurative, rather than logical procedures, so that the single occurrence may be transfigured right away in the type of the event. In this sense "tropology", as the work of tropes that gives rise to a typology, is the antecedent of logics (cf. Blumenberg 2010). Every figure of discourse, denoting a given *x* in terms of *y*, contains an ironic index that is equivalent to an algebraic function whose value cannot wholly be determined. Each figure of discourse, by reason of its constitutive ambivalence, thus combines occurrence and type, singularity and generality, through a process that represents that of the logos in its entirety (and this is the only way this entirety is accessible to us). The scientific status and qualification of a given discipline eventually depend on the degree to which the figural ambiguity of its context of reference can be reduced or even annulled according to the ideal of exactitude informing numeric calculus. Hence one can understand the *logos* as a gradual passage from qualitative to quantitative determination, or as a transfiguration from history to structure through the different disciplines of knowledge. Such a transference or transposition however is always partial, both because it leaves irretrievable energy as much as information residues behind (a sort of "thermodynamic" degradation of the system) and because it is a partisan operation, carried out to the advantage of the dominant part or power at play (be it a disciplinary or human subject), which therefore deform the vision of the world they inhabit.

Above all, the transference of energy-information between levels and phases within a complex self-regulating system, that is to say its whole evolutionary process, cannot ever appear to us in its completeness from one single perspective, but is rather bound to the principle of complementarity. What at a certain level of reality appears to be a dynamic form in progress or phenomenon (both in science and the humanities) depends on interactions that are actually not perceivable as present entities, since they in fact pertain to a different level of reality than the one of perception. This level we can only possibly figure as a state of latency, as an effective yet invisible horizon of the events. The processes happening at a different level from that of present perception can be only conceived of as *infractions*, clefts or fractures of the world tissue. Depending on the instruments and organs in use, besides, we can have access only to certain types of traces of the processes we are exploring, and which have at this point become part of the horizon of sense in which they are to be understood. The design or constellation of such a horizon represents events that are *per se* incommensurable, and yet they can be prefigured *by us* by way of hypothesis. This means that the sense of the event presupposes a

level of reality that is in principle different from that of mere sense perception. Precisely in the act of such *as if* fictional translation resides the principle of sense making.

The phenomenon taking place at a certain level of perception is, so to speak, the *noumenon*, or thing in itself, of the other. Phenomenon and *noumenon* are interrelated in the formulation of a hypothesis within a given theoretical-experimental context, that is within a fictional dimension referring to a putatively "real thing" transcending it. Such a reciprocal transposition of fact and possibility, entailing non-refundable losses both in the forms of life and of sense, is the only conceivable *history of the "world"* for the subject that not only observes but also inhabits it. This is our basic cosmological assumption, as well as the premise for the following remarks on the concepts of complexity, infraction and the emergency of forms in evolutionary processes both in science and the humanities.

## 1. Form and function

The way I am using the concept of "infraction" in the following argument, refers both to the exchange of energy and information involved in the production of an event, and to the violation of a norm, be it statistic or juridical in kind. The notion of "infraction" in fact relates first of all to that of statistical norm, that is to the habitual behavior of a given subject within its environment, and thus issues in a given set of expectations. For this reason its meaning appears to be less peremptory than that of "violation", meaning the breaking of a law, which calls for inevitable consequences in terms of prescribed sanctions. In the US legal system for example "infraction" is opposed to "misdemeanor" as a violation of lesser degree within a given local jurisdiction.

But the more "local" the normative order which is concerned, the more it will be expected to be affected and consequently modified by the infraction. So the two meanings of the word "infraction", the phenomenological and the normative one, eventually come together as the modification of the probability curve of the expected event, or the singular *emergence* wherein the dialectics of form and norm will quiet down for a short while.

Thus one could conceive of the event, as emerging singularity, as the result of latent infra-actions, in any field of observation. The turn from an epistemology of the object to an epistemology of the event was determined in the first decades of the twentieth century by the experimental and theoretical problems of microphysics and from the subsequent development of

relativity and quantum mechanics. Twentieth-century Western art, philosophy and literature have on the other hand dealt at large with the thematic of the event, breaking with traditional conceptual paradigms and disciplinary conventions, stressing the importance of singularity and favoring the fragmentary form. But the crisis of the paradigm of causal, coherent and exhaustive representation in the twentieth century, roots in the passage from the universe of Newton to the meta-verse of relativity and the quantum theory, which have by now found a practical instantiation in the multilayered virtual space of the World Wide Web.

