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Darwinian Ethology and Naess' Principles of Deep Ecology

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INTRODUCTION

Charles Darwin's theory is often reduced to a single book, *On the Origin of Species* (1859), and its slogan: descent with modification by means of natural selection. Although the range of topics treated by Darwinian studies is ever expanding, most of the works written about Darwin's thought take natural selection as its central principle. The figure of Darwin as a champion of the hypothetico-deductive method (Ghiselin 1969) leads one to consider him as a chamber naturalist. Sheltered from the external world, Darwin elaborates, in *The Origin of Species*, a logical theory of evolution articulated around natural selection. However, another aspect of Darwin's character and thought must be underlined. Indeed, Darwin's career as a naturalist is intrinsically linked and indebted to experiences in the field. From the circumnavigation aboard *H.M.S. Beagle* to his last work on *The Formation of Vegetable Mould through the Action of Worms* (1881), Darwin's thought remains grounded on his personal relationship to nature in general. More precisely, Darwin's still underestimated considerations of the behaviour of non-human animals and human beings are particularly rich, opening an all-new range of possible receptions of Darwinian theory (Burkhardt Jr. 1985; Durant 1985; Richards 1987; Townshend 2009). In this article, I underline one of these possible readings of Darwin, matching the naturalist's thought with deep ecology as defined by Arne Naess in his 1973 article "The Shallow and the Deep, Long-Range Ecology Movement: A Summary."

Although worries about the destruction of ecological systems are absent from Darwin's works, the methodology behind the naturalist's considerations on animal behaviour is compatible with Naess' deep ecology. Indeed, most of the seven principles developed by Naess in his 1973 article agree with Darwinian ethology. In order to make these relations evident, a brief introduction to Darwin's theory of animal behaviour must firstly be given before concentrating on the compatibility between Darwinian ethology and Naess' principles of deep ecology. More than a mere historical interest will result from the identification of these links between Darwin and Naess. In fact, focusing on the links between Darwinian ethology and Naess' deep ecology contributes to the effort of a larger philosophical foundation of ecosophy.

1. DARWIN'S OVERLOOKED ETHOLOGY

In his 1985 article on "Darwin on Animal Behaviour and Evolution," Richard Burkhardt Jr. noted that Darwin's thought on behaviour was largely overlooked. Almost 30 years later, the situation has not completely changed. Three main reasons explain the fact that Darwin's thought on behaviour is not explored in its full range. First of all, except for the chapter on

instinct, *The Origin of Species* (1859) does not really address behaviour. Secondly, Darwin's methodology with respect to the study of behaviour seems outdated. Indeed, in the works dedicated to behaviour, such as *The Descent of Man and Selection in Relation to Sex* (1871) and *The Expression of the Emotions in Man and Animals* (1872), Darwin intentionally uses both anthropomorphism and anecdotes in order to describe animal behaviour. In short, Darwin contradicts Morgan's canon (Durant 1985, 291-292, 302-303; Burkhardt Jr. 1985, 328, 348-349, 351; Townshend 2009, 26-27, 102-103, 108, 132-138), developed in 1894 against George John Romanes (the most fervent defender of Darwinian ethology),[1] which stipulates that "[i]n no case is an animal activity to be interpreted in terms of higher psychological processes if it can be fairly interpreted in terms of processes which stand lower in the scale of psychological evolution and development" (Morgan 1895, 53). As noted by Dominique Lestel (2001, 19-58; 2011), ethology has been historically founded on a realistic-Cartesian paradigm,[2] which respects Morgan's canon, and continues to be developed within this framework. Finally, when he addresses issues regarding animal behaviour, Darwin extensively uses what has become a dubious principle since Weismann's distinction between *soma* and *germen*, i.e. the heredity of habits. In short, the statement that Darwin was not at his best in his theory of behaviour seems to be justified with respect to modern science (Ghiselin 2003 [1969], 187-213), which explains a certain lack of interest from Darwinian scholars concerning this aspect of Darwin's theory.

1.1. Habits vs. Instinct

Corresponding with the double image of Darwin as a chamber naturalist or as a field naturalist, two Darwinian approaches of animal behaviour can be identified.[3] Indeed, Darwin either considers behaviour as mostly instinctive or as mostly habitual.[4] Although instinctive and habitual behaviour can be phenomenally similar,[5] they drastically differ with

[1] A selection of Darwin's notes on animal behaviour, more particularly on his complex theory of instinct, were for the first time published by Romanes as an appendix to his volume on *Mental Evolution in Animals* (1884).

[2] "Contemporary ethology emphasises an approach to the animal which could be characterized as realistic and Cartesian. It combines fundamental description of the world with stipulation of the legitimate ways of studying it. It supposes that there is a world which is separated from the subject, and that we can provide a genuine description of the animal by investigating the causal and mechanical procedures determining animal behaviour. The possibility of observation without observers, and the description of an animal as a machine, therefore fundamentally define this approach" (Lestel 2011, 83-84)

[3] Although Darwin as a chamber naturalist bases his approach of the animals on material acquired from the field, such a distinction is important since it corresponds to two distinct theories: one in line with Morgan's canon, the other contradicting it.

[4] Darwin never clearly defines the concepts 'instinct' and 'habits'. However, habits have a strong Lamarckian flavour in Darwin's works, while instinct has four main characteristics: innateness, fixity, collectivity, ignorance of the end (Richards 1987, 83-105).

