

## **Part I: Foundation of Activity Theory**

### **Chapter 2: Being and Becoming-Ontology and the Conception of Evolution in Activity Theory**

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**PART I**

**FOUNDATION OF ACTIVITY THEORY**

## 2. Being and Becoming

### Ontology and the Conception of Evolution in Activity Theory

As mentioned in the first chapter, this treatise is about a specific anthropological theory, Activity Theory. In the first chapter, the historical tradition of Activity Theory was discussed. Before presenting the core of the theory, however, I will introduce and discuss its philosophical basis. This philosophical footing is comprised of the *basic concept of reality* and our *knowledge of this reality*. The current chapter presents the former, the *ontology*, and chapter 3 presents the latter, the *epistemology*.

#### 2.1 Ontology

Ontology is the philosophical discipline that explores the question of *being*. Thus, the ontology of Activity Theory must answer such questions as, “What things exist around here?” “Are there different modes of existence?” Moreover, although epistemological in nature, “How are we, the *subjects* discussing ontology, related to the *entities* we are discussing?”

In principle, I will distinguish between the *object matter* of ontology (i.e., the category of *the ontic*, and the content of ontology itself) and *the ontological* (i.e., the description of the ontic). This is in principal, because when there is no danger of confusion, I may be a little lax in the terminology.

The reason for going into ontology, a somewhat foggy field within metaphysics, is that there are, actually, some rather important controversies in science related to ontological problems. This is true especially in a scientific field such as anthropology that is in itself somewhat foggy. This is even more appropriate for a theory like Activity Theory, which most of my colleagues within anthropology find at least misty. There is indeed a lot of ambiguity or controversy about the existence of what we are discussing.

When a clinical psychologist talks about a *personality conflict*, or a *defence mechanism*, not to mention a patient’s *narcissistic personality structure*, is this psychologist postulating that the term refers to something that exists? When the

sociologist discusses *class tension* and *ethnic conflicts*, how or where do these phenomena take place? When the cultural anthropologist describes a *culture* he or she has studied, what is this entity called “culture”?

Scientific controversies are largely about positive or negative assertions of existence.<sup>1</sup> For instance, the radical behaviourists often state that *mental phenomena*, not to mention *mental agencies*, do not exist, whereas *behaviour* does exist. The main goal of the deconstructivist school of social science is to negate assertions of existence, implying that there are no objective entities corresponding to concepts like culture, as these concepts are merely social constructions.

### 2.1.1 To be or not to be

Parmenides is generally presented in the history of philosophy as the antagonist of Heraclite, the former being the founder of the Eleatic doctrine of invariance, asserting the illusory character of perceived change, the latter being the father of dialectics, teaching the illusory character of perceived identity and the permanent flux of change. I have already announced my affiliation to the Heraclitic line, but I admit that Parmenides had a valid point when he refused to talk about non-existence.<sup>2</sup> We are involved in an embarrassing conundrum when we state that *something does not exist*. The very linguistic form of the statement suggests an object-predicate logic, the something not existing being the object and the predicate being existence. Modern logic to a certain extent has solved some of the paradoxes that were obstacles to Parmenides.

Since Russell, however, the set corresponding to the description of the object is empty. The exact meaning of the sentence that, “the celebrated Scottish monster called Nessie does not exist,” should thus be that, “the extension of the set of huge aquatic animals living, at the time being, in Loch Ness is nil.” However, if we attempt to analyse the content of the term “Nessie”, we would soon be in trouble.

It would be unsatisfactory to simply suggest that the term is meaningless, because nothing with that term as its name exists. Nonetheless, we may be able to go on living without any clear solution to the semantics of Nessie.

However, when some psychologists assert that the number of narcissists is increasing and other psychologists deny that such a category of individuals exists, it reveals an ontological problem in psychology as a discipline. Likewise, some years ago the PLO declared itself to be the exile government of

Palestine. Israel, on the other hand, denied that there was such a thing as a Palestinian people. This was a dispute of not only ontology, but also of an important political matter.

To clarify our ideas of existence, we first have to specify the *coordinates* of existence. The existence of something means that this something has existed in a certain interval of time and space. Talking about such an entity as the Sumerians, we cannot just bluntly deny their existence. Instead, we say that between about 4,000 and 2,000 BC, these people populated the area of the Middle East called Mesopotamia.

Of course, we do not have to specify this when we refer to something present, the here-and-now specification has a privileged status: it is normally unmarked as a deictic default.

Nonetheless, my primary concern is not problems of spatial-temporal specification, but deeper problems of existence. In the Israeli-Palestinian conflict, the Israelis did not deny the existence of some people calling themselves Palestinians, nor did they deny the existence of such people going to the extreme of announcing their own government. What they did deny was that these individuals constituted a *people*.

The Israeli government perceived their antagonists *not* as a people entitled to a state, but as a criminal terrorist organisation. In a way, this conceptual aspect of the Middle East conflict may be more correctly understood as a semantic, not an ontological antagonism. However, it is not always easy to distinguish between ontological and semantic questions. Not many people would be willing to sacrifice their lives to fight for a semantic position, but for millions it is a matter of life and death whether a certain category of people is to be recognised as a nation or not.

The following examples should help to clarify the relation between ontology and semantics. Are there any entities corresponding to physical concepts like *black holes* or *quarks*, or even a concept with a firmer standing such as the *electron*? In the psychological arena, how do we make up our minds about the disputed ontology of the *superego*, not to mention the *mind* (that we are making up so often, without ever really knowing what is). And what about the *aura* of a person, the postulated mental surrounding that is a popular object of diagnosis and even massage in some varieties of modern therapy. Of course, an ardent materialist could bluntly deny that statements referring to "aura" have any meaning at all. However, I can suggest an alternative way to deal with such

problematic entities. Partly concurring with Parmenides, I am rather reluctant to make a total verdict of non-existence. This is true as well for the supposed referents of “Unicorn” and “God” or “The holy spirit”.

Generally, I am heading in the direction of redefining rather than denying the existence of referents of elusive concepts like the ones just mentioned. These concepts may be misunderstood and misrepresented, very often because they are thought of in a context to which they actually do not belong. In particular, the misrepresentation can be a mis-categorisation. Therefore, the re-definition will often be a re-contextualisation and a re-categorisation.

Any kind of ontological critique, even as moderate as the one proposed, at best will be a criterion for the weakness of the positions criticised, but not a criterion for its validity. To argue for the validity of a certain ontological position, we need an explicit criterion to acknowledge something’s existence. Incidentally, it should be noted that what I am suggesting is *a criterion for acknowledging existence*, not a *definition of existence*, which is evidently something entirely different.

### 2.1.2 Practical Necessity as a Criterion for the Acknowledgement of Existence

I will now propose the following criterion:

We acknowledge something as existing when we are *forced* to realise its existence, thus being *unable to deny its existence*.

And conversely:

We can deny that something is in existence only when we are *not forced* to realise its existence, thus being *unable to assert its existence*.

In fact, this criterion for the acknowledgment of existence is a key to developing an ontology, but is not an ontology in itself. Therefore, the criterion should not be understood as a definition of existence. In this form, the criterion would be a position of extremely ontological idealism: our refusal to acknowledge that something exists implies that we are throwing it out of existence. Yet, often entities have existed long before their presence was known by human beings. The crucial question is whether there are also entities in existence that never *will* be known by human beings. As a metaphysical postulate, this seems quite plausible to me. However, according to my own criterion, I have to deny *not* their *existence*, but the *acknowledgment of existence* of such entities until their time of arrival, when they can nicely and orderly announce their existence.

Furthermore, the plausibility that there is more in existence than human beings are aware of is implied by the specific relativity theory that we enclose within a triangle of space-time (the apex being the point of Here and Now), outside of which we are unable to receive information.

Events happening a billion light years away thus will not be available to us within the next billion years. Having emphasised the nature of the criterion for the acknowledgment of existence, I will explain its implications and present the merits of the criterion.

What, then, is the supreme court of ontology that forces us to accept something as existing? This court is our mundane practice. Recently, the so-called hole in the ozone layer has been the centre of controversy. Currently, there is widespread acceptance that this hole exists, because the apparent effects of this phenomenon seem to be a threat to our very existence.

My criterion is very much inspired by international law, in which there are two concepts for the *recognition of one state by another*. On the one hand, there is the *de jure* recognition, where a new state or a new government of an old state is recognised by the legitimate ruler of a certain territory. This is the normal state of affairs. Sometimes, however, a new state or government is only recognised *de facto*. The recogniser would rather not recognise the new political entity at all, because the recogniser does not consider it legitimate. The *de facto* recogniser is more often than not very reluctant and has probably taken a long time to admit that the new entity is in existence. The *de facto* recognition is something like the following: "I wish you had never come into existence, and I

actually hope that your existence will be short. As it is, I will have to admit that you are a (n) (uncomfortable) part of reality.

If we now go back to the Israeli-Palestinian dispute, for some years one of the following three scenarios has been destined to happen:

1. In the end, Israel will deport the Palestinians to such a distance that they no longer represent any political problem, or they will beat and frustrate the political and military opposition of the Palestinians until they give up any pretences of being a particular people
2. The Palestinians and the Arabic allies will crush the Israeli military or the prolonged military and economic stress will result in a flow of Jews emigrating to more peaceful parts of the world
3. The two antagonists will, on the one hand, maintain their own political coherence and pretensions, but they will be forced, on the other hand, to a *de facto* recognition of one another

However, I will refrain from speculating on or evaluating the future of the three scenarios (the third scenario at the time being is still a rather weak newborn). The main point is that there is a connection between the question of existence and our practical relation to the matters concerned.

This is true also for scientific questions. We have to accept a psychological phenomenon as real when it forces us to do something about it. Thus, even an ardent atheist is forced to a *de facto* acceptance of the social force of religion.

My pragmatic criterion of existence introduces some serious problems. How do I distinguish between ideological oppression, on the one hand, and the force of what I call practice on the other? Thus the Inquisition and after the Reformation, even the Protestant sovereigns could enforce the dogmas of Christianity for many years. Would it not be in accordance with my criterion to say that the poor Jews or Cathars surrendering their own conviction after being tortured were just forced by practice to acknowledge the existence of the Trinity? Or that the poor women accused of witchcraft in accordance with Mallea Mallefi-



corum were moved by practice itself to admit the existence of the Devil as the agent that had seduced them to a black sabbath in his own satanic person?

Nonetheless, my immediate court of practice must be distinguished from the court of political power. By *practice*, I mean the organised activity of a societal entity. And the verdict must be a consistent one. I thus have smuggled in a scientific criterion of consistency. What is more, it is a criterion of *consistency over time*. The interesting thing is not what we momentarily find necessary to admit, but what we are forced to admit in the end: forced to admit by the *totality of our existence*, not just by a random regime in politics, religion or even science.

It is evident that this criterion of existence concerning verdicts (that they shall be consistent, and consistent over time) is actually identical with a postulate that there is a convergence in the progress of knowledge. Furthermore, that such a knowledge evolution is possible at all presupposes a corresponding political evolution. The tyranny of arbitrary religious and ideological doctrines must be replaced by a Popperian scenario of an "Open society", where a rational scientific discussion is the supreme court. This evolutionary scenario has been heavily criticised in recent decades, for instance by Lyotard (1984) and Giddens (1990a). The critics assert that an evolutionary conception such as the one advanced in this treatise is a hopelessly outdated frame of thought called *modernism* or the *enlightenment* programme. Parallel criticisms have been raised against evolutionism, and these will be discussed in the section on the phylogenic and cultural evolution of humans.

I am willing to admit the relevance of this criticism. If the coherent and convergent evolutionary course from the Renaissance until now is broken by a new Dark Age with a surge of fanaticism and repression of free thought under the burden of an ecological and social breakdown and dissolution, the whole edifice of the philosophy of science and especially of the anthropological sciences would certainly become impotent and non-functioning. Just as the science and philosophy of ancient Greece was pushed aside for a considerable period.

This means that the principle of activity is a guide to scientific questions, implying as a presupposition a certain organisation of the totality of human activity. Unfortunately, it is not certain that such an organisation will endure for the remainder of the presence of our species.

My proposal of the activity principle is co-extensive with a proposal for a certain rational and humanistic organisation of global activity. In opposition to

the neo-relativist and neo-pessimist. I find it premature and unwise to give up a belief in the continuous evolution of knowledge and a belief in a reasonable way of arranging life on this somewhat shattered planet. The remainder of this treatise is, among other things, a defensorate for this view.

This optimistic scenario for the future of humankind is perhaps just a pipedream. However, it is my intention to show that my point of view, naïve and outdated as it may be, is at least consistent, and founded on many good arguments.

We have been concerned thus far with the political and historical presuppositions for my criterion of existence. However, there is another concern: the danger of a too liberal criterion, accepting as a particular entity whatever is pestering or exciting people. I will now discuss different categories of existence that can potentially circumvent this problem.

### 2.1.3 Categories of Existence

Until now, we have primarily talked about the question of existence assuming that it can be answered by an unequivocal Yes or No. However, the examples have shown that there are several ways of being in existence. Therefore, I will introduce different **categories of existence**. By a category of existence, I mean a certain *modus of being*. I suggest that there are three of these categories, namely **phenomenon**, **object** and **essence** (German *Wesen*). I have already used the term “phenomenon” to refer to the somewhat casual mode of existence, where something just appears. An *object* is a more substantial entity: it is a member of a category of ontology and from whom we expect a more solid and dignified behaviour.

Finally, *essence* (this is the nearest term in English to what in the German philosophical tradition is called *Wesen*) is a category that refers to something that exists in an even more fundamental sense than objects. An object is an entity that can be subject to dramatic changes during its existence, whereas an essence is the ensemble of properties that have a total resistance to change, or at least a rate of change that is magnitudes lower than that of the objects to which the essence is attached.

The preceding can be considered the common sense definition of the categories and from which I will try not to retire completely. In the following, I will change the order of presentation, starting with the category of the object, as the

neighbouring category of phenomenon in a way is negatively determined by the former.

### 2.1.3.1 Object

I propose that an **object** should be defined as something that has a certain *autonomous* and *bounded* presence. An object must be locatable with a specific precision<sup>3</sup> in time and space. Its temporal presence must be coherent, and in respect to the place that the object is occupying, it should be preferably a relatively coherent region of space. Finally, an object must have a certain ontic autonomy in relation to other objects and to phenomena (of which we will talk in a moment). Even when an object is inextricably bound up with other objects, we can at least say something about how these relations are constituting conditions of existence for the object.

Evidently, many objects, which we will just call *things*, are quite unproblematic in respect to these defining characteristics: for example, a cup of coffee, which probably is the most popular item to be discussed in philosophical discussions; or an example with a more sentimental standing, a puppy. However, leaving tools and pets aside, there are of course other entities that are somewhat more intangible. These forms can be:

### Intangible Entities

1. Microscopic
2. Astronomic
3. Compound systems
4. Short-lived
5. Totally dependent on other objects
6. Natural kinds
7. Abstract concepts

In other words, 1, 2 and 3 are intangible objects, 4 and 5 are phenomenon, and 6 and 7 belong to the category of essence.

To start, I will renounce palpability as a characteristic of objecthood. Atomic particles, galaxies and nations should not be excluded from the object category for this reason. Perhaps palpability is a criterion of the narrower category of *things*, a category that therefore has an anthropocentric standing, and hence more of a specific epistemological than ontological interest. The problems of temporal and spatial coherence are better solved within the specific scientific disciplines. For example, Heisenberg<sup>4</sup>, the founder of quantum mechanics, suggested that atomic particles really existed (possessing *Wirklichkeit*, Engl. actuality), but without a thing-like existence (not possessing *Realität*, Engl. reality).

I will proceed now to the three criteria excluding entities from the category of objects: the criterion of dependence, the criterion of natural kinds and the criterion of concepts. The first criteria will be discussed under the heading of the phenomenon.

### 2.1.3.2 Phenomenon

Generally, a phenomenon is something:

that is directly present to us, but present in such a fuzzy, incoherent or transient way that we cannot accept it as an object

or it is something of which we have only an indirect knowledge, indicating that it lacks the coherence and stability of an object

or it is something of which we know too little to be convinced that it is indeed itself an object, and not just the effect of another object

A typhoon can be categorised as a phenomenon, because it fulfils the practical criterion of existence (in a rather impressive way), even though it does not possess the spatio-temporal stability and boundedness, that is, the substantiality of an object. And the same goes for a sunset, a headache, a depression, a revolution or a crash at the international stock exchange.

In this subcategory of the transient phenomena, I am referring to *processes*. However, in the main category of phenomena, I would also include another subcategory of phenomena that have more *stationary* attributes. Thus, even though it is in opposition to normal language, I will put *qualities* of objects and even of other phenomena into this category. In this way, the red colour of the sun is a phenomenon, the speed of a typhoon, the pain of a headache, the despair of a depression, and the panic of the crash, all these qualities are placed in the category of the phenomenon.

This categorisation applies to relationships as well, which can be seen *as qualities of systems of objects*. Thus, the marital bond of a couple is a relational phenomenon, and therefore is included in the subcategory of qualities.

But what about the concepts attached to these qualities?

This problem will be treated specifically in chapter 4, which concerns semiotics. Here I shall limit myself to the premature assertion that a concept is a specific instance of meaning. Meaning is a specific relation between a semiotic carrier, which is an entity (phenomenon or object) called the *sign* and the semiotic goal (phenomenon or object) called the *referent*. This brief definition suggests that a *concept* is a type of **phenomenon**.

Thus, the fifth point in the list of problematic forms of existence is placed in this category. Please note that there is an ambiguity in the use of the word "concept". Here I have talked about the semiotic meaning of a "concept", meaning exactly *meaning*, i.e., what we *mean* when using the concept. There is, however, also an *ontic sense* of the term "meaning", referring to actual conditions of the world<sup>5</sup>, to natural kinds or the essential matters concerning objects. This ontic type of meaning is discussed in the presentation of the category of essence.

The Copenhagen Interpretation of quantum physics<sup>6</sup> is that the quantum phenomena are associated with the total experimental setting, including the macroscopic instruments and the experimenter, and that there consequently is no basis for talking about atomic particles as objects. I personally do not agree with this opinion on atomic particles, but I agree with the ontological distinction between an object and a phenomenon.

According to my interpretation, the distinction made by Heisenberg (who concurred with the Copenhagen Interpretation) is that the atomic phenomena are part of *actuality* (Wirklichkeit), but not objecthood, *reality* (Realität). This interpretation is consistent with my understanding of the category of phenome-

na in relation to the category of objects. However, it is not in accordance with my understanding of the nature of the atomic particles, but that is another matter to be discussed later in this chapter.

The *aura* is a postulated object-like entity referred to (and manipulated) in certain types of therapy. This entity, which has a more metaphysical flavour than I would personally recommend, also should be seen as a phenomenon. This is regardless of the disagreement about the status of aura as being either an effect of the astral body attached to the person seen, as physiological attributes influencing experimental instruments, or as an amodal perception of a certain psychological state.

I reject the first interpretation, that the aura is the proof of the existence of an astral body. Actually, I see the assertion that a non-material astral body is the producer of the aura as a case of *hypostasy*. By that I mean a circular assignment, whereby a phenomenon is either directly elevated to the status of an object, or is more or less identified with a hypothetical object, of which we have no other evidence than the phenomenon that was our starting point.

