Life as Its Own Designer
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Life as Its Own Designer

Darwin’s Origin and Western Thought
Since pre-Socratic times Western thought has been shaped by the tension between two rival epistemic frameworks, each aiming for the most adequate and comprehensive understanding of our world. As far as it can be traced, the schism started with Xenophanes (born around 570 BC). Offended by inconsistent, contradictory and amoral Homeric descriptions of gods, he introduced the concept of one, immovable, rational and moral deity, from which all the rules of our world emanate and which stands in opposition to the mere “just-so” stories of myth. These two kinds of logos we shall refer to as “rational” and “narrative” respectively. In any given epoch or culture the difference between them has usually been clear, although rational explanations have always enjoyed somewhat higher status than any narrative lacking intellectual evidence. Taken historically, however, the difference between the two frameworks is not that clear. Often what has been taken as rational in an earlier culture has come to be regarded as mere myth, “figments of times past”, from the point of view of a later one. Moreover, the introduction of rationality has often been considered a measure of progress; rationality and progress became synonyms, and progress was, of course, “better”.

Xenophantian argumentation has existed in a practically unchanged form since the 2nd century AD, when it was used the in service of Christian argumentation against older beliefs. Here again it is implied that the “new truth” (and morality) soars against the “folly and perversity” of older, pagan times, potentiated by the new eschatology of synoptic Gospels and the Paulian concept of a “new man”. This is illustrated by two authors who are separated in time as in views, yet congruent in their perception of the world. First, passages from Augustines’ De doctrina christiana (AD 396–427; English translation 1997):

“A wise mind (in other words, one that has acquired wisdom) was not wise before it acquired wisdom; but wisdom itself was never unwise, and never can be. If they did not see this, they could not, with such complete confidence, subordinate the changeable form of life to a form of life that was unchangeably wise. They certainly see that the actual standard of truth, by which they maintain the superiority of that life, is not subject to change, and they can only see this as belonging to a realm above their own nature, since they see themselves to be subject to change. Nobody is so brazenly stupid as to say, ‘how do you know that the form of life that is unchangeably wise is to be ranked more highly than the changeable form?’ The answer to this question, about how I know, is publicly and unchangeably present for all to...
behold. Anyone who fails to see this is like a blind man in the sun, who cannot be helped by the brightness of such a clear and powerful light shining into his eyes.” [VIII.8/IX.9] “Among all these things, then, it is only the eternal and unchangeable things […] that are to be enjoyed; other things are to be used so that we may attain the full enjoyment from those things.” [XXII.20] “God exists in the supreme sense, and the original sense, of the word. He is altogether unchangeable, and it is he who could say with full authority ‘I am who I am’, and ‘You will say to them, I have been sent by the one who is’ [Exod 3:14]” [XXXII.35]

Hence, “objective” evidence is preferred to conveyed, mediated knowledge. Such concepts in many variations survived for many centuries; finally the Enlightenment and later times recycled the same pattern of argumentation again, but this time directed against Christianity. In totalitarian conceptions it was enhanced by the eschatology of the “Last Battle”, which promised to open the Way to a better future for all humankind. (It is, of course, a New Man – differently coloured in different regimes – who will dwell in this New Future.) One who knows the external truths has a duty to work on quickening the advent of their ruling, of course. At this point we could refer to communist and similar teachings, but utopias provide even better examples. In Walden Two it is apparent that B. F. Skinner (1976 [1948]), the leading 20th century proponent of behaviorism, also sought to stop the ever-changing world in the name of eternal truth:

We want a government based upon a science of human behavior. Nothing short of that will produce a permanent social structure. For the first time in history we’re ready for it, because we can deal with human behavior in accordance with simple scientific principles. The trouble with the program of anarchy was that it placed too much faith in human nature… (182)

There is a telling exchange between Fraser (the principal character and founder of the Walden community, a scientist) and his opponent, Castle (240–242):

F: . . . What would you do if you found yourself in possession of an effective science of behavior? Suppose you suddenly found it possible to control the behavior of men as you wished. What would you do? […]
C: I think I would dump your science of behavior in the ocean.
F: And deny men all the help you could otherwise give them?
C: And give them the freedom they would otherwise lose forever!
F: How could you give them freedom?
C: By refusing to control them!
F: But you would only be leaving the control in other hands.
C: Whose?
F: The charlatan, the demagogue, the salesman, the ward healer, the bully, the cheat, the educator, the priest – all who are now in possession of behavioral engineering.