[5] Darwin's reflections on animal behaviour in his manuscripts (especially his *Sketch* [1842], *Essay* [1844] and *Natural Selection* [1856-1858]), in *The Origin of Species* and, though less prominently, in *The Descent of Man* and *The Expression of the Emotions*, always underline the similarities between instinctive and habitual

respect to their origin. Instinctive behaviour is the result of selected accidental variations, whereas habitual behaviour is based on vegetative or intellectual actions.

As a chamber naturalist trying to systematise the development of species by means of a hypothetico-deductive method,[6] Darwin, in *The Origin of Species*, favours an approach of animal behaviour as based on instinct:

> It will be universally admitted that instincts are as important as corporeal structure for the welfare of each species, under its present conditions of life. Under changed conditions of life, it is at least possible that slight modifications of instinct might be profitable to a species; and if it can be shown that instincts do vary ever so little, then I can see no difficulty in natural selection preserving and continually accumulating variations of instinct to any extent that may be profitable. It is thus, as I believe, that all the most complex and wonderful instincts have originated. As modifications of corporeal structure arise from, and are increased by, use or habit, and are diminished or lost by disuse, so I do not doubt it has been with instincts. But I believe that the effects of habit are of quite subordinate importance to the effects of the natural selection of what may be called accidental variations of instincts; that is of variations produced by the same unknown causes which produce slight deviations of bodily structure. (Darwin 1859, 209)

Animal behaviour can be explained with the same mechanisms as the ones accounting for physical structures. Advantageous accidental variations are retained by natural selection. Such an approach implies a mechanistic account of animal psychology. Indeed, any appeal to the will of animals is superfluous.[7] The "subordinate importance" of habits with respect to animal behaviour is the premise of a much more radical aspect of Darwin's approach in *The Origin of Species*: reducing the origin of animal behaviour to instincts due to selected accidental variations. Indeed, by considering the case of neuter insects, that, by definition, cannot transmit their peculiar structures and instincts, Darwin uses community selection for the first time and concludes:

> no amount of exercise, or habit, or volition, in the utterly sterile members of a community could possibly have affected the structure or instincts of the fertile members, which alone leave descendants. I am surprised that no one has advanced this demonstrative case of neuter insects, against the well-known doctrine of Lamarck. (Darwin 1859, 242)

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behaviour. Indeed, habits can lead to instinct-like behaviour through inheritance, which constitutes Darwin's Lamarckism. However, *true* instincts are issued from the selection of accidental variations.

[6] The debate that tries to determine whether Darwin uses Hershel's *vera causa* or Whewell's consilience of induction must be mentioned here. In order to have an idea on these two rival interpretations, see Hodge (1977 & 1992) and Ruse (1999, 176-180, 197-198, 235-236).

[7] Such an approach confirms Darwin's doubt, though somewhat ambivalent, concerning the transforming effect of the will in Lamarck's theory (Richards 1987, 92-95).

With the model of the neuter insects, animal behaviour becomes globally determined by the biology of each species, ultimately reducible to the action of natural selection. In other words, the chapter on instinct of *The Origin of Species* confirms the interpretation of Darwin's works as compatible with extreme materialism and his image as a champion of the hypothetico-deductive method, an image that is challenged by Darwinian ethology, which will be defined in the rest of this section.

The motives behind the strategy adopted in *The Origin of Species* must be considered. In a crucial passage of *The Descent of Man*, Darwin states that, while writing *The Origin of Species*, he "had two distinct objects in view; firstly, to show that species had not been separately created, and secondly, that natural selection had been the chief agent of change" (Darwin 1874, 62). The true status of *The Origin of Species* is clearly revealed: by defending transmutationism, Darwin writes a manifesto, prone to exaggerations. However, Darwin immediately adds that natural selection is "largely aided by the inherited effects of habit, and slightly by the direct action of the surrounding conditions" (Darwin 1874, 62), a concession announcing a switch inherent to his ethology. Indeed, a closer look at the vegetal and animal realms, which can only be operated on the field through a direct experience with the environment,[8] requires a somewhat less systematic account than the one strategically preferred in *The Origin of Species*. Therefore, the reintroduction of vegetative and intellectual habits becomes necessary in order to explain complex features in plants and peculiar animal actions. Most of Darwin's works post-*Origin* thus show a radically different argumentative style, incompatible with the interpretation of Darwin as an extreme materialist and champion of hypothetico-deductive method, especially when it comes to the description of animal behaviour. In conformity with his manuscripts, Darwin uses numerous examples and anecdotes, describing animal behaviour in anthropomorphic terms.[9] It is precisely because of its anthropomorphic approach (Burkhardt Jr. 1985; Durant 1985; Townshend 2009) and because of its rejection of the Realist-Cartesian model praised by the philosophy of biology (Ghiselin 1969) and mainstream ethology (Lestel 2011) that Darwinian field ethology is generally overlooked.

1.2. The Domain of the Useless

As Durant notes, Darwin's theory (of behaviour) has two complementary sides, i.e. "zoomorphic anthropology and anthropomorphic zoology" (Durant 1985, 302). It is by

[8] Darwin's sources are both direct and indirect. Five years of circumnavigation have provided him enough data for a lifelong research, completed by years of observations of domestic animals (Townshend 2009) and testimonies from diverse scientific and unscientific figures, such as zookeepers, hunters or breeders (Secord 1985).

