

A Critical Companion to Zoosemiotics

BIOSEMIOTICS

VOLUME 5

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Combining research approaches from biology, philosophy and linguistics, the emerging field of biosemiotics proposes that animals, plants and single cells all engage in semiosis – the conversion of physical signals into conventional signs. This has important implications and applications for issues ranging from natural selection to animal behaviour and human psychology, leaving biosemiotics at the cutting edge of the research on the fundamentals of life.

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Dario Martinelli

A Critical Companion to Zoosemiotics

People, Paths, Ideas



Springer

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To Smile and his/her mum.

Preface

*There are other forms on intelligence on Earth,
Doctor. Only human arrogance would assume the
message must be meant for man.*

(Dr. Spock, Star Trek IV)

There are many reasons why this is a good time for writing a Critical Companion to Zoosemiotics; reasons that pertain to each of the words carefully chosen for the title of this book.

First of all, Zoosemiotics. Why write a book about this subject? Pretty soon after these lines have been written (in 2013), zoosemiotics will turn 50. As is well known, people at the end of their first half-century often feel the need to sit down for a while and make a sort of self-evaluation of their life, look back and look forward, look around, look inside. Writing a “companion”, that is, something which aims to cover the majority of the topics related to a given subject, can be seen as just this sort of activity: discussing the status of the art of zoosemiotics as it turns 50. Discussing its values, impact, innovations (if any), and limitations.

Despite its popularity within the semiotic environment, zoosemiotics is still surrounded by a certain curiosity, the kind of curiosity that manifests itself in attitudes like scepticism and “exoticism”. One goes from questions like “Do they *really* communicate?” to comments like “Oh! I know what you mean, you should see how smart my dog is”. It is all understandable, of course. Zoosemioticians are the first not to have awfully clear ideas on what zoosemiotics is exactly, how far can they go, and so on. Less than fifty is very young, scientifically speaking, for a discipline to answer its most important questions, and moreover, it should be admitted that Sebeok’s work, outside semiotics, was not as influential as it probably would have deserved to be. In this sense, a widespread curiosity about the zoosemiotic discipline is more than comprehensible.

But this is not the whole story. There is a growing interest not only about zoosemiotics, but also about the whole area of non-human animals studies. Finally, after decades of prejudices, those studies caught the interest of *cognitive sciences* (see the most recent trends in ethology and, partly, zoosemiotics itself), *human sciences* (is it still fair to call them just *human?*), and more generally are now also

approached according to a wider perspective. Most of the competencies so far collected on non-human animals have been specialistic, punctual, *microscopic*, and thus not so open and interdisciplinary. Zoology focuses largely on the anatomy, the structure, and the particulars of animals. Classical ethology organizes animal behaviour in patterns and ethograms. TV constantly broadcasts documentaries showing, say, a group of lions in the African savannah, dealing with the usual two or three situations (hunt, reproduction, territory defence), or – as it is becoming trendier and trendier in channels such as Animal Planet – exceeds in the opposite sense, i.e., making a reality candid-camera-like spectacle out of animal abilities and actions. What has clearly been missing for a long time, in the discussion on non-human animals, are the good old philosophical questions (the *macroscopic* issues). As far as non-human animals are concerned, it seems that we either (believe we) know things for sure, or we do not. Very little seems to be in the middle. It is not so often that we have had “doubts”, in the philosophical sense of the term.

But we now feel an urge to *doubt*, when discussing other animals. We feel the urge to define and refine them, as concepts. It is true that human sciences are generally hardly practical and empirical, but it is also true that biological sciences are a bit too uninterested in theoretical reflection. History has proven on various occasions (and keeps on doing so) that these forms of opposite yet sadly complementary superficiality have the primary effect of slowing down, rather than supporting, the evolution of human knowledge. We also start to realize that to study other animals under a humanistic perspective helps us, as humans, to learn more about ourselves. For a start, it reminds us that we ourselves are animals, thus, at least on a basic level, certain principles that are applicable to non-humans are of scientific interest for humans too. And that also means addressing new questions, or reformulating old ones. So, communication, signification, representation are all zoological phenomena, rather than simply anthropological ones. Therefore: what is really communication? What is signification? Where do they come from? What are the behavioural processes implied in their production? All these questions (and attempts to answer them) are good reasons for wanting to write about zoosemiotics.

Not only. This can also be an opportunity to open a new chapter for the field. A self-evaluation, after all, has mostly this purpose: we find what did not work out in our life, we try to explain why, and we seek for change. It will be seen later that there are quite a few things, within zoosemiotics, that should probably undergo a positive revision.

Most of all, finally, a field like zoosemiotics *deserves* attention, a work of this type is simply worthwhile. As a field of inquiry, one has to assume, it has made a strong contribution to animal studies, and it has still a lot to say and give. In fact, this companion was written largely with the idea of *adding* something to the subject, rather than restating the already-known.

Which introduces the second word, “Companion”. Why a companion, then, if the intention is to say something new? The most obvious reply is that a companion to zoosemiotics was simply never written before, and this is already enough a reason for wanting to write one. But that would not be the end of the story. It is very possible that scholars approaching zoosemiotics need a working tool of this type.

And so do scholars who are already acquainted with the field, but feel the need to have a practical point of reference to quickly find out about a certain topic, or to compare their own hypotheses with.

In this sense, the aim is still to perform the proper job of offering sources and information about most (“all” would be impossible, of course) of the topics of interest for this field. In a way it is the foundations of this book that make it a Companion in the truest sense of the word. At a general level, the reader should be able to find nearly all s/he needs to form a fair picture of what zoosemiotics is, does, and aims to.

However, on top of this layer, a few more were developed, in directions that it is probably appropriate to call “Critical”. Zoosemiotics, like all respectable fields of inquiry, has its own problems, controversies, on-going debates. Those, obviously, deserve a particular treatment. Not only: some other aspects, even though commonly accepted by the community of zoosemioticians, are probably still rather “critical”, and cannot be taken so easily for granted. Finally, other aspects may be overlooked, or not given the amount of attention they deserve. All these became *layers* built over the basic “Companion” structure, and came to form the word “Critical” in the title of this book.