Thus Fraser lobbies for the rational control of human affairs in order to marginalize irrational bullies who would deceive the people. He concludes:

If man is free, then a technology of behavior is impossible. . . . I deny that freedom exists at all. I must deny it – or my program would be absurd. You can’t have a science about a subject matter which hops capriciously about. Perhaps we can never prove that man isn’t free; it’s an assumption. But the increasing success of a science of behavior makes it more and more plausible.
And one also gets a hint of the irrationality of the past when, for example, Frazer speaks of Jesus who refused punishment (245): "He certainly had none of the experimental evidence which is available to us today, and we can't conceive that it was possible, no matter what the man's genius, to have discovered the principle from casual observation." Further on we read (258) that the Russian experiment was good at the beginning, but failed to stick to well-designed experimental schedules, in addition to other faults. Such a global perspective is the single bit of palpable progress in sight in the 25 centuries that separate Xenophanes and Skinner, for Xenophanes definitely expressed no concerns about humankind! The pattern of argumentation, however, is independent of whether the particular author knows and quotes Xenophanes, or has any idea about his works.

The notion of rational and moral divinity also lies in the background of typically modern concepts of "natural law" and "moral law", both seen as issued by God. Nature is fully subordinated to His will; only humans, endowed in His image with reason and freedom, are also free to disobey. But disobey what? Natural laws obviously cannot be disobeyed (nature, in this conception, is fully deterministic); what can be disobeyed is the moral law – and human transgressions then must be punished by God. A deistic idea thus arises, taking divinity as a combination of supreme watchmaker and vice squad. Natural, as well as moral, laws become understood as a divine plan of creation – creation as a construction, as a product, in contrast to wiser currents of religious tradition. An atheist can easily take over this concept, in which natural and moral laws are understood as necessities: even for him it is, of course, good and advantageous to know as much as possible about them. He can argue – along with the creationist – that science and technology based on logic and mathematics indeed works. The chapters that follow represent an attempt to show how unobvious such a cult of rationality is in the world which is physis. We shall concentrate our analyses on questions concerning self-sustaining life and the living world.

When considering life, we perceive a trend for the bodily nature of living beings to be reduced to forms of rational calculi devoid of bodily existence but easier to grasp through mathematics, logic, or informatics. Such a trend is focused on locating the ultimate causes of living beings in strings of nucleic acids, in evolution that alters the frequency of alleles in populations, or in ecology construed as the spontaneous by-product of activities of myriads of hapless, quasi-autistic individuals. Consequently the whole process of ontogeny and of "performing" life itself becomes understood as analogous to an assembly line or a computer program – complicated, but decipherable and understandable to the last details. To quote Richard Dawkins (1976, preface): "We are survival machines – robot vehicles blindly programmed to preserve the selfish molecules known as genes". In another book (1981, 17) he states that we are "the most complicated and the most perfect machine in the knowable universe".

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1It may be argued that the book was meant ironically, but we doubt it: the whole spirit of the time favored the belief that everything, from molecules up to the universe, can be explained on the basis of simple rational principles.
Laws are normative rules, parts of a rational system. Yet, in addition to many difficulties with these efforts to forget about *physis*, another peculiarity of such approaches will be seen to stand out. This is the way in which they totally forbid novelty: they are unable to take into account anything that has not already been present virtually, and thus identifiable *in potentiam* by standard calculations or logical sequences.

Hence, three principal mysteries in the realm of life are: (1) Where does the novelty come from? (2) What is the essence of evolution? and (3) What is the role of living beings in evolution? Such questions have a lot to do with the two forms of logos – narrative and rational – as mentioned above. If novelty is allowed then history enters the stage; and if history is allowed then living beings should be taken into consideration as *interpreters* of the past.

This text is an experiment in writing a multi-authored book without ending up with a collection of standard papers, each written by somebody else. Instead, half a dozen people working in theoretical biology, philosophy, and informatics provided rough material that was then welded together by one of us (AM), with all authors assisting in, commenting on and discussing the whole welding process. It was a peculiar and enriching experience for all of us.

The book is divided into two parts. The first deals with more philosophical topics while the second focuses on living beings, their evolution and being in the world. We begin the first part, concerning *the hermeneutic nature of the world*, by dealing in Chapter 1 with the roots of rationality and the hermeneutics of the natural, with how narrative can help us to explain life. Chapter 2 is devoted to living beings as co-creators of the world in the process of evolution. An analysis of why novelty is so hard to comprehend in the framework of Western thinking constitutes the topic of Chapter 3. This theme is developed further in the Chapter 4, which is devoted to the conflict between evolutionism and traditional rationalistic worldviews.

The second part of the book takes its inspiration from the Heideggerian parable of the Region [*Gegnet*] determining the path of wanderers, but, at the same time, moulded by their wandering. The key idea in the second part, then, is that living beings are wanderers that co-create their region. Chapter 5 is devoted to global activities of the Gaian biosphere and what can we learn from it. In Chapter 6 we focus our attention on another aspect of the mutualistic conception of life, on like-ness as demonstrated in homology studies. The last chapter addresses the problem of so-called evo-devo science, but considered from the angle of the concern of life itself with own its being.

