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DENIALISM WHAT IS "REAL" IN PUBLIC DEBATES TODAY? THE CASE OF EVOLUTION

We define here "denialism" the public refusal of empirically corroborated scientific evidences, like biological evolution by natural selection, or shared scientific consensus, like climate change as a global process also due to human activities. We focus on scientific denialism, leaving apart a more general definition of the concept that includes historical denialism (the refusal of proven historical events). Any form of denialism is clearly related to social and political issues, like religious fundamentalism spreading around Western countries and conservative movements, but here we concentrate mainly on its philosophical and cognitive features. It could be argued that denialism is an expression of trivial irrationalism, opposed to the use of common sense and rationality. For a philosopher of science, the allegedly simple contradiction between the self-evident rationality of science and the obscurity of a lazy superstition is not the whole story. We propose here to consider denialism as based on much more influential cognitive roots, on the ambiguities of the demarcation of sciences, and on the counter-intuitive results of many scientific researches. In this field, what is "real" and "true" is disputed between science, philosophy and socially driven public opinions.

Intuitive teleology

We will use the acceptance of the theory of evolution as a case study. Denialism in this matter is growing on and it is a widely inter-cultural and inter-religious phenomenon. It must be explained. Every teacher of evolutionary

topics knows that students' minds have strong propensities for the overlapping between ontogeny (the development of an individual towards the adult form) and phylogeny (the evolution of species as a process of descent with modifications), both misunderstood as directed and quite finalistic processes. In Aristotelian terms, efficient and formal causes have less appeal than the finalistic ones[1].

Now, convergent data, coming from developmental psychology, evolutionary psychology, anthropology and neurosciences, suggest a biological predisposition of our minds, even in the earliest phases of development, to distinguish inert entities (like physical objects) and entities with psychological features (like living agents) very instinctively (Bloom 2004), and to attribute or, incidentally, hyper-attribute intentions and purposes to animate and inanimate objects, producing "teleo-functional explanations" of the natural world (Keleman 2003). The discovery of the cognitive bases of this promiscuous teleology – so similar to the folk teleology of Voltaire's dr. Pangloss – could explain the natural propensity to find psychologically and emotionally satisfying the animistic justifications of natural events or those based on invisible intelligent designers. We like to attribute mental states to a large variety of entities,[2] when they have proper movements, complex structures, and anthropomorphic appearances.

How can we philosophically interpret these experimental results? The widespread diffusion of cognitive detectors of causality and causal agents also in other animals (Vallortigara 2008) and the presence of inferences about hidden causes in early childhood (Saxe *et al.* 2005) suggest that it could be a mental habit – strongly rooted in adaptive specializations – to suppose rapidly and economically that a purposeful agent with projects and aims is hidden behind the complexity of natural phenomena, rather than a laborious series of blind mechanic processes. Humans seem affected by an hypertrophy of the system dealing with animated objects (Boyer 2001): we tend to attribute desires, intentions, and projects, whereas they do not exist; and supernatural entities have the double feature of being causal agents able to disobey the physical laws. Our mental world is William Paley's world, the world of a natural theologian (paradoxically, we are so by natural evolution!).

For those reasons human beings love explanations based on purposes, as if they had a sensor always turned on for detecting the presence of other

1 When we study animate beings, frequently the functional question "what is it for" hides meanings of purposefulness, the same meanings present in early childhood (and in patients affected by Alzheimer's disease: cf. Lombrozo *et al.* 2007) about inanimate objects as well.

