Introduction to evolutionary epistemology, language and culture

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Abstract

Evolutionary epistemology (EE) is about developing a normative framework, based upon evolutionary thinking, that can explain all of an organism's phylogenetic and ontogenetic evolution. (1) EE is sketched as an inter- and transdisciplinary field that evolved out of naturalized epistemology as a reaction against logical empiricism and sociology of knowledge. (2) Different schools of evolutionary epistemological thinking are examined and compared. (3) It is argued that within EE today, the search for a normative evolutionary framework is narrowed down to the development of a framework based upon Neo-Darwinian theory. Because of this, other evolutionary theories that are very useful to explain certain phenomena are neglected. (4) These theories are briefly discussed. (5) It is shown how EE can be implemented in the scientific study of language and culture.

1. INTRODUCTION

Evolutionary epistemology (EE) is the most controversial, the most fascinating and the most difficult discipline within philosophy today. It is controversial because it declares all other philosophical disciplines bankrupt, and explains itself as part of the sciences. At the same time, it is a fascinating and difficult discipline because of its inter- and transdisciplinary character.

Philosophy can (amongst other distinctions) be divided into two domains: an *ontological* domain that examines what exists; and an *epistemological* domain that examines how we can gain knowledge of that what exists. EE obviously is part of the latter domain.

This article is divided into four parts. First, a brief historical sketch is given of how EE developed out of naturalized philosophies, the latter themselves being a reaction against empiricist and rationalist traditions. EE is a scientific discipline that evolved out of Quine's *Naturalized Philosophy* and adheres to the view that we can examine the knowledge-gaining-process from within

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evolutionary theory, because knowledge is a biological evolutionary product. Because EE involves a naturalistic and positivistic approach, it stands opposed to sociological frameworks of knowledge and post-modern thought.

In the second part of the article, different programmes that developed within EE are examined. EE does not only examine human knowledge-gaining-processes, it examines the knowledge-gaining-processes of all organisms while at the same time it also studies the products of these knowledge-gaining-processes, such as language, culture and science from within evolutionary biology.

The main goal of EE is to develop a *normative framework*, based upon and analogical to biological evolutionary thinking, that can explain not only all of *phylogenetic* evolution (the origin and evolution of species), but also *ontogenetic* evolution (the development of an organism from conception until death). This means, as will be demonstrated, that evolutionary theory is internalized, thereby raising questions about the *units* and *levels* of selection.

The normative frameworks that are being developed today, however, only make use of Neo-Darwinian theory and hence develop frameworks that are analogous to the evolution of genes by natural selection. Evolution is the phenomenon we want to explain; natural selection is only a theory that tries to explain this phenomenon. Evolution can occur in many different forms, and, therefore, it is necessary for us to broaden our perspective and look at other evolutionary theories as well, to see how these can enhance our understanding of language and culture. In the third and fourth part of the article, we, therefore, examine some peculiarities of languages and cultures and examine how EE can be implemented in the scientific disciplines that study language and culture.

2. PHILOSOPHY IS DEAD, LONG LIVE PHILOSOPHY!

> "In the middle of the 20th century, when it was realized that Bacon's New Atlantis had turned out to be Max Weber's Iron Cage, inhabited by Riesman's Lonely Crowd, and that the view that scientific theories have a partial observational interpretation by means of correspondence rules should never have become the Received View, philosophers started to move away from the long tradition of modernism, which had stretched from Bacon and Locke to the early Wittgenstein and to Carnap. Disillusioned with modernism, they turned a blind eye to the implications of biology and veered instead towards the post-modern relativism of Kuhn, the post-modern post-structuralism of Foucault, Derrida and Lyotard or to the post-modern pragmatism of Rorty and are showing unending and increasing interest in the obfuscations of Heidegger (Munz, 2001: vii)."

2.1. Empiricism/Rationalism

Within classical philosophy, there has always been the idea that we can found science upon something stronger than science itself: a first philosophy. Knowledge, according to this view, was perceived as a relation between a knower and something known (the rationalistic school, from which ideas about innateness developed) or something knowable (the empiricist school, from which ideas about nurture developed) (Munz, 2001: 28). This *something known* or *knowable* was the world in itself (*an sich*).

Rationalists and empiricists conceive of this knowledge relation as a direct relation: empiricists adhered to the view that they could perceive the world as it is, through their sense organs and that these senses somehow immediately were transformed into knowledge, knowledge that takes on the form of language; rationalists adhered to the view that men possessed innate ideas, that also took on the form of language, and that these ideas, because of a benign God, immediately gave direct knowledge of the world out there. There is an immediate correspondence between our words and the world in itself. So knowledge gained through the senses or through thinking, was correct knowledge.

People then, knew how the objective world out there was, and furthermore: this world was the precondition for all thinking and sensing. The knowers, therefore, were also interchangeable: they were conceived of as a-historical, unevolved or unchangeable individuals that were equipped with the same sense apparatus or with the same *universal* reason (see also Lorenz, 1987).

2.2. Hume and Kant

Two philosophical thinkers, David Hume and Immanuel Kant, put an end to this naïve realism. Hume (1985) stated that we can only trust knowledge that we receive from our senses. All knowledge that is not the result of, or that cannot be reduced to, our impressions,[1] is suspicious. Therefore, he distinguished between the world as we perceive it and the world as it is in itself. We do not have direct knowledge of the world out there and, therefore, we should not try to talk about that world, because we cannot make sense out of it. Hence, the knowledge relation becomes indirect. The generalizations we make regarding our incoming knowledge cannot be explained as being part of the world, but only as being part of our psychology. When we conclude that the sun will shine tomorrow, because she shined yesterday and the day before, and the

[1] Impressions in Hume's view are literally *im-pressions*, imprints from the world upon us. Locke's concept of *tabula rasa* is in order here: we are blank slates that are written upon by the world.

day before . . . we are not telling truths about the world, rather we are expressing our expectations towards that world, based upon previous experience. This, however, implies that we need to study human (psychological) nature, to make sense out of these statements.