It is therefore proposed here a consciously “unbalanced” account of zoosemiotics. An account which privileges the problematic over the granted, the controversial over the institutionalized, the adventurous over the safe. Most of all, however, the idea is to offer as many sources as possible for a satisfactory introduction to zoosemiotics. This is why, this book is “packaged” with different forms of reference, schematic and discursive. Foreword and references apart, the work is divided in five main parts. In Chapter 1, “Introduction to Zoosemiotics”, a hopefully extensive presentation of the field is provided, with a particular attention to its definition and its main problematics. A little coda to this part will gather a few definitions of zoosemiotics, as collected from very different sources, from Sebeok to Wikipedia. Chapter 2, “Ethological Zoosemiotics”, describes the most traditional and important area of inquiry of zoosemiotics, i.e., the actual semiosis among non-human animals. Elements of systematics of the field shall be presented, the main theoretical issues, and a specific example of this type of research. Chapter 3, “Anthropological Zoosemiotics”, on the other hand, focuses on the increasingly popular area of investigation of the human-other animal relationship, an area that includes applied zoosemiotics and the diverse cultural representations of the non-human animal. Chapter 4, “A Glossary of People, Paths and Ideas”, offers a few hundreds entries for topics and scholars related to zoosemiotics. The intention is to provide the reader with a very practical tool for consultation, introducing (or deepening, if they are already mentioned in any of previous parts) the most important, and/or critical, key-terms and people of the field. The companion will also have an Chapter 5, entitled “Does Zoosemiotic Have An Ethical Agenda?”, which explores the possibility of including ethical reflections on the zoosemiotic program, following the example of other branches of semiotics, which are currently addressing questions of this type in their own field of inquiry. It is not a “traditional” topic in zoosemiotics, but it is a specific author’s intention that of making it an increasingly regular presence within the semiotic discussion.

It has been a labour of passion, which hopefully will be of some help for the readers.

Helsinki, Finland

Dario Martinelli

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Chapter 1

Introduction to Zoosemiotics

1.1 What is Zoosemiotics?

Zoosemiotics is a field of inquiry introduced in 1963 by Thomas Albert Sebeok. That is the year when the term and a first definition make their first appearance, initially as a compromise between ethological and semiotic research (in the beginning, Sebeok was convinced that “zoosemiotics” had to be meant mostly as an umbrella term, gathering different scholarly approaches to animal communication). A synthetic definition of zoosemiotics, in the light of its most recent developments, can be today that of *the study of semiosis within and across animal species*. A spectrum of different possible definitions of the term has been attempted (in the next chapter of this book), but at the end of the day it is probably safe to trace a common ground in the way just mentioned.

The implications of this definition are crucial. First of all, the focus of zoosemiotics is not simply communication (which is what people normally expect to be the actual goal of semiotics), but rather the broader *Semiosis*, i.e., following Charles Morris, the process in which something is a sign to some organism. Communication, the process in which a sign is coded and transmitted from a sender to a receiver, is thus to be considered a special, therefore smaller, case of semiosis.

By consequence, zoosemiotics is interested in at least three important semiotic phenomena:

- (a) *Signification*, occurring when the receiver is the only subject taking part in the semiosis, and a true sender is missing. In other words, zoosemiotics studies here the way animals make sense out of each other, or out of their environment;
- (b) *Representation*, occurring when the sender is the only semiotic subject. In this case, zoosemiotics studies here the way animals construct sense and, often but not always, *offer* it to somebody else; and
- (c) *Communication*, occurring when sender and receiver take both part in the semiotic phenomenon, and therefore the above-mentioned “sense” (or text) is exchanged, understood or misunderstood.

This specification, besides its paradigmatic necessity, is also needed because the first and foremost objection that can be (and has been in several occasions) put

forward against studies like zoosemiotics is: can the message exchange that occurs among non-human living forms be really called communication? If there is no big problem in accepting that what happens among such animal species like dogs or dolphins is actually a communication process, the sign exchanges occurring among insects or reptiles, are more often than not surrounded by much scepticism, among semioticians.

The research target of zoosemiotics, and in fact of the whole semiotics, is thus a different broader one. Semiosis can be defined as the action of signs, or, as mentioned already, the process in which something is a sign to some organism. What normally happens is that semiosis is identified with communication, just because the latter is the most evident and predictable manifestation of the former.

This also means that another concept that is strictly related to the notion of communication, i.e., *intentionality*, is not necessarily part of a semiotic phenomenon. A common tendency, which comes straight from the linguistic/semiological tradition, is that of considering only intentional messages as worthwhile of semiotic analysis. For semiotics to be *interested* in a given message, that message must be somehow *meant*. This is still the main trend among those who see zoosemiotics as a threat for (what they consider to be) the real identity of semiotics. Such an identity – it is maintained – remains that of text analysis: it is acceptable that a painting, a building, a sonata are considered “texts”, along with literary works, but the alarm signals of vervet monkeys, the song of a blackbird, or the dance of the honeybee cannot.

This stand, however, presents two main difficulties. On the one hand, to limit semiotics to the sole communicative/intentional dimension means to classify not only non-human semiosis as semiotically-uninteresting, but also most of the human semiosis as well, starting from body-language, proxemics, plus several types of anthropological and social interactions. And this might be rather peculiar if one thinks that such a position is advanced by those semioticians who have a strong linguistic background, i.e., they relate to a field that has an enormous interest for non-verbal human semiosis.

On the other hand, more importantly, it must be said that a concept like “intentionality” is not clearly-defined at all. What does it mean to *have an intention*? Is it the same as *to want* something, or is it something else? And how do one detect the existence of an intention in our thoughts/actions? In a famous article on primate deception, Richard Byrne and Andrew Whiten (1991), traced a 0–3 scale of intentional behaviour. The 0 level (observed when the animal reaches a goal in a completely random manner) is the only one that cannot be considered intentional. Level 1 (the simple aiming to a goal) is already an *intention*.

What seems to create the misunderstanding, in a common-sensical definition of “intention”, is that, in human interaction, we witness the *awareness* and then the *verbalisation* of the intention: we are aware that we want something and we can say it. This is a process that is often confused with intentionality itself, which – in turn – could be nothing else (or nothing more) than the main characteristic of the sign: referring to something else than themselves (Dennett 1996: 48). Whether this (reductive?) definition is acceptable or not, it is clear that most of the time, when

talking about intentionality, we tend to refer to the wrong phenomenon, i.e., the awareness of the intentionality, which is evidently a different matter. Intentionality itself seems to be a much more obscure concept. Peirce himself would extremely often use the term semiosis in his writings, but very seldom would he employ terms like communication and intentionality.

Putting the argument less seriously, one could say that the object of semiotics is also a sentence like “Go from A to B”, and not only a sentence like “*I am telling you to go from A to B, and I mean it*”.

Let us go back to the initial definition of zoosemiotics. It was said that this discipline studies semiosis *within* and *across* animal species. This means that there is a range of semiotic phenomena that may be called “intraspecific”, and another category that should be called “interspecific”. By intraspecific, it is meant the kind of semiosis occurring within one single animal species (or community, being the concept of species still a bit problematic, to a certain extent), i.e., within a group of animals that supposedly share a fairly similar perception of the world and similar ways to codify it. By interspecific, on the other hand, it is meant the kind of semiosis occurring between different species (or communities), i.e., between groups that do not share the above-mentioned perception and codification of the world, if not to a very basic extent (this latter normally being the very ground for establishing a – temporary or not – common code). It is a rather important distinction, because it implies a (sometimes radical) change of methodologies, and an address to a (sometimes radically) different order of problems.