Turning to a phenomenon like *narcissism*, I am very liberal in my phenomenology. That is, I am quite willing to discuss the phenomenon, the existence of which has been so eagerly defended by imminent psychotherapists. However, I am quite restrictive when referring to the objects, not to mention the essence, by which this phenomenon is to be understood. The interest in the phenomenon that my clinical colleagues are reporting does not necessarily implicate an acceptance of explanatory concepts like *narcissistic personality disorder*, *narcissistic social character*, or on the most grandiose level, a *culture of narcissism*.

What then is the demarcation line between phenomena and objects? What are the defining characteristics of objecthood? I will now set up a criterion in accordance with my former practical criterion of existence.

When something is shown in practice to be of such a standing that we have to deal with it at all, and to deal with it as something with an autonomous and stable existence, then we are coping with an object. Conversely, when we are dealing with something that surely exists, but only as an appearance of a specific object or systems of objects, then we are just coping with a phenomenon.

For instance, a specific typhoon being a meteorological process produced by a vast section of the atmosphere is a *phenomenon*, not an *object*. Likewise, a

depression is a phenomenon attached to the object that is a specific person, rather than an object in itself.

How are we to conceive of an atom? Around the turn of the 20th century, the famous physicist and philosopher Mach suggested a phenomenalist theory of atomic physics. Intending to circumvent dualism, he introduced a neutral monism based on what he called an "element". This term refers to what I have called phenomena, but in Mach's phenomenalist ontology it implies something that is always necessarily attached to what we call "the material world" and to what we call "experiences".

Thus, physical phenomena, according to Mach's neutral monism, cannot be separated from mind, because phenomena at the same time constitute our conception of *matter* and of the *mind*. Therefore, we cannot assert the objective existence of atoms. Atoms cannot possibly be separated from our mind. Instead of an objective standing, Mach suggested that the concept of an atom is a *thought-economic construction*. In fact, there could be arguments for this regardless of the specific ontological approach, as long as a specific physical term is referring to a hypothetical theoretical construction intending to explain as much as possible of the phenomena known in certain areas of research. However, the problem with Mach's position is that instead of offering a dialectical theory of the evolution of scientific concepts, he constructed, in fact, an anti-objectivistic metaphysics.

This so-called monistic philosophy of Mach provoked Lenin's so much that he wrote a polemic book about it. Now almost a century has passed since Mach developed his philosophy, and three quarters of a century since Lenin's diatribe against Mach.

In spite of the mentioned disagreement about the nature of atomic phenomena, the sophisticated teaching of Mach about the atom as a *thought-economic device* seems unsatisfactory today. In a world where atomic bombs and atomic plants are important parts of reality, the nature of atoms is no longer a mere matter of discussion for physicists and philosophers. The people being threatened by the radiation of Chernobyl will not be calmed by hearing that they are just victims of the effects of a thought-economic concept.

In fact, they are hit by radiation from a certain material, which happens to be radioactive atoms. What Mach seems to have ignored is that discussions should not be limited to theoretical matters, and that in the technological evolution, practical and scientific matters are connected to one another.<sup>9</sup>

Because of this interconnection, (which I shall discuss in detail in the chapter concerning science, chapter 6) we have to supplement the direct practical criterion of existence with a scientific one. The scientific criterion should require a consistent theory explaining the matters of existence. If we take an object like the Andromeda galaxy, it would be somewhat difficult to establish its existence merely in accordance with the criterion of practice. Besides the empirical observations, which are in themselves hardly demonstrating the existence of any object, cosmological and astrophysical theories are however available, enabling us to produce a convincing portrait of not only the topography of the galaxy mentioned, but also of its birth, career and family relations. The specific practice within the professions of astronomy, astrophysics and cosmology<sup>10</sup> would certainly experience an enormous crisis if they suddenly had to relinquish the existence of galaxies, such as the one named after the Andromeda star constellation.

The members of these basic sciences would not be the only ones hard hit; the total theoretical framework of natural science would be in a state of a virtual coma, and as a consequence, the high technology based on natural science would have its very basis of understanding severely compromised.<sup>11</sup>

Actually, the primarily scientific question concerning the existence of a specific object, the question of the truth of scientific theories and the question of how we human beings organise our daily lives to suit our own existence are closely interrelated, because technology is simultaneously a part of science and a part of ordinary practice. This is a point I discuss in more detail in the chapter on science.

A critical reader could legitimately ask about the epistemological subjects that are the decision makers in these matters of ontology. Who is to decide whose existence is linked to what questions? I prefer to postpone a more detailed discussion to the next chapter on epistemology. Here I shall merely point out the controversial alternatives:



The subject could be the individual, which would dissolve ontology to the asylum of solipsism.

The subject could be some societal or historical agent, a class, a government, a knowledge regime, which would reduce ontology to ideology.

Finally, the subject could be transcendental like the Hegelian *spirit of the world*<sup>12</sup>.

I hold a variant of the latter position. The subject making decisions about knowledge, however, is not *the ghost of objective idealism*, but *the cultural history of humans*. Which of course presupposes a belief in human progress; this belief developed during the period of Enlightenment and is nowadays ridiculed by the deconstructivist and post-modern thinkers.<sup>13</sup>

After this epistemological excursion, I return now to ontology. In the list of the problematic forms of existence that are not *things* in the daily meaning and may not even be *objects* in the extended meaning, the two last points are *natural kinds* and *abstract concepts* in the ontic sense. I assert that these points do not fit into the category of either phenomenon or object.

### 2.1.3.3 Essence

In our daily existence and even more in our scientific activity, we are quite often dealing with things that can be placed neither in the *category of objects* nor in the category of *phenomena*. When we are talking about the *personality* of a specific person or of the *culture* of a certain country (or if so preferred a certain people), or just perceiving a certain animal as a dog, we are referring to entities of a more mysterious nature than the two preceding categories.

An entity of this kind is often called a *concept*, but this term is seriously ambiguous. It is difficult to decide whether we are just thinking of the linguistic or cognitive phenomenon that appears in our speech or thoughts, or whether we are designating something objective, an entity of an extra-linguistic and extra-psychological nature.

To start with the simplest sub-case of this evasive category, we can take the last example mentioned, the natural kind of *dogs* (i.e., the universal concept signified by the term "dog"). We shall then proceed to the issue of the even more complicated problems associated with concepts like *personality* or *culture*.

One of the decisive controversies in the history of philosophy has been the famous diatribe on universals. A universal is a concept referring to a kind. The controversy about universals occupied a large period of time and work in medieval philosophy, but the basic positions originated with the philosophies of Plato and Aristotle.

Plato actually referred to only the ontological categories of phenomena and essence, the content of the latter category he referred to as *ideas*. He assumed that ideas were the true substance of existence and phenomena were more or less illusory reflections of the former. For instance, a specific horse cannot fulfil in all respects the specification of the concept or the idea of horse. It may be missing a limb, for instance. The *idea of a horse* is necessarily attached to the *property of being four-legged*, whereas a specific horse may have less, or occasionally even more, than this number of legs. Plato therefore judged phenomena to be the result of our somewhat poor and deluded sensory access to that which, according to his philosophy, was the origin of the phenomena.

Aristotle being more inclined to empirical science than his mathematically inspired predecessor revised this ontology by asserting a double standard of existence. A specific horse exists as primary substance, whereas the kind of horse exists as secondary substance.

In the Middle Ages, the reading of at first exclusively Aristotle, and later also Plato, led to a heated discussion about the status of universals. The dispute was dramatised by a dichotomous grouping. On the one hand, there was the party called *realists*, who asserted the existence in itself of a referent of a universal. On the other hand, the party called *nominalists* attacked the former by postulating that a universal concept referred to nothing in existence.

The extreme positions of the two schools were *radical realism* and *nominalism*. The school of *radical realism* asserted, quite similarly to Plato's theory, that a specific object had no genuine existence, whereas the universal had a genuine existence as an entity (i.e., that the universal existed *in re*). The school of *radical nominalism* asserted the contrary opinion that only the individual representative of the universal had an existence, whereas the universal itself

was only a name without any meaning whatsoever (i.e., that the universal is understood as *in nomine*, as a senseless sound). In this way, the two schools got their names.

There are two more moderate ontologies that fall between these extreme positions deserve to be mentioned. *Moderate nominalism* was represented by Abailard. Abailard proposed that the universal was present not only as a meaningless sound, but as a sensible mental generalisation of the individual member of the kind, thus he asserted the existence *in intellectu*. The other moderate position was that of *moderate realism*, found in the classical position of Aristotle. He asserted that the natural kind exists *not as something apart from its individual members*, but *as a structure of reality attached to the very existence of the individuals*.

More recently, the mainstream in science has been nominalistic, most often the moderate version developed by Occam. This was the tradition held by the English empiricists and lately by their phenomenalist and positivistic heirs (e.g., Mach). This position was found, as well, in the very influential source of logical positivism, *Principia Mathematica*. Russell and Whitehead successfully propagated the notion of all kinds as the mental constructions called sets.

I suggest that there is an ontological distinction between an *arbitrary set* (like the set of all persons with a name having P as the initial letter) and a *natural kind*. In this context, natural kinds are limited to creations of nature (i.e., the biological kinds that were actually the empirical basis for much of Aristotle's thinking, and the natural kinds of astronomy, physics and chemistry).

By a natural kind, I mean the following:

### A Natural Kind

A set of objects having not only common qualities, but even a common origin and possibly a common destiny. They must fulfil the condition of genealogical relatedness.

This definition refers to the third and final category of existence, the category of **essence**. Classification as a natural kind implies an aspect of the essence of an object. This was actually Aristotle's strategy. Moreover, he tried to capture the specific individuality of primary substance by specifying the character-

ristics that are unique to a certain individual. However, this is where I depart from Aristotle's more taxonomic and logical than historical approach.

Another aspect of essence in my ontology is of a Hegelian descent. Additionally, the concept *essence* refers not only to the *existence of the stationary qualities* of an individual object, but even to its way of changing, the essence is thus even to be understood as a *concept* of the evolution of the object.

In fact, the most important concepts of essence in this treatise are the concepts of *culture* in the social sciences and of *psyche* in psychology (more specifically, personality with respect to the human person). I will postpone the definition and discussion of these concepts to the chapters dedicated to them, but I will repeat that I distinguish between the semiotic and the ontic sense of the word "concept". If you say that *personality* is a concept, that is quite correct. The term "concept" has, however, a double sense, and there is therefore an ambiguity hidden in the assertion that "*personality* is a concept".

Thus, the word "personality" is a sign with a certain meaning. However, *the personality* of a specific person is an entity referring to everything of importance about the manner of being and behaviour of this person, not only his or her stationary attributes, but even his or her total pursuit of life. The relation between the *semiotic* and *ontic* aspects is that the ontological category of essence cannot be perceived directly via the senses, as both Plato and Aristotle rightly asserted. This is at the same time a very elusive and a very important fact of life. An Essence can only be understood through its semiotic representation, i.e., the *meaning of the concept*, a meaning that we have to represent in words. The most efficient way of grasping the essence of the objects in the world is by developing scientific concepts, especially the concepts of essence, or the essential concepts.

In this trichotomite ontology, the *object* is the central category from a *realistic* position. The *phenomenon* is central from a *phenomenalistic* position. However, the *essence* is central from a *scientific* point of view. The very task of science is to search for what is essential in the empirical phenomena. Even in daily life, it seems rather difficult to maintain the very identity of a certain object over time, because with the often immense changes in the phenomenal appearance of the object, one must consider the essence of the object.

For example, consider Adolph Hitler's personality development from his youth as a social loser in imperial Vienna to his career as *Führer* of a Germany on the verge of world domination. We do not conceive of this impalpable entity

*personality* to be an invariant, the psychological traits being unchanged during this 30-year period.

Rather than such a stationary set of invariant attributes, we are thinking about a biographical coherence. This coherence guides the development from his initial state of frustrated impotence (characterising the unsuccessful artist in Vienna) to the later state of near-omnipotence (of the dictator and war lord) to the final state of the bitterness and contempt (of the defeated warrior). This biographical history can be perceived as the course of an individual life, an individual life to be seen, if not understood, as a totality. This unstable (dynamic) and intangible (basic) entity is the *personality* of the individual, and more generally, it is the essence of the object.

We are dealing with matters of essence all the time in our daily life, but ultimately the area of practice is unfit to decide these matters. The area evolved to deal with matters of essence in an appropriate way is theory, in other words, scientific activity.

#### 2.1.3.4 Forms of Existence and Modes of Appearance

This discussion on the distinction between phenomenon, object and essence has revealed a certain ambiguity in the use of these concepts. On the one hand, they were applied to *phenomenological* matters (i.e., the way we perceive or understand what is present to us). On the other hand, they were used with purely *ontological* matters (i.e., regarding what we assert to be actually out there). I suggest using the categories for the **modes of appearance** when referring to phenomenological matters. When we discuss ontology, I propose using the three categories of the **forms of existence**.

This distinction is of particular importance when we use the word “phenomenon”. It is my assertion that we can consistently use “phenomenon” as a phenomenological concept about an appearance that lacks an object- or an essence-like quality. In other words, this should be the case whenever we perceive something as having a certain fluid or un-substantial appearance, and we are without the necessary competence or interest in making a verdict about the ontic basis of the phenomenon. This is referring to phenomena such as “aura” or “narcissism”.

Thus, without much argument we can characterise all of these matters as phenomena by their *mode of appearance*. On the other hand, I want to reserve the alternate meaning, *form of existence*, to phenomena that really *do* have an

actuality independent of the subject that has knowledge of them, but that do not have the boundedness, substantiality or stability of an *object*, or the fundamental quality of *essentiality*. Maybe we could make the distinction between a phenomenon as a mode of existence and a phenomenon as a form of existence by understanding the first as **phenomenonlike-ness** and the second as **phenomenon-hood**.

In other words, we can carefully start to describe *aura* by its **phenomenonlike-ness**, and then we can proceed to investigate the arguments (pro and con) concerning the *form of existence* of this aura. The possible conclusion of this investigation, but certainly not the necessary one, is the **phenomenon-hood** of the entity in question.

Likewise, I will make a distinction between the phenomenological and ontological use of the word "object". In the first sense, we talk about the *object-like quality* of an appearance, in the second about something actually *being an object*. Here I suggest that we should talk of **objectlike-ness** when we are discussing *mode of appearance* and **object-hood** when discussing *forms of existence*. For instance, in the case of the phenomenon of *aura* (here just perceived as a mode of appearance), it is experienced, no doubt, as an *object-like mode of appearance* by the aura-therapist or -masseur.

Thus, asserting the phenomenonlike-ness of the aura seems to be a purely phenomenological fact. This has quite a different meaning from the much more controversial assertion about the existence of the objecthood of the aura. The fundamental disagreement does not begin with the statement of *phenomenonlike-ness of aura*; it starts, however, when an aura-therapist proceeds to assert the *objecthood of the aura*.

For the term *essence*, I also will distinguish between a phenomenological and ontological meaning. An appearance can have an *essence-like mode*. On the other hand, we can talk of the *essentiality* or *essencehood* attached to qualities contained in a certain concept. For instance, many clinical psychologists perceive the attributes of a narcissistic personality structure as having a very essence-like quality regarding the way a certain person is perceived. This, no doubt, can be a useful way to view clinical problems.

On the other hand, there is also the strictly theoretical assertion that narcissism is the basic trait of the personality of a certain individual or even of our entire contemporary culture. In this case, the issue is not that narcissism has a

certain essence-like mode of appearance, but that it is assumed to be an aspect of the essencehood of the persons involved.

### 2.1.3.5 The Dialectics of the Forms of Existence in the History of Science

The distinction made between forms of existence and modes of appearance is not to suggest that our judgment about forms of existence is purely subjective, otherwise we could be satisfied with the categories of the modes of appearance. There is, however, an epistemological and meta-scientific problem associated with the historical process by which we assess the form of existence for an object of investigation.

Returning to atomic physics, the concept of the atom started as a purely speculative theory of essence in the materialistic school of natural philosophy.<sup>15</sup> In the evolution of the field of chemistry during the 19th century, it matured into a concept of the essence of the chemical substance consisting of a composition of elements, the concept of the element gradually being made scientific via an empirical foundation of chemical experiments.

However, it was not before the turn of the century, with the discovery of the radioactive elements and the types of radiation attached to these, that the new atomic physics, led by Rutherford, was able to design a series of experimental investigations on the mysterious microcosm of the still hypothetical atoms. What Rutherford did observe, of course, was just the phenomena of secondary radiation from a target that was hit by other sources of primary radiation. This appearance, however, enabled him to develop a theory of the specific essentiality of the atom.

This was the famous model of the atom, with the beautiful structural correspondence between the microcosm of the atom and the macrocosm of the solar system. The radiant phenomena that appeared for the atomic physicist was soon upgraded when it acquired a firm empirical base. This empirical base was developed in conjunction with the search for the still hypothetical entities: that is, the *atoms that* were the intended goal objects of the experiments.

This is where the mentioned dispute began about the objecthood or the lack of objecthood of the "atom", a discussion involving, for instance, Mach, Bohr and Heisenberg (and from a position of what could be called *political metaphysics*<sup>16</sup>, even Lenin).

We shall return to this problem of atomic objecthood shortly. However, what I would like to point out is that the very evolution of such a professional domain

with its own perceptions, manipulations and conceptualisations produces an amodal objectlike mode of appearance.<sup>17</sup> According to my criterion of existence, when the objectlike-ness of the atom is propagated by technological implementations (here the nuclear technology) to people as an important and inevitable fact of life, we actually have to admit the object-hood of the atom. This is the case even when a specific objecthood of the atom appears in a baffling and unfamiliar way, at least in the beginning.

The atomic physicists, however, were not satisfied with an empirical basis of the atom as an object, or if preferred, a phenomenon. The theoretical physicists wanted to know the essence of these objects, respectively phenomena.

Characteristically in the history of chemistry, a theory about the essence of chemical substances tends to be more specifically a theory of the existence of more fundamental objects or phenomena. The *essentiality* of the chemical substance involved at first the hypothetical *object-hood* of the componential atoms.

The objects on the level of the chemical substance are the molecules, the essence of which is explained by the composition of their constituents, the atoms. However, this reductionistic type of explanation only has heuristic value if the enormous number of chemical substances are characterised by chemical observations. These chemical observations then must be explained by the assumptions of the chemical substance as a composition, the constituents of which are a strictly limited number of qualitatively different atoms.

The number of elements increased dramatically as an effect of this very endeavour undertaken by science and by its twin sibling technology. Therefore, the chemists had to abandon the hope of the parsimony of the kinds of atoms<sup>18</sup> and instead look for chemical invariance, not on the level of the chemical *composition*, but within the very system of *elements*. This system was the periodic system<sup>19</sup>. The essential differences and similarities of the elements were thus explained by an abstract system, and of course this was promising as a beginning, but not very satisfying as a result.

To proceed, science had to look for a more substantial explanation, and this could only be found within the structure of the atoms; that is, the composition of atomic particles. This is where chemical explanation ended and atomic physics began.

Just as with the analysis of the essence of the chemical substance, the essentiality of the atom was considered an abstract structure, and this was explained



by the assumption of the object-hood of some even more minor hypothetical objects called *atomic particles*. We see here a dialectic of three ontological levels: the level of the chemical substance, the level of the atom and the level of the atomic particle.

Again, the ontological status of the new found entities was discussed and disputed. An important ingredient of this discussion was the mixture of a phenomenon-like appearance (the wave-like behaviour of the atomic particles) and an object-like mode of appearance (the particle-like behaviour of the atomic particles).