Kant (1788, 1997) developed Hume's theories further, synthesizing them with rationalistic thought. We can only know the world as it appears to us, which differs from how we perceive it. Kant, therefore, introduced what he calls the Copernican turn in philosophy: it is not the world (*an sich*, in itself) that presses its categories on the human brain, which leads to immediate and correct knowledge of the world. It is us, who form the objects, through the categories of our mind. These are *a priori*; they are part of us, before we look upon the world or before we can even begin to gain knowledge about the world. *"In other words, our empirical 'synthetic' knowledge is infused by elements that do not come from the external world, and that are thus 'a priori'."* (Ruse, 1991: 194). The knowledge relation between the knowing subject and the world hence is interpreted as an indirect knowledge relation. We perceive the world with our senses, however, only when we *think* the incoming information with our mind (in a language-like fashion), can we gain knowledge. Knowledge, therefore, is based upon experience, but interpreted by the mind (Ruse, 1991:194).

2.3. Logical Empiricism

Logical empiricism (also known as Neopositivism) came along with its adherents who argued that they knew that the world out there was structured in an orderly fashion, and that we could formalize this natural order in the world within a language-like system called logic (Gibson, 1998), from wherein we could deduce eternal truths about that world. Developed out of nineteenth century positivist thinking, Neopositivists adhered to the view that only science, as the most enlightened stage in history, could develop truths. These truths would be reducible and deducible from information gathered by our sense organs and somehow we would be able to form *Protokolsatze*, *observational sentences* as they called them: sentences that describe, no, correspond to elementary facts in the world, and this in an immediate fashion. Mathematics and logic were conceived of as instruments: objective measurements used to gain knowledge from the world. Simple observations somehow would immediately transform into verbal expressions (Munz, 2001: 50).

Wittgenstein (1989), however, showed, that we cannot say that language refers to a world out there. The early Wittgenstein, as Bertrand Russell, for example, pointed out before him, adhered to the view that the structure of the world and the structure of language are the same: language and the world show a structural resemblance. More problematic, however, is the fact that,

according to Wittgenstein, we cannot say (although it somehow shows) that language refers to the world out there, that for instance the word 'cat' refers to the animal we see and call a cat, so we would never be able to talk about eternal truths out there. Thinking is always thinking based upon language, and we cannot talk about this kind of thinking without using language. Hence, his famous statement that the boundaries of my language are the boundaries of my world (Wittgenstein, 1989: 5.6).

2.4. Language Games

The early Wittgenstein subscribed to the view that logic is an objective instrument, and, therefore, a universal language. The later Wittgenstein (1989) stated in his *Investigations* that words do not straightforwardly or solely refer to objects in an external world, instead words can have different functions and different meanings. Language is not solely an instrument of knowledge either, because we can use language for contact and communication between members of the same language community, as well. Hence, the introduction of the concept *language games*, in the plural: language can have many manifestations. Because of this he introduced the term 'family resemblance'.

The meaning of words does not lie in their possible referential relation to the world, but in their use. What matters is how these words are being put to *use*, by members of the same community that partake in different language games. Therefore, language has a *social* function: it enables social relations between members of the same community that make use of the same language. Meaning, therefore, also is explained as being intersubjective, excluding all possible forms of a private (inner, non- or pre-linguistic)-language (Munz, 2001): meaning and language hence are externalized and are supposed to be part of a (social or cultural) community.

The concept *meaning* is, therefore, introduced for the first time, and this notion is distinguished from truth. Meaning is a secular concept and can only be part of secular thinking, because meaning becomes relative to the community, and what is comprehended as meaningful is dependent upon and restricted to the language community in which we are born. One can only talk about truth in a religious framework or from within naïve realism, because here a correspondence between language and the world is presumed to exist.[2]

[2] As we shall discuss later on, these ideas gave way to the idea that when studying language (from an evolutionary view or otherwise), one is studying the social or the cultural (the Sapir-Worf hypothesis) and the general relativistic accounts as defended by post-modern sociology and anthropology, that conceive of subjects as determined by society, and knowledge as an idealistic non-existing phenomenon.

2.5. Strange Encounters

All of this might and should look strange to anthropologists, who conceive of language as a medium through which people partly express their feelings, and it might look strange to linguists as well, because they understand language first and foremost as a communicative system,[3] while biologists or neurologists should also be surprised, because they know that impressions or information coming from our sense organs does not get magically transformed into language. Nonetheless, Western philosophers have always regarded language as an instrument to gain knowledge about the world.

Within classical Western philosophy, beginning with the ancient Greeks, language, reason and thinking were referred to synonymously as *logos*, a principle that brought order into the world. Language, according to this view, allows us to order the world in a logical way. The idea, therefore, has always been that with language, we can develop true statements about the world, because every knowledge relation and every form of thinking is conceived of as a language relation.

With Wittgenstein, and the failures of positivism and logical-positivism, philosophy is declared bankrupt: the reference problem (how our language relates to the world) cannot be explained from within philosophy. Albeit the fact that analytical philosophy, as a discipline within the field, still goes on in a somewhat modified version, two reactions to this failure can be distinguished: *philosophy is dead* and *long live philosophy*.

Those who respond that because of the failure of logical empiricism, 'philosophy is dead', can be classified as post-modern thinkers. Those who respond, 'Long live philosophy!', can be classified as Naturalized Philosophers or Evolutionary Epistemologists.

2.6. Sociology of Knowledge

Sociology of knowledge (SoK) is part of post-modern thinking because it regards knowledge, not as a relation between a knower and the world, but as a relation between different knowers (Munz, 2001: 106). Knowledge hence, becomes a *sociological* problem, instead of a philosophical one. Beginning with Hegel, and culminating with Durkheim and Foucault, the only thing relevant and real, becomes the *social*. And the social is reified as part of a deeper lying structure or some superorganic structure. The social as an entity can do things to people; it can *work causally*, thereby rejecting the possibility

[3] These views, however, are the direct result of the secular philosophical traditions (discussed in note 2). There is a reason why we nowadays emphasize the role of the social and the cultural so strongly, when studying (the evolution of) language and culture.

of any form of creativity or emancipation of the individual. Science can and should only be explained from within society: science and scientific thinking is the expression, they say, of cultural and social tastes, and those tastes are the expressions of those groups within society who are the most powerful. Science, however, has nothing to do with gaining knowledge about the world, and, hence, we see the introduction of terms like *regimes* or *epistèmes* (Rabinow, 1997: 31–34). All one needs to do, according to this view, is deconstruct all scientific theories ever developed, see whose cultural and social ideas are being promoted and answer the questions: who has got the power and why did they want it in the first place.