As I have said, in the present discussion I am assuming the notion that reality (as far as it can be experienced) is structured according to different levels, areas and disciplines, which can intuitively be made to correspond to the three spatial dimensions: height (levels), breadth (areas) and depth (disciplines). Massimo Piattelli Palmarini once argued that to conceive of reality as structured according to levels is indeed quite a natural thing to do (Piattelli Palmarini 1987: 15-34). And 25 years later this statement seems to me to hold true, as in the meanwhile the paradigm of complexity has become dominant in various disciplines, and the conversion to digital media-technology has contributed to the establishment of the new hypertext-metaphor, which is radically supplanting that of the world as a book. The hyper-textual instrument/model has in fact a heavy influence on both natural sciences and humanities and it may indeed constitute their juncture. With regard to this, it suffices to think that the dialogue between disciplines has been made much easier by the W3 and digital simulation. Therefore cyber-culture is not merely to be reckoned as a part of our contemporary culture, but rather as the dominant shaping trait of our epoch. The notion of "the dominant", which I shall use in what follows in relation to those of infraction and emergency, comes down to us from linguistics (Jakobson 1971: 82-7), and yet can profitably be applied to most cultural fields. But in order to understand the interplay between levels, areas and phases of knowledge it may be useful to dwell on the relationship between form and function.

The interplay of form and function is the gist of historical dialectics, in its most classical formulation, that given by Hegel in the *Phaenomenologie des Geistes*, where the process of *Aufhebung* (the double move of superseding and preserving the past), meaning a shifting and a condensation of the preceding logical-historical figure into the following one, can be understood as a combination of *metaphor* and *metonymy*, eventually producing an exchange of form and function. This process thus puts the previous world image in a corner of the new one, as a detail of the pattern, in a manner similar to what in the sciences has been called a *paradigm shift* (as for instance the passage from classical to quantum physics, where the former still holds true as a special case of

the latter for medium dimensions).

Form and function influence each other in time. In the focusing of a detail of a given worldview, it is the function or value of the whole picture which changes. When for instance a specific textual or generic element becomes dominant within a given literary system, first the function of the whole system and then its very form undergo a sea change. This dialectics between part and whole, which was formulated in literature by the Russian Formalists (cf. Todorov 1965), virtually regulates the exchange between any system and its environment. Although this dialectical model has a good explanatory power for continuous processes, it seems to fall short when it comes to grip with discontinuous or explosive natural and cultural processes (Lotman 1993), also known as "emergences", in such diverse fields as quantum mechanics, cosmology and the evolution of life (Gould 2000), mathematical topology (Thom 1980), as well as in the thermodynamic of unstable systems (Prigogine and Stengers 1984), Artificial Intelligence and Artificial Life (Hayles 1999: 222-46).

When confronted with an emerging unforeseen form that unsettles our horizon of expectations, our "inner" statistical scheme, the dialectical model of the *Aufhebung*, with its rather intuitive interplay of form and function, fails to account for the change that is taking place. This is why I deem it necessary to presuppose the existence of different levels of reality and of unperceivable field-perturbations or *infra-actions*, which constitute, if not the causes (since the relationship is not verifiable), at least the conditions of possibility of an event. Here is when the paradigm of complexity takes over, wherein one must beware of preemptively reducing the unforeseen event to an element of a known system or to an object of deterministic calculation. In such a predicament one has instead to adapt the given epistemological field, and possibly the entire system of inference in use, to the emerging exception. My assumption is that such interference effects, as they were observed in early microphysics and have since been incorporated in the development of relativity and quantum theories, are now virtually spreading into all cultural fields through the *digital conversion* of all media, which makes it possible to immediately access and technically manipulate a virtually planetary archive, so that a single act of consumption affects the whole network of information.

Whenever it becomes hard to make out the relation between the new emerging form and the functional modifications within a given field of experience, or when the function describing a transformation process becomes discontinuous (that is lacking real values at some of its development), – then we find ourselves facing an event that is irreducible to the current calculation system. This *emerging form* cannot be simply integrated within the normal procedures involved in the development and transmission of knowledge, be-

cause it falls out of the horizon of expectations of the scientific community. It is at this point that a radical paradigm shift takes place (Kuhn 1962). We are dealing in this case with an interplay not so much of form and function, but rather of *form and norm*. As I have already said, "norm" has to be understood here both as the horizon of expectations induced by the statistical recurrence of an event, and as the institution that presides over a given set of related recurrences. And the norm intended as a statistical recurrence usually turns into the norm as institution when it becomes indispensable to a community of interests and therefore needs to be carefully administrated and regulated. So the change of function does not simply disappear within the dialectics of form and norm, but it rather gets involved (both surpassed and contained – *aufgehoben*) in it, and thus becomes a constitutive element of the new horizon of expectations.