Thirdly, the use of the term “animal species” in the definition here provided is intended to cover the entire Animal Kingdom, i.e., the human species as well. This means not only that a part of human semiotic behaviour (more or less, what transcends the linguistic domain, although the notion of language itself is “critical”, as it will be shown later) easily falls under the zoosemiotic domain, as ethology had already shown, but also that zoosemiotics investigates a field of knowledge that include both natural and cultural elements, and that – ultimately – the critical notion of Culture is to be considered a part of the critical notion of Nature.

This is probably one of the most important, and courageous, statements of zoosemiotics, as – among other things – it represents the attempt (which by now can be deemed fully successful) to extend the attention of semiotic research to the realm of the non-human, starting exactly from the assumption that a great deal of characteristics that we thought were typical of human semiosis, are in fact to be widely reconsidered.

Throughout almost its entire history, indeed, semiotics has always been an anthropocentric and logocentric discipline, with an exclusive emphasis on human- and language-related issues (this despite the fact that the earliest conscious examples of semiotics consisted in the medical observation of the body – symptomatology, diagnostics, etc. – carried out by the likes of Hippocrates or Galen of Pergamon). John Locke, in the seventeenth century, used the word “semiotics” for describing the “doctrine of signs”. It was once again a human-centered enterprise. Yet,

While his prime concern was with those signs of our ideas “which men have found most convenient, and therefore generally make use of,” that is, “articulate sounds” or verbal signs, Locke was fully aware that other creatures, such as birds, also have perception, “retain ideas

in their memories, and use them for patterns”, in brief, that they are comparably served by signs. (Sebeok 1990: 37)

The real turning point, in terms of the scope of this companion, appeared in the nineteenth century, as Charles S. Peirce gave a first clear acknowledgement of the semiotic nature of the non-human world (to him, the sign was a connective element not only in all experience and thought, but in the whole universe), but it is not until the biologist Jakob von Uexküll that the first, important, specific argumentation in support of what is nowadays known as biosemiotics, appears, that is, the study of semiosis in living forms. Uexküll’s *Institut für Umweltforschung*, founded in 1926 at Hamburg University, investigated the perceptive environment of animals (i.e., their Umwelt, as shall be soon discussed at length). Though not a semiotician, and probably never intending to be one, Uexküll brought to attention a number of topics of fundamental (bio) semiotic interest, and later his son Thure, and Thomas A. Sebeok, introduced his work to the semiotic community, labelling the German biologist with the infamous term “cryptosemiotician” (a fate shared with nearly all great contributors to human knowledge, in one moment or another of the ever-in-progress construction of semiotic history).

All this was going on while the then-dominant school of semiotics, the so-called semiology, of Saussurean tradition, made it very clear that the discipline was a natural continuation of Linguistics, or even – as Barthes had put it – just a part of it. In Sebeok’s account:

In an independent but parallel tradition, amplified by F. de Saussure’s heritage, semiotics, alias semiologie, has remained steadfastly anthropocentric, intertwined with language, le patron general of Saussure’s programmatic science. Many linguists later tended to more or less agree: thus L. Bloomfield asserted that “Linguistics is the chief contributor to semiotic,” and U. Weinreich called natural languages “the semiotic phenomenon par excellence.” But it was the prominent French critic Roland Barthes who – like W. H. Auden’s “linguist who is never at home in Nature’s grammar” – carried this glottocentricity to its preposterous (but perhaps playfully conceived) conclusion by turning Saussure’s formulation topsy-turvy with his declaration that “linguistics is not a part of the general science of signs, even a privileged part, it is semiology which is a part of linguistics. . .” The validity of this paradoxical inversion of the customary order of things can be contemplated only, if at all, at the price of throwing all of comparative semiotics overboard by dividing the animate world into two unequal classes – speechless vs. language-endowed – and then consigning the sign behavior of well over two million extant species of animals beyond the semiotic pale. (Sebeok 1990: 38)

Back on the “opposite front”, other signals of an upcoming new field of inquiry came from Charles Morris, the truest follower of Peirce, and from the oncologist Giorgio Prodi, who termed the study of biological codes “Nature Semiotics”, and from Friedrich S. Rothschild (1962: 777), who first actually used the term “biosemiotics” in a scientific context:

This approach presupposes acceptance of our position that the history of subjectivity does not start with man, but that the human spirit was preceded by many preliminary stages in the evolution of animals. The symbol theory of psychophysical relation bridges the gulf between these disparate avenues of research and unites their methods under the name of

biosemiotic. We speak of biophysics and biochemistry whenever methods used in the chemistry and physics of lifeless matter are applied to material structures and processes created by life. In analogy we use the term biosemiotic. It means a theory and its methods which follows the model of the semiotic of language. It investigates the communication processes of life that convey meaning in analogy to language. (Rothschild 1962: 777)

One year later, as already mentioned, Sebeok coined the term and developed the theoretical paradigm of a specific biosemiotic field named “zoosemiotics”, somehow inaugurating a new phase for semiotic history, a phase in which non-human semiotics is no longer ignored or underrated. This event certainly represents *the* milestone in zoosemiotic history, and shall be deepened later on.

Sebeok maintained that

The process of message exchanges, or semiosis, is an indispensable characteristic of all terrestrial life forms. It is this capacity for containing, replicating, and expressing messages, of extracting their signification, that, in fact, distinguishes them more from the nonliving – except for human agents, such as computers or robots, that can be programmed to simulate communication – than any other traits often cited. The study of the twin processes of communication and signification can be regarded as ultimately a branch of the life science, or as belonging in large part to nature, in some part to culture, which is, of course, also a part of nature. (Sebeok 1991: 22)

Later, he added that “the life science and the sign science thus mutually imply one another”. (Sebeok 1994: 114)

These reflections introduce a number of important key-terms and concepts, that should be considered the pillars of the bio- and zoosemiotic disciplines:

- (1) The concept of semiosis, i.e., the action of signs, is the real target of semiotics;
- (2) All life forms are semiotic. Thus, semiosis is primarily what distinguishes life from non-life;
- (3) Culture and Nature are not concepts in opposition, but in fact the former is part of the latter;
- (4) If life science intersects with sign science, then semiosphere and biosphere are probably synonyms.

In addition, Jesper Hoffmeyer pointed out the centrality of semiosis in biological studies. To Hoffmeyer, the biggest contribution that biosemiotics can make to the life sciences is the emancipation of sign and semiosis as the crucial elements in life: semiosis is the “most pronounced feature of organic evolution”, and signs are the “basic units for studying life”.