The next problematic step in this developing story concerned not only establishing the *nature* of the new entities, but also their *number* as well. So many new particles were being discovered by the researchers in the newborn field of particle physics that the elegance and explanatory parsimony of the reduction from the level of the atom to the level of the atomic particle was severely depreciated. Actually, the number of atomic particles discovered soon increased to about the same magnitude as the number of elements.<sup>30</sup> The strategy used was precisely the same as the one developed in the field of chemistry. The particle physicists began to look for structural invariance in the baffling number of atomic particles. And once again, there was success. The structure of the atomic particles was expressed in the so-called gauge theories. The objects that were designated as being atomic particles had their essence expressed in a purely mathematical way, as had been done with the periodic system. Again, this purely mathematical representation of essence was unsatisfactory. A more solid explanation was sought, and again the answer was a new hypothetical type of object conceived as the carrier of the already found mathematical structure.

This new endeavour, called particle physics, is thus the child of atomic physics and the grandchild of chemistry. The main hypothetical constituent of particle physics was named the *quark*. Just as chemistry started with just four elements, and atomic physics with three atomic particles, the new field optimistically tried to restrict itself to three or four quarks. The hunt started again for empirical evidence of the new hypothetical objects. Just as with the atom and the atomic particle, initially there was healthy scepticism concerning the reality of these sub-constituents. However, now after 30 years, there is hardly any particle physicist doubting the existence of the quarks.

Actually, the historical pattern, already seen twice, is now about to be repeated for the third time. The number of quarks and their related sub-particles, the

so-called leptons, is now increasing in a rather embarrassing way. And of course, structural theories are created to explain the essence of the different quarks. During the last 10 years, a new hypothetical sub-sub-particle, a component of the quark, has been proposed. However, here is where my story ends, for this new hypothetical entity is yet without any empirical basis.

I have kept my discussion on the dialectics of the modes of appearance and the epistemological discovery of the forms of existence to the history of natural science, because it is the best-known area of knowledge. It is, however, an example of what I see as a general trend in the evolution of the Human's understanding of the world. It also demonstrates the interplay of the use of the categories of phenomenon, object and essence.

What seems to be the general pattern is a progression from phenomen likeness to objectlike-ness to essencelike-ness in the amodal perception of the natural scientist. Additionally, there is a parallel development of argument for first the *phenomen-hood*, later **the object-hood** and finally the *essence-hood* of what is discovered. The progression on a superior level seems to presuppose a related progression on its immediate following level. To establish the essentialities of the chemical substances, the recognition of the objecthood of its constituents, the atoms, was needed. To proceed from the abstract structure of the periodic system to the theoretical understanding of the essentialities of the atoms, the objecthood of their constituents needed an empirical foundation. Finally, the essentiality of the atomic particles was at first described in an abstract system only, but soon there was a search for an explanation of this abstraction by presupposing the objecthood of somewhat hypothetical entities called the quarks.

Perhaps the transition from the status of *phenomen-hood* and only hypothetical objecthood to established objecthood is not the story of a change from one to another of two clear cut (dichotomous) categories, but rather a matter of what is called fuzzy logic. That is to say, there is a gradually increasing conviction among the scientists about the reality of an entity. Perhaps the same pattern is found in the parallel transition of the status of *essencehood*.

## 2.2 Conception of Evolution (Genealogy)

In the title of this chapter, I have placed the *conception of evolution* as a philosophical discipline parallel to that of ontology. The philosophical background of Activity Theory is the tradition of dialectics from Heraclites to Marx. Within this frame of reference, *being* cannot be properly understood in abstraction from *becoming*, consequently *ontology* and *evolutionary theory* are understood as inseparable. Nevertheless, traditional philosophy has been dominated by the Parmenidian-Platonian tradition of immutable invariance, and therefore no common concept has been coined for a philosophical theory of evolution.<sup>21</sup>

Therefore, I will propose a somewhat odd term for this, namely *genealogy*, a term that generally means the pastime of finding, hopefully, something interesting among one's ancestors. After having been ignored by philosophy, the idea of evolution at last got a stable foothold in biological science with Darwin's theory of phylogenetic evolution. Vico's (1986) and Hegel's (1986) theories of historical evolution were proposed. With Marx's theory of socio-economic evolution, the social sciences got a genetic theory, which since its birth has been rightfully disputed, not only by social science, but also by the historical evolution itself. The theory of the material forces in human history has, nevertheless, an impressive theoretical consistency and an overwhelming empirical basis.

Psychology borrowed the idea of evolution from Darwin, around the turn of the last century, with Freud's integration of a theory of sexual development in the system of psychoanalysis and Binét's founding of developmental psychology (Piaget and Vygotsky being successors in developmental psychology).

Paradoxically, the most basic of all sciences, the sciences of pre-biological matter (i.e., the disciplines of astronomy, physics and chemistry) were the latest to develop a theory of evolution. One possible reason for this is that in these sciences, the anti-dialectic tradition has had its greatest triumphs originating with Pythagoras (the godfather of Parmenides and Plato) and culminating with Newton. The idea of eternal, immutable laws is not easy to combine with the idea of development.

Since World War II, the dominating area within the astronomical field has been cosmology, with Hubbell as its empirical parent. Hubbell discovered that the red displacement of light from a celestial body increases with the distance

from the observer. Einstein, cosmology's theoretical parent, by proposing his general theory of relativity, unintentionally, and in fact even unsuspectingly, provided the theoretical presupposition for an exact theory of cosmological evolution.

The so-called dialectical materialism was the official philosophy of the former Soviet Union, a qualification of dubitable value. It was, however, also the frame of reference for the founder of the cultural school, Vygotsky, and for the founder of Activity Theory, Leontiev (both of these psychologists were introduced in the first chapter). In the lifelong cooperation between Marx and Engels, it was the latter who took responsibility for codifying dialectical materialism as a coherent philosophical system, a dialectic of nature, as he called it. Engels<sup>22</sup> tried to define an abstract theory of change and evolution by setting up three laws of dialectics governing all matter. I have already criticised this idea, which aptly has been criticised by Sartre as *hyperdialectics*<sup>23</sup>.

The primary idea of this section on genealogy is to work towards an elevation of the Parmenidian and the Heraclitian tradition. I suggest that the static theories of eternal essentiality have only relative validity, because they have to be complemented with theories of change, evolution. The Pythagorean-Parmenidian-Platonic varieties of laws of nature must be combined with the theories of evolution.

Hyperdialectics in the tradition of Engels is, however, problematic because it paradoxically takes a static view on the concept of evolution itself. The very essence of evolution is supposed to incorporate general, eternal and abstract laws of nature. This makes hyperdialectics an abstraction that is problematic in two different respects:

Firstly, it is a general theory assuming the same pattern of evolution in all branches of the universe.

Secondly, these patterns of evolution are seen as eternal. The laws of hyperdialectics are elevated above the mundane dimensions of space and time.

How, then, do I see change and evolution?

For one thing, I suggest that the more static traits of *being* co-exist with the changing and *evolving* traits; the **ontic** and the **genetic** traits are thus intertwined. We should therefore never talk about ontology without having genealogy in mind, and vice versa.

In the remainder of this chapter, my intention is to provide a foundation for all the sciences, including (and up till) anthropology, by outlining a more detailed ontology than was created for the general categories in the beginning of this chapter.

I will define three fundamental ontic domains called **object fields**. The *creation*, the *essentiality* and the *history* of these object fields and consequently of their individual objects, as well as the relations between the three domains, will be described from an evolutionary point of view.

The disposition of the last part of this chapter is therefore the creation, the evolution and the nature of the three successive domains or object fields. These fields being:

### The 3 Fields of Nature

The Cosmological Field

The Biological Field

The Anthropological Field

For instance, the cosmological field will have a **cosmogony** (theory of creation), a **cosmogogenesis** (theory of evolution) and a definition of the **cosmological object field**. Of course, there is a science associated with each domain, in this case **cosmology**, but these will be treated in the chapters on epistemology and science (Chapters 4 and 5).

### 2.3 Cosmogony, Cosmogenesis and the Cosmological Object Field

For the past several decades, the irrefutable cosmological theory has been the so-called Big Bang theory, which is a synthesis of astronomy and atomic physics. According to this theory (that surely is not incontestable, but until now has been without serious alternatives), **cosmos**, the whole universe, originated out of pure nothingness as a point-like concentration of matter, and has been expanding ever since. This is a **cosmogony**, and although it is conceptually a rather meagre one, it has the mathematical strength of Einstein's general theory of relativity. There are, however, some fundamental problems with the nature of the Big Bang itself, as it represents a singularity in the mathematical sense, and thus by the definition of mathematics itself, is placed outside the scope of its basic theory of space and matter.

Of course, there have been many speculative theories on the origin of the Big Bang itself, a favoured type being a spontaneous generation of particles by the vacuum oscillations. At present, this is the most detailed scientific theory of the creation of our universe. However, I suggest that **cosmogony** is a term for a still rather empty concept. It is a concept that seems to be a potential bearer of a content that is not yet found by cosmology.

Swallowing this unexplained cosmogony of the Big Bang **cosmology** (that, on the other hand, is no worse than the parallel creationist story of Genesis), results in an impressive tale of what immediately followed creation.

The **cosmogogenesis** of cosmology provides a timetable specifying when the constituents and objects of the universe originated; a timetable indicating the time of birth age in billions, millions and thousands of years for the larger objects, and in minutes, seconds and nanoseconds for the minor objects and constituents of matter.

One of the crucial features of this cosmology is that there is a link between ontology and genealogy. The structural relations of matter, the systemic or mereological<sup>24</sup> pattern of systems, parts and constituents of parts, is connected with the evolutionary pattern of how these entities came into being. There is a logical string between being and becoming. Cosmos is subjected to the same genetic and mereological hierarchy. The genetic hierarchy describes the succession of cosmological entities being created as:

### The Genetic Hierarchy

the Constituents of Particles  
Atomic Particles  
Atomic Nuclei  
Atoms, Molecules  
Galaxies  
Clusters  
Superclusters  
Solar Systems  
Celestial Bbodies

The mereological hierarchy is however:

### The Mereological Hierarchy

the Constituents of Atomic Particles  
Atomic Particles  
Atomic Nuclei  
Atoms, Molecules  
Stars and Planets  
Solar Systems  
Galaxies  
Clusters  
Superclusters

## A Model for the Cosmological Object Field

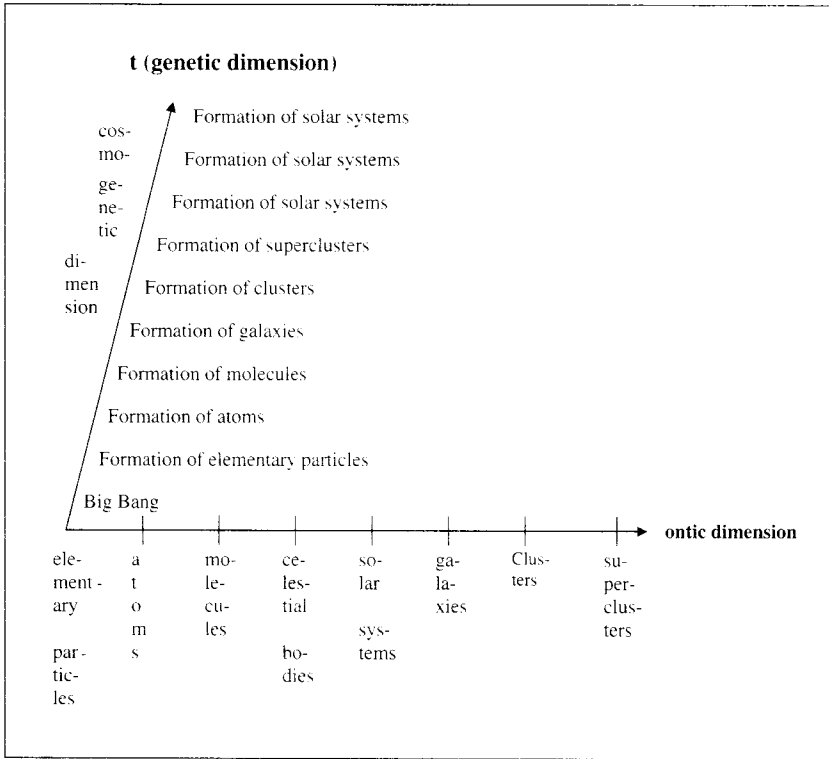


fig. 2.1

These two hierarchies are similar, with the single exception that the formation of stars and planets (i.e., solar systems) comes after, not before, the formation of galaxies.

This general correspondence between genealogy and mereology, or rather between the genetic and systemic dimensions, is referred to as the general coincidence between the part of the whole and the ancestor of the offspring. We find the same tendency in biology, and, to a certain, but less extent, even in anthropology.

Using the **cosmological object field**, I will describe the phenomena, the objects and the essential qualities created in the cosmogony and developed through cosmogenesis. I have already mentioned the hierarchy of cosmological objects. Attached to these objects are the essential qualities that are the



*basic forces of cosmos*. These forces are the four so-called fundamental forces: *gravity*, *electromagnetism*, and the *weak* and *strong interactions* of atomic physics. According to some cosmological theories, it may even be necessary to add to these fundamental forces the universal expansion of the universe.

Just like the struggle in physics to integrate knowledge of material structures by reducing them to more basic constituents, there has been an attempt to integrate the basic forces. Until now, there has been a successful integration between only two of them, electromagnetism and the weak interaction (which is responsible for atomic fission). However, there is a rather widespread optimism among particle physicists about the possibility of a further integration of the strong interaction (which is responsible for the bonding of quarks into elementary particles). There have even been some serious attempts of superintegration, by including the fourth of the fundamental forces, gravity, into a total theory. The superstring theory seems to be the most promising of these attempts. However, up to now, there is no theory combining the cosmological expansion with the fundamental forces.

Without intending a hypostasis of these essential qualities, I suggest a concept that describes the total functioning of cosmos, naming its *modus operandi* **causality**, or if you like a more philosophical flavour, **the principle of causality**.

### 2.3.1 The Principle of Causality

The **principle of causality** is simply the interplay of the basic forces in the cosmological object field. How this interplay is to be characterised precisely is of course a task for physics. I have no ambitions of metaphysical prescriptions for physics. On the contrary, I intend to get free of as much metaphysics as possible. Here, however, it is of particular importance to overcome the two strongest metaphysical trends in natural philosophy, the **metaphysics of determinism** and the **metaphysics of thermodynamic disintegration**.

#### 2.3.1.1 The Metaphysics of Determinism

The great system builders of science and philosophy in the celebrated 17th century left behind a strong belief in natural determinism: a view of a cosmos governed by *eternal and inescapable laws of nature*. This determinism was most sharply formulated by Laplace in his famous equation of the world; providing a system of differential equations, for instance, one for each atom in the

universe. Knowing this truly universal equation, a subject would be able to calculate the past of the world, and even its future, the subsequent actions of the subject included.

The only loophole in this determinism was a rather inconsistent addition of a deistic theism and an idealistic belief in the free will. Thus, determinism presented a terrible existential dilemma for human life, a severe philosophical problem for moral philosophy and later a scientific problem for the scientist within the anthropological field:

*Either*

we had to admit that we were natural objects of deterministic causality, just as predetermined as billiard balls and celestial bodies (at least according to the science of that time). In this way, free will and feelings of responsibility were just illusory ideas, but at the same time necessary phenomena, because even these illusions were themselves predetermined.

*Or*

we had to accept a dualistic and inconsistent theory combining the determinism of the body with the voluntarism of the soul.

During the 20th century, however, determinism has been waning and seems now to have been totally abandoned. It actually started with the evolution of probability theory, in which paradoxically enough Laplace, himself, was a leading figure. Probability theory was one of the presuppositions of the thermodynamics that was founded in the 19th century. In thermodynamics, the concept of *deterministic causality* and *probabilistic chance* seem beautifully integrated, but some unsolved problems remain about the ontological and epistemological status of the concept of probability.

From the perspective of Laplacian determinism, the behaviour of an individual particle of a gas is fully determined, and consequently the gas consisting of these particles must be determined. The subsequent thermodynamic theory explains, however, the state of a gas and the statistical outcome of numerous particles, whose movements are supposed to follow a certain probability distribution.

Thus, from the standpoint of Laplace, the subsequent thermodynamics must be seen as a mere approximation, using a pseudo-stochastic description of the constituent particles that really are deterministic.

From the standpoint of thermodynamics, the supposition of stochastic individual particles was more epistemological than ontological. The prescription of probability was not seen as an expression of a metaphysical indeterminism, but rather as our lack of knowledge about the microcosm. The thermodynamic physicists would still prefer a Laplacian world equation. As long as this was not available, they had to accept a statistical description.

Thus, at the end of the 19th century, the microcosm of the individual particle was still understood as, in principal, and thus ontologically, quite deterministic, but in practice this microcosmic determinism appeared to be epistemologically inaccessible. The macrocosms of gas (or the thermomechanic assembly) are actually described in a quasi-deterministic way by the laws of thermomechanics. The element of chance seemed mainly attached to our description of the individual particles, which were understood as deterministic and pseudo-stochastic, the prescription of probability being actually epistemological, as it expressed our lack of knowledge about the microcosmic determinism.

In this way, thermodynamics was not a break with determinism, but neither was its direct offspring, the theory of *quantum mechanics* in the new atomic physics. The theory is *not* a probabilistic macro-approximation to a principally deterministic, but epistemologically inaccessible microcosm. Instead, it is the microcosm of the atomic particles themselves that are understood as governed by probabilistic laws, not as a matter of approximation, but as a matter of principal.

Even after this break with determinism in the microcosm, however, deterministic metaphysics still governed the understanding of the classical macro-world, but the strength of determinism was very much waning.

Just as thermodynamics was a compromise between determinism and indeterminism, with the stress on the former, the interpretation of the Copenhagen school was an attempt to reconcile the determinism of the classical macro-theory with the stochastics of the micro-theory, but with a stress on the latter.

The compromise was Bohr's principle of correspondence, which asserted the necessity of reconciling the two seemingly contradictory descriptions:

## The Two Seemingly Contradictory Descriptions Referred to in Bohr's Principle of Correspondence

On the one hand

the very description of the atomic phenomena involved a classical part, expressing the experimental apparatus and the measuring device, and a quantum mechanic description of the micro-phenomena.

And on the other hand

there was, just like in thermodynamics, a mathematical consistency of the two levels of descriptions.

The deciding break with determinism, however, happened very recently with the emerging *chaos theory*.<sup>25</sup> This theory is a direct attack on the very heart of determinism, namely the dynamic description of macrocosmic phenomena. In chaos theory, the concepts are turned upside down. Indeterminism is no longer a practical approximation to an epistemologically inaccessible complexity of micro-events.

Rather, deterministic theories are now generally seen as practical, but not truthful, descriptions of, in principle, indeterministic<sup>26</sup> macrocosms. I therefore suggest a decisive modification of macro-physical theory: the Newtonian understanding should not be discarded, but rather reduced to the status of being an indeed excellent approximation or at least a very special case of reality.