> What Foucault has called the regime, or game of truth and falsity is both a component and a production of historical practices. […] Truth is linked in a circular relation with systems of power which produce and sustain it, and to the effects of power which induce and which extend it. (Rabinow, 1997: 35–36)

Sociological systems theory was born and implemented within different disciplines such as history, science, culture and language. These should be comprehended as closed self-containing, self-explaining systems. These systems develop in and from within themselves and can only be explained from within these systems, in a *synchronic* way (Munz, 2001: 122–123). Wittgenstein's language games, Malinowski's (1949) social, functional anthropology, Talcott Parsons' functionalist sociology (1964), Foucault's regimes/epistèmes/discourses, de Saussure's linguistics and Kuhn's paradigms (1996) have the following in common: all turn away from evolution, all turn away from *diachronic* studies, all defend synchronic studies, all reject bridge laws or continuity between earlier and later or geographically distinct, sciences, cultures or languages . . . Why? Evidently because they wanted to ban *historicism*, with its developmental laws. Meaning, language, science and culture are all understood as systems that need to be explained from within these systems, because there exists nothing outside the system: there is no God's eye view, nor does there exist anything besides the social and/or cultural domain. Meaning becomes *variant*, and is defined by the time and place, the community of which we are part, which eventually leads to the introduction of concepts such as *incommensurability*.

2.7. Naturalized Epistemology

When interested in language or culture, neither analytical philosophy nor SoK, taken on their own, can help us: we need to study evolution, biology, embryology, child development . . . and here we need to be able to distinguish scientific ideas from misfits.

A much more optimistic view is, therefore, given by EE. EE grew out of naturalized epistemology (NE), a term first introduced by Quine (1969). Instead of trying to ground science, outside of science, in a first philosophy, we should ground science, in science itself. *"[. . .] The quest for a foundation outside of science upon which science can be grounded (i.e. justified or rationally reconstructed) is a will-o'-the wisp and, therefore, ought to be abandoned."* (Gibson, 1998: 668). In other words, the foundations of scientific thinking can and should be based upon scientific theories, and, therefore, epistemology should get naturalized. This does not mean that philosophy is dead, according to Quine's view; it still goes on, as a part of the natural sciences (and natural sciences here are conceived broadly, including physics, biology, psychology and social sciences). NE is not merely a descriptive discipline that records how we can gain knowledge using different sciences, it is also normative: it adheres to the view that it is *only* by making use of sciences, that we can gain insight into the knowledge relation and that knowledge can be founded.

> [. . .] [A]t this point it may be more useful to say that epistemology still goes on, though in a new setting and a clarified status. Epistemology, or something like it, simply falls into place as a chapter of psychology and hence of natural science. It studies a natural phenomenon, viz., a physical human subject. This human subject is accorded a certain experimentally controlled input—certain patterns of irradiation in asserted frequencies, for instance—and in fullness of time the subject delivers as output a description of the three-dimensional external world or its history. (Quine, 1969: 273–274)

Naturalizing epistemology for Quine meant that somehow psychology would show us how our language which we use to gain scientific knowledge about the world, relates to our brain which receives sensory information from that world. Psychology would show us the relation between our neural input and observational sentences, sentences that are associated in a direct way with sensory stimuli. And the reason that we humans would all have the same sensory stimuli is that we all evolved by natural selection and all human beings share the same biological constitution. *"…[T]he observation sentences are the sentences on which all members of the community will agree under uniform stimulation."* (Quine, 1969: 276).

This, however, still implies that all languages are *commensurable* with regard to observational sentences, and that somehow the relation between sensory input and language is direct.[4] Neurology today, however, has already

[4] Indeed, there is a reason why linguists search for linguistic universals and that anthropologists search for cultural universals.

shown numerous times that our brains do not carry any language-like labels (Changeaux, 1985; Edelman, 1987; Gazzaniga, 1994, 1998, 2000; Damasio, 1996, 1999; Ledoux, 1998). Regarding theoretical sentences, sentences that are more complex and that cannot be reduced to observational sentences, Quine subscribed to a *relativistic* view: these sentences are *incommensurable* and hence a SoK or social constructivist position is taken by him. Any reference to the external world, however, is underdetermined according to Quine (Levinson, 1998), for knowledge is about the relation between neural input and observational sentences and the relation between observational sentences and theoretical sentences. Therefore, all our knowledge of the world is filtered by our sense organs that are the products of evolution (Gibson, 1998: 681).

3. EVOLUTIONARY EPISTEMOLOGY

"In short, evolutionary epistemology is an epistemological system which is based upon the conjecture that cognitive activities are a product of evolution and selection and that, vice versa, evolution itself is a cognition and knowledge process." (Wuketits, 1984: 2).

EE, a term first coined by Donald T. Campbell (1974), developed out of NE, but also goes further than NE. Whereas Quine still believed that the natural sciences would somehow show the exact relation between the world, humans and the language uttered by human beings, EE gave up on this idea. The anthropocentrism of Quine cleared room for the idea that all organisms *re-present* their environment, and that all organisms engage in a knowledge relation with the environment because of the workings of natural selection. EE not only examines the relation between human, language-like knowledge and the world: it regards every relation between an organism and an environment as a knowledge relation, irrespective of whether or not these organisms have language. EE understands the knowledge relation not as a relation between a knower and a knowable world, nor as a relation between different knowers, but rather as a relation between an organism and its environment (Munz, 2001: 9).