2 Even in front of the idea of death, in early human development there is a sharp difference in the acceptance between the physical end of the individual and the psychological and intentional disappearance of the individual (Bering and Bjorklund 2004).

animate agents and prevent the moves of potential external enemies. These cognitive devises (typical of a species with a prevalent history of prey, rather than predator like in our preferred "just-so-stories" (Hart and Sussman 2009; Pievani 2011a)) could have evolved afterwards in different ecological niches, shifting their contributions to the behavioural human fitness and then being co-opted for other functions. If this is right, following a classical theoretical dichotomy in literature, it means that such beliefs could not be direct adaptations for cooperation in groups and pro-social behaviours, but primarily exaptation (Gould and Vrba 1982; Gould 2002; Pievani 2003): by-products of already evolved, non-religious, cognitive functions (Pyysiäinen and Hauser 2009). The conclusion seems confirmed by the data of developmental psychology concerning the precocious natural attitude towards empathy, benevolent acts and precursors of moral actions, independently from the cultural acquisition of supernatural beliefs (Hamlin *et al.* 2007).

In front of incomprehensible dangers or heavily painful events that hanged over us, eagerly an intuitively theist species looked for explanations involving invisible histories, processes and agents. The authentic satisfaction of psychological, social and cognitive needs in our teleologically equipped minds was so wide that it turned out to be the common sense that science is frequently compelled to face and dismantle, sometimes unsuccessfully. It is plausible to think that there is a connection between these data of folk biology and the peculiar situation of the public acceptance of the theory of evolution, a situation with few equivalents – in terms of widespread misunderstandings and persistent ideological denial – in other similarly technical and demanding scientific research programmes (like those coming from particle physics: apart from some isolated "conspiracy theorists", there is no denialism about Higgs boson and the Standard Model) .

The scandal of contingency

Darwin himself thought pessimistically that the objections to his theory had something spontaneous, or intuitive, something that we can easily imagine, even if wrong as a matter of fact. He understood that natural selection was challenging common sense.[3] He had no great hopes that our reasoning could prevail over the resistances of imagination, as if the structure of our brains was

3 He was so aware of the dangers of the teleological reasoning that he apologized to the readers, in the *Origin*, for using anthropomorphic terms in the descriptions of the agency of natural selection like an engineer or like a breeder, underlining that natural selection is certainly a designer (or better, a tinkerer) though a blind and unaware one (Darwin 1859).

not adapted for the acceptance of such ideas. As a young student, he tested the persuasive power of the alternative inference, based on the analogy between the complexity of human artefacts, products of a conscious and intelligent activity, and the complexity of organic structures (the quite unavoidable comparison between the eye and the telescope). Reading William Paley's *Natural Theology* (1802) like many of his contemporaries, he was aware of the communicational efficacy of the finalistic explanations achieved through the classical Thomistic argument of design (then also present in John Ray's and William Derham's works, and mostly in Isaac Newton's *Opticks*), based on the analogy between the complexity of elements and relations in human artefacts and the "intelligent" complexity of living beings (Darwin 1836–1844; Pievani 2012c).

Through contemporary science and history of science, we see here a huge philosophical question of Modernity. The teleological analogy, the metaphor of the design, could be a kind of natural inference. Conversely, the differential survival of individuals bearing inheritable non directional mutations, under ever changing and contingent environmental circumstances, finding case by case trade-offs with the internal and developmental constraints of the available organic materials (Pievani 2009), is somewhat an "unnatural" inference, a counter-intuitive explanation.

The point is that the evolutionary explanation – in its mix of functional, structural and historical inferences, with at least three robust inflows of chance (random mutations, random genetic drifts, contingent ecological macroevents) – is deeply a-teleological and purposeless, even if in philosophy of biology we had some inappropriate overlapping between the concepts of function and purpose. As a matter of fact, our teleological attitude is clear also in the ease with which we accept evolutionary unverifiable "just-so-stories", reconstructions of intuitive narratives where the past is involved for justifying a necessary present. The anomaly of human evolution – since two decades ago intended as a quite exceptional linear chain of progress by the mainstream of evolutionists – is a clear example of this anthropocentric and teleological bias inside the science itself (Eldredge and Tattersall 1982).