Newton's beautiful celestial and terrestrial mechanics was the solution of simple, linear differential equations. However, a calculable solution only exists for the most simplistic case, the two-body problem. Even for three bodies, for example, the Sun, Earth and the Moon, there is no explicit solution, and there is actually now empirical evidence for celestial behaviour that demonstrates the unpredictable, chaotic movement of certain members of the solar system. Thus, the clockwork model is not the paradigm of universal dynamics, but either a gross approximation to complicated systems behaving complicatedly, or at most an adequate model of the simplest systems in existence (e.g., the

movement of a double star). If there is a contradiction between the apparent determinism of Newtonian metaphysics and the unpredictability of life, the error seems thus to be on the side of Newtonian metaphysics.

Another fascinating aspect of chaos theory is that, in a way, it represents a Hegelian sublation of the traditional contradiction between order and chaos.

In fact, chaos and indeterminism were complementary concepts to order and determinism. When states of, for instance, political upheaval were so unorganised that they were conceived as unpredictable, chaos was the alternate to an orderly deterministic description. In chaos theory, however, chaos and order are no longer mutually exclusive concepts. On the contrary, even the most complicated chaotic system has at the same time an ordered structure and a behaviour that is outside the scope of practical control or prediction.

The implication of this change in the conception of determinism for the field of anthropology is actually indirect rather than direct. I do not believe in the new positive metaphysics of *quantum philosophy or quantum psychology*<sup>27</sup>, in which the new understanding of physics is somehow extrapolated to human existence. However, I *do* support the dissolution of the old positive metaphysics of determinism, with its relevance for anthropology. In terms of our self-understanding, it signals the release of the yoke of not only a physical, but also a *generalised ontological determinism* that gave anthropology the choice between the absurdity of an apparently scientifically based predeterminism and an idealistic and inconsistent voluntarism.

### 2.3.1.2 The Metaphysics of Thermodynamic Disintegration

The other brand of physical metaphysics that has given the biological and anthropological disciplines a hard time is *thermodynamic disintegration*. After the Newtonian world picture, with its conception of the universe as an eternal always correctly working clockwork, thermodynamics presented the opposite perspective of unavoidable *disintegration*. In any closed system, the *entropy*, that is the degree of disorder in the system, increases all the time, until the system is turned into an amorphous, but homogeneous gas. This *downhill cosmology*, based on one of the most influential theories in physics, was just as a conceptual barrier for the thinking in the life sciences as the metaphysics of determinism was. How could the evolution of life forms on earth be possible given this grim metaphysics of universal disintegration?

One breakthrough towards solving this riddle was Schrödinger's concept of *negentropy*. Negentropy is the working principle of life and is defined as being not in contradiction with thermodynamics, but on the contrary, a *direct effect* of thermodynamics. Negentropy implies an uneven distribution of entropy within a greater system, the solar system for example. The sun is the source of a *grand total increase* in entropy by exhausting its atomic pile. However, at the same time, there is a *local entropic decrease* in the organisms that import negentropy (a difference in temperature or chemical concentration) from their surroundings and export entropy (a lessened difference in temperature or chemical concentration) to these surroundings.

Even this concept of negentropy was only a partial relief from the burden of metaphysical dissolutionism. Negentropy, to a certain extent, reconciled the fact of the highly structured functioning of life forms, with the expectation of ultimate thermodynamic extinction of any life a consequence of vanishing thermal differences. Nevertheless, the existence of a monotonous entropic increase was still in flagrant conflict with the Darwinian perspective of the formation of biological structure.

How could phylogenesis be running up hill, when thermodynamics taught us that all change was downhill, in the direction of entropy? Thermodynamics was a basic theory of dissolution, whereas the theory of evolution was a theory of formation.

Actually, one of the reasons for the *vitalistic* tendency in biology was exactly this contradiction, leading to a dualism between physical and biological matter. This was similar to the way that the contradiction between physical determinism and anthropological voluntarism led to the dualism of a materialistic physics and an idealistic anthropology.

The evolution in recent thermodynamics has been dramatically changed by Prigogine's theory of *non-linear* states.<sup>28</sup> The grim prospect of the entropic increase of any closed system is just as limited as the prospect of the Newtonian determinism of a mechanical system. Just as the simple solution of a linear mechanical equation has very restricted validity, limited to the most simplistic system, the thermodynamic prospect of entropic increase is restricted to states where the thermodynamic equations are *linear*.

This presupposed linearity is not universally fulfilled, however. It is true that any closed system with an overwhelming probability will undergo an entropic increase. However, there is a certain positive, although normally very low, pro-

bability that there will be an entropic decrease. The “normal” state of thermodynamic equilibrium is systematically suspended in the biological and the so-called pro-biotic structures, which we shall discuss in the following.

## 2.4 Biogony, Biogenesis and the Biological Object Field

The two metaphysical positions I have just discussed presented some serious obstacles for the development of a scientific theory of life. The deterministic and disintegrative laws of physics contrasted so drastically with biological phenomena that it was theoretically impossible to develop a theoretical biology that was consistent with the knowledge of the fundamental laws of nature. That left two theoretical positions for biology: theistic *creationism* and anti-mechanistic *vitalism*.

Both positions regard purpose or goal-directed activity as a fundamental attribute of living organisms. This attribute, which was unexplainable from a physical perspective, thus pointed either to a divine creator or to some special “life forces” that vanquished the disruptive physical forces to ensure the structure and functioning of living beings. Recently, however, the revolutions in the cosmological sciences have approached the anti-mechanistic positions of biology. At the same time, progress in molecular biology has narrowed the gap between our understanding of non-living and living nature. I shall return to this discussion in a moment, but will now put the history of biology aside to focus on the history of life.

As with the former section on cosmological matters, we have a starting point when studying the history of life: the birth of life or the **biogony**; the evolution of life or the **biogenesis**; and the **biological object field**, consisting of life forms, their interrelated systems and the phenomena attached to these life forms and ecological systems.

I propose that there is a basic principle common to biogony, biogenesis and the biological object field: the **principle of functionalism**.

### 2.4.1 The Principle of Functionalism

In apparent contradiction to the cosmological principle of causality, the principle of functionalism states that living beings and their interrelated systems are designed in such a way that they can maintain their own existence or the existence of their species. Darwin provided an essential contribution to the principle of functionalism with his theory of natural selection. Darwin proposed that the purposive design of living beings could be understood as the result of biological phenomena and not merely as their prerequisite. Actually, purposive design was redefined by Darwin in two respects. First, the adequacy of the design of an organism or its parts was relative to its surroundings, its living conditions. Secondly, adequacy was not a divine guarantee, but an empirical relation that certainly was not always met, or was often compromised by changes in the surroundings. Darwin's principle of natural selection thus has two basic assumptions:

#### The Two Basic Assumptions of Darwin's Principle of Natural Selection

1. The assumption of competition between individuals, with varying attributes of the natural resources of existence and procreation
2. The principle of inheritance of some of the varying attributes

Darwin's theory has been consistently, and to a large extent erroneously, accused of circularity. The very heart of his theory is that the organisms selected are those best fitted to their environment. Critics have claimed that this thesis is vacuous, because the very fitness that is the *explanans* of the thesis is identical with the *explanandum*, the good luck of survival. This criticism is not fair. The *explanans* is a relation between, on the one hand, certain living conditions, and on the other hand, certain morphological or ethological attributes of the organism.



This relation can be evaluated for a specific eco-niche, and different competing species or sub-species can be compared. It can even be predicted that changes in the living conditions in a certain eco-niche will result in a certain press of evolution for the species occupying that particular eco-niche.

### 2.4.2 Biogony and the Theory of Evolution

The theory of evolution, from its very beginning, has been burdened with the problem of biogony. To constitute the competition necessary to drive natural selection, some life forms are needed to begin with, however primitive. Darwin's theory, however, does not explain how this competition can ever get started. This is where Prigogene's non-linear thermodynamics and modern molecular biology come in. Covering the apparent gulf between the causal and disintegrative lumps of physical matter and the functionality of living beings, there is a large spectrum of chemically very active carbonate compounds. Actually, the basic building blocks of life, the amino-acids (of which the proteins are made), as well as the nucleotides, (the constituents of heredity) have been experimentally constructed from chemical elements in the laboratory through the outlet of energy in the form of lightning. Further, they have been found in the cosmos outside the Earth as well, for instance introduced by comets or meteors.<sup>29</sup>

Natural conditions have existed without variation since shortly after the formation of planet Earth. The basic chemical elements were present on the surface and in the atmosphere of our planet or introduced by meteorites. Energy was not only provided in the form of lightning, but also was supplied through tectonic activity from the volcanic core of Earth, breaking through the cracks of the crust, where the tectonic plates were colliding.

If we now presuppose a certain probability of non-linear thermodynamic self-organisation in the chemistry of the combinations of carbon, whenever the other elements and the necessary energy are present, the atoms or the simple molecules will be turned into increasingly complicated combinations. Thus, there will be a biogenic direction opposite to the disintegration of linear thermodynamics.

These chemical combinations (i.e., proteins, lipids, carbohydrates, the energy-preserving molecule ATP, and the protein-building and heredity-preserving

RNA and DNA) will be spontaneously made, and once made, they will constitute what Prigogine calls *dissipative structures*. These *dissipative structures* are entities that consume matter and energy to preserve themselves or to expand by transforming outside matter into their own design.

This part of biogony is really a *molecular or probiontic* evolution, to which Darwin's principle of natural selection can readily be applied. The macromolecules are not yet living, but they do compete for the surrounding energy and matter. They have a quasi-biological way of maintaining their existence and propagating their design, a way of functioning quite similar to the parasitic, quasi-biotic *modus operandi* of the virus. A virus is a macromolecule (mainly a string of RNA or DNA with a jacket of protein), without internal means of energy, but designed to use the energy and material resources of other living organisms.

Viruses are actually not *pro-*, but rather *quasi-biotic*, because they *presuppose*, not *precede* real life. However, there must be a great similarity in the function of the virus and the function of the hypothetical probionts.

The scheme Margulis proposes is that the simplest life forms, the prokaryotic bacteria, were constituted by a possibly cannibalistic combination of probiontic structures. The prokaryote is a cell with a protective membrane inside, which has some protein-structures, some enzymatic proteins, some ATP-molecules and hereditary genes of RNA or DNA. However, these, the simplest of real organisms known, have a great advantage compared to the probionts: they have their own metabolism, their own means of not just *absorbing* energy, but also *preserving* energy. That means a dramatic change in their functioning. They are not only passive beneficiaries of the instantaneous external energy outlet in their surroundings, but they have their own internal power stations. These organisms can be traced almost back to the very beginning of life, some 4 billion years ago. They are the anaerobic bacteria: they are not merely profiting from natural chemical processes in their surroundings, but they actively organise chemical processes by their own enzymes and then bind the chemical energy into ATP, from which afterwards they can get the energy to drive their metabolism.

Thus, a new kind of process is born. Besides the causal process of cosmological objects, now we have the metabolistic *activity* of the organism.

This is the actual biogony and now the biogenesis can get started. Margulis developed a theory to explain the next two steps in evolution:

## Margulis' Endosymbiosis Theory of Evolution

Step one is the jump from the *prokaryotic* bacteria to the *eukaryotic* protist of one-celled organisms. These have an internal nucleus that includes their genetic matter and specialised organelles like mitochondria (which are more elaborate power stations), chlorophyllic organelles of photosynthesis and microtubuli (which are the means of locomotion and internal communication).

Step two is then the jump from the eukaryotic protists (like the amoebae) to the multicellular organisms constituting the realm of fungus, plants and animals.

Both of these steps are explained by Margulis using symbiosis. The first step is mediated by the endo-symbiosis of original organisms being reduced to organelles, and the second step is mediated by the collective symbiosis of the colony of singular organisms.

### 2.4.3 Biogenesis and the Biological Object Field

In accordance with Margulis' theory of the biological "big bang", I will suggest the following hierarchy of the types of biological objects (next page):

In this list, at least until level 4, the same correspondence exists between ontology and genealogy that we found in the cosmological field; that is, the conformity between composition and evolution. The relation between the component and the composite system coincides with the relation between the old and the new.

## The Biological Hierarchy

### 1. **probiotics** (akin to virus)

biochemically active structures with the ability to self-reproduce. now extinct, but probably rather akin to virus, and as a parasite without internal means of energy is quasi- and not pro-biotic

### 2. **prokaryotes** (like bacteria)

fully formed, one-celled organism with a relatively simple structure, lacking a nucleus and most of the organelles found in the higher organisms

### 3. **eukaryotes** (protists like amoebae)

one-celled, but already highly, structured organisms with a separate nucleus and with many organelles, like mitochondria (sites of energy, storage and use), microtubuli (tube-like structures for internal and external motor functions) and plastids (chlorophyll or pigments)

### 4. **polycellular organisms** (fungi, plants and mammals)

organisms consisting of many cells that according to Margulis' theory originate from individual one-celled organisms living in cooperation, either as a colony or in a symbiosis

### 5. **ecosystems**

a part of the total biosphere, in which a large number of separate organisms from different species are living interdependently, these relations being either symbiotic, parasitic, use of waste products, or the food chain relation between prey and predator.

### 6. **total biosphere - Gaia**

the totality of life on earth, according to the Gaia hypothesis of Lovelock (1979), the organised system of geological, meteorological and biological components and processes maintaining an equilibrium.

However, the ontic level 5, consisting of the ecosystems, is much more complicated and problematic than its preceding level. The ecosystems are ontologically distinguished by their vague boundaries and their extraordinary heterogeneity. One important aspect of Margulis' theory of evolution of more complicated life forms through endo-symbiotic composition is, nonetheless, that the composite life forms actually start as a kind of micro-ecological system. Thus, I will assert that an ecosystem is not just a system-theoretical abstraction, but also a real entity, a *biological object*.

The highest level in the biological object field is the *biosphere*, or *Gaia*<sup>39)</sup>, the quasi-organismic system of the whole planet. The concept of the biosphere as the frame of all ecological processes is now generally accepted (not just in scientific circles, but in an ever-increasing way in practical and political public life). However, the Gaia-hypothesis is just about to go from a rather metaphysical or poetic metaphor to an empirically testable theory, examined by palaeontological and geophysical data.

The total model for the biological object field is presented in the following diagram:

### A model for the Biological Object Field

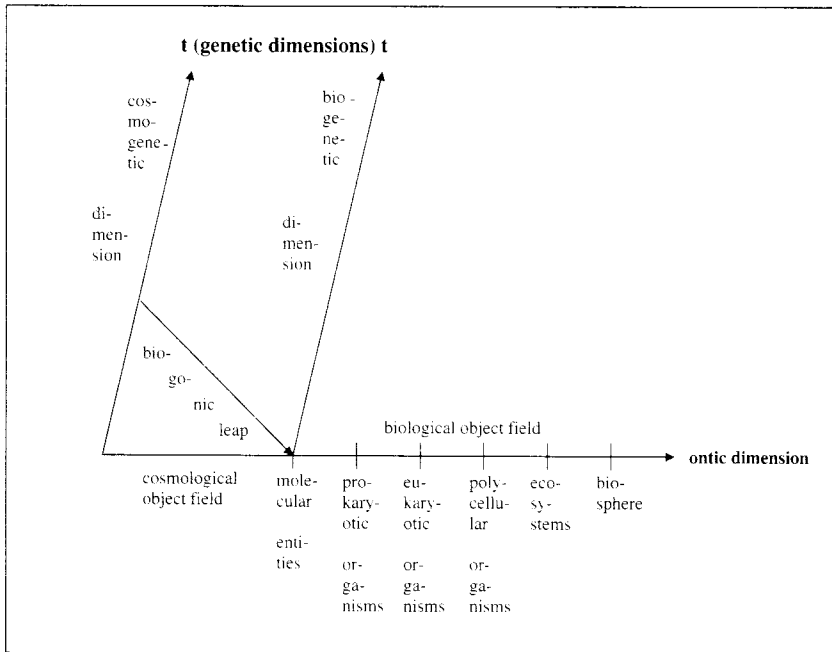


fig. 2.2

### 2.4.4 The Principles of Functionalism and the Controversy about Finalism

Above, I asserted that the cosmological object field is characterised by a principle of *causality*, whereas the biological object field is peculiar because it follows a principle of *functionality*. What does that mean? Here we face one of the oldest problems in science, the controversy of *finalism*. In his metaphysics, Aristotle introduces several kinds of causality. In the scholastic translation they are called:

1. *causa materialis*
2. *causa efficiens*
3. *causa formalis*
4. *causa finalis*

From our perspective, the first two categories are similar to what I have termed *causality*; that is, the causality of the cosmological object field. Further, *causa materialis* refers to *mass*, one of the two aspects of cosmological existence, and *causa efficiens* refers to the other aspect, energy. Admittedly, Aristotle's dynamics are deviant from their modern descendants. However, there are no great problems with these two forms of causality, even though it seems a little redundant to define two forms instead of one.

On the other hand, the other two types of causality have severely marked Aristotle, not just as a rather unlucky physicist, but also as a pre-scientific and metaphysical natural philosopher with anthropomorphic, or even animistic tendencies. The *causa formalis* is the hidden form, similar to what is here called essence<sup>31</sup>, and thus this type is related somewhat to *causa finalis*, which is the force exerted from the goal situation, that is the final state found *after* the causal process.

When Galilee founded modern science in his anti-Aristotelian, or as he called it anti-peripatetic, diatribe, *causa finalis* was one of his major targets. Galilee was justified in his evaluation that the physics of Aristotle was so heavily loaded with finalism, that it was totally useless. For instance, in Aristotle's theory of the four elements, the earth is the heaviest element, placed naturally at the base, then comes the lighter element of water, then air and above the other three is fire. From this premise, he then explains the free fall of a stone as the result of the *causa finalis* attached to the seeking of the earthly stone, dis-

placed in the inadequate element of air, to get back to the earth where it belongs.

Since Galilee, mechanistic science has maintained that there is just one principle of causality, the efficient one that adheres to the condition that the cause is always antecedent of the effect:

### The process of efficient causality

point of time:	$t_1$		$t_2$
causal relatant:	cause	→	effect

However, if we now turn to the case of finality, we find a reversal of the sequence:

### The process of final causality

point of time:	$t_2$		$t_1$
causal relatant:	cause (teleologic)	→	effect

That is, the final cause, for instance the harmonic state of the stone having found its right element, is defined at a point of time *subsequent* to, not *prior* to, the cause. This criticism of finalism has been accepted as valid in physics. However, the success of mechanics in the cosmological sciences (astronomy, physics and chemistry) resulted in an export of the principle of efficient causality to the life sciences, that is the biological and the anthropological sciences.

This is, however, precisely where the rational mechanics of physics tends to be expanded to metaphysical *mechanism*. Contrary to this, there has been a continuous tradition of finalism in the life sciences. One basic unanswered question is whether this concept of finality is just attached to mere secondary *phenomena*, actually compatible with the principle of causality and even produced by this principle, or rather an *essential* principle, intrinsic to the biological and the anthropological object fields.

The apparent incompatibility between finalism and reductionistic mechanism presented a grave dilemma for the life sciences. A dilemma that resulted in:

### 1. The Position of Mechanism:

The mechanistic position claimed that researchers of the life sciences should pursue knowledge in concordance with the methodological rigor of natural science, and consequently they had to adjust to the thesis of a *deterministic causality*.

### 2. The Position of Vitalism:

Alternatively, the vitalistic position claimed that researchers could (and should) reject the validity of the physical sciences in the realm of living beings, but in this case, they had to postulate some rather obscure and mysterious forces or principles, specific for life, forces or principles by definition incompatible with what is acknowledged in the physical sciences.