Within the frame of this radical dialectics of form and norm, concerning the emergence of truly singular events, the notion of *infraction* finds its place. Infraction, as I have said, has to be understood in a twofold way, namely as a violation of the ruling norm and as a meta-event taking place at a different level from that of the perceived event. The infraction-hypothesis thus conceived responds to the observed mis-functioning of both the inferential system and of the socially regulated, institutionalized power structure in the face of truly new emerging phenomena. This hypothesis can be applied to the entire field of knowledge/power, that is to the episteme of a given epoch (Foucault 1970), according to the three-dimensional structure I have already indicated: thus the episteme can be articulated in provinces or fields, media or levels, and disciplines or methods of knowledge.

## 2. Structure and event

I want now to consider the relationship between structure and event with regard to the evolution of life on earth, assuming the perspective of a caesura in the evolutionary process during the Cambrian period, testified by the finding of fossils at Burgess, on the Canadian Rocky Mountains at the eastern border of British Columbia. These findings are the first document of the existence of multi-cellular organisms already 570 thousand years ago. According to the suggestive and authoritative hypothesis of Stephen Jay Gould, "the invertebrates of the Burgess mineral clays are the most important animal fossils in the world […] our only rich source of information about the most crucial event in the history of animal life, the first blooming of the Cambrian explosion" (Gould 2000: 17-18). If we are to accept the now widespread

hypothesis of a discontinuous evolution of life on earth, then we have to re-think the notions of cause, purpose and contingency, as well as those of process and event, in their relation to the evolution of both forms of life and knowledge. Since the "fossil documentation almost exclusively tells the story of hard parts" (*ibid*.: 18), whereas animals are for the most part made of soft material, we might rightly ask ourselves: what is the equivalent in the history of civilization of these "soft parts" of organic evolution that leave no trace in the fossil documentation? For instance, what is the "soft" material of social history that could not be stored in print? What can we say at all about all sorts of fleeting and ephemeral forms and events, spanning in size from the Big Bang to the action quantum, passing through that *flatus vocis* and that blink of an eye that, as we know, can trigger chains of events leading to catastrophes far away from the point of their origin? Finally, all the while we are changing the scale of our experiences, at which point does the new detail that can dissolve the pattern appear? Where does the event that can disrupt the habitual perception of a process stand?

At every level of reality, at every degree of pertinence, the relationship between hard and soft parts, permanent and ephemeral phenomena, cause and chaos is constantly shifting. These changes and modulations can at most be accounted for by way of inference, but certainly they are not available to our perception the moment they happen. While, in the course of evolution, organisms become on the one hand more and more complex, and on the other their anatomies diverge at points of occasional bifurcation, let us ask what sort of change is that through which the branch can no longer be traced back to its trunk and roots.

The fossils of Burgess for example have revealed the existence in the past of twenty more arthropods' anatomical planes than the four that we know today. Hence one is tempted to conceive the evolution of life as a history of explosions and "mass extinctions followed by a differentiation within the few surviving species, not as a constant progress in excellence, complexity and diversity" (*ibid*.: 19). This should lead us to acknowledge the impressive improbability of human evolution. Basing on this "evidence", we might also ask ourselves if it would be useful to transfer analogically the theory of discontinuity from paleontology to anthropology, historical linguistics and cultural history. Of course this would shake from the grounds the notion of causality, the idea of progress and the belief in an anthropocentric finalism, even in the field of the humanities and with far reaching consequences.