From a philosophical point of view, reading his private early writings, Darwin's denial of natural theology was based on an argument by absurd (if there is an Intelligent Design, is it so intelligent?) and an argument by parsimony (do not add hypotheses, like special creations, if not strictly necessary). Furthermore, historical contingency is the crucial concept today when we try to reconstruct evolutionary histories, mostly in paleo-anthropology. Contingency means that evolution has to be interpreted not only as a process in

time – with the risky "great narratives" produced in our minds by the teleological preferences – but also as a process occurring in a material space: the ecological and geographical space, which is not "for us" but in which we have to survive.

The dependence of our evolution on external (and frequently accidental) circumstances – like the Great Rift Valley formation and the Pleistocene climate oscillations – does not mean that human evolution occurred exclusively "by chance", but through an entanglement of functional factors (produced by selective pressures), structural constraints, and historical contingent events: an interplay between random events and regularities (Gould 1989; 2002). *Homo sapiens* is an improbable and tiny branch at the end of a luxuriant tree of species. Like any other species, we are not at the top of a process of perfect optimisation, but we are the offspring of the material and contingent relationships between localized populations and ever-changing environments (Tattersall 2009). The massive contingency of human evolution means that particular events, or apparently meaningless details, were able to shape irreversibly the course of natural history.

Then, the clash between human time and geological deep time changes irreversibly our historicity. This alternative explanation (a narrative anyway, but of other kind: a narrative of possibilities) requires a much more costly cognitive investment. It is harder to believe, definitely less cheering, counter-intuitive in its challenge against some firm pillars of our common sense. Something we do not like to think. Leaving Paley's world and entering Darwin's one is a hard cognitive enterprise.

The appeal of pseudoscience and the risk of "hardened" answers

The evidence that the teleological propensity and the hyper-attribution of mental states are not stupid or childish human attitudes, but a mental activity crucial for the functioning of our minds, does not belittle the fact that we can misuse these attitudes very badly in many occasions, like when we deny the validity of a corroborated scientific programme following fallacious but intuitively amusing arguments. To be conscious of the evolution of our adaptive or exaptive cognitive constraints is a tool for dealing with them in a more careful and rational way, because the evolutionary explanation of their emergence is not a justification by nature, and the understanding of a behaviour as product of the biological and cultural evolution of our species does not imply that the

behaviour itself is forever written in the stone (Girotto *et al.* 2008)[4]. Nevertheless, we should consider the intentional misuse of these mental habits carefully, with respect to the counter-intuitive nature of many scientific explanations.

A cognitive study of neo-creationistic ID arguments[5] shows that they are carefully suited for our minds attracted by teleological beliefs and by vaguely defined concepts like complexity, and for our intuitive refusal of chance and contingency in causal explanations. Furthermore, all such unfair psychological advantages are powered by the privileged position of any unorthodox minority in a public debate. For these reasons, without any intention of justification, we should admit (as in *Nature*, April 2005, about the diffusion of ID in North American University campuses: Brumfiel 2005) that ID is not only the manifestation of blind religious fundamentalism: it is an ideological campaign able to fit our minds, and perfect to be manipulated (like fear) as a political instrument of consensus.

The structure itself of ID doctrine, presented as a way to conciliate science and faith, is consciously shaped by this cognitive appeal for our minds "born to believe", then implemented by a strong familiarity with the specific rules of public debates and communication, and with the politically-correct arguments of the freedom of research and the need of a plurality of schools of thought. The basic elements of the structure are: negative arguments about the gaps and the alleged lack of evidences; generalization of single anecdotal cases considered as critical; rhetoric tricks like irreducible complexity discussed as supposed alternative explanations. The appeal of ID is rooted in the cognitive docility that accepts inferences concerning the effects of the hidden actions of an animate and intelligent agent. Meaningfully, quite nothing consistent is said about the identity, the properties and the supreme mind of the designer.