Thus, the consequence of mechanism was an often rigorous, commonly unimaginative, barren, study of living beings. On the other hand, the consequence of the position of vitalism was possibly more imaginative studies. However, the abandonment of mechanism often resulted in a metaphysical idealism tending towards unscientific speculation or even occultism.

This conflict between the mechanistic and the vitalistic conception represents a case of a Hegelian contradiction. This contradiction actually has led to a *sublation* (German: *Aufhebung*): a negation of the previous negation, producing a theory on a higher level, where the mechanistic principle of causality is reconciled with the vitalistic principle of finalism. This synthesis is the principle of **functionalism**.

As mentioned earlier, Darwin's theory is a precursor of such a functionalistic theory of life. The process of natural selection associated with the ecological



level is governed by a principle of pure *causa efficiens*, and that is also the case for the changes in the morphology and ethology of a species living in this ecology. Through the interplay of selection, however, the result is a functionalistic adaptation that *appears* to be finalistic; that is, the outcome is characterised by a phenomenal finalism, not in discordance, but on the contrary in concordance with the principle of causality.

In this way, the adaptation in a species of a certain organ to a function is necessary in its specific eco-niche. For example, the evolution of tubular bones in birds, on the phenomenal surface, is in accordance with the finalistic principle of Aristotle. Darwin's theory, however, has freed us from the quite unattractive theoretical assumption of an occult predetermination of an evolution tending towards the form that is most appropriate for the well-being of a particular species. This dynamic finalism is just as metaphysical as the static one assuming the hand of an omniscient creator that has designed the shape of all his creatures in the most benevolent way possible.

Thus, evolutionary theory of natural selection does present the correct alternative to, on the one hand, *mechanism*, with its insufficient principle of efficient causality, and on the other hand, *vitalism*, with its just as unacceptable principle of occult finalism.

This negation of the negation, however, is valid only for the more stable attributes of a species, such as morphology, undergoing an adaptation in the process of phylogenesis. It does not explain, in precise enough terms, the apparent finalism of individual behaviour. Another limitation of Darwin's theory of evolution is that it is still very coarse. Although, it is a macro-theory concerned with the grand lines of natural history, it does not cover the causal micro-processes through which the forces of selection actually work (i.e., the informational system in which the hereditary traits of a species is conserved or changed).

Although the Darwinian macro-theory of phylogenesis addressed the riddle of finalism, the ontogenic micro-world of behaviour and the detailed processes of the transmission and the changes of the still hypothetical hereditary carriers were still inaccessible. In other words, no theory of genes was yet available for either a mechanical explanation or a dialectical sublation of the contradiction between the principle of physics and the facts of life. However, just as non-linear thermodynamics reconciled bio-chemistry with inorganic chemistry, it

was the formation of the concept *information* that solved the problem of finalism in biology.

Around World War II, the progress in electronics and telecommunication inspired the theoretical work in information processes (i.e., the physical processes in inanimate systems, constructed by humans to transmit signals). The seminal works in this area were by Shannon and Weaver (1964) and Wiener (1949). The work of the former led to mathematical *information* and *communication theory*, the latter to *cybernetics*. Next, I will present this second line of work, attempting to give a rather strict definition of the basic concepts. The aim of this is to illustrate the relation between the cosmological principle of causality and the biological principle of functionality.

#### 2.4.4.1 Signals, information and self-regulation

In the cosmological object field, there are cosmological objects (understood as non-living entities) characterised by their physical attributes such as mass, and causal processes characterised by a calculus of energy. In the realm of life, on the other hand, there are self-regulated and (at least seemingly) goal-seeking beings that are finalistic entities. How, on (cosmo- and biological) earth, can these two types of concepts ever be reconciled?

Let us look at one of the simplest manifestations of life, the chemo-kinesis of a bacterium. One of the obligatory abilities of any being is what Leontiev<sup>32</sup> calls irritability, which is the disposition to react to, for instance, "harmful" chemical influences in the environment. If a strong acid is poured into the water of a bacterium, the prokaryote will usually move away from the acidic area, an "action" that is just as sensible as it is unexplainable from the principle of efficient causality.

Now, let us describe the process in the language of signals:

## The Information process

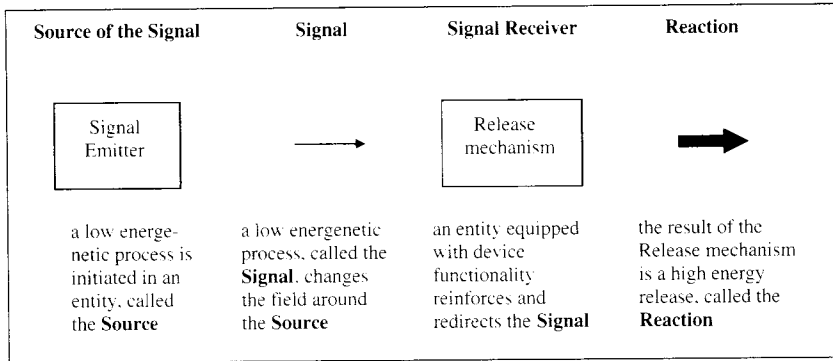


fig. 2.3

In the current example, the source of the signal is the acid poured into the water. The so-called signal is the chemical process of the ions moving around in the vicinity of the acid. The signal receiver is, of course, the chemo-kinetic bacterium, the reaction of which is a well-advised departure from the acidic scene. This reaction, however, is not directly caused by the energy outlet of the acid.

The chemical signal is energetically very weak, whereas the locomotory energy spent by the clever little fellow is on a considerably higher level.

This is the kernel of rationality in the vitalists' criticism of mechanism and its principle of efficient causality. Vitalism, in fact, rightly opposed the mechanistic postulate of a direct causation. Mechanism was right and vitalism wrong in the question of a possible reconciliation between physics and biology. The reconciliatory explanation, however, must operate with two modifications of the mechanistic scheme:

## The Cybernetic Modifications of the Mechanistic Scheme

1. *The energy transmitting process of the signal* is an indirect, and not a direct cause of the biological reaction.
2. In between the signal and the reaction is hidden *a response mechanism* of the receiver, and this mechanism has its own high-energy resources at its disposal.

This modification takes into consideration that the response mechanism should be described in a purely cosmological (physico-chemical) way. It is, in fact, the biochemical power station, ATP, that is the hidden high-energy response triggered by the signal and released as locomotion.

Thus, the release mechanism is the missing link between the mechanistic postulate of causality and the vitalistic postulate of spontaneity and purpose. The release mechanism has a double function:

### The Double Function of the Release Mechanism

**1. reinforcement:**

the *level* of the low-energy signal is amplified

**2. directing:**

the direction of the reaction is defined, not by the signal in isolation, but by the “image” or functional value of the signal in the pre-designed system of the release mechanism.

Followers of, for instance, Bateson's speculative philosophy of information<sup>33</sup> have tended to assert a neo-vitalistic conception of information as a category that is akin to the classical categories of matter, mass and energy. In my opinion, this is a step backward to the old, but now solved, contradiction between inorganic matter and life.

I will present a system-theoretical explanation of the rather obscure phenomenon called emergence. **Emergence** means the sudden creation of a quality not present in the old state. Here we can distinguish possibly between simple **compositional** emergence and evolutionary emergence.

In compositional emergence, something new, a composite entity arises through the composition of old parts that individually lack the emerging quality.

In evolutionary emergence, a new entity is not created by composition. Instead, an already existing entity in the course of its development suddenly obtains a new quality, originated for instance through a new type of relation between its parts or through a changing process.

The emergent phenomenon we are discussing here is **information**. A basic concept that, of course, has to be defined:

### Information

The quality of a certain **signal** in relation to a certain **release mechanism**, the signal being a low-energy phenomenon fulfilling some release specifications.

The **signal** is thus the *indirect cause*, and the process of the **release mechanism** the *direct cause* of the resulting high-energy reaction.

The release mechanism itself is, of course, an emergent entity, when it is seen from a cosmological position. This is the precise agenda, for biogony and biogenesis to furnish theories with an analysis of this emergence. We can thus more precisely define:

## Release Mechanisms

Systems having at their disposal a store of potential energy, the system being “designed” to let this energy out in a specific way, whenever triggered by a signal fulfilling the specifications of the release mechanism.

It is now clear why there has been this tendency to consider information to be an obscure category that is in addition to the classical categories of physics. Information is indeed a new category, but it cannot be placed, eclectically, beside the prior physical categories. Information is a category, not *beside*, but indeed *above* the classical categories of physics. Therefore, information is neither directly reducible to these classical categories, nor is it a radically different category of another nature than mass and energy. Information is, in fact, the causal result of existing physical components and processes. Moreover, it is an *emergent* result of such physical entities. This is revealed in the systemic definition of information. It is a relational concept that includes the *source*, the *signal*, the *release mechanism* and the *reaction* as its relatants.

One might ask where I place the category of *information* in my system of ontology. Should it be placed in the object field of cosmology, just as mass, energy and causality? Or, should it be placed in the object field of biology? My answer to this question will be the latter position. But, here we are getting into the ambiguities of the concept of the *physical*. The very reason I have introduced the term *cosmological*, in fact, was to avoid these conceptual problems. In the preceding section, I have actually used the ill-defined concept of “physical”, but only as an innocent synonym for *cosmological*.

What then is the ambiguity of the concept of physicality?

### Physical<sub>1</sub>

The first way to use the term is as an antonym to *biological*, meaning *not at all related to life* (either non-human or human), rather *in- or pre-organic*.

“Physical<sub>1</sub>” is thus anything existing in total independence of life. It exists in places where there is no life, or at a time before the arrival of life, or possibly as entities or phenomena completely uninfluenced by any processes of life (including human life processes). Here, I will use another dichotomy that is *cosmological* in contrast to biological.

### Physical<sub>2</sub>

The second way to use the term is in signifying *technological* entities and phenomena.

Physical<sub>2</sub> is often identified with physical<sub>1</sub>, because both are seemingly attached to inanimate entities or processes. There is, however, a quite important difference: physical<sub>2</sub> is a direct result of human activity, and consequently the result of a special kind of life process. However, I will not simply include human activity and its results in the biological object field, but instead, in a following section and chapter, define a special object field, the anthropological one. Thus, the processes and artefacts of technology are not cosmological, but rather *anthropological*.

In this way, we shall not confuse original cosmological phenomena or objects with the technological ones. Thus, electronic devices are often defined as physical objects (in the physical<sub>2</sub> sense), but they are of course technological entities, that is, they are not cosmological at all. As anthropological entities, they are emergent in relation to the prior object fields, such as the cosmological one. In a way, they are even emergent in relation to the biological entities. Basi-

cally, the rationality of the cybernetic identification of biological and anthropological information processes with the electronic ones is based on the fact that the electronic devices are genealogically *posterior* and not *prior* to the cosmological object field.

However, I am recklessly using the concept of cybernetics, although I have only just now defined the simple quality of signal reception and response mechanisms. In order to progress to the full vocabulary of cybernetics, we have to proceed to the concepts of **feedback** and **self-regulation**.

In order to get to the heart of the problem, we have to involve the phenomenon of feedback, Wiener's master concept.

We go from simple *information* to *feedback* by enclosing the disparate systems of the signal emitter and the signal receiver in the same system, a system capable of self-regulation. Via this loop, the simple concept of information as a signal mediating an indirect influence from the source of the signal to the signal receiving system is turned into an integrated information entity, the self-regulatory system. As an example from pure biology, we can look at the important concept of homeostasis, a quality possessed by all organisms and ecological systems, and indeed by the planet itself according to Lovelock<sup>34</sup>.

Just as with the concept of information, there is the problem of technological, seemingly physical (that is un-biological), self-regulation. For example, this is evident with the thermostat. Again, we must see this ontological confusion as a specific quality of technology and science. It is the combined process of a technological externalisation followed by the utilisation of the former in science; it is a form of a scientific *re-internalisation* of the externalised artefact. In short, we make our artefacts in the image of nature, and then understand nature as an image of our artefacts.

This scientific re-internalisation of technological externalisation was precisely the thought figure of the classical mechanism of the 17th century.<sup>35</sup> The mechanical devices of early manufacturing can be understood, on the one hand, as externalisations of the motor system of the human individual. On the other hand, the re-internalisation of mechanism was seen as a template for the principle of a mechanistic world-view.

With Wiener (1950) as the inventive precursor and inventor of cybernetics, the same man is the originator of the technological externalisation of cybernetics understood as a technology and of the scientific re-internalisation of cybernetics understood as a branch of science.



Therefore, using the thermostat as our example actually will not compromise the understanding of *biological self-regulation*. We just have to remember that the electronic, self-regulatory devices are highly simplified in comparison to the real biological system.

If we look at a thermostat as the regulator of a heating system, we have a subsystem attending the main system for which the thermostat is a dedicated component. In this case, the system attended is the heater, or possibly the system for which even the heater is dedicated. This attended system is in fact the *signal emitter*, that is, the temperature of the attended system is the signal. To be more precise, the signals are thermal processes of the attended system. The thermostat is a *signal receiving system*, consisting of a thermometer, which is the input part of the release mechanism, and a thermal valve, which is the output part controlling the outlet of the heat of the heat producing machine (or in warmer parts of the world a cooling machine).

The control principle is the following: when the thermostat receives input signals specifying a temperature *above* the parameter of the thermostat, it will emit output signals to the valve *starting* the heater, and when it receives input signals specifying a temperature *below* the parameter of the thermostat, it will emit output signals to the valve *stopping* the heater.

This kind of feedback is what Wiener has called *negative feedback*, because a spontaneous increase in the main system, through the reaction of the response system, will result in a decrease in the system attended by the response mechanism. The other kind of feedback is the positive kind, where an increase in a certain quality of the main system causes the response mechanism to provide a further increase of this quality. An isolated response mechanism of positive feedback, however, can be only a part of a more complex system also consisting of other response systems working on the principle of negative feedback, otherwise the system is doomed. The system is bound to break down as soon as the parameter concerned transgresses the interval in which the system can exist.

## The Self-Regulatory System

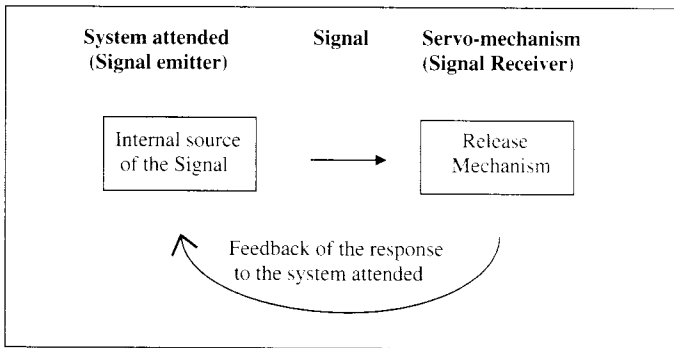


fig. 2.4

In the self-regulatory system, the signal and the release mechanism are bound together. Together they form a closed circuit in which the very distinction between input and output data, and consequently between *signal emitter* and *signal receiving release mechanism* may be sublated.

I will suggest that the quality of functionality is the rightful heir to the animistic principle of finalism. That an entity is designed in a functional way with respect to a certain quality means that the design in question is a (possibly partial) causal condition for the attribute mentioned. Thus, functionality is really a relation between a certain *design* and a certain *attribute*. For instance, the hollowness of birds' bones is a partial causal condition for the attribute of flying, and therefore this morphological trait is functional for the ability of flying.

This is an example of the static type of functionality, which I call **morphological functionality**.

There is, however, also a *dynamic* functionality that I call **processual functionality** (i.e., the functionality of a certain physiological process or the functionality of a certain kind of behaviour). A process is functional for achieving a certain goal state if the process is cybernetically structured in such a way that it realises or maintains the goal state, unaffected by possible variations in the external conditions and disturbances.

The feedback process through which a deficit in oxygen intake is compen-

sated for by an increase in the production of blood cells is an example of processual functionality.

A third kind is **device functionality**, the functionality of an organ or a device. The organ or device has a certain design that possesses *morphological functionality* with respect to a certain process that is itself characterised by a *processual functionality* with respect to a certain goal state. Thus, the thermostat possesses *device functionality* with respect to maintaining a fixed temperature.

A fourth kind of functionality is **designing functionality**, the very process shaping an entity in such a way that the entity possesses either *morphological* or *device functionality*. This type is primarily concerned with two varieties of functionality: the *phylogenic functionality* in the process of evolution and the *ontogenic functionality of behaviour*. The former is evidently of the *designing* type, whereas the latter is of the *processual* type.

To overcome finalism, the theory of evolution has to produce an explanation for the cybernetic mechanism through which the phylogenic designing is done in such a way that *morphological* or *device functionality* is ensured. Likewise, ethology has to explain how the schemes of behaviour are construed in such a way that they possess processual functionality. Ideally, the explanation of functionality should be carried through all the ontic levels.

Thus, the concept of functionality in the analysis is divided into 4 sub-concepts:

- 1. morphological functionality**
- 2. processual functionality**
- 3. device functionality**
- 4. designing functionality**

The discovery of the genetic code was vital to explaining the cybernetics on the biochemical micro-level of both the genetic apparatus of evolution and the physiological level of behaviour. I shall abstain here from going deeper into the details of biology, but instead I will sum up with the possible dialectical lesson of this piece of science history. The battle between the opposite schools of mechanism and vitalism was never decided by the victory of either. Neither did the diatribe end in a compromise. The end result was not even the often seen termination known as mutual fatigue. The outcome was none of the above, but exactly of the kind that Hegel has described as a *sublation of the contradictions*. That is, it resulted in the evolution of a completely new and from both sides unforeseen third possibility, the *sublation of the contradictions*, or in the somewhat pompous language of dialectical materialism, the *negation of the negation*.

After this excursion into cybernetics and the history of biology, we can now define the *principle of functionality* characterising the biological object field in the same way that *the principle of causality* characterises the cosmological object field. The principle of functionality is essential for all biological entities, including ecosystems, social groups of animals, organisms, cells, organelles, and even para-organisms, such as virus (structurally designed as strings of DNA or RNA, but have developed a parasitic kind of quasi-life with qualities like procreation and phylogenic evolution).

The principle of functionality means that the structure and the processes of biological objects are not simply reducible to the cosmological principle of causality. The design and the functioning of biological objects is so complex that the mechanistic principle of a direct causal explanation is, from a practical point of view, an *impossible* and, from a theoretical perspective, a *pointless* strategy of reductionism. Biological objects are essentially characterised by their functional qualities, that is, by the functionality of their morphology, their physiology and their ethology.

The old mechanistic goal of physicalistic reduction, however, is attainable on the *meta-level*. The qualities of the biological objects are not accessible for physicalistic explanation. Instead, the biological theories do a far more successful job of explanation. Specifically, these theories can be consistently linked to cosmological theory. This means that in a way, we can decompose the biological objects to their ultimate cosmological components, and the biologi-

cal processes to their terminal cosmological constituents. However, it should be kept in mind that this decomposition is theoretical, not empirical. The real scientific relation is obtained by some strategic *ridging theories* (such as the genetic code), through which the terms of the biological theory are translated to the terms of cosmological theory. However, this translation is not possible using the methods of empirical science, because the biological data cannot be effectively translated (reduced) to the cosmological data.