In any case, the history of life, as much as that of science, seems to consist in a series of paradigmatic leaps. To this purpose, Freud had already observed that our relationship with science must necessarily be paradoxical, since every advancement in knowledge and power exacts an almost intoler-

able psychological toll from us, namely that of our progressive removal from the center of things and of our increasing marginalization within a universe that does not care about us. Freud's belief is confirmed by the paleontological assumption that if humanity was born only yesterday on a minor branch of a blossoming tree, life cannot be here for us nor to our purpose. Maybe we should acknowledge "our being only second thoughts of creation, a sort of cosmic accident, or a decoration on the Christmas tree of evolution" (*ibid*.: 40). And this would imply that human finiteness, contingency and historicity are of a phylogenetic rather than ontogenetic order, as they concern the species before the individual. Such a knowledge, when brought to its consequences, would unsettle our understanding of history as well as our humanistic hermeneutics. The moment we throw a glance over to the other, the scientific culture, in order not to either appropriate or exorcise it, but rather to learn from it, we are confronted with an incommensurable world, both too big and too small in relation to humankind, both pre- and post-human, contingent and indifferent to our ends. Scientific progress has always been a succession of mutually incommensurable paradigms, a process of constant de-centering of the subject of knowledge through an alternation of *metonymic marginalization* and *metaphoric re-appropriation*. It seems to me that our condition today is similar to that of a sacrificial victim in a self-inflicted ritual of death and rebirth. What I mean is that in order for us to become gods once again, or to regain at least the illusion of mastery over our own destiny, we cannot shrink back from the sacrifice of our past.

Paleontology, genetic epistemology and system theory all agree on the idea that gradual change and abrupt leaps combine in the course of system-evolution within a given environment. This evolution is a singular and irreversible process characterized by the contingency of external inputs and by mechanisms of adaptive feedback that constantly modify the relationship between system and environment. And as we know from complexity theory, the repetition of the same initial conditions in a complex system always leads to different results. The notion of complex system, that is of a system that evolves according to feedback mechanisms, can be applied to many different disciplines. This notion in my opinion cannot but lead us to an insight into the intrinsic historicity of science on the one hand, and the techno-scientificity of history on the other – that is a mutual recognition that should underpin the difficult dialogue between the two cultures. We are not dealing here with the historicity of science in those extrinsically sociological terms, according to which every development of science and technology is conditioned by the societal texture in which it takes place (Fuller 2006: 11-44), but rather with the intrinsic historicity suggested by system theory and artificial intelligence, where contingency plays a decisive role in the development of any complex

system. If technology and science have a historical dimension, history has both a rhetorical and a scientific dimension, meaning that it is a form of knowledge in its own right. Its "legality" is not grounded though on predictive hypotheses and their experimental verification, but rather on a plausible *retro-diction* based on the concordance of documents and findings (or fossils). The predictive procedures of natural sciences and the retrodictive procedures of historiography indeed integrate each other in the process of cultural evolution. And this process of completion constitutes the very *dialectics of culture*. So the acknowledgement of the role of contingency in universal evolution can constitute a contribution to the understanding of both human and natural sciences. It can help us bridge the gap between the two cultures, and thus live up the challenge of our time.

## 3. Figure and plot

I shall now make a rather abrupt digression which nonetheless, I hope, will help finishing off my whole argument. In the poetics of the Sacred Scriptures, and especially in their interpretation by the Church Fathers, the concept of "figure" (or "type", which has been variously interpreted by classical rhetoric as "likeness, image, copy, plastic formation and transformation") becomes a synonym for "real prophecy". Biblical figures are historical facts or characters that foretell future historical facts or characters, which in turn are to be regarded as their fulfillment or validation (Auerbach 1961: 18; cf. White 1999: 87-100). For example Joshua, who succeeding Moses in the *Exodus* leads the chosen people out of the desert into the promised land, is to be regarded within the general economy of the Sacred Scriptures as an anticipation, a figure or type of Jesus. The latter in the Gospels breaks in fact with the Mosaic Law and leads man out of earthly desert towards eternal salvation.

We are dealing here with a circular implication of historical prediction and retro-diction, reinforcing each other within the frame of a relationship between text and world, appearance and substance, past and future. The logical and figural relationship – be it of similarity, exclusion or implication – which in classical rhetoric relates to either the *logos* or the world (figures of thought vs. figures of action), in biblical typology and its patristic interpretation fundamentally bears on the whole complex of text *and* world, that is Sacred Scripture/Universal History. The logical notion of truth as correspondence, as *adequatio intellectus et rei*, is a result of this mode of interpretation, according to which the intellect or spirit constitutes the historical process of figural interpretation of the Scriptures, that is the production of a total,

meaningful, progressive history of salvation.