3.1. Traditional EE

EE is a branch within NE that examines evolutionary processes that form the basis of our knowledge-gaining-process. It searches for analogies between biological evolutionary processes and the evolutionary processes of science, culture and language. These evolutionary processes, however, are reduced to the mechanisms of natural selection, as the standard definition given by

Michael Bradie and William Harms in the *Stanford Encyclopaedia of Philosophy* shows:

> Evolutionary Epistemology is a naturalistic approach to epistemology, which emphasizes the importance of natural selection in two important roles. In the first role, selection is the generator and the maintainer of the reliability of our senses and cognitive mechanisms, as well as the 'fit' between those mechanisms and the world. In the second role, trial and error learning and the evolution of scientific theories are construed as selection processes. (Bradie and Harms, 2001:1)

This means, first of all, that because of the mechanisms of natural selection we can gain knowledge of the environment by studying the organisms that live in it, and secondly, that all organisms are instruments, systems of knowledge. Whether these organisms develop language or not, have a brain or not, have sense organs or not is not relevant: all organisms represent and contain knowledge about the world out there.

Since organisms evolved by natural selection and only those organisms that are adaptive to the environment live long enough to reproduce, organisms become representations of their environment. Organisms that fail to survive long enough to reproduce, and, hence, are maladaptive to the environment, are conceived of as hypotheses which got falsified in the Popperian sense of the word (Popper, 1974).

Every relation that an organism engages in with its environment is regarded as a cognitive relation, a knowledge relation, this knowledge itself being the result of the workings of natural selection.

So knowledge-gaining-processes are not only understood as the products of biological evolution or as a biological phenomenon, the knowledge-gaining-mechanisms themselves are regarded as knowledge.

And the theoretical models from evolutionary biology are also implemented to study the products of these knowledge-gaining-mechanisms.

3.1.1. The EEM- and EET-programme

EE is about developing a normative framework based upon evolutionary thinking. Natural selection *strictu sensu*, only focuses on the *external* relation between the phenotype and the environment: the *level* where natural selection selects the adaptive ones, in an indirect way, by weeding out maladaptive organisms.

However, because organisms, as a whole, are the product of evolution and some organisms develop language and culture or science, the *products* of these biological organisms are also proposed to be comprehensible and explainable from within evolutionary theory.

EE, therefore, no longer distinguishes between ontogeny and phylogeny, but tries to explain organisms and also the cognitive products of these organisms, from within evolutionary theory.

Michael Bradie and William Harms (2001), therefore, distinguish between the evolution of epistemological mechanisms (EEM) and the evolutionary epistemology of theories (EET) programme. The EEM programme on the one hand studies the development and evolution of knowledge-gaining-mechanisms (broadly conceived as including the central nervous system, the brain, the sensory-motor system . . .) of all living organisms. The EET programme studies the evolution of ideas, theories, cultures . . . the products of these knowledge-gaining-mechanisms, from within evolutionary models, by analogy.

Especially within the EEM-programme, there is a general consensus that the Modern Synthesis—Darwin's theory of natural selection combined with population genetics based on Mendel and mathematizised by Fischer, Wright and Haldane (Schwartz, 1999)—is sufficient to explain the evolution of knowledge-gaining-mechanisms. Within the EET-programme, there is more discussion going on about whether selectionist models alone can suffice in explaining the evolution of culture, language or science.

The Modern Synthesis (Ayala, 1978; Mayr, 1978, 1983; Maynard Smith, 1993) adheres to a strict distinction between ontogenesis (the development of an individual from conception until death) and phylogenesis (the origin and evolution of species). If this distinction is not made properly, one repeats Haeckel's biogenetic law which states that *ontogeny recapitulates phylogeny*: during development, an individual passes through the evolution of the species. Phylogeny is explained using natural selection, at the *micro-level* (the variation and evolution within species) and the *macro-level* (the evolution of new species by speciation). Ontogenesis is not explained by the Modern Synthesis: it only subscribes to the view that a genotype lies at the basis of a phenotype (Gontier, 2004).

Natural selection, according to this view, works at the level of the interaction between the phenotype and its environment, and here the environment selects the organism, while the organism is comprehended as a passive element of that evolution: either the organism is adapted to its environment, which means that given its phenotype, the organism can survive long enough to reproduce; or else it dies and does not get selected, because the genes of this organism are not passed on to the next generation (Gontier, 2004).

3.1.2. Internalizing evolutionary theory and the units and levels of selection debate

Deviations from this paradigm lead to a position in which the strict distinction between ontogenesis and phylogenesis is no longer made. A new trend in

biology states that selection does not only work at the *level* of interaction between the organism and the environment, but that it can also work at other levels, selecting *units* other than the phenotype as well.

Hence, with EE natural selection got *internalized*, thereby raising questions about the *units* and *levels* of selection (Brandon, 1982; Brandon and Burian, 1984).

Richard Dawkins (1983, 1984, 2000) for instance, was one of the first, together with George Williams (Schwartz, 1999), to state that the *unit* of selection is not the phenotype, but the individual gene, and that the level of selection can be the environment, but it can also be other genes within the genome.

The ideas of neural Darwinism, as defended by Changeaux (1985), Edelman (1987), Gazzaniga (1994; 1998; 2000) or Sperber (2001), are indeed the products of this kind of thinking: natural selection is internalized and is proposed to work at the level of brain development, the unit of selection being individual neurons or perhaps even modules.

This debate over the units and levels of selection, which more appropriately should be called the discussion over the units and levels of evolution, results in the search for a universal (selection) evolution mechanism, that can be understood as a theoretical framework from wherein we can explain all of evolution.

There are, however, numerous accounts already of what exactly this universal mechanism consists of. There is the *blind variation and selective retention-scheme* of Donald Campbell (1959, 1960, 1974, 1977, 1987, 1996; Heyes and Hull, 2001), *Universal Darwinism* put forward by Richard Dawkins (1983), *Universal Selectionism* introduced by Gary Cziko (1995), the *generate–test–regenerate-scheme* of Henry Plotkin (1995, 1996) and the *replication–variation–environmental interaction-scheme*, first introduced by David Hull (2001). All these theories focus on the theory of natural selection as it is applicable to genes. The evolution of genes by natural selection is of course the best reported kind of evolution and, therefore, extrapolations start from here, thereby reducing this theory further to adaptationist accounts.