The most pronounced feature of organic evolution is not the creation of a multiplicity of amazing morphological structures, but the general expansion of “semiotic freedom”, that is to say the increase in richness or “depth” of meaning that can be communicated (Hoffmeyer 1996: 61).

And:

The sign rather than the molecule is the basic unit for studying life (Hoffmeyer 1995: 369)

This position is somehow antagonistic to that held by Marcello Barbieri, who is on the contrary a supporter of a code-based biosemiotics, an approach that focuses on three important aspects:

One is the idea that the cell is a duality of genotype and phenotype, i.e., a biological computer made of genetic software and protein hardware. The crucial point is that a computer contains codes but is not a semiotic system because its codes come from a codemaker, which is outside the system.

The second basic concept is the idea that all biological novelties are generated by natural selection, i.e., by an agent, which is outside the cell just as the human mind is outside the computer. But if the cell is a biological computer assembled by natural selection, it is perfectly legitimate to say that it is not a semiotic system, and this justifies Florkin's statement that there is no real meaning in it. Ultimately, that leads to the physicalist thesis that there is no real code either at the molecular level, and that molecular semiosis is merely an illusion. The computer model of the cell, in short, keeps semiosis out of the cell, and this is why the first true model of molecular semiosis was the idea that every cell is a trinity of genotype, phenotype, and ribotype, i.e., the idea that the cell contains an internal codemaker [...] This was complemented by the idea that coding is not reducible to copying, and, therefore, that natural selection (based on copying) and natural conventions (based on coding) are two distinct mechanisms of evolution [...]

Another important contribution to code-based biosemiotics came from the discovery of an increasing number of organic codes. That development started with the unveiling of the sequence codes by Trifonov [...] and has grown slowly but steadily ever since [...]

The „code based“ approach to biosemiotics, in short, is a road that started with the recognition of semiosis at the molecular level and worked its way up by extending the concepts of code and meaning to the higher levels of biological organization. At about the same time, however, there was also another road to biosemiotics that was being developed. A road that went exactly the other way round, i.e., that started at the higher levels and worked its way down towards the lower ones. (Barbieri 2008: 594)

This discussion is at present the hottest one within biosemiotics, and it is not within the scope of this book to declare a preference. It must be however pointed out that the notion of sign-based biosemiotics is more sympathetic to an idea of the field as a humanistic-oriented one, while code-based biosemiotics heads clearly in the direction of natural empirical sciences. The goal of this book is certainly to find a compromise between human and natural sciences in a paradigm that hopefully takes the best from both, yet one perceives that this compromise, on the part of a discipline like zoosemiotics (i.e., a branch of “semiotics”), requires more effort in the direction of biology, than the other way round. In that sense, there is a natural sympathy towards any contribution that will help in keeping the discipline within the necessary empirical premises, and will prevent any risk of metaphysical drift (a sympathy that will be more explicit in the paragraph “The ever present Cartesian dualism”).

In any case, both Barbieri's and Hoffmeyer's schools make a strong case for the centrality of semiosis in biological processes, and for the intimately interdisciplinary nature of biosemiotic research. As Barbieri himself states:

There have been historical disputes between the two versions but [...] they are not incompatible, and both share the idea that every living creature is a semiotic system, i.e., that semiosis (the production of signs) is fundamental to life. (Barbieri 2008: 577)

1.1.1 Characteristics of Zoosemiotics

Life semiosis, in general, can take place either *within* a living being and/or *between* two or more of them. The former case is named **endosemiotics**, or – according to the specific cases – protosemiotics, microsemiiotics, cytosemiotics, etc. Endosemiotics involves the message exchange among cellular organelles, cells, tissues, organs and organ systems. When Hippocrates, for instance, analyzed the symptoms of a given disease as signs of the disease itself, he was basically a forerunner of endosemiotics.

Endo- is a Greek preposition that stands for *Inside*: the internal semiosis that takes place in an organism's body is extremely complex, it involves at least four channels (the chemical, the thermic, the mechanical and the electrical: further on it shall be discussed in detail what precisely channels are, but for now a preliminary definition would be: “a method or system used to send and receive information”), and is probably the most intense semiotic activity a scholar may find. A single human body consists of about 25 trillions cells, a number which – alone – is 2,000 times more than the entire human population on this planet. Plus, all these cells have direct or indirect connections with each other through more than one modality. The number of messages exchanged inside one single living organism is unimaginably high:

Millions of so-called receptors capable of recognising specific signal molecules in the cell environment are located in the membranes of each of our cells. These receptors function as communication channels through which our cells, tissues and organs are persistently communicating with each other all around the body. Especially interesting is the recent discovery that receptors on the surface of immune cells are capable of decoding the messages exchanged among nerve cells and vice versa. The psycho-somatic integration of the nervous system, the immune system and the endochrinological system in a healthy organism is the result of this gigantic semiotic interaction among many thousand billions of cells, each of which is capable of interpreting a limited range of molecular signs. Disease may be seen then as the result of erroneous communication among our body parts. We fall ill because our cells cannot quite succeed in uniting to create us. (Hoffmeyer, in Bouissac 1998: 84)

Probably, the earliest forms of semiosis in our bio/semiosphere are those of the *prokaryotes*, one-celled nucleus-less micro-organisms, better known as bacteria.

Along with endosemiotics, there is *exosemiotics*, which regards the entire spectrum of message exchange between two or more complex organisms. Fields of exosemiotics are mainly *phytosemiotics* (whose object is the semiosis among plants), *micosemiotics* (semiosis among fungi) and, finally, *zoosemiotics* (semiosis among animals). A relevant branch of zoosemiotics is obviously *anthroposemiotics*, i.e., the semiosis among the human animals. Some people still consider anthroposemiotics as a separate field, to be lined alongside the other three, claiming that the distinctive feature is the presence of culture in anthroposemiotics only, but the classification is incorrect, both scientifically (the human being *is* an animal, not a distinct entity) and conceptually (as it will be shown further, the notion of culture, unless meant very narrowly,¹ is not alien to other animals as well).

¹So narrowly that several human communities would be excluded too.