The latter type of reductionistic reduction will generally fail to see the organised complexity that is the very basis for the functionality of biological objects. The irreducibility of biology to cosmology is not metaphysical, and in a way not even theoretical, for as we have seen there is no essential inconsistency between the theories of the two object fields. The irreducibility is attached to methodology. We cannot directly observe the complexity of the biological phenomena by cosmological methods, nor can we directly describe them by cosmological terms. Finally, we cannot even reduce the theoretical explanation of biological phenomena by cosmological theory. The biological complexity necessitates the use of specific biological theories that are logically consistent, but in general, not practically reducible to cosmological terms and theses.

I will end this meta-theoretical section by returning to the level of the object field, that is to the question of the difference in the essentiality of the cosmological and biological fields of objects. We can conclude that where the former can be characterised by the concept of causality, the latter has the essential quality of functionality.

After having discussed the relation between the cosmological and the biological object fields, we can now proceed to the next level of ontology and the next relation between consecutive levels: the *biological* and the *anthropological* object fields. Just as we started the section on biology with the concept of information as signal emission and reaction between different entities, we have to go back to the related concept of communication. This must be done to pave the way for the sublation following the genealogical jump from energy of the cosmological level to information of the biological level, the jump from *information* to *meaning*.

### 2.4.4.2 Animal communication

Until now, I have been talking about signals from a mainly cybernetic perspective. The concept of information, however, is relevant outside the intra-individual limitation of self-regulation. Signals carrying information also work well, in principle, between individuals, that is, within the framework of inter-individual communication. Indeed, intra-organismic communication is, according to Margulis<sup>36</sup>, just the closing of what was originally an inter-organismic communication between symbionts. Because we are actually heading towards human communication, we should focus on a special case of communication between individuals, namely *intra-specific* communication.

We shall proceed from the simple concept of *information* towards *communication* in very much the same way that we derived the concept of self-regulation. That is, we use the concept of information recursively. In this case, however, the recursion is not an auto-recursive circle, but rather the double use of the original relation between the *source* of the signal and the *receiver* of the signal. Thus, we get a chain consisting of three entities, two signals and a terminal reaction, as shown in the diagram below:

### Intra-specific Signals

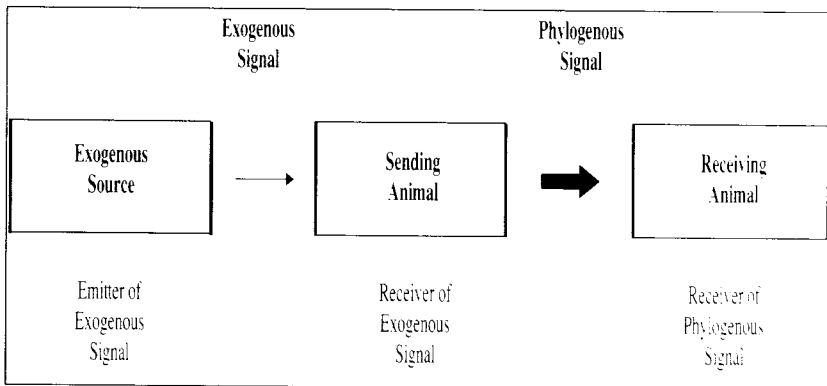


fig. 2.5

The chain of intra-specific communication starts, as in the original definition of information, with an external source emitting a signal in the previously described manner. This signal can be anything of biological importance for the first receiver of the signal. This is the case, for example, when the source is a predator of a certain species of fish, the signal of the former being optical (i.e., energy in the form of light). The fish that has the unfortunate fate of being the prey of its predator is, as a certain compensation, the proprietor of a phylogenous release mechanism detecting signals emitted (certainly most involuntarily) by the predator, which release a reaction of swimming away at the highest speed possible. This release mechanism is what ethologists call an *Innate Response Mechanism*, abbreviated IRM, and the signal triggering the IRM is called a *Key Stimulus*.<sup>7</sup>

In the terms of functionality, the function of swimming is of the *processual* type, whereas the IRM (understood as ethological mechanism) can be characterised as *device functionality*. The phylogenic evolution by which these two kinds of functionality are created thus can be described as *designing functionality*.

Whatever the selection value of these functionalities, a third can now be placed above them. This paramount phenomenon is the evolutionary refinement of *fright communication*. After all, survival cannot be restricted to the single individual, because it is a matter concerning the whole species. Thus, if our vigilant little fish besides assuring its own individual life could simultaneously secure the lives of some other co-specific individuals, this would be a major evolutionary advantage. This is indeed what has happened among our piscine ancestors.

How is this intra-specific, inter-individual alarm system realised? Evolution is generally characterised by a *designing functionality* operating according to the supplementary functionality condition of *parsimony*. In this case, the new communication system is based on the already developed IRM, that is, the detection and the reaction system directed towards the danger of the predator. Actually, the first, the nearest or the most vigilant fish does not need anything more than the IRM already available. What is needed on top of that is a secondary detection and reaction mechanism, so that another fish in the neighbourhood can take advantage of the reaction of the first fish.

Thus, in the secondary IRM, the key signal does not have the predator as its source. Rather, it is the reaction of the first fish, either the movement of increased swimming speed, or some expression of the affective state of arousal. This expression can be chemical; it can be produced by hormones implementing the internal physiological regulation needed in this case of emergency. It can also be visual, implemented by some external changes in the surface characteristic or the appearance or behaviour of the fish detecting the danger.

Actually, there often is a further evolution of the primary IRM in such a way that it develops double-device functionality. Besides the original functionality of securing the life of the detector fish itself, it can develop new qualities with device functionality directed towards the detectability in relation to the nearby species fellows. In this case, the intra-individual or even intra-organismic self-regulation that is part of the emotive system of the affect called fright has obtained a superstructure of *inter-individual communicative functionality*.

This phenomenon of fishes behaving unanimously is known as *fishes of schooling*<sup>38</sup>. Besides the defensive version just described, there is also a predator type, where our species is now the big one and the prey the little one. A school of predator fish has an original IRM directed toward the detection and the hunt of the prey fish, and a derivative IRM consisting in the contagious release of hunting behaviour among the nearby co-specific individuals.

Proceeding yet a step further, we go from the chain of inter-individual signals to the closed circle of inter-individual communication. Here we are going to make another modification of our original scheme of information. This time we shall take away the external source of the signal, and we change the consecutive recursion of signals to symmetric recursion. That is, we observe two individuals that, at the same time, are mutual signal emitters and signal receivers in relation to one another.

In the diagram below, the mutual recursive informational circle is shown:



## Intra-specific Communication

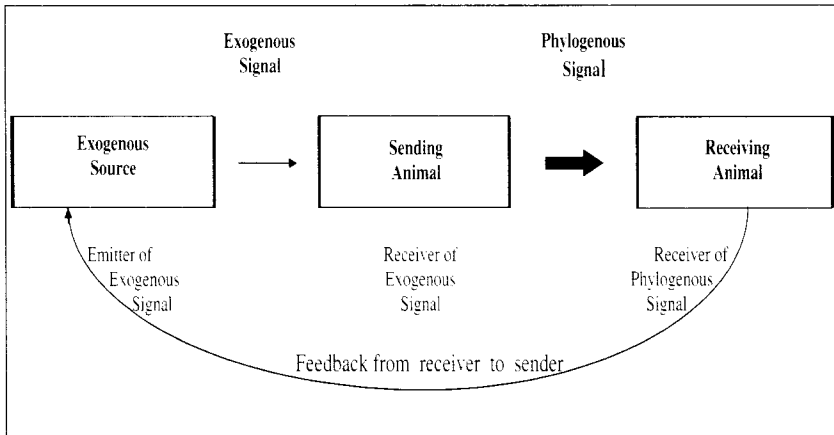


fig. 2.6

Here we have two individuals from the same species engaging in genuine communication. Actually, we need not, and we often cannot, appoint either of the two individuals as the originator of information. They are sending and receiving information simultaneously from one another. Instead of the specific *roles* of the sender *or* the receiver, there are the complimentary and alternative *functions* of sending and receiving.

In fact, this structure closely resembles another closed circle of information, namely self-regulation, and indeed intra-specific communication can be seen as an example of self-regulation. However, it is not working at the individual level, but at the level of a social system, in this case a dyad.

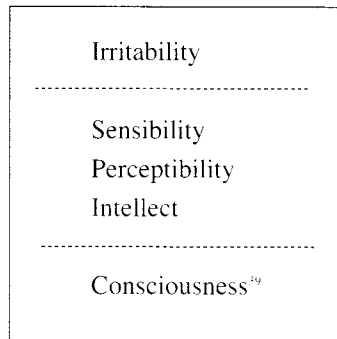
A beautiful and rather romantic example of this kind of communication is once again found in our piscine origin, the great precursor of all informational exchange. The case in question is the well-studied "ritual" of courtship among the three-pickled stickleback (Tinbergen 1969). In a prolonged exchange of dance-like movements, a sexually motivated male and a rutting female are checking the intentions and adequacies of one another. The specific (in fact species-specific) signals involve a sequence of movements, in which each successive movement is orthogonal to its antecedent. Thus, the courtship behaviour is called the zigzag dance, every consecutive pair being a zig and a zag. This zigging and zagging continues until either or both parties are convinced that the other is a member of the right species and of the satisfactory sexual

state to be a prospective fiancé(e). Once this has been concluded, the real mating can occur. The mating is, of course, just another case of intra-specific communication, but as in any good love story, it is designed to lead to a happy encounter.

### 2.4.5 Biogenesis and Evolutionism

One heated controversy concerning the theory of evolution is whether evolution has a direction or not. Leontiev's psychogenic theory (that I accept in broad terms) postulates a certain evolutionary direction with respect to the level of the working of the psyche, and according to the following sequence:

#### Leontiev's Sequence of Reflection:



This theory seemingly presupposes a specific interpretation of the biological evolution of biogenesis, namely a Spencerian evolutionism. As such, there is not only the micro-evolution of specific adaptations to the ever-changing, multitudinous eco-niches, but also a macro-evolution of life forms. This macro-evolution forms a hierarchy of higher and higher organisms and even social or societal forms, characterised by an increasing level of organisation and complexity.

This evolutionistic hierarchy should not be understood, using vulgar Darwinistic terms, as a tendency of the higher life forms ousting the lower life forms. It is my thesis, however, that a sequence can be defined that is at least *methodically* sound, if we follow the principles of the so-called cladistic inter-

pretation of evolution. This branch of evolutionary theory, called cladism, rejects the tradition of systematic biology to define classes of species by an arbitrary array of attributes. The basic principle of cladism is that a class of biological species is only meaningful if it is open-ended. For instance, the class of fishes is not a sound one, because it arbitrarily cuts off vertebrates from a later formation, such as amphibians, reptiles, birds and mammals. According to cladism, there are no relevant attributes specific to fishes, but there are such attributes specific to the successive clades:

### A Cladistic Genealogy for the Descent of Humankind

1. Chordates
2. Vertebrates
3. Semi- or fully air-breathing vertebrates  
(amphibians, reptiles, birds and mammals)
4. Fully air-breathing vertebrates (reptiles, birds and mammals)
5. Higher vertebrates (birds and mammals)
6. Primates
7. Hominides
8. Human beings

There is, however, a problem with this pedigree. The problem is not that it is inconsistent in relation to the rules of cladism.<sup>49</sup> What is problematic, however, is that there could be many other ways of selecting a consistent line of evolution besides what could be called the local or anthropocentric pedigree. This is akin to a snobbish genealogist who experiences an unpleasant reaction to his elaborately designed pedigree, for example, that it was really rather egocentric and without any interest for people of another descent.

Therefore, the tendency to hypostasise the seemingly quite arbitrary, or even subjective pedigree to the essential history of the world, could be criticised as a meaningless evolutionism, and indeed even an anthropomorphistic evolutionism. Thus, from a certain entomocentric (or to be precise myrmecocentric) point of view, we could suggest an alternative pedigree:

## An Alternative Pedigree

1. Arthropods
2. Land-living arthropods
3. Insects
4. Ants

The classic metaphysics of progress, born by the Renaissance, matured during the era of enlightenment and turned into a system and philosophy of history by Hegel<sup>41</sup> and into a philosophy of evolution by Spencer<sup>42</sup>; this metaphysics has recently been under heavy fire from the so-called post-modernistic school. However, in evolutionary theory and anthropology during most of this century, a constant methodological and theoretical criticism of such an evolutionism had been raised even before this.

As an adherent of this evolutionistic tradition, I will discuss the two basic problems of this position:

### Two Basic Problems of the Evolutionistic Tradition

**A. The non-arbitrary choice of evolutionary terminal:**

The end point is on an *absolute*, not just on a *self-defined*, higher level than other species<sup>43</sup>

**B. The theoretically sound path of evolution to this terminal**

the process of evolution agrees with the chosen order of successive species, and this process is explained in a defensible way.

The defence of point A is often a somewhat arrogant meta-theoretical argument, namely that possible competing claims of being the terminators of the pedigree are evidently not able to articulate competing theories of evolution.

However, I shall try to neutralise my position by admitting that what I am about to formulate has a clear anthropogenetic perspective. This does not mean that my theory should be considered adequate only for human beings, because I will certainly stick to the all-embracing scope of my tradition. The anthropological domain is not just *pragmatically* of particular interest, but also *ontologically* of a unique standing in being a sublation of biology, being in a relation to biology corresponding to the relation between biology and cosmology.

Thus, in my theory of biogenesis, I shall move toward the end point of this evolution, which is really an anthropogenic jump out of the biological object field. This is similar to the manner in which we treated the biogenic jump out of the cosmological object field at the beginning of this chapter.

In fact, this defence for an anthropomorphic theory of evolution will retreat to a methodological argument. To a certain extent, this resembles the cosmological discussion concerning the nature of critical cosmological parameters determining such qualities as openness or closeness (whether the universe will expand forever or is going to either shrink or oscillate), and the magnitude of the basic forces (gravitation, electricity and the atomic interactions).

All these parameters seem to be fixed at values that are extremely convenient for the type of life that we humans share with our planetary cohabitants.

There is to date no scientific explanation of this cosmological generosity<sup>44</sup>, but of course a rather evident theological one. However, if we prefer the scientific line rather than the theological, a sophisticated type of explanation has been given. It is, at the least, a logical fact that any *thinkable*, and in the language of modal logic *possible*, universe must necessarily be shaped in such a way as to accommodate the scientist who is formulating these cosmological theories. Of course, there have been some misgivings about this *anthropic principle*.<sup>45</sup> It has been called circular and metaphysical. Although the principle has been branded as theoretically unsound, it is hard to imagine it to be false. If it is meaningful at all, a true meta-assertion must be that in order for such an assertion to be asserted about the universe, this universe must be inhabitable for the person making the assertion.

There are even cosmological scenarios where the anthropic principle gets a more ontological status. Namely, this is true if we assume the theory of parallel universes, where our universe is not the only one, but only one of a class of diverse and possible different universes. In this theoretical case, the anthropic principle boils down to a methodological selection effect. That is, the universes

about and in which cosmological theories are formulated are those in such a shape that they can accommodate living beings with sufficient intelligence to be engaged in such an endeavour.

We have not yet discussed how far the anthropic principle can specify the nature of the cosmologist being able to study his (using "his" in its gender-neutral sense<sup>46</sup>) cosmos. Let us, however, now leave the anthropic principle of cosmology and go back to the evolution of this specific planet in this specific solar system in this specific galaxy of this (possibly) specific universe. The question is whether we can take a perspective on evolution that is somewhat similar to the anthropic principle. Just as many types of universes seem to be theoretically possible, a lot of evolutionary pedigrees, alternatives to our anthropogenic pedigree, are thinkable, and indeed some of these pedigrees are not only theoretically possible, but empirical actualities.

A mating between cosmological and biological speculation has created the somewhat monstrous offspring called *exo-biology*. Exo-biology is a non-empirical branch of science (as of yet), focussing on the possibility and eventual shape of life on other planets. An especially interesting, although again somewhat anthropocentric problem of exobiology is the determination of whether other intelligent life forms can exist somewhere else. (See Sagan 1973.) This question could be described as the *mono-* versus *poly-genesis* of intelligent life.

The exobiological speculation can be divided into a line of either *convergence* or *divergence*. The convergence theories in exobiology predict (or postulate) that intelligent life must necessarily be very much resembling human beings, as it is sometimes naïvely supposed in science fiction. The divergence theories, on the contrary, predict (or postulate) that intelligent life on other planets with different conditions can develop or has developed to forms quite remote from human beings. Here the starting point or divergence can be more or less remote. In the most remote case, we can imagine structurally different universes with entities very much non-human. In a less remote scenario, we can imagine life forms of this universe, but based on the chemistry of silicon rather than carbon (a hardware-like life form that may seem more plausible after the invention of the silicon chip).

Next, we can develop exo-biologies, with intelligent beings having an intermediate magnitude of remoteness. This is the case found with the entomological scenarios, which have been immensely popular in the more trivial type of

science-fiction, the so-called pulp science fiction, where this specialty of generally rather vicious creatures have been given the technical name of "Bug Eyed Monsters" (acronym BEM). Yet nearer to us is the reptilian variety of intelligent exobiology, which in pulp science fiction generally shows terrestrians having a sexual interest of a maybe less perverted, but anyway most bestial nature. A far nearer speculative evolution is of course the Darwinian ape (or rather primate) scenario.

The objective for this excursion to exo-cosmology and exo-biology has been to accentuate the two questions of anthropocentric theories of evolution:

### Two Questions of Anthropocentric Theories of Evolution

- A. Why is our pedigree of a special standing or at least interest?
- B. Why have the anthropic qualities, such as intelligence, consciousness and culture, developed in just our line. Why not in other lines, such as the entomological, the reptilian, the pongidian?

Question A may be answered in a way that is inspired by the anthropic principle, along the following line.

Any satisfying biogenic theory must at least take into consideration the empirical fact that human beings appear to engage themselves in biogenic contemplation. Thus, an *anthropocentric* point of view can be justified by an *epistemo-centric* perspective. In the concluding section of this chapter, I will introduce the basic anthropology of Activity Theory, and later, the main part of this treatise will be dedicated to anthropology.

Here it will be argued that the evolution of Humans is at the same time a jump *out* of evolution. That is, the anthropogenic jump is a creation of an ontic object field, which is actually *no longer* biological, or at least *not just* biological. In very much the same way that the biogenic jump is a jump out of cosmology, there is a distinct, new object field with characteristics of its own, not in contradiction with, but outside the scope of the cosmological field.

In the remainder of this section, however, I will concentrate on question B, which can be formulated as the following:

Given that the anthropological (and in the case of exo-biological speculation, even quasi-anthropological) end point is an especially interesting terminal of a pedigree, do we have non-circular arguments for necessary qualities of our actual genealogy, and can we, in the case given, explain the evolutionary process by which this has been brought about?

The psychogenic theory of Leontiev, which has lately been modified by Engelsted, is in fact such an argumentation. Before concentrating on Leontiev, however, I will place his theory of the emergence of the psychic, or the psyche if you dare to use a strict substantiation, within competing theories.

### **2.4.6 Psychogonic Theories**

Leontiev's theory, which will be introduced shortly, is on the phylogenic level a psychogony and psychogenesis, a theory of the formation and the evolution of the psychic. Making the psychic or the psyche the subject of a theory, a question to be addressed must be the extension or the scope of the concept. Here we will discuss the most important positions in this discussion on the extension of the psychic.