3.1.3. Problems with universal selectionist accounts

"*In all versions of EE, Panglossian adaptationism must be avoided. […] Selection Theory emphasizes the role of 'retention' (and hence tradition) fully as much as variation and selection.*" (Campbell, 1987: 140).

Evolution is the phenomenon we want to explain, natural selection is only a theory that tries to explain the phenomenon of evolution.

The late Stephen J. Gould (1980, 1982, 1984, 1991) and Richard Lewontin are amongst the most well known biologists who criticize these ideas: the former, together with Niles Eldredge, developed the theory of *punctuated*

equilibrium which states that natural selection does not work gradually, that small random mutations do not slowly result in the evolution of new species, but that we encounter long periods of stasis within evolution, and that these periods get punctuated by short periods of rapid changes.

Lewontin (1978, 2000) is known for his ideas about *niche construction*: organisms are not passive objects who are selected or do not get selected by the environment. Organisms are actively engaged in their own development and perhaps even their evolution, because they systematically form and reform their environments in an active way.

The problem with universal Darwinism and universal selection accounts is that it reduces evolutionary thinking to Neo-Darwinian thinking. For it states that theories which mainly got developed by zoologists—people who study animals, not bacteria, nor plants, fungi or protists—can get universalized to explain all of evolution (Margulis and Sagan, 2002). The blind variation and selective retention scheme, the generate–test–regenerate-scheme, all the proposed schemes, try to develop a normative scheme of evolution which, in turn, is analogical to the evolution of genes by means of natural selection.

And they want this scheme to work, not only in this world at all levels of life ranging from unicellular organisms to the evolution of humans, but in all possible worlds as well. They also want to explain the evolution of language and culture using these schemes. They attempt to do this by implying that there are elements such as genes which vary and mutate, are selected and evolve within the evolution of language and culture. Hence, the success of *modularity theory* (Sperber, 1996; Whitehouse, 2001) and *memetics* (Blackmore, 1999).

These theorists oversimplify. They forget that there are two kinds of genes, structural and regulatory (Gehring, 1998; Davidson, 2001), and that only structural genes behave in a Mendelian fashion, while *regulatory genes* can influence ontogeny and phylogeny, by switching structural genes on or off, through the proteins they encode for, in a non-Mendelian fashion (Gontier, this volume).

These zoologists forget that two-thirds of the evolution of life took place within unicellular organisms, organisms that do not behave in manners explicable by natural selection alone. The development of multicellular organisms was the result of symbiotic mergers, as Lynn Margulis's theory (Margulis, 1999; Margulis and Sagan, 2000, 2002) shows: bacteria merged, whole bodies fused together and then developed into eukaryotic, multicellular organisms. Species do not only develop as a result of speciation, they also can develop as a result of horizontal mergers (Gontier, this volume).

And zoologists forget how physics can help the study of evolutionary processes. As the mathematician Ian Stewart (1999: 88) has said: *"Nobody is silly enough to think that an elephant will only fall under gravity if its genes tell*

it to do so, but the same underlying error can easily be made in less obvious circumstances."

The time that physics was about studying timeless universes, where unchangeable laws determine everything that has happened, is, and ever shall happen, is long gone. New physics, systems theory, chaos theory, complexity theory, as developed by the late Ilya Prigogine (1995, 1996), René Thom, Stuart Kauffman (1996) and Freeman Dyson (1990), are about trying to develop a framework that can be put to use to study evolution, by the introduction of terms like self-organization, bifurcations, phase transitions, irreversible processes and so on. Olaf Diettrich (this volume) and Diederik Aerts, Marek Czachor and Bart D'Hooghe (this volume) will explain how physics and quantum theory can help the study of cognition and language, while Bart de Boer (this volume) will explain how we can also formalize these theories using artificial intelligence in order to study language.

3.2. New EE

All ideas defended by what I call traditional EE's still adhere to the view that we can develop a correspondence theory: that there is a one-to-one correspondence between the environment and the organisms who live in it. As Konrad Lorenz pointed out (Riegler, this volume; Wuketits, this volume), this does not mean that the hooves of a horse have to be like the steppe land on which they walk, but that the way the hoof of a horse is shaped gives us a correct and true theory about how the steppe land is. This idea, however, implies that natural selection is reduced to the mechanisms of adaptation, for it is only the idea of adaptation that can lie at the basis of such a correspondence theory.

A whole different story develops when we look at *developmental systems theory (DST)* (Maturana and Varela, 1980; Oyama 2000a, 2000b; Dupré, 2001), which perceives organisms as autocatalytic systems: systems which are able to self-organize and self-maintain, not so much because they are adapted to the environment they live in, but because they are able to self-maintain due to the inner mechanisms they develop in order to survive (Gontier, 2004). These inner mechanisms of self-organization and self-regulation can contradict the world out there: instead of being adapted to the environment, organisms maintain themselves, sometimes even despite the environment they live in (Gontier, 2004). Because of the rise of biological systems theory, the idea that organisms are passively selected by an active environment is put to rest. Organisms are understood as beings that largely construct their own environment in an active way, for example, by habitat or niche construction (Lewontin, 2000). Therefore, these inner mechanisms of self-organization and self-regulation are comprehended as *causal* factors that need to be part of the *explanation* of *why*

organisms behave in a certain manner, rather than focussing exclusively on the external relation between an organism and its environment. In contrast to the perspective of sociological systems theory, organisms are comprehended as partly open, partly closed systems (Kauffman, 1996; Prigogine, 1996). They are *closed* because they distinguish themselves from the environment through the formation of a membrane, or skin, whereas they are *open* because they constantly interact with the environment they live in, thereby influencing and (re)constructing that environment as well. Therefore, the relation between an organism and its environment is comprehended as being *dialectical*, instead of *dualistic*. As Richard Levins puts it:

> Organisms (a) select their environment, (b) actively modify their environment by their own activity, (c) define their environment in terms of relevant variables, (d) create new environments for other organisms, (e) transform the physical nature of an environment input as their effects percolate through the developmental network, (f) determine by their movements and physiological activity the effective statistical pattern of environment, and (g) adapt to the environmental pattern that is partly of their own creation. Further, each part of the organism is 'environment' to the other parts. The conclusion of (d), (f) and (g) that organisms adapt to and create statistical patterns of environment finally suggests that the utilization of resources by populations not only uses up ecological opportunities but also create new ones: The variability in resource level may itself behave as a resource. . . . The traditional separation of the world into organisms and environment as mutually exclusive classes . . . leaves us with the task of then connecting them. A more dialectical approach emphasizes the mutual interpenetration of organism and environment. (In Hahlweg, 1989: 61)

In this case, adaptation does not mean that an organism is adapted to an external world, but that an organism is able to change its environment to enhance its *survival*. And adaptation does not mean that an organism is able to reproduce at maximal rate (as implied by the term fitness), but it means that an organism can *survive* and *self-maintain*. *"Organisms do not simply correspond to their surroundings and do not get everything that is 'out there' but rather form their own 'picture' of what is around and react adequately, according to the specific requirement of their lives, i.e. for the sake of survival."* (Wuketits, 2001: 178). Non-adaptationist views, therefore, cannot adhere to a correspondence theory; instead they make use of a *coherence theory* (Wuketits, this volume).

Those theories that I characterize as new EE are especially part of a German tradition: Wuketits (1984, 1990, 1992, 1995, 2001, this volume), Riedl (1984), Kasper (1984) do not adhere to a universal selectionist account but state that EE

has to be based upon biological systems theory, where the notion of adaptation, with its connotations of progress or increase in correspondence needs to be replaced by the concept of self-regulation, which implies a coherence theory (Diettrich, this volume; Riegler, this volume; Wuketits, this volume).

Cybernetics models do not fit into to the EEM (form)—EET (function) dichotomy either. This is because there is a strong analogy between the products of the knowledge-mechanisms and the knowledge-mechanisms themselves (Hahlweg and Hooker, 1989a, 1989b; Hooker, 1989).

Cognition and the cognitive capacities themselves (the form and the function) are comprehended as a function of active systems which actively interact with their environment. *"Hence, the crucial question is not how animals and humans have evolved through adaptation to a given environment, but rather the interactions between organisms and their environment(s)."* (Wuketits, 1995: 359).

An EE based upon systems theoretical evolutionary theory, therefore, is not *anti*-adaptationist; it is *non*-adaptationist (Wuketitis 1995: 359–360), because there is no constant unchanging world out there that an organism is passively adapted to. The world out there changes constantly by actively engaged organisms that are busy enhancing their survival.

4. EE AND CULTURE

4.1. Mathematizing Culture?

EE first started the study of culture almost 25 years ago, beginning with the work of Luca Cavalli-Sforza and Marcus Feldman (1981). Based on mathematical population genetics, they developed a *theory of cultural transmission*, the unit of evolution being cultural traits. These cultural traits, they said, could evolve and often did evolve more in accordance with neutral evolutionary theory (Kimura, 1976). As a result, these investigators used concepts such as genetic drift, because most cultural traits neither harm nor enhance the reproductive success of its carriers, rather, they are neutral.

At the same time Charles Lumsden and Edward Wilson (1981) were developing their theory of *gene–culture co-evolution*. Again using mathematics to formalize culture, they stated that human cultural transmission is ultimately gene–culture transmission (Allot, 1999: 68). They developed the ambitious idea of tracing development all the way from genes through the mind to culture, thereby paving the way for epigenetics, sociobiology (Laland et al., 1995; Day et al., 2003; Ehrlich and Feldman, 2003), and evolutionary psychology (Cosmides and Tooby, 1994; Barrett et al., 2002). They stated that the unit of selection and hence the unit of inheritance, was the '*culturgen*', which included

artefacts (material remnants, the topic of research of archaeology) and *mentifacts* as they called them, that is, mental ideas or behaviours.

Robert Boyd and Peter Richerson (1985) soon followed their lead, presenting a *Darwinian theory of the evolution of cultural organisms*. Culture, in their view is described as the transmission from one generation to the next—through teaching and imitation—of knowledge, values and other factors that influence behaviour (Allot, 1999: 68). Their dual inheritance theory was based on the idea that genes and cultures are analogous: both genes and culture are the sole determinants of behaviour.

Later on *memetics* was born (Blackmore, 1999), that is, after Richard Dawkins proposed that as genes are the sole determinants of biological behaviour, so *memes* act as infectious ideas. Ideas, that just like viruses, work in an epidemiological fashion.

Tim Ingold's reaction to these theories does not leave much to the imagination:

> Not so much can be said for these models in their present state of development, the assumptions on which they rest are either so remote from reality or so ultimately trivial that they do not so much advance our understanding of evolutionary processes as provide an excuse for the exercise of mathematical ingenuity. (Ingold, 1986: 364)

In other words, these theories mainly got developed by biologists and mathematicians who were not schooled in culture, and hence were not sufficiently acquainted with this subject matter in order to develop adequate models, although their intentions were of course good.

4.2. Post-Modernism?

Anthropology is the discipline that suffers most from post-modern thinking, and which finds itself most in crisis (Harris, 1995). There is a reason for this: the subject matter that anthropologists set forth for itself represents the most complex phenomenon ever encountered throughout history, that is, human cultures.

The empiricist tradition, described above (2.1.), has its anthropological counterpart within *cultural anthropology*, especially within the Boasian school (Pinxten, 1999: 5). These anthropologists defended the following position: given enough observation, a detailed description of the *other* could be given, from wherein we could deduce recurrent patterns that, in turn, would lead to objective knowledge.

The rationalistic tradition has its counterpart in *social anthropology*, with the structuralists, the most well-known being Claude-Lévi Strauss, who wanted to overcome mere observations in order to develop adequate

theories (Pinxten, 1999: 50–53). These scholars ended up explaining culture as part of a superorganic structure, again denying the autonomy and, therefore, agency of the individual and the group.

Both schools regard the researchers as *interchangeable*. Empiricists regard researchers as neutral *recording devices* (Pinxten, 1997: 35), while structuralists are privileged because they have a priori knowledge about the world: they know that it is structured and layered into superorganic, organic and anorganic structural levels. The *other* is regarded as an object that needs to be examined.