Finally, the globalistic conception of life as a whole as sign processes, that is, the interpretation of the fully and intimately semiotic nature of life, mostly promoted by the American semiotic tradition (Peirce and Sebeok first of all), led a few biosemioticians to the slightly pretentious belief that the entire Universe can be analysed and interpreted semiotically:

In its most radical version biosemiotics sees itself as “general semiotics”, while traditional semiotics studying human sign systems is seen as just a special part hereof, anthroposemiotics. This understanding may eventually be coupled to a cosmological vision of evolution as a general tendency of our universe to strengthen the autonomy of the semiotic sphere relative to the physical sphere on which it depends. In system Earth this might further be seen as a trend in organic evolution towards the formation of species with increasingly sophisticated umwelts, or in other words towards a general growth of semiotic freedom, a trend which has reached its temporarily richest expression in the art, religion and science of human cultures. (Hoffmeyer, in Bouissac 1998: 85)

It should be said quite frankly that it is very hard to consider this (increasingly popular) trend worth of too much attention, as the idea of biosemiotics expressed here is that of an approach that exclusively relies upon empirical bases. Biosemiotics, as well as zoosemiotics, is trying to build up a reputation as a serious field of research, both within semiotics (wherein it is often accused of being a bit too pretentious) and in relation with other fields of knowledge (wherein it is often labelled as too metaphysical and abstract). In both cases, the presence of this-is-how-the-universe-works and I-give-you-the-Answer types of approach does not help at all. This certainly sounds like quite a strong stand, and some may even consider it a bias. Be that as it may: at least this book will not be accused of being hypocritical.

Sebeok’s very introduction of zoosemiotics into the scientific world (“The term zoosemiotics – constructed in an exchange between Rulon Wells and me – is proposed for the discipline, within which the science of signs intersects with ethology, devoted to the scientific study of signalling behaviour in and across animal species”, 1963: 465) was obviously far from being the first attempt to study non-human signalling behaviour: leaving aside a series of philosophical reflections, as those provided by Porphyry, Locke or Hume, it was the impact of Darwin on animal studies, and particularly two of his late works, *The Descent of Man* (1871), and *The Expression of Emotions in Man and Animals* (1872), that radically changed the scientific perception and conceptualization of animal semiosis.

Still, Sebeok opened a door that scholars were rather hesitant to open. When one compares pre- or non-semiotic definitions of animal communication, such as those of Cullen (“Animal communication evokes a change of behaviour in another individual”, 1972: 101), or Dawkins and Krebs (“Communication occurs when an animal, the actor, does something which appears to be the result of selection to influence the sense organs of another animal, the reactor, so that the actor’s behaviour changes to the advantage of the actor”, 1978: 282), with those provided by Sebeok (“the discipline within which the science of signs intersects with ethology, devoted to the scientific study of signalling behaviour in and across animal species. The basic

assumption of zoosemiotics is that, in the last analysis, all animals are social beings, each species with a characteristic set of communication problems to solve”, 1963: 465) and other semioticians, it is clear how, thanks to the semiotic approach, animal information exchange could finally get rid of the rigid stimulus-reaction scheme and achieve a much more significant status.

From that point on, zoosemiotics has enjoyed an increasing popularity among scholars (although not enough to confer it the status of an autonomous field within semiotics, as it will be later discussed). The wide range of topics covered by zoosemiotics, plus its intrinsically interdisciplinary nature, has made this field a rather eclectic one, with incursions in several fields of semiotics, including some apparently-strictly anthropological ones.

Following, but also upgrading, the classification suggested in Martinelli 2007 (32–34), at least two main branches should be distinguished within zoosemiotics, both to be divided, in turn, into two more sub-branches. On the one hand, there is zoosemiotics in the traditional sense, i.e., a discipline dealing with animal semiosis, through the most obvious theoretical tools of semiotics. This branch is named *Ethological Zoosemiotics* (EZ). This field can be divided in a chronological sense, into an *early* current (eEZ) and a *modern* one (mEZ). The former refers to the first stage of zoosemiotics, in which there was no explicit attempt to develop an autonomous paradigm, but rather to use “zoosemiotics” as an umbrella term for gathering different approaches on animal communication. Also, the emphasis on “communication”, rather than the broader semiosis, plays a role in defining this early stage. In this phase, zoosemiotics is a discipline largely relying on the Lorenzian ethological school and on the behaviouristic tradition.

In its modern stage, zoosemiotics achieves a few results: first, it operates clearly a transition from having uniquely communication as its research target, to including the entire spectrum of semiosis. Second, it starts developing a paradigm on its own, trying to propose itself as a viable field of inquiry for discussing animal semiosis (and in that sense, it sees the appearance of scholars who explicitly adopt this paradigm, therefore not leaving Sebeok alone with colleagues from other fields). Third, in the majority of the cases, it embraces a cognitive approach, reflecting exactly the type of transition that ethology experienced after the appearance of Griffin 1976. Such transformation, which goes in the direction of a truly semiotic nature (at least according to the traditional definition of “semiotic threshold”, which always implies a mental process underlying sign production), emancipates zoosemiotics, as it emancipates ethology, from old mechanistic or semi-mechanistic interpretations of animal behaviour, somehow bringing to final completion some of Darwin’s early auspices (not to mention philosophers of the likes of Locke, Porphyry and Hume). It is always difficult to locate exact chronological records of any historical transition, especially when such a transition is the result of organizational demands (as is the proposal of dividing EZ into two historical trends). Therefore, we may gladly welcome the ethologists’ effort to spot their own transition in Griffin’s work, thus suggesting that, here too, the passage from early to modern EZ occurred sometime in the late 1970’s.

The second branch of zoosemiotics, called *anthropological*, in short anthrozoosemiotics (AZ),² refers to those studies dealing with the semiotic interaction between human beings and other animals, including those of cultural and/or sociological type. This branch was much anticipated by Sebeok and by the zoologist Heini Hediger. The nature of this interaction has two completely different sides (they should be three, as a matter of fact, but, it shall be shown, one is almost always the natural consequence of another).

The first type is called *communicational* (cAZ). In this context, the human-animal interaction is of a communicative type, i.e., interactive, reciprocal and – with the above-mentioned reservations – intentional. Studies of applied zoosemiotics, such as human-pets or human-cattle interaction, fall under this group, as well as all forms of interspecific communication. In other words, in communicational anthrozoosemiotics, both humans and other animals are semiotic agents, and the study focuses on both parties.

The second sub-category refers to such cases when the non-human animal is a pure source of meaning, an object, rather than a subject, of semiosis. The model is of ecosemiotic type: whereas, indeed, ecosemiotics is the study of human representation of nature, this typology of zoosemiotics deals with the human representation of other animals. This is evidently the case of myths, tales, allegories, but also systematic classifications, such as taxonomy. Now, to be fair, this process corresponds to two different phenomena, signification and representation. On the one hand, the human being *perceives* the non-human animal in a certain manner, and therefore gathers different forms of meaning from it. On the other, this step may be (and is, in most of the cases) followed by an action of representation, in which this perception is shaped, “packaged” and handed over a receiver (virtual or actual, human or not). These two semiotic moments, signification and representation are obviously two different steps, and one (signification) may also occur without the continuation of the other. However, in the economy of this model (which, as said, includes instances from fictional, scientific or everyday discourses), it is very difficult to witness instances where signification and representation operate independently. The mythic representation of, say, the cunning fox is always a consequence of a general perception of that animal as possessing that quality. The (representational) decision of gathering a group of animals under one single species is always the consequence of the (significational) perception of that group as homogeneous under different aspects.