[9] The second part of *The Descent of Man* dedicated to sexual selection illustrates the anthropomorphism inherent to Darwinian ethology. For instance, Darwin draws parallels between birds courtship and "young rustics at a fair courting a pretty girl" (Darwin 1874, 421).

analysing some peculiar animal actions through anthropomorphic analogy that Darwin identifies what can be called the domain of the useless:

> It is, as I can now see, probable that all organic beings, including man, possess peculiarities of structure, which neither are now, nor were formerly of any service to them, and which, therefore, are of no physiological importance. We know not what produces the numberless slight differences between the individuals of each species, for reversion only carries the problem a few steps backwards; but each peculiarity must have had its efficient cause. If these causes, whatever they may be, were to act more uniformly and energetically during a lengthened period (and against this no reason can be assigned), the result would probably be not a mere slight individual difference, but a well-marked and constant modification, though one of no physiological importance. Changed structures, which are in no way beneficial, cannot be kept uniform through natural selection, though the injurious will be thus eliminated. Uniformity of character would, however, naturally follow from the assumed uniformity of the exciting causes, and likewise from the free intercrossing of many individuals. During successive periods, the same organism might in this manner acquire successive modifications, which would be transmitted in a nearly uniform state as long as the exciting causes remained the same and there was free intercrossing. With respect to the exciting causes we can only say, as when speaking of so-called spontaneous variations, that they relate much more closely to the constitution of the varying organism, than to the nature of the conditions to which it has been subjected. (Darwin 1874, 62)

The observation of animals leads the field naturalist to recognise some structures and behaviour that present no advantage with respect to immediate individual survival. Since Darwin is not a precursor of sociobiology,[10] he concludes that such peculiarities are inaccessible to natural selection. Although the two-step model (spontaneous variations and selection) (Hoquet 2009) on which the theory of natural selection is based seems to be retained in the previous extract, a much more radical and Lamarckian or pre-Baldwinian[11]

[10] Many of the structures and behaviour presenting no advantage with respect to (individual) survival are useful when reproduction or social cohesion (and survival) is taken into account. Therefore, some (Cronin 1991) have interpreted Darwin's theory of sexual selection, which I consider as a paradigmatic example of the domain of the useless, as a premise of a Fisherian account of sexual behaviour. However, as noted by Mayr (1972), Darwin strictly differentiates natural selection and sexual selection. In short, sexual selection is not a particular case of natural selection for Darwin. With respect to social behaviour, and more particularly altruistic actions, I propose a radicalisation of Tort's theory. Indeed, Tort (2008) argues for a transformation of the model of natural selection from the survival of the fittest to the survival of the weakest. I argue for what could be called a deselection of natural selection, the selective power having been transferred to the animal itself. Note that any genetic interpretation of Darwin, even insisting on altruism (for example Judson 2007) is not applicable to Darwinian ethology.

[11] By introducing "A New Factor in Evolution", Baldwin (1896) develops an alternative to both a Lamarckian and a radically Darwinian (or should we rather say Wallacian) account of animal behaviour. Indeed, his theory of organic selection aims to explain facts that cannot be the result of natural selection and traditionally require the use of the heredity of habits. Organic selection (or 'Baldwin effect') confirms the transfer of the selective

model is favoured in the examples selected in the second part of *The Descent of Man* and in *The Expression of the Emotions*. As a consequence, the role of natural selection is drastically modified. From a positive and creative principle, natural selection becomes a negative and eliminative principle,[12] the positive and creative selective power having been transferred to the animal itself, as in Baldwin's organic selection.[13]

1.3. A limitation of Natural Selection

Several crucial elements with respect to the links between Darwin's theory and deep ecology have to be underlined from the very brief introduction to Darwinian ethology given in this first section. Firstly, Darwinian ethology has to be distinguished from the mainstream[14] interpretation of Darwin's theory. More precisely, Darwinian ethology cannot be based on the radical interpretation of *The Origin of Species* summarised by the slogan 'descent with modification by means of natural selection'. Secondly, in order to make Darwinian ethology apparent, it is necessary to overcome a certain reticence towards an apparently outdated methodology. As a result, reading Darwin's account of animal behaviour can lead one to question the realist-Cartesian paradigm in which ethology has been developed.

Far from being deprived of any systematic method, Darwinian ethology can be centred on a single theoretical movement: the limitation of natural selection. Such argumentative movement, which contradicts the aim of *The Origin of Species*, operates on several levels. On the one hand, the hermeneutic power of natural selection is diminished. Indeed, natural selection is not a sufficient cause that explains the majority of natural phenomena, particularly with respect to animal behaviour. Such a conclusion is significant in *The Descent of Man*, specifically when Darwin addresses sexual selection, and found throughout *The Expression of the Emotions*, directly contradicting the program of *The Origin*, which is reflected in its structure (Hodge 1977 & 1992). The domain of the useless characterises and gathers the phenomena inaccessible to natural selection. On the other hand, natural selection has to be redefined. Since the animal itself possesses a creative and positive

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power to the animal and the transformation of natural selection from a positive, creative principle to a negative, eliminative principle.