This *objectivistic*, *naturalistic* tendency is rejected by members of the *phenomenological*, *subjectivist* school (Pinxten, 1997: 5) who regard their research themes as subjects. These subjects cannot be explained from outside the cultural system. Rather they need to be explained from within this closed, self-encapsulating system, using the folk categories of these subjects to explain how these people *intuitively feel* their culture (in a hermeneutic *einfühlende* tradition). Hence, the success of *participant observation* (we learn from them by becoming one of them), a fieldwork approach first introduced by Malinowski. Hermeneutics also defend the post-modern idea that cultures are incommensurable, a position that thereby rejects any scientific theory that is able to compare different cultures, in order to develop a generalized model of culture (evolutionary or otherwise).

So, basically, until recently only two positions could be taken up by an anthropologist, interested in culture: an *emic* position or an *etic* position (Lett, 1990: 130–131) which correlate, respectively, with an insider and outsider position (a conceptual opposition borrowed from the contrast between *phomemics* and *phonetics* in linguistics). *Emic* constructs make use of the terminology and perspective of the (native) informants to explain their culture while *etic* constructs use the (universalist) terminology and perspective of the scientific community.

The whole point, however, is that, within both positions only the scientist decides what (s)he encompasses in his/her theory because only (s)he can obtain *objective* knowledge of the other (Pinxten, 1997: 36).

Hermeneutic traditions differ from naturalistic traditions within anthropology (Bloch, 1998a: 40–41) because they call into question the possibility of an anthropology as science altogether. In contrast, *naturalists* emphasize that anthropology needs to be reconciled with other scientific endeavours, by the use of objective, measurable and quantitative fields. In this latter tradition, Sperber (1998: 16) goes so far as to state that anthropology is not a science: it does not study something material, it studies meanings and interpretations of different groups. Rather he views anthropology as an objective, scientific tool that gives objective concepts from wherein we can explain all of culture while

these concepts themselves share a form of family resemblance. An example that he gives is the concept *marriage*: thereby implying that some relations between individuals, within all cultures, can be explained as marriage (Sperber, 1998: 21).

Hermeneutics even goes so far as to regard anthropology as a form of literature: according to Clifford Geertz (1973), for instance, each description is an interpretation and cultures are just texts that need to be read, thereby doing what this discipline never intended to do: materializing their subject matters.

> Anthropology has always posed this problem for science: by showing us that everyone is embedded in a cultural matrix of meanings, it makes clear that all truth, reality, and certainty are local orthodoxies [. . .]. This postmodernist movement has embraced this finding and forged it into a devastating weapon against all efforts to ground theory in empirical data. (Johnson, 1995: 13)

A third position to take has been developed recently, by Bourdieu (1979) and Pinxten (1997), called the *praxiological* position.

> It aims at combining the objectivist and the subjectivist approach: the external knowledge of 'the other' is internalized by the researcher and the introspective knowledge of the researcher is externalized into the subject of research at the same time. The dialectic between both movements allows for a full understanding of cultural phenomena. (Pinxten, 1997: 68)

Now here is where EE fits in. This is because of the fact that we need to look at biological, neurological and cognitive learning theories in order to understand how external knowledge is internalized and how introspective knowledge is externalized. Moreover, we need to know how we obtain this introspective knowledge in the first place, how we are able to explain this in a meaningful way to others, and how others can understand this knowledge, ending with general agreed upon knowledge shared by different members of the same or diverse communities. And here is where embodied, ethnographical and cognitive sciences fit in (see for instance Ingold, 1986; 2000; 2001; Strauss and Quinn, 1993; Shore, 1996; Dupré, 2001; Whitehouse, 2001).

4.3. What is Culture About?

Most people not schooled in anthropology still define culture as the higher arts, or as literature or going to the theatre. Some think of those exotic Pygmies in Africa or the Maori from New Zealand. But almost nobody thinks of culture as going out and having a drink with his/her friends, or nipping from a glass

in a certain way, or looking somebody straight in the eyes or avoiding eye contact at all times.

Some logicians still find it amazing to hear that people think in contradictory ways, that, for instance, a child knows that people die, but believes that Santa Claus lives forever. Yet that is what culture is about. Anthropology is not about distinguishing true from untrue; it is not about finding contradictions or paradoxes that need to be solved. Rather it is about coming to understand *how* and *why* these people have contradictory ideas. And indeed, these contradictory ideas are starting to get formalized as well: the development of default logics within artificial intelligence and paraconsistent, inconsistent and adaptive logics within philosophy, are disciplines that look very promising.

Biologists interested in formalizing culture, analogous to the evolution of genes, search for the unit(s) of cultural evolution that is (are) passed on from one generation to the next, and this in a most faithful way. Hence, we encounter concepts like culturgenes that include artefacts and mentifacts.

Anthropologists have been studying these phenomena for a long time. *Cultural materialism* (Harris, 1995), a subdiscipline within anthropology, years ago tried to study culture through the examination of artefacts, and artefacts here included ideas, that, in good sociological tradition, were 'materialized' as part of the superorganic. They developed diffusionistic models in order to determine how ideas or artefacts came into existence and hence spread throughout the world. All they discovered was that their models did not work, because when studying complex phenomena like, for example, *cargo cults* (Englund and Leach, 2000; Douglas, 2001), they saw that the Christianity preached by the missionaries was not learned nor transmitted without being changed. All they heard was that Jesus was a black man and church rituals got mixed with voodoo or other local customs. It is difficult to find units of culture that are transmitted faithfully as genes are passed on faithfully from one generation to the next.

The same idea, adhered to by a different individual, living in a different context, a different culture, can get interpreted in a wholly different way (see, for instance, Dupré, 2001). And again, it is not about right or wrong; it is about formalizing these kinds of evolution because this is what culture is about.

Anthropology is about the 'Benz mammas' in Africa (Fox and Sannwald, 2003), women referred to in that way because they all drive a Mercedes-Benz, because they got rich working the land, during and especially after colonization. In some African cultures, men did not work the land and hence stayed poor. The implementation of one element, Western capitalism, thereby changed the social structure from a patriarchy to a matriarchy.