²Two colleagues, one very young, one very famous – both obviously too busy in showing off their knowledge of Ancient Greek, than in actually grasping the practical side of the question – noticed that the correct shortened formulation should be Anthropozoosemiotics. The result, however, is hardly an economic improvement from Anthropological Zoosemiotics. It may still be one word instead of two, but it is so long that one may easily get lost somewhere in the middle, maybe exactly around the “po” region. This is why, possibly, the social scientists who developed the field of Anthrozoology, decided to skip that syllable too. Semioticians cannot just afford being practical, can they? (And then again, the same famous scholar takes a similar liberty by gladly using the term “Proprioception” in his writings, instead of the etymologically correct, but again impractical, “ProprioREception”. Perhaps, when it comes to Latin, he is less demanding).

Table 1.1 Different theoretical trends in zoosemiotics

Zoosemiotics			
Ethological Z		Anthropological Z	
Early EZ	Modern EZ	Communicational AZ	Significational/ representational AZ

For this reason, the name for this type of anthrozoosemiotics will be *significationalrepresentational (srAZ)* (Table 1.1).

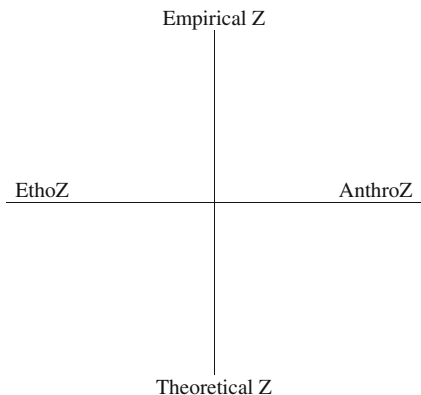
One obvious observation, regarding this classification, is that EZ has a close relationship with natural sciences (starting, obviously, from ethology), while AZ is a closer relative of human sciences, especially the so-called anthrozoology and the social sciences, which nowadays show an increasing interest towards animal-related issues. It is thus safer than before to say that zoosemiotics (1) is interdisciplinary, and (2) occupies an intermediary position between natural and human sciences.

Another way to treat this classification is essentially Greimasian (and therefore, among other things, it allows us to dismiss the urban legend according to which it should be impossible to perform any biosemiotic action within non-Peircean structuralist schemes). Besides a distinction between EZ and AZ, indeed, one should also consider the transversal condition of zoosemiotic research in terms of empirical or theoretical approaches. Once again, as the scientific position of zoosemiotics is located somewhere in between biology and humanities, it is not difficult to imagine that the methodological approach or research interest of zoosemioticians may vary from the typical biologist role of the field scholar to that equally typical philosopher role of the speculative thinker.

Naturally, as it is always the case with these categorizations, differences are not clear-cut and the separation of these roles hardly leads to a simply dichotomy. Besides a purely empirical approach, indeed (that is, a direct observation or data collection from the scholar who will eventually analyze those data), one should at least take into account a semi-empirical one, that is, the situation in which the zoosemiotician, although not personally collecting his/her data, relies anyway on (somebody else's) professional findings and offers a purely semiotic interpretation of them, with the support of analytical tools (software, scales, etc.) that normally are part of the field research package. At the same time, also the theoretical zoosemiotician's position is not so sharply defined. The development of a theoretical model based, again, on empirical evidence is clearly a different cup of tea from a mere speculation departing from an abstract intuition. In zoosemiotics, be that a strength or a weakness, there seems to be room for this entire range of possibilities.

Summing up, thus, both EZ and AZ may be investigated by an empirical or theoretical approach. A schematic representation of these four combinations, exactly because they are not just four but virtually endless, is better represented by a Cartesian plan than by the traditional (for semiotics) Greimasian square. This way, for example, the position of purely empirical research will occupy a place much

Table 1.2 Methodological approaches



closer to the edge of the empirical-theoretical axis, while the semi-empirical one (depending on its degree of empiricism) will appear more towards the middle of the same axis (Table 1.2). In practice:

A small afterwords to this paragraph. What about language? Is it a zoosemiotic topic or not? And, if yes, what type of zoosemiotic topic is it? In an interview he gave to Susan Petrilli, back in 1987, Sebeok declared the following:

It is clear that semiotics is interested in two aspects: the study of verbal semiosis (i.e., linguistics) and the study of non-verbal semiosis. However, what most semioticians who are illiterate in biology fail to grasp is that non-verbal semiotics is an enormously wide field, that includes not only the non-verbal human behaviour – which is about 99% of what human beings do – but also an entire, vast world of millions of animals. In addition, it includes the semiosis of plants and other forms of semiosis that occur within our body, such as the genetic code, the immunological code and other similar mechanisms. Therefore, in terms of pure quantity, it is non-verbal semiosis that largely prevail on the verbal one (translated from Sebeok 1998: 23)

Through these words, one would easily assume that, because language belongs to the remaining 1% of the examples provided by Sebeok, then zoosemiotics is *not* a discipline entitled to discuss language. Surely this is how Sebeok and most semioticians thought. However, the position held in this book is slightly different, and proves once again why this is a “critical” companion. The following observations will serve as points of departure:

- (1) It is not clear whether language is a human species-specific feature or not: one has at the same time proofs that other animals do not *use* language, and proofs that they are able to *learn* it, at least to a certain extent. Within such a picture, the criteria for species-specificity become more ambiguous;
- (2) Even if language was a human species-specific feature, one cannot use it as an excuse for creating, once again (after Aristotle, Descartes, religions, etc.), qualitative differences between the human animal and other animals. This book is fully supportive of Darwinian theories, and entertains the idea of implementing

them with Uexküllian ones. In both cases, there is no trace of *qualitative* differentiation between humans and other animals. A species-specific trait develops naturally and analogically in one species, from a (cognitive, evolutionary, adaptive) basis shared with more species, so it still bears traces of that common basis. There are zoosemiotic aspects also in language, also in verbal semiosis, and hopefully this book shall give a contribution in this direction;

- (3) What exactly language is, is something that scholars are far from agreeing on. Sebeok himself had the rather provocative opinion (which he held firmly, as no provocation at all) that language is *not* a communication device, but primarily a modelling system. Other fields of inquiry would strongly oppose this. And anyway, a common definition of language is far from having been reached;
- (4) Among semioticians, however, a rather solid opinion on the definition of language seems to have been established. And, among other things, that opinion seems to be very critical towards those many studies (particularly in primatology and psychology) that seem to have proven that other animals are able to learn human language. The fact that such contrasts exist (the present one, and the one mentioned in point 3) are enough to consider “Language” a critical topic, which therefore deserves a through discussion in this book.