[12] As noted by Hoquet (2009), determining whether natural selection is a positive and creative principle or a negative and eliminative principle is a key to the interpretation of Darwin's entire theory.

[13] Sexual selection is a good example of the transfer of the selective power to the animals. According to Darwin, it is through conscious choice that females choose certain males that have consciously learned how to display their often harmful ornaments. Contrarily to what Diehm seems to suggest, Darwin does not situate "nature outside the sphere of purpose and agency" (Diehm 2014, 83). Indeed, Darwinian ethology, by transferring the selective power to the animals, insist on their agency.

[14] I do not deny the diversity and complexity of Darwinian studies. However, a certain tendency, from Darwin scholars, to concentrate on *The Origin of Species* and on natural selection is undeniable. As noted by Fodor and Piattelli-Palmarini (2010, *xvi*), such reductive interpretation of Darwin is even more present in other fields that use the theory of natural selection without focusing on Darwin's works.

selective power in phenomena belonging to the domain of the useless, natural selection is limited to a negative, eliminative principle, operating when the animal fails to adopt an adequate behaviour with respect to mere survival.

Taking Darwinian ethology seriously leads to two main complementary practical consequences. Firstly, a purely logical, systematic approach of animal behaviour is precluded.[15] In other words, direct fieldwork, contact with the environment, is compulsory. Secondly, such fieldwork necessitates an anthropomorphic approach in order to avoid anthropocentrism. Indeed, anthropomorphism and anthropocentrism are mutually exclusive, which is particularly well illustrated in the case of Darwinian ethology. Anthropocentrism consists in believing that human beings are the most significant species. A hierarchical approach of the environment, with human beings on top of it, characterises anthropocentrism. An anthropocentric approach requires a movement towards human beings, precluding any identification with the other species and resulting in detachment from the animals. On the contrary, a process of identification necessarily accompanies anthropomorphism, which consists in attributing human characteristics, and particularly human feelings, to animals. An anthropomorphic approach requires a movement towards the animals. Darwinian ethology precludes anthropocentrism by arguing for knowledge of the animals based on anecdotes in anthropomorphic terms. Contrary to what could be implied by the theory developed in *The Origin of Species*, a purely hierarchical approach is undermined by Darwinian ethology. Rather than the 'tree of life', Darwin being reluctant to use this metaphor (Hoquet 2009), the entire animal realm is included in a 'coral of life', its branches growing in different directions. Thus, most human characteristics are identified in animals, not as traits that are lesser and/or antecedent to those in humans, which would correspond to a hierarchical view, but as distinct expressions of the same characteristics.

Both Darwin's theoretical movement away from natural selection and its practical consequences (a necessity of field work and anthropomorphism) allow drawing links between Darwinian ethology and Naess' definition of deep ecology.

2. Darwinian Ethology and Naess' Seven Principles of Deep Ecology

In his now famous 1973 article "The Shallow and the Deep, Long-Range Ecology Movement: A Summary," Naess identifies seven principles framing deep ecology. Although never cited, the compatibility of Naess' theory with that of Darwin, and more precisely Darwinian ethology, is striking. Indeed, most of Naess' normative principles are in accordance with Darwin's theoretical approach of animal behaviour. The following section is dedicated to showing the compatibility between Darwinian ethology and the seven principles developed by Naess. Although Naess' normative principles exceed Darwin's theoretical views with respect to strictly ecological considerations, Darwinian ethology is compatible with Naess'

[15] Such an approach corresponds to the image of Darwin as a chamber naturalist.

practical deep ecology and is not itself devoid of practical consideration. The previous section has shown that the development of other theoretical principles than natural selection by the recognition of the domain of the useless leads to the exigency of fieldwork and to the use of anthropomorphism to account, in a non-hierarchical approach of the animal realm, for anecdotes witnessed on the field.

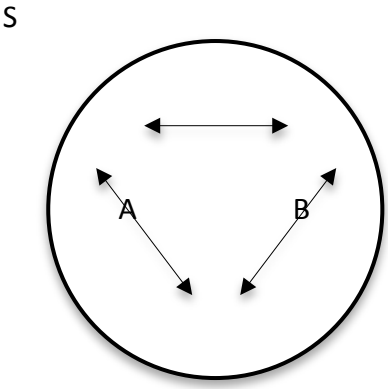
2.1. Theoretical Considerations: "The Relational, Total-Field Image", "Principles of Diversity and of Symbiosis", "Complexity, not Complication"

Among Naess' seven principles, the "[r]ejection of the man-in-environment image in favour of *the relational*, *total-field image*" (Naess, 1973: 95) can be considered as architectonic and illustrative of the change of paradigm necessary for the foundation of deep ecology. According to this principle, every organism is defined by its relations with other organisms:

> Organisms as knots in the biospherical net or field of intrinsic relations. An intrinsic relation between two things *A* and *B* is such that the relation belongs to the definitions or basic constitutions of *A* and *B,* so that without the relation, *A* and *B* are no longer the same things. (Naess 1973, 95)

The relational, total-field image can be looked at from several points of view leading to the very same conclusion: the definition of any organism is negative. Indeed, breaking with the anthropocentric approach of the environment, Naess' first principle not only leads one to challenge the prominent position traditionally given to human beings, but also to question the definition of every living being. By refusing the "thing-in-milieu concept" (Naess 1973, 95), Naess adopts a radical non-essentialist approach of species. However, rather than defending a nominalist definition of species, Naess' approach to living beings can be linked to Saussure's definition of the linguistic sign. Indeed, every living being is co-determined by its living surroundings. In other words, the relational, total-field image is a differential system: while every being is negatively defined by its relationships with others, positivity only results from the sum of all these relations between organisms.