The point is that pseudo-science is something different from a plain non-science: it is a camouflaging of science and an abuse of its methods (Kitcher 1982), adopting cognitively and psychologically persuasive and deceptive inferences. In this situation – a powerful mix of psychological appeal, cognitive constraints, communicational unfairness, and political supports – is it still

4 The assumption that we are "born to believe" should not offer any fatalistic excuse for irrational manifestations of credulity, as demonstrated by the empirical successes of many projects of early and interactive science education, which is a truly "conceptual change" (Carey 2000), and by the fact that analytic thinking seems able to discourage superstitious beliefs (Gervais and Norenzayan 2012).

5 For such a proposal, we refer to T. Pievani, "Intelligent Design and the appeal of teleology. Structure and diagnosis of a pseudoscientific doctrine", in *Paradigmi*, Sept. 2012, in press. See also Pievani 2006.

useful to oppose arguments (like in Richard Dawkins 1986 and 2006, or in Coyne 2009) based only upon pure evidences of "truth" and on a supposedly shared naïve definition of what is science and what is not?

Denialism and post-modernism

Denialists have a great success in public virtual arenas without substantial controls and references, like the web and the blogosphere. They love weak epistemologies and relativistic ideas of science, represented as a set of fights between free and equivalent interpretations of subjective images. They love the idea that science is always provisional. In this way, they try to deny a shared space of dialogue, a shared world based on the scientific state of the art in a specific field. But without this shared field of common interests and fair rules any democratic debate is precluded. Denialists flourish in a radical post-modernist culture medium. In contrast, but following the advancements of recent epistemology, we should rediscover the possibility to talk about scientific evidences as "facts", intended as real and irreversible constraints for our future paths of knowledge. It is possible to avoid the use of old fashioned categories like scientific "objectivity", substituting it by an operational concept of "robust inter-subjectivity".

The advanced controversies around the demarcation problem in philosophy of science and the rise of an epistemological and methodological pluralism in the philosophy of special sciences could become, paradoxically, insidious Trojan horses for the neo-creationistic pseudoscience (Forrest and Gross 2004), not by chance attracted by post-modernist tendencies and by the hermeneutics of epistemological anarchism. But it is also clear, on the other side, that we should not be urged to harden our technical debates about the updating of the theory of evolution because of extra-scientific religious attacks. To erect a defensive barrier in the name of an alleged universal Darwinian algorithm, presenting natural selection with neo-teleological terms (as pointed out in Godfrey-Smith 1999), seems a losing strategy in the mid-term. The same we could say for the use of strict, apodictic demarcation definitions, already epistemologically weakened as the ID supporters know.

If ID arguments find an unexpected ally in our deeply rooted mental attitudes (results of our adaptive evolution, ironically) for hyper-detecting causes, purposes, intentions and finalities in the external reality and nature, we have today other reasons to accept, carefully and wisely, the neo-creationistic challenge in mass media (and exclusively in mass media, because the acceptance of

debates in scientific institutions could become an implicit certificate of scientific relevance). After the defeats in Courts – the latest one in Pennsylvania at the end of 2005 – ID supporters are concentrating their efforts on mass media and entertainment: this strategy may be not so bad in our commercial and secular societies. Secondly, the spreading of private teachings in US and Europe – and the current political appeal of the idea that a liberal policy should allow the constitution of private schools distinguished by culture, confession or ethnic group – actually creates a propitious context for these fundamentalist lobbies. In 2007, the rapid spread of creationistic inter-religious movements throughout Europe produced for the first time a formal critical response by the Council of Europe (*The Dangers of Creationism in Education*, Resolution 1580).