With such premises, a question will arise spontaneously in the reader: is there in humankind something *at all* that is *not* of zoosemiotic interest, if not even language may aspire to be an exclusively anthroposemiotic subject? It is at the same time a very easy and a very difficult question.

On the one hand, one still has the obvious and scientifically unavoidable fact that the human being *is* an animal. Nothing more, nothing less, and nothing else. Everything a human does is something that an animal is doing. So, nothing human *completely* escapes a zoosemiotic insight.

On the other hand, discussing topics like language, or art, or culture, does not mean to discuss what animals species-specifically do with them. And that particularly applies to human beings, who have of course developed an endless number of scientific fields (including the semiotic ones) that are specialized in analyzing these activities. Zoosemiotics likes to have a hand in the definition of music, its origins, the components that makes it a biological phenomenon, the notion of performance, the universality of the dance-music association, etc., but cannot (and would not care to) comment on Busoni’s transcriptions of Bach, history and evolution of the French horn, differences and similarities between Miles Davis and Chet Baker’s versions of *Summertime*, or the use of Pro-Tools in Radiohead’s recordings. This is a musical semiotician’s job.

Yet, zoosemiotics may (and wants to) discuss what nightingales, or humpback whales, or wolves *species-specifically* do with their music. But this is only because musical semiotics has not developed a branch exclusively devoted to these species. This is why zoomusicology is much more a part of zoosemiotics, rather than of musical semiotics (or musicology tout court). Otherwise, the objection would be just as legitimate as the one raised about humans.

Language, in conclusion, can be either an ethozoosemiotic topic (empirical or theoretical, depending on the instances), when the focus is the investigation upon the possible existence of language in non-human animal species or when one attempts to define language in a zoosemiotic sense, or it can be an anthrozoosemiotic topic of the communicational type (again empirical or theoretical), when the focus is topics such as the experimental programs on interspecific communication.

1.1.2 Zoosemiotics and the Natural Sciences

In 1995, at the Collegium Budapest, where he was Senior Fellow, Thomas Sebeok delivered an important paper (reprinted in Sebeok 2001: 59–73), discussing the initial conditions for a relationship between semiotics and biological sciences. He rhetorically wonders what probably most biologists *really* have been wondering about the alleged necessity to let semiotics participate in the natural sciences' discourse: "If one accepts the intrinsic identity of the life science and the sign science, combining at their root into a "natural semiotics" [...] the question still lingers: what is gained thereby?" (Sebeok 1995: 6).

The scope of this paragraph is thus to explore the affinity between zoosemiotics and other natural sciences, and to explore the *role* played by each of them in the construction of the zoosemiotic scientific discourse.

Ethology is inevitably the point of departure, and the major focus, first because the similarity of interests between the two disciplines goes well beyond the differences in methodologies and "philosophy", and second because this connection was already in the agenda of zoosemiotics since its early days. In a 1969 article entitled "Semiotics and ethology" (in Sebeok-Ramsay 1969: 122–161), Sebeok presented the terms of this connection, with the additional service of a very detailed bibliography of, so to speak, "converging" studies. At the time, Sebeok had set important task of showing ethologists (and biologists in general) that the systematics of zoosemiotics was a very effective way for classifying communication, as behavior, and that its theoretical tools had great potentials for analysing it.

As it was already emphasized in the previous paragraph, the early steps of zoosemiotics were mostly characterized by the use of this term as a general way to label the various approaches to animal communication. Not yet having an approach of its own, zoosemiotics was borrowing from the classical ethological school much more than it was lending. The innovations that occurred in ethology during the 1970's, however, determined an advancement that, perhaps by coincidence, perhaps not, had serious repercussions on zoosemiotics as well. "Cognitive" became a key-word for both fields. The idea that there could be an intermediate stage between a stimulus received by an organism and its behavioral response, completely bypassed by behaviorism, was adopted by both ethologists, in the form of "cognitive processes", and by zoosemioticians, in the familiar form of "interpretation".

If the classical ethology of Lorenz or Tinbergen "was the product of the contemporary behaviourist milieu, and the founders of ethology generally had little positive

to say about the possibility of understanding the inner workings of animal minds by scientific methods” (Colin Allen, at host.uniroma3.it/progetti/kant/field/ceth.htm), the new cognitive trend was now devoted to the “the evolutionary and comparative study of nonhuman animal thought processes, consciousness, beliefs, or rationality, and [to] an area in which research is informed by different types of investigations and explanation ” (Bekoff 1995: 119). Although some of the contents of this discipline were already anticipated by Darwin and some of his followers, the birth and definition of the term took place only after Donald Griffin’s crucial book, *The Question of Animal Awareness* (1976). Griffin had introduced the topic in the following way:

Ethologists and comparative psychologists have discovered increasing complexities in animal behaviour during the past few decades. [...] The flexibility and appropriateness of such behaviour suggest not only that complex processes occur within animal brains, but that these events may have much in common with our own mental experiences. To the extent that this line of thought proves to be valid, it will require modification of currently accepted views of scientists concerning the relationship between animal and human behaviour. Because of the important implications of these developments in ethology, [cognitive ethology] will examine both the pertinent evidence and its general significance in the hope of stimulating renewed interest in, and investigation of, the possibility that mental experiences occur in animals and have important effects on their behaviour. (Griffin 1976: 3–4)

A position like Griffin’s, courageous at the times, gave cognitive ethology in the long run a more established and visible role, and a large following, too. Zoosemiotics was one of the fields that took up the challenge. Sebeok (1981) contains already several hints in that direction, while, in more recent times, it is safe to say that most efforts in zoosemiotic research have explicitly embraced this approach, present companion included. Such a development must be considered a significant step forward, and even a crucial presupposition in order for zoosemiotics to exist, at least in the sense of an autonomous semiotics-based discipline. “The complexity of animal communication systems cannot be explained except by assuming that animals do have a mind. What does it mean to have a mind? A first definition may be the following: to have a mind implies at least the capacity of (i) guiding one’s own behaviour from the “inside”, on the basis of projections not directly connected with what happens outside; and (ii) elaborating and transforming such representations [...]” (translated from Cimatti 1998: 9).

Other branches of ethology are in a significant relationship with zoosemiotics. To start with, one must count in all those specialized fields that focus either on a specific portion of animal semiosis (e.g., acoustic signals for bioacoustics, sociality for sociobiology, and so on), or on a given species/family/order (like in the cases of ornithology, cetology, primatology, entomology, etc.). It is crucial for the zoosemiotician to keep up to date with the developments of each of these disciplines, even when (as in the case of bioacoustics) the communion of interests does not correspond to a communion of conclusions (it is safe to say that bioacoustics and zoosemiotics run in the same direction, but on two parallel tracks).

In an ideal world the zoosemiotician may, without fear, answer Sebeok’s rhetorical question: “what is gained [by merging the life sciences with the sign sciences]?”.