Following Saussure's terminology, and therefore applying a structuralist approach to the living beings, the differential system representing the relational, total-field image can be qualified as synchronic. A synchronic understanding of the living beings means that knowledge of organisms is obtained through the consideration of the state of relations between the living beings. Let us take an example: an organism (A) can only be defined through its relations with other organisms (B, C,…) in a given state (S). In other words, any organism in the state (S) is negatively defined by its relations with the other organisms in the same given state (S). In summary, a synchronic approach is necessarily based on a differential system that applies to a specific state (S) and negatively defines elements (A,B,C…) through their relations as opposed to defining them positively through essential traits (see fig. 1).



(fig. 1.)

Synchrony, i.e. applying a differential system to the study of living beings, is perfectly compatible with the theory of *The Origin of Species*[16] and therefore seems to undermine the necessity of Darwinian ethology. Indeed, considered as a positive and creative principle, natural selection differentially organises the relations between species in a given state, i.e. ecological niche.[17] As Naess states while explaining his principle of complexity:

> Organisms, ways of life, and interactions in the biosphere in general, exhibit complexity of such an astoundingly high level as to colour the general outlook of ecologists. Such complexity makes thinking in terms of vast systems inevitable. (Naess 1973, 97)

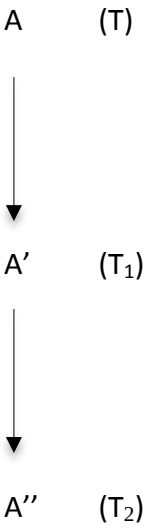
Complexity leads to the elaboration of vast systems. Such necessity can be interpreted, on face value, as an argument for a purely synchronic approach. Indeed, complexity requires thinking synchronically, i.e. through a differential system, which confirms the approach of the relational, total-field image. The compatibility between such synchronic representation of the biosphere and natural selection must be underlined, both historically and theoretically. In *The Origin of Species*, Darwin organises his theory around natural selection, satisfying Victorian philosophy of science (Hodge 1977 & 1992; Ruse 1999). Within the realist-Cartesian paradigm, natural selection still appears as a convenient, though arguably reductive, organising principle. However, complexity cannot be entirely understood through synchronic systems organised around natural selection. As Naess underlines, complexity leads to "a keen, steady perception of the profound *human ignorance* of biospherical relationships" (Naess 1973, 97). In other words, the relational, total-field image, allied with the principle of complexity understood in its entirety, require altering a purely synchronic approach of the living beings. In other words, elaborating vast differential systems cannot

[16] Röllin (1980) considers that Saussurean synchrony can be associated with natural selection, whereas Saussurean diachrony corresponds with accidental variations.

[17] Ospovat (1995 [1981], 170-209) shows how Milne-Edwards' division of labour influences the long development of Darwin's theory of natural selection, notably through the discovery of the principle of divergence.

represent the complexity of biospherical relationships. In Darwinian terms, considering living beings through natural selection as the sole organising principle does not match the diversity of natural phenomena. Darwinian ethology precisely answers the need to overcome a purely synchronic, systematic approach to the living beings based on a differential system organised around natural selection.

By limiting natural selection, notably through the development of the domain of the useless, Darwinian ethology undermines the all-sufficiency of a synchronic description of the biosphere. It can be argued that Darwinian ethology is intrinsically panchronic. A panchronic approach takes into account both diachrony and synchrony. Whereas synchrony considers a state comprising several units (see fig.1), diachrony focuses on the history of a particular unit over time. A diachronic study of an organism (A) would focus on its different modifications (A', A'', …) over time (T, T_1,T_2, …), without considering other elements (see fig.2).



(Fig.2)

In the context of Darwinian ethology and the relational, total-field image, panchrony requires the study of the history of individuals in order to understand the state of their relationships. As Lestel notes in the description of the bi-constructivist[18] approach of the animal, which can be linked to Darwinian ethology, "each animal represents the crossroads of three lines of history – phylogenetic, cultural and individual – differing in their importance" (Lestel 2011, 84). Animal behaviour is thus influenced by a triple contingency: biological[19], cultural and circumstantial.[20] These three lines of history automatically lead to

[18] By considering the complex relations that motivate animal action, Darwinian ethology is similar to bi-constructivism, which requires the elaboration of a model able "to understand how to construct the way the animal constructs its world" (Lestel 2011, 84) and implies the refusal of more simple and systematic explanations such as ethograms.

[19] Biological contingency corresponds to the phylogenetic history of the animal, i.e. the evolution of its species over time.

the study of panchrony, i.e. of the successive states of relationships the individual crosses. In short, Darwinian ethology, or its more modern form, bi-constructivism, is necessarily panchronic, a diachronic or synchronic approach being necessary but not sufficient.