#### **2.4.6.1 Anthropsychism**

The modern concept of the psychic is a product of comparative psychology, because as long as psychology was exclusively occupied with the consciousness of the human being, the psychic was of course a quality thought to be found only in our own species. In this understanding, the concept of the psyche will not be of particular importance. The psyche of a specific person will be co-extensive with expressions such as the person's personality. This conception of the psychic can be called anthro-psychism, and has Descartes (Cottingham 1992) as one of its most influential and eloquent advocates.



In Cartesian dualism, there was, on one hand, the world of *res extensa*, the physical world containing the animals and the human body, and on the other hand, the world of *res cogitans*, the world of consciousness. Cartesian metaphysics dominated biology until Darwin, and psychology until Pavlov and Watson.

In anthro-psychism, there is a grave problem regarding the liaison between the split parts, that is the body and the psyche, but no problem of psychic evolution. In fact, Descartes describes not only the human body, but even the animal (a concept that of course did not include human beings) as an *automaton*<sup>47</sup>.

We can see anthro-psychism as the narrowest definition of the psychic.<sup>48</sup>

#### 2.4.6.2 Panpsychism

At the other extreme, we have theories giving the psychic an extension of literally universal breadth. Neo-occult authors like Capra (1983) propose psychic qualities to be found even in the micro-world of the atoms. This conception I will call **panpsychism**, and in this scenario, there is no reason to distinguish between the cosmological, the biological and the anthropological object fields. This universalism is similar to mechanism in its identification of the non-living and the living nature. However, where mechanism, in conceiving the living as non-living, is reducing downward, pan-psychism is reducing upwards by seeing the non-living as living. In pan-psychism, there is no problem of psychogony, the psychic has no specific origin, because cosmos in itself is sentient. The price is that the very concept of the psychic is rather vague, not to say metaphorical.

In spite of a sometimes quite impressive scientific cloak of for instance quantum mechanics, the modern version of pan-psychism is, after all, a true heir to primordial animism and classic pantheism, as found in for example Hinduism or Buddhism.

In between the rather arid extremes of anthro- and pan-psychism, we have three intermediate positions as illustrated in the table below. It should be noted that the presentation sequence of the three positions is not following the systematic order of the table, but rather the historical succession of these psychogonic theories.

## Schools of Psychology according to the Extension of the Psychic

Extension of the Psychic	Cosmolo- gical entities	Living organisms	Mobile organisms	Sentient organisms	Human persons
<b>School of Psychology</b>	Pan- psychism	Bio- psychism	Kino- psychism	Neuro- psychism	Anthro- psychism
<b>Theoretical Advocate</b>	Capra	Aristotle	Engelsted	Leontiev	Descartes
<b>Evolutionary Position</b>	x .....→ x .....→ x .....→ x .....→ x				

### 2.4.6.3 Biopsychism

Aristotle's position (1907) is consistent with his strong biological foundation. He defines the psyche as the essence of a living organism, and thus includes not only all the animals, but also even the plants. In fact, Aristotle establishes a hierarchy somewhat like that of Leontiev's, but is systematic rather than evolutionary. The psychic hierarchy of Aristotle is:

### The Psychic Hierarchy of Aristotle

1. the vegetable psyche
2. the animal psyche
3. the human psyche

The vegetable psyche had, according to Aristotle, the faculties of *growth* and *reproduction*.<sup>49</sup> The animal psyche had in addition the attributes of *sensation*,

*desire and movement* (autokinesis).<sup>50</sup> Finally, the human psyche is even equipped with *reason* (nous).

An evaluation of the *psychology* of Aristotle, who was, in fact, the very inventor of the term, must take into account that the word “psyche” originally meant *breath*<sup>51</sup>. Psyche, in the time of Homer, simply meant *force of life*. In the early classical period of Greek Antiquity, *psyche*, however, began a semantic evolution toward a dualistic separation from the *body*, possibly under the influence of oriental creeds imported through the Orphic movement in mysterious and religious-philosophical sects, such as the Pythagoreans.<sup>52</sup> This influence was of decisive importance for the immortality teaching of Plato.

Aristotle takes, as usual, a very sensible middle position, between the original holistic meaning of psyche as the *force of life* and the new religious meaning of an immortal soul. This conceptual *compromise*, which is not a *sublation* in the Hegelian sense, is made through the Aristotelian concept of *form*. Psyche is defined as the *form of the organism*, thus acquiring the meaning of form of life or rather *principle of life*.

#### 2.4.6.4 Neuropsychism

Leontiev’s position, sketched out in the first chapter, places psychogony after the mere *irritability* that is the tendency to direct metabolic reaction toward relevant substances in elementary life forms.

At the earliest stage of life, interaction with the environment depends on the irritability of the organism towards the environmental qualities, either by immediately serving the assimilation or immediately releasing defensive reactions... It is, however, hard to imagine that these primitive organisms would also be influenced by stimuli that were neutral to its life.<sup>53</sup>

This stage of life, the stage of irritability, is considered pre-psychogenic. The immediate reactions to the relevant chemical compounds imply no psychic reflection on the environment, according to Leontiev.

But then, an evolution in biogenesis takes place that is in fact the birth of the psyche, the **psychogony**:

At a definite stage in the biological evolution, the interaction process serving the maintenance of life is bifurcated, so to speak. On the one side, we see the impact from the surroundings immediately determining the existen-

ce of the organism and on which it reacts with the basic life processes and functions. On the other side, neutral influences operate, on which the organism responds with processes that only realise the organic basic functions mediately, that is, behavioural processes. [Author's translation]<sup>54</sup>

With this bifurcation, the first stage of psychogenesis is created, the *stage of sensibility*:

[T]he origin of sensitivity is connected with the organisms' transition from a homogenous medium, from a 'medium-element' to one formed as things to an environment of discrete objects. The organisms' adaptation, which is always, it goes without saying, a kind of reflection of the properties of the environment around them, now acquires the form as well of reflection of the affective properties of the environment **in their objective connections and relations**. This is also a specific form of reflection for the psyche, object reflection. For the object, i.e. a material thing, always has several interconnected properties: in that sense it is always a knot of properties.

At a certain stage of biological evolution, the former single complex process of reciprocal action realising organismic life, thus bifurcated as it were. Some of the environment's influences affected the organism as determinants (positive or negative) of its very existence, others only as stimuli and directors of its activity.

There was also, correspondingly, a bifurcation of the organisms' vital activity.

On the one hand, the processes that were directly linked with the support and maintenance of life became differentiated. They constitute the primary, initial form of the organisms' vital activity, underlying which are phenomena of their primordial irritability.

On the other hand, processes became differentiated that did not directly have life-supporting functions and simply mediated an organism's links with those properties of the environment on which its existence depended. They constituted a special form of vital activity that also underlay the organisms' sensitivity and their psychic reflection of the properties of the external environment. (Leontiev 1981, 45)

Thus, sensibility, presupposing a distinction between mere *biochemical metabolism* and *ethological activity*, is a sensitivity to signals not in themselves of metabolic relevance, but carrying information of objects of such relevance. Leontiev is somewhat cautious to specify the empirical jump in evolution from irritability to sensibility. The examples he uses to illustrate sensibili-

ty, however, point in the direction of organisms that possess organs of sensation and a certain neural organisation to process the sensory information and to activate motor reaction. Thus, he uses the jellyfish and the starfish to illustrate the stage of the *sensitive psyche*.

#### 2.4.6.5 Kinopsychism

Engelsted holds a position slightly modified from Leontiev (1989, 1993), and is more inclined than his predecessor to stress the dynamic side of biological activity. Engelsted considers the sensory or (in his materialistic dialectical terminology) the reflectory side of life to be a consequence (not to say a reflection) of goal-seeking activity, for which he uses the technical term *teleology*. Here, psychogony is the spontaneous goal-seeking activity of mobile organisms, that is, organisms not merely reacting to immediate present substances of nourishing or adverse metabolic relevance, but engaging themselves in an active pursuit of food or other goals, such as a mating partner. This *autokinesis*, as it is called by Aristotle, presupposes not only organs (or at least organelles) of locomotion, but also a mechanism of sensoric detection that is able to identify the object sought. Engelsted is arguing that this sensibility of spontaneous mobile organisms is already found in, for instance, the amoeba.

Thus, Engelsted actually accepts Aristotle's definition of the animal psyche, but he deviates from the ancient master in denying that plants have any kind of psychic life.<sup>55</sup>

*Kinopsychism* (which is my name for Engelsted's position, not a name he used) is thus the psychogonic thesis that the psyche originates with the spontaneous teleological autokinesis of the mobile organism.

#### 2.4.7 The Major Biogenic Leaps

A way of synthesising these conflicting psychogonic views is to see them as a description of consecutive steps in a biogenic evolution, which at a certain step justifies the concept of *psychogonia*, from which point a psychogenic evolution is occurring.

I shall now present a table of the major biogenic leaps, placing this psychogenic evolution within the table:

**Table of the Biogenic Leaps**

<b>Biogenic Leap</b>	<b>Defining Quality</b>	<b>Biological Scope</b>
<b>1. The pro-biogenic Leap</b>	Cybernetic Reactivity "Telenomic" processes	Probiotics, Virus
<b>2. The Biotic Leap</b>	Autonomous, self-sustaining Metabolism	Prokaryotes
<b>3. The Teleological Leap (Engelsted's definition)</b>	Spontaneous goal-seeking Activity	Protists
<b>4. The Sensibility Leap (Leontiev's definition)</b>	Splitting of Metabolism and Psychic Reflection	Multicellular Organisms (Sensory/neural equipment)

#### **2.4.7.1 The Pro-biogenic Leap**

The first leap is in a way the *biogenic* one, but the entities of this step in the evolution of life are not really *living* organisms. In fact, these pro-biogenic entities are neither living, nor organisms, yet. However, I will include these probiotics or quasibiotics in the biological object field for systematic as well as for evolutionary reasons. In terms of systematics, they are already following the principle of functionality, even though they do not dispose of their own resources of energy, and thus cannot maintain their own metabolism and procreation. In terms of evolution, they occupy the very essential position of molecular evolution.

#### **2.4.7.2 The Biotic Leap**

The second leap is the biotic leap to *real life*, to organisms with *autonomous* metabolism and procreation, as found in prokaryotes such as bacteria.

#### **2.4.7.3 The Teleological Leap (Psychogenic according to Engelsted)**

The *psychogenic* leap marks the beginning of the psychic as a revolution in the biological processes. These processes are divided into the already defined metabolism and the newly created *activity*. Activity is a spontaneous search for

a specific kind of object, as a true finalism and teleology. Here, the goal is present in the thriving of the organism, before it is found, that is, identified as an object in the actual neighbourhood of the organism. According to Engelsted's position, this leap is already found in protists.

#### 2.4.7.4 The Sensibility Leap (Psychogenic according to Leontiev)

The fourth leap is the leap to multicellular *sensibility*. Leontiev, who is more demanding in his psychogony than Engelsted, places the leap to the psyche in animals with an at least elementary sensory and neural system, such as worms and molluscs.

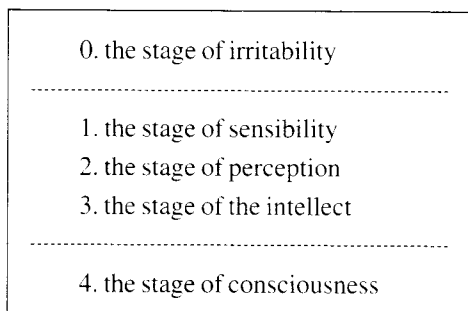
In the following section, I will present the total psychogenic theory of Leontiev, trying to stay strictly within the frame of his theory. Thus, all the concepts are in italics, not in bold, meaning that they are unchanged and not personally redefined. Nonetheless, the emphasis and interpretation of this great theory can hardly fail to be coloured by my personal understanding.

### 2.4.8 The Psychogenesis of Leontiev

Having defined the psychic as a theoretical quality and for a while abstracting from the empirical question about where on this world (and possibly on other worlds) spontaneous and sentient beings are found, we can now proceed to the other psychogenic leaps according to Leontiev.

Leontiev suggests the following stages:

#### A Diagram of the Psychogenesis of Leontiev



In the table, the intermediate three stages are separated from the first and the last by dividing lines. The first stage does not belong to psychogenesis, but only to pre-psychogenic biogenesis. The last stage is not included in psychogenesis either. However, this separation is not the result of *under*-qualification. On the contrary, it is due to *over*-qualification, as this stage, the stage of consciousness, is co-extensive with anthrogenesis, and as such represents a leap *out* of bio- and psychogenesis

#### **2.4.8.0 The Stage of Irritability**

This stage has already been presented in Leontiev's psychogenic theory. It is considered pre-psychic, as there is no segregation of metabolism and object-oriented activity, and no reflection of the object toward which the organism is oriented.

#### **2.4.8.1 The Stage of Sensibility**

This stage contains the first form of the psychic, which is characterised simultaneously by motivation and reflection. Motivation means that the organism has some biological needs that are expressed in its activity, as an orientation toward those objects suitable for satisfying these needs. Reflection means that there is sensory and neural equipment enabling a representation of an object as a specific type of psychic reflection.

#### **2.4.8.2 The Stage of Perception**

The second leap in the psychogenesis of Leontiev is the transition from sensibility to perception. This is the leap from *goal identification through signal detection* to *goal awareness through object perception*. This is what Leontiev calls the leap from the *sensible* to the *perceptive* stage of psychogenesis. The signal detection type of sensibility in the stage of merely sentient organisms means a rather rigid scheme of innate reactivity to so-called key stimuli, *schlüssel reizese*. These are innate response mechanisms (abbr. IRM), that although somewhat modifiable by learning are basically systems of reactions to certain schematic features in the total field of the animal set in a certain biologically defined situation.

However, perception is something more. It means the awareness of objects as distinctive entities. In the case of other animals (and in fact we are referring



to animals only), this implies an understanding of these animals as beings with a specific kind of activity that is directed towards specific goals and a performance according to this.

According to Leontiev:

The next stage after that of the elementary sensory psyche, the second stage of evolution, can be called that of the perceptive psyche. It has the capacity to reflect external, objective reality already in the form of a reflection of *things* rather than in the form of separate elementary sensations evoked by separate properties or a combination of properties. (Leontiev 1983, 175)

Just as with the previous transition of psychogenesis, however, it is not just on the *reflectory* (mirror) side that the change takes place. The more integral comprehension of the object as not just a signal releaser of instinctive motor behaviour, but rather as an organism capable of learned, non-stereotypic, situated activity toward a specific object, indicates the change on the *executing* side of the activity. This is demonstrated clearly in the behaviour of an animal that bypasses a hindrance blocking its goal.

[T]he influence to which mammals' activity is directed no longer merges with influences from the barrier in them, but both operate separately from one another for them. The direction and end result of the activity depends on the former, while the way it is done, i.e., the mode in which it is performed (e.g., by going around the obstacle) depends on the latter. This special make-up or aspect of activity, which corresponds to the conditions in which the object exciting it is presented, we shall call operation. (ibid, 175f)

Thus, just as the previous leap from irritability to *sensibility*, and thereby to the psyche, was characterised by the bifurcation of *metabolism* and *object-directed activity*, the next leap from *sensibility* to *perceptivity* is distinguished by a bifurcation. This is a bifurcation of the object-directed activity into the integral system of object-directed activity itself, and partly into the plastic part of this. In other words, it is not directed immediately toward the object itself, but toward the situational aspects modifying the activity. These modifying parts of activity are the *operations*.

In defining the consecutive stages, Leontiev consistently focuses on the aspect of reflection, rather than the aspect of motivation. This is the case for the present stage, the stage of perception. However, in my opinion, we could make the definition of *stage* more well-founded by focusing on the activity of the perceptive animals. The new psychogenic stage is peculiar because of its object-specific motivation. The motivation of the animal is directed towards a specific object distinguished from the field that simultaneously contains the animal itself and the object in question.

The *object-directiveness in the motivation* of the animal and the *object-perceptiveness in the cognition* of the animal are logically combined into an *object-orientation in the very activity* of the animal.

That is, just as the motivation and the cognition of the animal is getting more specific in relation to certain objects (such as prey, predators, competitors, mates or offspring), the activity as such *increases in specificity*. The phenomenon of increasing specificity is, of course, the empirical basis of the theory of psychogenesis.

That the perceptive activity is object-specific means that the animal can distinguish between the *object*, towards which the activity is directed, the *goal state* being the success criterion of the behaviour and the *conditions of the field* that are setting the requirements for its performance.

#### 2.4.8.3 The Stage of the Intellect

This evolution towards a more complex organisation of object-directed activity is reinforced in the next stage, the stage of consciousness (in Leontiev's theory). Here, the operational aspect of activity, in a way, is made independent as a separate, preparatory phase before the goal-seeking activity itself. Additionally, the intellectual animal (Leontiev had the primate in mind) has to indulge in pure reflection about strategy before continuing its business.

In the subsequent (and final) human stage of consciousness, there is a clear distinction between the *action*, the conscious goal-directed part of activity, and the *operation*, the possibly conscious, possibly automated part related to the conditions of implementing the action. Leontiev's concept of operation covers the subordinate sections of activity, the choice of which is merely determined by the specific conditions of the field. Additionally, *action*, according to Leontiev, is referring to the *intentional totality of activity* directed toward the object

and defined in relation to the superordinate-goal situation. Granted, there are important characteristics of conscious action generally missing from the perceptive stage, this is not quite the case in the intellectual one. Therefore, the superordinate portion of activity defined by the *object and the goal* should be called a **proto-action**.

The proto-action is defined by its two constituents:

### Proto-action

#### 1. The goal

either directly present, or placed in the proximate, but not visible part of the neighbourhood that has to be mediated (and represented) by memory.

#### 2. The way towards the goal

that can be somehow blocked or disturbed, so that the animal has to choose and perform certain operations that fit into the specific *conditions* of the setting of the proto-action.

Until the last stage, the anthropological one (or in Leontiev's terminology, *the stage of consciousness*), the activity of an animal or a group of animals is a ready-made composition of fixed operations. In the higher vertebrates, however, and especially in the apes, a certain activity can consist of a proto-action that controls the choice of an operation suitable for overcoming the complications to goal realisation determined by the conditions of the setting.

As an example, we can take the shrewd chimpanzee misleading a dominant bully by deliberately visiting a tree without bananas. He thus leads the muscularly superior, but cognitively inferior fellow to a futile search for fruit, while he runs to a tree of real abundance.<sup>56</sup> Here the proto-action is the composite process of:

## Proto-action as a Composite Process

- a. Choosing the second (abundant) tree as its main object and the consumption of the bananas as the goal situation
- b. Perceiving the bully as a threat, thus constituting the specific condition of the proto-action
- c. Figuring out that the bully can be fooled by performing the first operation of running to the fake tree
- d. Conclusively realising the goal by performing the second operation of running to the genuine banana tree.

Unlike Leontiev, I will not make a systematic distinction between a perceptive and an intellectual stage (defined to be inhabited by the apes). Leontiev had access mainly to Köhler's cognitive experiments with apes (Köhler 1973). There is growing evidence, however, that many other mammals can also exhibit, to an admittedly much lower degree, intellectual ability. Nonetheless, not all the stages are of course plane levels, but rather oblique ones. On the other hand, field observations as well as carefully designed experiments with primates have demonstrated the wide scope of primate intellect.