These figural poetics and hermeneutics, which are at the base of both our historical and scientific interpretation, depend on the fundamental assumption of the *world-as-book* metaphor, informing the religion of the Book and our literary civilization on the whole. Man is called to read the signs of the Book in order to discover God's plan all throughout the chain of being from the microcosm through the body-politic to the macrocosm (Lovejoy 1976). The relationship between prophecy and retro-diction thus constitutes a positive feedback loop, reinforcing both terms in an eschatological progression towards the final Revelation and Redemption. This positive circle constitutes the foundation (in faith rather than reason) of the modern Western historical and hermeneutic tradition, which are both informed by Christian eschatology and by its secularized version, that is the idea of progress. In the Bible the mutual Platonic participation (*méthexis*) of *logos* and world becomes a form of consubstantiality, which issues in a totalizing vision permeating both humanistic and scientific thought, and leading to the modern technological project of neutralization of contingency, causal rationalization of history (human and natural) and mastery over nature. The concept of figure, or type, elaborated by the Church Fathers constitutes the source of sense production in the Sacred Scriptures, but also the foundational principle of a unitary, teleological and totalizing vision of the world and its history, as it was developed from late antiquity onwards, in medieval Scholastics, in the thought of Descartes and Newton, in Hegel's Phenomenology, and eventually in the dialectical materialism of Marx and the evolution theory of Darwin. This vision was really only put into crisis, if at all, at the beginning of the twentieth century by the challenging paradoxes of microphysics issuing into relativity and quantum theory.

The importance of biblical typology in the development of Western thought – both humanistic and scientific – as well as of the Western tradition of realistic art and narration cannot be overestimated. It indeed informs the logic of history and the history of logic, that is, the entire order of representation of the West. Figural hermeneutics determines our notion of the event – historical or natural – as a singularity that can be traced back to a preceding event and reduced to a norm of scriptural and literary interpretation. In the figural rhetoric of the Bible we can thus find outlined *in nuce* the strategy of reducing chance, contingency and the emerging singularity; a strategy that has characterized the history of Western science and culture on their whole.

But today our idea of a continuous, self-grounded and purposeful history of the human species is shaken from the grounds by experimental sciences. We should therefore ask ourselves if it is possible to adapt to the present world the figural rhetoric of the Sacred Scriptures informing our civilization and

constituting the generating principle of both Christian and laic humanism to our days. Or rather, if we should abandon any poetics of redemption along with the narrative model of the return – be it the Homeric *Nostos* of Odysseus or the Second Coming of Christ as Judge, both fundamental schemes of our idea of history. We have so far "enclosed" as it were the sense of history within a continuous and progressive figurative circulation of prophecy-fulfillment-prophecy aiming at a final fulfillment and revelation. Similarly, we have so far understood both the history of science and the science of history, in their common economy (despite all differences) of pre- and retro-diction, as either necessarily (that is causally) or freely (genealogically) ordered towards human ends. The logic of History and that of the natural sciences have both sought to defuse or normalize infraction and emergence, chance and the event, referring them to a prescribed pattern of recurrence. No "rational", well meaning conception of history has so far been able to evade the figural poetics constituting the scriptural foundations of Western literary civilization.

But the legacy of this traditional idea of history as a figural plot in progress towards a final revelation probably has to be reinvented today as a history of contingency, filled with digressions and curves of probability which are turned out by each significant event. In order for the figural mechanism of narration to live up to our present, we need to reorient it towards the new hyper-medial perspective and translate it into an alphanumeric rhetorical code. How such a transition will be achieved is not easy to say, but certainly it will add new surprising dimensions to the "vectorial space" of Western, Christian-humanistic historiography.

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## Abstract

The purpose of this article is to enquire into the notion of change in figures of speech, concepts, topics, and technical instruments-models when they are "travelling" through different milieus, contexts, systems or disciplines. I conceive of this travelling as a basic exchange of energy/information, amounting to an event which can reshape a given field of experience.

My argument is based on the premise that our experience happens at multiple levels and areas, and develops along different phases, which imperceptibly flow into each other and bear at times barely decipherable traces of the events that have constituted them. The processes happening at a different level from that of present perception can only be conceived of as infractions of the world tissue and of the related universe of discourse. Therefore in any field of enquiry the process of discovery can develop only through figures of discourse. My thesis is that, at the present stage of techno-science, Scriptural Figurality, which constitutes the basis of both Western epistemology and hermeneutics, is superseded and has to be replaced by a new hypermedial rhetoric, capable to cope with complexity, infraction and emergence, both in science and the humanities.