Panchrony is not only present in Darwin's post-*Origin* works, but can also be identified in his manuscripts, notably in *Natural Selection*, the draft of the second part of the *Species book* that Darwin intended to write before being compelled to summarise his theory.[21] Still influenced by his experiences on the field, Darwin does not hesitate to anthropomorphise animal behaviour, using diachronic principles (mainly the heredity of habits) while taking into account synchronic states. The acquisition of fear is one of the most documented examples illustrating the panchronic approach of Darwinian ethology:

> I have already discussed the hereditary tameness of our domesticated animals: from what follows I have no doubt that the fear of man has always first to be acquired in a state of nature, & that under domestication it only is lost again. In all the few archipelagos & islands uninhabited by man, of which I have been able to find an early account, the native animals were entirely void of fear of man: I have ascertained this in six cases in the most distant parts of the world, & with birds & animals of the most different kinds. <Old Dom Pernety says that the Ducks & Geese at the Falkland Islands walked before them as if mad [sic; Pernety wrote 'prives i.e. tame.]> At the Galapagos Islands I pushed a hawk off a tree with the muzzle of my gun, & the little birds drank water out of a vessel which I held in my hand. But I have in my Journal given details on this subject; & I will here only remark that the tameness is not general, but is special towards man: for at the Falklands, the Geese build on the outlying islets on account of the foxes. These wolf-like foxes were here, as fearless of man, as were the birds; & the sailors in Byron's voyage, mistaking their curiosity for fierceness ran into the water to avoid them: in all old/civilised countries, the wariness & fear of even young foxes & wolves is well known. At the Galapagos Islands the great land-lizards (Amblyrhynchus) were extremely tame so that I could pull them by the tail whereas in other parts of the world large lizards are wary enough. The aquatic lizard of this same genus, lives on the coast-rocks, is adapted to swim & dive perfectly, & feeds on submerged algae: no doubt it must be exposed to danger from the sharks; & consequently, though quite tame on the land, yet I could not drive them into the water & when I threw them in, they always swam directly back to the shore: see what a contrast with all amphibious animals in Europe, which, when disturbed by the more dangerous animal, man, instinctively & instantly take to the water.

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[20] Behaviour is considered as cultural when biology and/or the environment do not determine it. In addition Lestel (2001, 368) adds another criterion, i.e. that the animal elaborates meaning with respect to its actions, which requires considering the animal as a hermeneutical subject.

[21] Darwin wrote *The Origin of Species* in haste because Wallace was on the verge of publishing a similar theory of natural selection.

> The tameness of the birds at the Falklands is particularly interesting, because most of the very same species, more especially the larger birds, are excessively wild in Tierra del Fuego, where for generations they have been persecuted by the savages. Both at these islands & at the Galapagos, it is particularly note-worthy, as I have shown in my Journal by the comparison of the several accounts up to the time when we visited these islands, that the birds are gradually getting less & less tame; & it is surprising, considering the degree of persecution which they have occasionally suffered during the last one or two centuries, that they have not become wilder; it shows that the fear of man is not soon acquired. (Darwin in Stauffer 1975, 495-496)

From his observations on the field, Darwin concludes that fear can be acquired. The vocabulary of heredity and acquisition, rather than the use of terms such as 'variation' and 'selection', is typical of Darwin's interpretation and use of the heredity of habits,[22] Such diachronic principle automatically leads to the consideration of synchrony through the three lines of history identified by Lestel (2011). Framed by its phylogenetic history, i.e. by its biological heritage, the animal can acquire fear with respect to its own individual experience (its relations with other species) or its cultural heritage (in this case, the fear individually acquired and collectively transmitted by its predecessors). In sum, the acquisition of fear illustrates that the complexity of biospherical relations inherent to the relational, total-field image cannot be grasped by a synchronic approach, notably unified around a single principle – natural selection – but has to take into account the different histories of such relations through an approach that can be qualified as panchronic since diachronic and synchronic considerations are necessarily intermingled.

Within Darwinian ethology, the limitation of synchrony, and by extension the limitation of natural selection, leads to the consideration of the domain of the useless, i.e. the study of non-adaptive and anti-adaptive structures and behaviour. Among them, expressive movements represent a particularly interesting case. Indeed, Darwin's theory of expression allows drawing further links with Naess' deep ecology, more particularly with the principles of diversity and symbiosis:

> Diversity enhances the potentialities of survival, the chances of new modes of life, the richness of forms. And the so-called struggle of life, and survival of the fittest, should be interpreted in the sense of ability to coexist and cooperate in complex relationships, rather than ability to kill, exploit, and suppress. 'Live and let live' is a more powerful ecological principle than 'Either you or me'. (Naess 1973, 96)

As in the case of synchrony, the principles of diversity and symbiosis are compatible with the theory developed in *The Origin of Species* and seem to undermine the necessity of Darwinian ethology. For instance, the analogy with Milne-Edwards' division of labour leads

[22] In order to avoid criticisms inherent to the heredity of habits, one can make a Baldwinian interpretation of such passages and substitute the heredity of habits with organic selection.

Darwin to recognise the advantages of diversity within a given niche with respect to the proliferation of species (Ospovat 1995 [1981], 170-209). Furthermore, cooperation is introduced with community selection and opens a wide range of interpretations that, whether strictly limited to Darwin's works or not, are based on an extended definition of natural selection.[23] However, Darwin's considerations of cooperation are mainly developed in *The Descent of Man* and should therefore be read through the prism of Darwinian ethology, i.e. outside of the reach of natural selection.[24] Moreover, the interpretation of biospherical relationships in terms of coexistence finds an historical and theoretical foundation in Darwin's theory of expression.