### 2.4.8.4 The Stage of Consciousness

I am not quite satisfied with the name of the former stage, as intellectuality is not an evident characterisation of primates, however clever they sometimes seem to be. Nevertheless, in this dissertation I will concentrate on the next level, which is the stage that Leontiev calls the level of *human consciousness*. The leap to this psychogenic level is, however, a leap out of biology, just as biogony was a leap out of cosmology.

In fact, Leontiev provides a characterisation of human activity. He emphasises two constituents as a *condition sine qua non* of human activity, which is here analysed in the peculiar form called work:

The two following features are above all typical of labour. The first is the use and making of tools. 'Labour', Engels said, 'begins with the making of tools'.

The second feature is that it is performed in conditions of joint, collective activity, so that man functions in this process not only in a certain relationship with nature, but also with other people, members of a given society. Only through a relation with other people, does man relate to nature itself, which means that labour appears from the very beginning as a process mediated by tools (in the broad sense) and at the same time mediated socially. (Leontiev 1981, 208)

Here, Leontiev pinpoints two of the three defining qualities of the theory of human activity I am going to present in the next chapter. The two characteristics outlined by Leontiev are the use of *tools* and *cooperation*, "common collective activity". The third characteristic that is missing, but certainly found elsewhere in his writings, is *meaning*. *Meaning* is in fact the category containing the very key to the purpose and coherence of a specific instance of human activity.

The **anthropogenic** leap is at the same time the last leap of biogenesis, and especially of psychogenesis, and the first leap of anthropogenesis, a leap that is much more than just psychogenic. This paradox will be treated in the last section of this chapter, in the section introducing the anthropological object field.

## 2.5 Anthropogony, Anthropogenesis and the Anthropological Object Field

Until now, this chapter has focused on the object fields studied in the natural sciences (the cosmological and the biological disciplines). However, the aim of this treatise is primarily the anthropological sciences, not the natural sciences. The natural sciences have been introduced just as stepping stones. According to the evolutionary perspective of the theory of activity, the natural sciences are necessary to understand the creation, and therefore also the nature of man.

The present section is only meant to be an introduction to the subject of the very topic of this treatise. In a way, the remainder of the book will be a continuous expansion of this subject matter. The following chapter treats anthropology in more detail, and the different aspects of anthropology are presented in

the chapters succeeding the anthropological one. Presently, I shall confine myself to a brief presentation of the ultimate basics of anthropology, according to my own theory. Only a scarce number of fundamental concepts are included here, and they are defined in a Laconic way, as a more thorough presentation follows in the succeeding chapters.

Once again, I shall distinguish between a finalistic and a historical understanding of evolution. From a *finalistic* perspective, Humankind is a necessary terminal point in the evolution of life, and possibly even of matter. From a *historical* perspective, the beginning and the course of life, and possibly even of matter, are necessary, but certainly not sufficient, preconditions for the proper understanding of the nature of that peculiar species of man that happens to be at the same time the object and the subject of anthropology. As the rest of this book will be dedicated to this subject matter, I will not go into any detail in this brief introduction.

Anthropogony must be understood to be just as dramatic as the two previous ontic leaps, i.e., cosmo- and biogony. It is analogous in particular to biogony, as a leap *in* a specific object field, and at the same time a leap *out of* this object field. This leap is a particular kind, it is an elevation to use the Hegelian expression.

What then is this anthropogonic leap, which starts as an ordinary part of phylogenetic evolution, but then has revealed itself as the beginning of something quite different? In accordance with the activity concept of the basic theory of Leontiev, it is a fundamental change in the very structure of activity itself. It is a change that comprises that mode of activity that is production.

The production of human activity means that human beings produce a totally new kinds of entity, i.e., *cultural products*; these include *artefacts*, *systems of meaning* and *organisational structures*. Ultimately, these cultural products, which I call **sociological objects**, are integrated into the super-entity of anthropology, the *societal system*. Thus, the objects of the anthropological field are either *sociological objects* (i.e., cultural products) or *persons* (i.e., human beings). The human beings at first sight seem to be just biological objects like any other organisms. Even human beings are organisms. They are, however, at the same time something else, something radically different from other organisms. On the one hand, they are offspring from the biological object field, and as newborn, very much so. On the other hand, they are also cultural products,

just as are the artefacts, the organisational structures and the meaning systems.

As a cultural product, however, a human being is not produced just by other people, but to a very large extent is a product of his or her own struggle to *appropriate* the culture as an integral part of the personality.

Thus, we have two kinds of anthropological objects. We have, on the one hand, the sociological objects that are the *externalised* products of human activity. On the other hand, we have the persons who, by producing themselves via the appropriation of culture, are the *internalised* products of human activity. The context of human activity is not an eco-niche defined in a biological way, as is the case for other species. Rather, we have a *scene of human activity*, the specific context of which is the societal system, which is in itself a product of human activity. The eco-niche of a non-human species is, of course, also partly the result of the activity of the species itself, but only *partly*, because the eco-niche is at the same time substantially determined by many other species and even by geological and meteorological processes.

The societal context of human activity, however, is decidedly produced by human activity, and is not only maintained, but also restructured by this activity. And as it is now becoming more and more visible, restructured in such a large scale that it is not just a local human eco-niche that is affected, but the entire biosphere. This macro-production of the human context brings us to the next characteristic of the new object field: the change in the fabric of evolution actually is at the same time an *annihilation* and an evolution.

It is a *Sublation (or Aufhebung)* that transforms biogenesis to sociogenesis; it is a leap from the evolution by natural selection to the historical development of humans by cultural accumulation of change.

Corresponding to the change on the macro-level of the species is the transformation of the ontogenesis of the individual animal through maturation and learning to the human ontogenesis that is personal development or development of personality.

The following diagram shows the major characteristics of the anthropological object field:

### A Model for the Anthropological Object Field

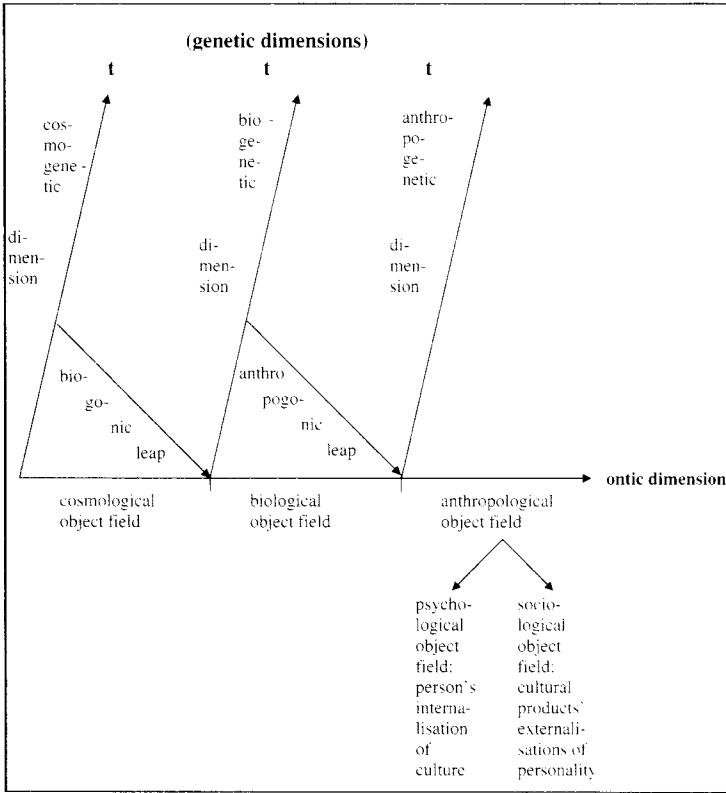


fig. 2.7

In the diagram, we see how the anthropological object field emerges from the biological object field through the anthropogonic leap, just as the biological object field emerged from the cosmological object field through the biogonic leap.

The anthropological object field is, however, a general frame having two different object fields as constituents. These are, on the one hand, the psychological object field, consisting of psychological objects, that is to say, human individuals, persons, and their internalisations of the culture in which they live. On the other hand, are sociological objects that are human products, and as such externalisations of personality.



When I introduced the biological object field, I explained how the word “physical” can be ambiguous, and I stressed that I shall consistently use the word only in the first sense, meaning whatever is *not* a living organism or a part, function or quality attached to such an entity, or a system consisting of living organisms.

Similarly, we can use the word “biological” in two ways:

### The Term “Biological” used in Two Ways

1. Biological<sub>1</sub>:

The first way to use the term is as an antonym to meaning *not at all related to human life* (either the psychological or the sociologic aspects), but *sub- or pre-anthropological*.

2. Biological<sub>2</sub>:

The second way to use the term is as an all encompassing concept meaning *anything related to life* (either non-human or human).

I avoid the use of the second sense of the word, not because I deny the obvious fact that human beings are animals, and that our life processes follow the general biological paths, as this fact is a banality. Nevertheless, I restrict myself to using the word in the first sense in order to avoid ambiguity. I thus use the word biological in such a manner that it relates its ontological stage to the previous one in the same manner used with the word “physical”. Thus, the three consecutive object fields are defined as a category system, in fact, as an ordered kind of such a system.

By following this convention, we have the methodological advantage that any phenomenon, object or essentiality can be placed within one object field only. For instance, work, according to this terminology, is an *anthropological*, *not a biological* phenomenon. Persons are *anthropological* and *psychological* objects, not biological<sub>1</sub> ones (meaning *not merely biological* objects). Tools are *anthropological* or *sociological* objects, but not *physical* ones. In all these

assertions it is, of course, a tacit precondition that the terms are used based on their exclusive, not their inclusive meaning.

Now that the major characteristics of the anthropological object field have been sketched, we could ask whether there has been a change in terms of *essence*, a distinctive difference in the essential principles of the two fields. I shall try to explain the change as a sublation from the *principle of functionality* to the *principle of intentionality*. If you so wish, you could also say that the change was to the *principle of conscious intentionality*, or just *consciousness*. This terminology, however, stresses the psychological sub-field too much and accordingly neglects the sociological sub-field.

Where are we then, just before setting out for the real matter of this book, the problem of anthropology. In this introductory sketch of the anthropogenic leap and of the anthropological object field, we have found a seemingly confusing plethora of diverse phenomena and objects. What then is the essence of it all? What is the content of the principle of intentionality?

In accordance with the very guiding concept of Activity Theory, I shall look for this essentiality in the general characteristic of *human activity*. This *specifica differentia* I will call the *mediation* or maybe rather the *mediationality of activity*. All the aspects of culture and personality just mentioned can be understood as mediators for human activity; the societal mediators forming the totality of **culture**, consisting of tools, (societal) meaning and the organisational structure; the psychological mediators creating **personality**, with its subsystem of consciousness. The mediating processes are then societal *productions* of culture in the sub-field of sociology and personal appropriation of culture in the psychological sub-field.

## Notes

- 1 Existence has been kidnapped by the existential philosophers and applied by them to the exclusive context of human life. For instance, Heidegger (1949) has used an etymological argument for this interpretation. (*ek-sisto*: Greek for to *stand outside*) In this book, however, existence is used in an inclusive way, encompassing all organisms and all non-living object.
- 2 (Kirk & Raven 1957).
- 3 The degree of precision, however, is dependent on the type of entity to which we refer. Thus, the Statue of Liberty can be located with a precision of within a metre, whereas an object like the U.S. is not confined within its geographical boundary.

but also has movable parts like its warships and bombers. The objects we call corporations, like Shell or Microsoft, are even fuzzier in their locations.

- 4 If they [the atoms] are expressions of the natural laws, that is the central order of the material world, you have to acknowledge them as actual [wirklich], as there emanates effects from them, you can not, however, acknowledge them as 'real', as they are no 'res', no thing. (Heisenberg 1971, 27f)
- 5 This is, of course, a (*concept*) *realist* position in the discussion of universals. This discussion will be treated in chapter 5.
- 6 Bohr's redefinition of the term "phenomenon" is clear in this quotation from an international conference in Warsaw 1938:  
 Speaking, as is often done, of disturbing a phenomenon by observation, or even of creating physical attributes to objects by measuring processes, is, in fact, liable of being confusing, since all such sentences imply a departure from basic conventions of language which, even though it sometimes may be practical for the sake of brevity, can never be unambiguous. It is certainly far more in accordance with the structure and interpretation of the quantum mechanical symbolism, as well as with elementary epistemological principles, to reserve the word 'phenomenon' for the comprehension of the effects of observed under given experimental conditions. (Pais 1991, 432)
- The most extensive exposition of Bohr's philosophy is found in three books that as far as I know have not been translated (Bohr 1959, 1964 and 1965).
- 7 See (Karpatschof 1983).
- 8 (Lenin 1977).
- 9 In all fairness, it should be borne in mind that this lack of awareness of the technologically mediated evidence was not at all as evident around the turn of the last century as it is now.
- 10 Here to be understood in its normal, narrow meaning, that is the theory of the history of Cosmos.
- 11 Crisis as in the concept of (Kuhn 1960).
- 12 (Hegel 1975, p. 426).
- 13 (Kvale 1992).
- 14 (Copleston 1985, vol II, p.136-155).
- 15 Democrite's atomic theory is described in (Kirk & Raven 1957).
- 16 I have here taken the liberty of using the concept of political economy in its Marxian (double) sense as a matrix for coining the concept political metaphysics.
- 17 See (Michotte 1963).
- 18 It should be remembered that the original number of elements believed to be in existence was 4. The final number exceeding 100 was thus far from the intended simplicity.
- 19 For a description of Mendeleev's discovery of the periodic system, see (Danaher 1988).
- 20 There are about 100 elements and at least as many kinds of atomic particles.
- 21 Darwin's theory is not preceded nor succeeded by such a philosophical investigation of evolution, and Popper has explicitly repudiated the very idea of a scientific

- theory of evolution.
- 22 (Engels 1974).
- 23 (Sartre 1978).
- 24 Mereology is a term suggested by the Polish logician Stanislaw Lesnoiewski for the study of the part-whole relation. See (Bastable 1975, p. 242).
- 25 See (Gutzwiller 1990) (Lorenz 1995).
- 26 Chaos theory still conceives of this indeterminacy as epistemological, as even the slightest imprecision in measurements of a system may have an effect on prediction that is totally destructive. According to my own epistemology, this distinction between an epistemological indeterminism and a conserved ontological determinism will prove to be un-defendable in the long run.
- 27 See (Capra 1983).
- 28 See (Prigogine 1980) (Prigogine & Stengers 1984).
- 29 See (Margulis & Sagan 1986).
- 30 See (Lovelock 1982).
- 31 This interpretation of Aristotle has been suggested by Engelsted (1989).
- 32 See (Leontiev 1981).
- 33 See (Bateson 1987).
- 34 See (Lovelock 1982).
- 35 See (Dijksterhuis 1961).
- 36 See (Margulis & Sagan 1986).
- 37 See (Eible-Eiblesfeldt 1970).
- 38 See for example (Parrish 1993).
- 39 See (Leontiev 1981).
- 40 See (Ridley 1986).
- 41 (Hegel 1982).
- 42 (Spencer 1850).
- 43 In the sociological chapter, I will assert in a similar way, now apparently ethnocentric, that our present, Western society is on a higher level than other societies.
- 44 In fact lately, an explanation has been proposed, however, that is at least as weird as the anthropic one. This theory is that there are, in fact, a multitude of universes existing beside one another, and that through a kind of pseudo-Darwinian selection, they develop in different directions, the ones fulfilling the critical parameters being the most extensive ones.
- 45 (Barrow & Tipler 1986).
- 46 As we are here abstracting about our own species, the politically correct use of "his and her" will not work. In this imaginative context, I find it, if not male chauvinistic, then at least terra-centric to presume the universal existence of exactly *two* sexes and exactly the sexes of *male and female*.
- 47 Descartes thus writes in "The passions of the soul":

...let us recognize that death never comes through failure of the soul, but solely because some one of the principal parts of the body disintegrates. Let us hold that the body of a living man differs from that of a dead man just as any machine that moves of itself (e.g., a watch or other automaton when it is wound up and thereby has in itself the corporeal principle of those movements for which it is designed, together with all else that is required for its action) differs from itself when it is broken and the principle of its movement ceases to act. (Descartes 1958,267f)

And further in the Discourse:

This [movement without being guided by the will] will not seem at all strange to those who know how many kinds of automatons, or moving machines, the skill of man can construct with the use of very few parts, in comparison with the great multitude of bones, muscles, nerves, arteries, veins and all the other parts that are in the body of any animal. For they will regard this body as a machine, which, having been made by the hand of God, is incomparably better ordered than any machine that can be devised by man and contains in itself movements more wonderful than those in any such machine.

I made special efforts to show that if any such machines had the organs and outward shape of a monkey or some other animal that lacks reason, we should have no means of knowing that they did not possess entirely the same nature as these animals; whereas if any such machines bore a resemblance to our bodies and imitated our actions as closely as possible for all practical purposes, we should still have two very certain means of recognizing that they were not real men. The first is that they could never use words, or put together other signs, as we do in order to declare our thoughts to others...Secondly, even though such machines might do some things as well as we do them, or perhaps even better, they would inevitably fail in others, which would reveal that they were acting not through understanding but only from the disposition of their organs. For whereas reason is a universal instrument which can be used in all kinds of situations, these organs need some particular disposition for each particular action; hence it is for all practical purposes impossible for a machine to have enough different organs to make it act in all the contingencies of life in the way in which our reason makes us act. (Descartes 1988,44f)

- 48 If we confine our discussion of the extension and genealogy of the psychic to the special form called consciousness, there is a tendency toward an even narrower definition. The argument for Descartes' Anthropism was actually his identification of the psychic with consciousness. Further, Jaynes (1976) ousted the Cartesian restriction of consciousness as a human quality by forwarding the hypothesis that consciousness is a product of cultural history, not born with our species, but developed in the high cultures of the Antiquity.
- 49 Aristotle thus writes about the soul [psyche] of the plants:  
The nutritive soul [psyche] belongs to other living things as well as man, being the first and most widely distributed faculty, in virtue of which all things possess life. Its functions are reproduction and assimilation of nutriment. (Aristotle 1907,63 [De Anima II, ch.3,4]).
- 50 The animal soul [psyche] is characterised in this quotation:  
The soul [psyche] in animals has been defined in virtue of two faculties, not only its faculty to judge, which is the function of thought and perception, but also of local movement, which it imparts the animal (Aristotle 1907,147 [De Anima III, ch.9]).
- 51 From "psychein" = to breathe. See (Jaynes 1976, 270f).
- 52 (Ibid.)

- 53 (Leontiev 1973, 109). All the quotations of Leontiev in the remainder of this section are the author's translations from the German edition of his *major opus*.
- 54 Auf einer bestimmten Stufe der biologischen Evolution werden die der Lebens-erhaltung dienenden Wechselwirkungsprozesse gleichsam in zwei Teile gespalten. Auf der einen Seite sehen wir die Umwelteinwirkungen, die die Existenz des Organismus unmittelbar bestimmen und auf die er mit grundlegenden Lebens-Prozessen und Lebensfunktionen reagiert. Auf der anderen Seite wirken neutrale Reize, auf die der Organismus mit Prozessen antwortet, die die organischen Grundfunktionen nur mittelbar realisieren, den Prozessen des *Verhaltens* (Leontiev 1973, 110) [The English quotation is of the author's translation, as the section quoted is not included in the English edition].
- 55 This deviation can be interpreted as a terminological rather than conceptual one, as explained above in the discussion of the Aristotelian concept of psyche.
- 56 (Lawick-Goodall 1971).