Nevertheless, every scholar involved in public debates on mass media has experienced a disagreeable communicational asymmetry: ID supporters can use very simple and effective messages and slogans – misleading but psychologically cheering – presenting themselves as a minority of free thinkers; reversely, scientists have the duty of a rational and supported argumentation, usually unsuitable for TV talks, with the continuous risk of appearing the defenders of an old and dogmatic orthodoxy. Considering the appeal of this pseudoscientific doctrine, in order to answer its tricky arguments we should represent science – in a positive and not only defensive way – as a process of discovery and as a peculiar field of researches based on specific rules, a process of growth of knowledge through confrontations and revisions in research programmes (Pievani 2012a).

The fact that in some points Darwin was wrong, of course, and evolutionary Modern Synthesis turned to be inadequate, loses a great part of its striking dramatic power. The theory of evolution, like any evolving research program, has a flexible structure: there are no Darwinian orthodoxies and the theory is quite different from the formulations of 1859 and XXth Century, though still consistent with the basic Darwinian processes (Pievani 2012a). In its internal rational dynamics of theoretical assimilation and accommodation, the structure of evolutionary theory shows its core-problems and belt-problems (Ayala and Arp 2010).

Science as an evolution of research programmes

How to answer the creationistic arguments in this political and cultural context? A reactive, defensive and spot by spot policy of rebutting seems not enough. Science is an open way of thinking, with common rules, it has a public

role in our societies and, as a matter of principle, any dissent is potentially useful. If ID were a good alternative school of thought about the explanation of life it should explain all the empirical basis of current Neo-Darwinian research program (1), it should explain something more (2), and it should do all that using different laws and factors from Neo-Darwinian ones (3). Through this pragmatic "benefit of doubt" methodology (Pievani 2012c), we can easily see that there is nothing like that (1-3) in the scientific field at the moment, and nothing predictable in the future.

So, let us play our shared game, not the ideological game imposed by the denialists. This approach is grounded also on the idea that science and religious beliefs inspiring pseudoscience are two radically different fields of research, but inevitably interfering one with the other in several points (mainly, when both of them face the themes of the evolution of human moral systems). So, this is not a procedure based on a strict and normative interpretation of Stephen J. Gould's "non-overlapping-magisteria" (Gould 1999). In the light of the distinction between scientific (methodological) naturalism and philosophical (ontological) naturalism (Forrest 2000), we should clarify that evolution is not the scientific door to atheism, but anyway an abundant harvest of knowledge that should influence any philosophical reflexion about man's place in nature.

If a philosophical argument is based on a naturalistic assumption (like "evolution has been a necessary trend towards human consciousness"), and the assumption is afterwards falsified by scientific data, it is hard to demonstrate that the falsification should not have consequences on the philosophical argument. On the contrary, it is a viaticum for pseudoscience also to affirm – according to the old course revived in the papal Regersburg's Speech in September, 12th, 2006 (De Caro and Pievani, 2010) – that the "wider" rationality of theology and philosophy must supervise the "narrower" rationality of natural sciences (for an example of this science *sub specie theologiae*, coming from a theologian not suspected of strict orthodoxy, see Küng 2007, and his theologically-oriented distinctions between good scientific theories and bad scientific theories in evolution and cosmology). Secular philosophers need to reinforce a *pars construens* in this public debate, exploring a scientifically informed ethics of contingency and the philosophy of human finitude (Pievani 2011b).

Evolutionary biology shows today the uniqueness of its old-fashioned and never tamed opponents, but also the peculiarity of its interdisciplinary frame of convergent countless proofs and its explanatory mixing of experimental, comparative and historical evidences. If we examine the philosophical arguments of ID in current literature, in their indifference towards the scientific

advancements, we see that they are quite exactly the same of the Natural Theology in the XIXth century, always using the same psychological refrains about intentional causality, the primeval scope, the alleged impossibility of explaining anything exhaustively through the action of laws and chance. On the contrary, both the scientific evidences for evolution and the structure of evolutionary theory are deeply evolving (Eldredge 1995; Gould 2002), in a process of criticism through sophisticated falsificationism (Lakatos and Musgrave 1974). This could be a *post hoc* criterion of demarcation.

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