Zoosemiotics, when (1) scientific and (2) up to date, provides a set of theoretical strategies and conceptual bridges that *support* and, with a bit of luck, *improve* the study of animal semiosis (if anything, at least making it clear that “communication” is not the only phenomenon related to information production and reception). Most of all – something that semiotic studies have always been good at – it provides a reliable, flexible-yet-consistent, methodology for framing the different and diverse semiotic phenomena.

The dialogue with natural sciences has not been awfully active, but it has been constant, and has produced remarkable results. It is a mutual relationship that is needed, and wished for, from both sides, not only the zoosemiotic one:

Interdisciplinary efforts, despite possible pitfalls (. . .), are essential in our quest for knowledge about animal minds. In these joint efforts, open minds and pluralism would also be useful at this stage of the game (. . .). Philosophers need to be clear when they tell us about what they think about animal minds and those who carefully study the behavior of nonhumans need to tell philosophers what we know, what we are able to do, and how we go about doing our research. Although providing alternatives might not be a requirement in thought experiments that conclude that animals do not have beliefs for one or another reason, it would be useful for students of behavior to be presented with some viable alternatives that could be used in their empirical investigations. If it is because philosophers do not have the experience with empirical work that allows them to make realistic suggestions for experimental design, then it would be useful for philosophers to watch ethologists at work (. . .). This experience might allow philosophers to gain a better understanding of what ethology is all about. Even then, it may be the case that ethologists are ill-advised to look to philosophers for a crisp and empirically rigorous definition of intentionality (for example), even if some philosophers promise to provide one (. . .). (Bekoff 1995: 139)

1.1.3 Zoosemiotics and the Human Sciences

The connection with natural sciences is not zoosemiotics’ only interdisciplinary task. The truth is, human sciences are nearly as important as the biological ones, at least in the development of specific areas of inquiry of the zoosemiotic field.

As always, everything departs from philosophy, for at least three reasons:

- (1) *Historical*: the fact that zoosemiotics was born in 1963 does not mean that the interest in animal semiosis dates back to that year. Questions that are relevant for both the etho- and anthro-zoosemiotic areas have been raised regularly since the dawn of philosophical thinking (a schematic summary will be provided later). Several authors, each in their own way, and within a specific context, have been dealing with semiotic manifestations in non-human animals. Terms like “communication”, “sign”, “cognition” have of course been employed according to the personal definition of each given philosopher, or according to the definitions dominant in a given period, allowing an extraordinarily heterogeneous picture to emerge, comprised of mere speculation and/or empirical research, anachronistic and/or future-oriented hypotheses, sharply focused and/or allusive arguments.

- (2) *Ecological*: in the Chapter 5 to the present companion, issues like the anthropocentrism/non-anthropocentrism debate are discussed. The question of the *approach* to animal-related topics, which (it will be shown) is relevant also at sociological level, was abundantly discussed in philosophy as well.
- (3) *Ethical*: also in the Chapter 5, it is suggested that engaging in the ethical implications of zoosemiotic research should not be considered out of place, and may in fact prove useful also at strictly scientific level. There exists, nowadays, an entire philosophical school (with followers like Peter Singer, Tom Regan or Mary Midgley) devoted to the discussion of non-human animals as moral subjects.

Considering that points 2 and 3 of this list are more fully discussed in the Chapter 5, it shall be worthwhile to spend a few more words on the historical aspects of the relationship between zoosemiotics and philosophy, a topic we might easily name “proto-zoosemiotics”. It would be an absurd task to attempt to summarize *all* the philosophical contributions to animal semiosis, neither could the selected ones be provided without a lengthy introduction. All that seems reasonable to do, for the purposes of a companion, is to *list* a few of the important and/or influential thinkers of western history, trying to point out the essential data that might prompt the reader into a specific inquiry. The list below is organized according to the following principles:

- (1) The list proceeds in chronological order.
- (2) When the inscription “About him” appears, it means that the information available was reported by other authors who wrote *about* the given philosopher. This will particularly be a case with ancient philosophers whose work we know only through post-mortem accounts.
- (3) The determination of relevance is based upon the following criteria:
 - (a) Interest of the given work within the topics dealt with in this companion,
 - (b) Interest of the given work within the topics dealt with in zoosemiotics in general,
 - (c) Interest of the given work within the topics dealt with in general animal studies,
 - (d) Length of the argument (the liberty was taken to omit a few works and philosophers whose mention of animal issues was merely *en passant*, and to consider very short mentions of “low relevance”, unless truly important, in the historical and philosophical sense – e.g. Bentham’s brief but crucial argument on animal ethics)
- (4) This summary will omit mentioning animal scientists with philosophical relevance (like Darwin or Lorenz), or animal right philosophers (like Singer, Regan or Midgley) whose work is *obviously* unavoidable, and therefore does not need to be mentioned in these pages.

Philosopher	Work	Parts	Topics	Relevance
Anonymous, various	<i>Bible</i>	Genesis, Psalms, Exodus	Human domain over other animals, animal sacrifice for human benefit	Middle
Anaximander (ca. 610–546 b.c.)	About him	–	Human origin from other animal species	Low
Pythagoras (ca. 570–490 b.c.)	About him	–	Cruelty to animals, vegetarianism.	Middle
Heraclitus (ca. 550–480 b.c.)	About him	–	Human irrationality	Low
Empedocles (ca. 492–430 b.c.)	Fragments	104, 117–119, 122	Cruelty to animals, vegetarianism.	Low
Anaxagoras (ca. 492–428 b.c.)	About him	–	Animal intelligence and <i>logos</i>	Low
Democritus (ca. 460–370 b.c.)	About him	–	Human origin from other animal species, origins of arts in animals	Middle
Plato (ca. 427–347 b.c.)	<i>Phaedrus</i>	248e–249c	Human reincarnation in other animals	Low
	<i>Statesman</i>	XVI, 272b–e, 273a–c	Human-animal coexistence	Low
	<i>Laws</i>	VII, 823–824; XII, 961d	Hunting, Soul and intellect in living beings	Middle
	<i>Timaeus</i>	XII, 41a–d; XXXIII, 76e; XXXIV, 77a–c; XLIV, 90e–92ac	Human-animal biological continuity	High
Aristotle (384–322 b.c.)	<i>On the soul</i>	Book II, Chapter III	Human distinction from other animals	Middle
	<i>History of animals</i>	All	Zoology, ethology and taxonomy of animals	High
	<i>Parts of animals</i>	All	Zoology and taxonomy of animals	High
	<i>Movement of animals</i>	All	Principles of motion in animals	High
	<i>Progression of animals</i>	All	Motion and anatomy in animals	High
	<i>Generation of animals</i>	All	Reproduction in animals	High