Developed in *The Expression of the Emotions in Man and Animals*, Darwin's thoughts on expressive movements are entirely based on the heredity of (intelligent) habits,[25] confirming the transfer of selective power to animals. According to Darwin, when expressive movements are not the result of the constitution of the nervous system, they are generally automatized or transmitted habits that were at first individually and consciously developed as reactions to the surrounding conditions.[26] The expression of anger in dogs illustrates Darwin's approach:

> I have already described the appearance of a dog approaching another dog with hostile intentions, namely, with erected ears, eyes intently directed forwards, hair on the neck and back bristling, gait remarkably stiff, with the tail upright and rigid. So familiar is this appearance to us, that an angry man is sometimes said "to have his back up." Of the above points, the stiff gait and upright tail alone require further discussion. Sir C. Bell remarks[1] that, when a tiger or wolf is struck by its keeper and is suddenly roused to ferocity, "every muscle is in tension, and the limbs are in an attitude of strained exertion, prepared to spring." This tension of the muscles and consequent stiff gait may be accounted for on the principle of associated habit, for anger

[23] For example, one can think of Cronin's (1991) interpretation based on game theory, Tort's (2008) theory of the reverse effect of evolution or De Waal (2009) theory of empathy.

[24] Darwin develops three possible explanations for the emergence of cooperative and altruistic behaviour: calculated interest, fear of opinion and community selection. Since this theory is developed in *The Descent of Man*, i.e. in the book where Darwin amends the excessive use of natural selection, it can be argued that the appeal to community selection is mainly a way to answer criticisms, notably exposed by the eugenicists Greg and Galton, against the capacity of natural selection to be effective in more advanced states of society.

[25] The expression of the emotions can be considered as useless (Richards 1987, 230) and the exclusive appeal to the heredity of habits, contrarily to what some interpretations suggest (Ekman 1973, 1-6), confers to such theory an apparently un-Darwinian flavour (Radick 2010).

[26] Darwin uses three principles in order account of expressive movements: "The principle of serviceable associated Habits," "The principle of Antithesis," and "The principle of actions due to the constitution of the Nervous System, independently from the first of the Will, and independently to a certain extent of Habit." These three principles are not within the reach of natural selection and require the adoption of Darwinian ethology.

> has continually led to fierce struggles, and consequently to all the muscles of the body having been violently exerted. (Darwin 1890, 122)

Confrontations that follow angry feelings have led to the automatization of voluntary bodily movements that are characteristic of struggles. Hence, the bodily expression of anger indicates the dog's hostility through a possible future outcome of the encounter. However, such outcome is not necessary and the expression of anger opens what can be considered as a space of negotiation. In short, hostile feelings do not automatically lead to aggression, depending on the reaction of the individual, who triggered anger, to the information provided by the expressive movements.

The space of negotiation identified in the precise case of the expression of anger can be extended to animal relations in general. Indeed, through anthropomorphic anecdotes, Darwinian ethology describes and generalises animal actions as negotiations for every particular aspect of life: survival, reproduction, social position. While males try to persuade females to share an initially personal pleasure,[27] every individual tries, consciously or unconsciously, to avoid dangerous confrontations and to obtain the most suitable social position through actions, i.e. negotiations such as inherited expressive movements, seductive patterns or intelligent reactions. Even cooperation can be considered as a particular case of negotiation. As Darwin notes in his explanation of the development of moral faculties in the case of man, cooperation can be motivated by the hope of a future advantage and the fear of opinion. The importance of language in the latter case represents a perfect continuity with the role played by expressive movements in more basic examples of negotiations.

In sum, in its description of animal actions as negotiations, Darwinian ethology theoretically supports the relational, total-field image. Indeed, animal relations appear to be more complex than simple predation interactions and are central in such a description of the animal realm that is not based on elimination through natural selection. 'Live and let live' seems to be the conduct aimed at by animals in both interspecific and intraspecific relations, which leads to the consideration of the more normative principles present in both Naess' deep ecology and Darwin's ethology.

2.2. Normative Considerations: "Biospherical Egalitarianism", "Anti-Class Posture", "Local Autonomy and Decentralization"

Among the more normative principles developed by Naess, "*[b]iospherical egalitarianism*" is central:

[27] "Sufficient facts have now been given to shew with what care male birds display their various charms, and this they do with the utmost skill. Whilst preening their feathers, they have frequent opportunities for admiring themselves, and of studying how best to exhibit their beauty. But as all the males of the same species display themselves in exactly the same manner, it appears that actions, at first perhaps intentional, have become instinctive" (Darwin 1874, 402).

> The ecological field-worker acquires a deep-seated respect, or even veneration, for ways and forms of life. He reaches an understanding from within, a kind of understanding that others reserve for fellow men and for a narrow section of ways and forms of life. To the ecological field-worker, the equal right to live and blossom is an intuitively clear and obvious value axiom. Its restriction to humans is an anthropocentrism with detrimental effects upon the life quality of humans themselves. This quality depends in part upon the deep pleasure and satisfaction we receive from close partnership with other forms of life. The attempt to ignore our dependence and to establish a master-slave role has contributed to the alienation of man from himself. (Naess 1973, 95-96)

Following the relational, total-field image, Naess' biospherical egalitarianism as a foundation of the normative character of deep ecology has a certain Kantian flavour, inequality of treatment with respect to non-human living beings leading to both moral and practical damage for humanity. Therefore, deep ecology is necessarily anti-anthropocentrist. Accepting and integrating his encounters with other living beings, the ecological field-worker realises the necessity of equality among the biosphere and automatically adopts the 'live and let live' motto.