These are the processes that need to be formalized and beg for a normative framework, for it is only when we gain more insight into present conditions that we can know what to look for in the past.

5. EE AND LANGUAGE

It is only recently that EE also began to express an interest in language. In 1866, the *Société de linguistique de Paris* banned all studies concerning the origin of language and/or the development of universal languages[5] (Lock and Peters, 1999: vii).

Afterwards, Chomsky (1967) came along, saying that language was innate and uniquely human. Chomsky never denied that language needs to be studied from within biology, but because of the uniquely human part, it was not useful, according to him, to study language from within evolutionary biology. As most philosophers, he defends the idea that humans are qualitatively different from all other animals, because they have language. Within Western philosophy, as said, there has always been a group that defended the idea that with language, humans can come to everlasting truths; it is just a matter of finding the right structure.

Steven Pinker and Paul Bloom (1990), in their by now famous article in *Behavioural and Brain Sciences*, written almost 15 years ago, have as their main aim synthesizing Chomsky's ideas with Neo-Darwinian thinking and modularity theory: natural selection should have evolved a grammar module or different modules that resulted in language. Natural selection, they say, designed a human language faculty, a language acquisition device (LAD) that takes on the form of a grammar module, the latter being the unit of selection. To be more precise, according to this view, the language module is the result of different modules and pre-adaptations that did not evolve to form language, but somehow they did, as the spandrels of San Marco are the most beautiful attractions, while they were made to support the cathedral's walls. But *how* can language be coded for in our genes? Pinker and Bloom (1990) are not quite clear on this matter. All they say is that language shows design, and, therefore, it *should* have and *must* have evolved by natural selection.

[5] The fact that the society also banned any investigations concerning universal languages is often ignored in the literature, although it is a rather important piece of information. EE after all, is the endeavour to extract a formal scientific framework from evolutionary thinking that can function as a universal (evolutionary) language to explain all phenomena that show signs of evolution.

Two years ago, Hauser et al. (2002) distinguished between the faculty of language in the broad sense (FLB), and the faculty of language in the narrow sense (FLN). They stated that only the FLN is uniquely human, whereas the mechanisms that underlie the FLB are probably shared with most higher animals. In their article, they also adhere to a modular view of cognitive evolution, stating that most aspects of the FLB probably developed in a modular and highly domain specific fashion, and that humans have the unique capacity to transcend these modules, because they developed a domain-general system.

And of course there are the works of James Hurford, Michael Studdert-Kennedy and Chris Knight (Hurford et al., 1998; Knight et al., 2000). The merit of these people is that they bring together different authors from within different disciplines that study language, thereby showing how interdisciplinary the field of language research is.

The field of language research can, however, still grow bigger, and must be conceived of not only as an interdisciplinary endeavour but also as a transdisciplinary one, an endeavour that includes physics, for example, and acknowledges the important role philosophy of science in general and specifically EE can play. For what is the *unit* and the *level* of language or cultural (or social) evolution? Answering this question means bringing EE to bear on these fields.

William Croft (2000) is the first one to actually use one of the proposed universal schemes put forward by evolutionary epistemologists: he tries to develop a theory of language evolution and variation, using Hull's *replication–variation–environmental interaction-scheme*. However, he immediately states that because languages, just as cultures, mingle all the time, e.g., because of warfare, trade, or culture contact, a *plantish* approach might better suite the purpose. Here he is referring to the fact that the evolution of language takes on a form that is more analogous to plant hybridization, rather than the mere vertical evolution that is more characteristic of animal (Neo-Darwinian) evolution.

And, indeed, that is what studying language is all about: it is not about finding an entity that is passed on faithfully from one generation to the next. Languages are not static entities but change constantly, by the introduction of new words, through the blending of grammatical structures as a result of culture and language contact, aspects of language change that have been described already by sociolinguists. These are the mechanisms that beg for a normative framework so we can go beyond mere descriptions to find scientific explanations (Gontier, this volume). Again, if only to know what to look for in the past.

6. CONCLUSION

By now, it should be obvious that EE is very important for the study of language and culture and I would like to end this introduction with a more

personal note, on how I perceive EE. I regard EE as a positivistic discipline and as the only possible response to post-modern thinking, for it still adheres to the idea that science, broadly conceived, ranging from physics, through biology to the life sciences, can explain, in the long run, complex phenomena such as life, language and culture. Of course, this endeavour cannot be a one-man job, inter- and transdisciplinary scholarship has become an absolute necessity.

Up until today, the only theories that are not rejected by the scientific community are evolutionary theories (which does not mean that they cannot be subject to revision). That is because evolution is a phenomenon. This is a fact that shows itself and that allows itself to be proven in so many different ways.

Adherents of EE are, therefore, so bold as to make the ambitious claim that there is only one phenomenon of which we are certain, evolution, and that it is only through the study of this phenomenon that we can gain knowledge of the products of evolution.

This, also, and most importantly, means that it is simply *not* enough to study language, culture, the social, knowledge . . . by using or implementing evolutionary thinking. It, first and foremost, means that the study in itself, of language and culture, and the methods used for this study, should also be *evolutionized*. And, therefore, we need EE desperately: a general framework based upon evolutionary thinking that is applicable to all domains and products of this evolution, for this and *only* this will mark the *beginning* of a *scientific* study of language and culture.

Although the criticisms given here with respect to the fields of philosophy, physics, biology, anthropology and linguistics might sound harsh, they are not intended to be fundamentally or merely negative. On the contrary, these criticisms should be interpreted in the most positive light, because we know what needs our attention and we know what is going wrong, and, therefore, we also know how to improve upon the current theories. And, of course, it will not be easy; we will not be able to formalize complex phenomena such as culture or language overnight, but let us keep Otto Neurath's words clearly in mind, a quote that I would like to introduce as the motto of this book: *"[. . .] to he who has arrived, no satisfaction can be given, whereas he who is 'in progress' will always be grateful."* (Neurath, 1936: 6).

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