The links between Naess' biospherical egalitarianism and Darwin are twofold, theoretical and practical. Indeed, Darwinian ethology is based on anecdotes, collected during fieldwork (Secord 1985, 519-542; Townshend 2009, 26-27, 81-82, 102-103, 108, 132-138), and refutes anthropocentrism through the application of anthropomorphism (Durant 1985, 291-292, 302-303; Burkhardt Jr. 1985, 328, 348-349, 351).[28] According to Darwin, the long development of morality itself results in an inclusion of other species, which makes anthropocentrism a mere temporary accident in human history. Such theoretical considerations reflect more practical and personal opinions on human-animal relationships expressed more freely in Darwin's manuscripts:

> Animals whom we have made our slaves we do not like to consider our equals. — Do not slave holders wish to make the black man other kind— animals with affections, imitation, fear of death, pain, sorrow for the dead— respect. (Darwin in Barret et al. 2008 [1987], B, 231)

Studying animals leads Darwin, the field naturalist still influenced by his recent circumnavigation aboard *H.M.S. Beagle*, to attribute human feelings and states of mind to non-human beings, evidence of an undeniable anthropomorphic approach that contradicts anthropocentrism. Inferring that animals are capable of such feelings from their action

[28] Anthropocentrism is precluded in an anthropomorphic approach that leads to an identification with the observed and studied animals. Diehm (2014) underlines the importance of identification in Naess' deep ecology. By considering Darwinian ethology, identification with the animals appears as central to Darwin's thought, which leads to consider Darwin's work more a boon than a bane to Naess, contrarily to what Diem (2014, 85) suggests.

requires an analogical projection from the observer that, according to Darwin, must be associated with the respect due to our equals. Disrespect towards animals is therefore as unjustified as slavery, which is based on flawed essentialist arguments. As Darwin and his family were long-time abolitionists (Desmond & Moore 2009), the reference to slavery testifies to the importance of the human-animal relations issue for Darwin. In short, equality ought to be as much interspecific as intraspecific. Such a normative principle finds an echo in Naess' "[*a*]*nti-class posture*" (Naess 1973, 96): biospherical egalitarianism ought to be applied for any kind of relation within the biosphere.

Finally, even the most political sides of Naess' deep ecology echo some aspects of Darwin's theory. Indeed, the "[*l*]*ocal autonomy and decentralization*" (Naess 1973, 98) can be linked with a well-known and accepted Darwinian proposition, which does not require consideration of Darwinian ethology:

> The vulnerability of a form of life is roughly proportional to the weight of influences from afar, from outside the local region in which that form has obtained an ecological equilibrium. This lends support to our efforts to strengthen local self-government and material and mental self-sufficiency. But these efforts presuppose an impetus towards decentralization. (Naess 1973, 98)

According to Darwin, the division of labour in an ecological niche, a theory inspired by Milne-Edwards, allows the development of the greatest number of species. Such division of labour leads to a stable state of relations between species that can mainly be threatened by the introduction of an external factor to this state. In Naess' words, the preservation of any ecological equilibrium requires a protection from external influences. In sum, the principle of local autonomy and decentralization can be considered as the political application of a cardinal aspect of Darwin's theory largely developed in *The Origin of Species*, i.e. the division of labour in an ecological niche. Local autonomy and decentralization respect the fragile equilibrium of political relations, which are comparable to an ecological niche supporting the maximum amount of species thanks to the division of labour.

3. CONCLUSION

In order to show the compatibility between Darwinian theory and Naess' deep ecology, it is necessary to study Darwinian ethology. It is true that focusing on a very traditional interpretation of Darwin's theory, reduced to *The Origin of Species* and articulated around natural selection, allows us to draw interesting parallels. For instance, Naess' relational, total-field image principle and the more practical local autonomy and decentralization principle can both be linked to the synchronic approach privileged on *The Origin of Species*.

Nevertheless, a more complete correspondence between Naess' deep ecology and Darwin's theory appears by the widening of the scope of Darwinian studies and by the development of a new interpretation of Darwin's theory. Focusing on the study of animal behaviour appears to be a fruitful angle. Indeed, through the observation of animals, Darwin is led to

reduce the influence of natural selection and to give anthropomorphic explanations for animal actions providing a better account of the complex relations within the biosphere described in Naess' principles of diversity and of symbiosis and his 'complexity, not complication' principle. Moreover, Darwinian ethology requires a profound respect for animals, gained from fieldwork, that is compatible with the more normative principles developed by Naess, such as biospherical egalitarianism and anti-class posture. From this perspective, deep ecology is still a developing field, notably compatible with new trends in ethology such as bi-constructivism, and as one that contradicts the necessarily anthropocentric realist-Cartesian paradigm. In sum, Darwin's theory, and more particularly Darwinian ethology, can be a key to a philosophical defence of deep ecology.

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