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To be Like Self ................................................... 73
Whence the New? .............................................. 74
Classification .................................................... 75
Clare et Distincte ................................................. 78
What is it Like to be Me? .......................................... 78
Abstractions ..................................................... 80
Logos Incarnate .................................................. 81
Semiotic Coherence .............................................. 82
Becoming ......................................................... 84
Speciation ....................................................... 85
Every World has its Own Time ..................................... 87
Vestiges of Creation ............................................. 88

4 Aut Moses aut Darwin. Creation Versus Evolution ............... 91
The Questionnaire .............................................. 91
Answering the Poll ............................................. 92
The Controversy Around Darwin as a Symptom .................. 96
Things and Objects ............................................... 97
Contest of Likenesses as a Manifestation of will to Power, i.e. the Struggle for Life ................................................. 98
Genesis and Phylogenesis ....................................... 100
Empirical not Rational ......................................... 102
This is not Science ............................................... 102
The Return to Natural Understanding – Evolutionary Nature of Science ........................................... 105
Logos as a Historical Contingency ................................ 106
Evolutionism as Reformation and Renaissance .................. 107
Evolution as Religion ............................................. 108
The Turn of Evolutionism Towards Naturalness: Discovery of Corporeality and of History ......................... 110
Nature as Narration .............................................. 113
History ............................................................ 115
Being from the Beginning ....................................... 118
The Turn of Ages ................................................ 119
Ecological Order ................................................ 121
There is Only One Single Truth: Each Truth is Single ............ 123
The Archetypal Essence of the Clash ................................ 124
The War of Giants ............................................... 126

Part II The Region Life
Emergence of Pattern ........................................... 129

5 The Living Planet ............................................... 137
Feedback and its Embodiment .................................... 138
Neo-Darwinism and Gaia ....................................... 141
<table>
<thead>
<tr>
<th>Contents</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gene pool, Communication, Body</td>
<td>142</td>
</tr>
<tr>
<td>Communication Networks</td>
<td>148</td>
</tr>
<tr>
<td>Multicellular and Multispecies Structures</td>
<td>149</td>
</tr>
<tr>
<td>Small World of Complex Systems, and Their Modelling by Graphs</td>
<td>150</td>
</tr>
<tr>
<td>Fitness Landscapes and Regioning</td>
<td>154</td>
</tr>
<tr>
<td><strong>6 What is the Source of Likeness?</strong></td>
<td>157</td>
</tr>
<tr>
<td>Short Glossary</td>
<td>158</td>
</tr>
<tr>
<td>How the Terms Homology and Analogy Got Their Recent Meaning: A</td>
<td>159</td>
</tr>
<tr>
<td>Brief History</td>
<td>161</td>
</tr>
<tr>
<td>Troubles with Levels of Description</td>
<td>162</td>
</tr>
<tr>
<td>Continuity of Information, Genes, and Structures</td>
<td>164</td>
</tr>
<tr>
<td>Structures and Traits; Ideas and IDs</td>
<td>167</td>
</tr>
<tr>
<td>Unity of Semantic Field</td>
<td>168</td>
</tr>
<tr>
<td>External Appearances</td>
<td>171</td>
</tr>
<tr>
<td>Back to Letter-Signs (ID) and Shapes (IDea)</td>
<td>175</td>
</tr>
<tr>
<td>Biosemiotic Interpretation of Portmannian Biology</td>
<td></td>
</tr>
<tr>
<td><strong>7 Creation and Its Vestiges</strong></td>
<td>179</td>
</tr>
<tr>
<td>Species as a Cultural Phenomenon</td>
<td>179</td>
</tr>
<tr>
<td>What is Passed Down?</td>
<td>182</td>
</tr>
<tr>
<td>The Sheaf</td>
<td>185</td>
</tr>
<tr>
<td>Cultural Parables</td>
<td>187</td>
</tr>
<tr>
<td>The Ghosts of Common Ancestors</td>
<td>188</td>
</tr>
<tr>
<td>Quaerendo Invenietis</td>
<td>190</td>
</tr>
<tr>
<td>Epilogue: Snow White and the Seven Dwarfs or On Nature</td>
<td>193</td>
</tr>
<tr>
<td>References</td>
<td>203</td>
</tr>
<tr>
<td>Name Index</td>
<td>209</td>
</tr>
<tr>
<td>Subject Index</td>
<td>213</td>
</tr>
</tbody>
</table>
In Quest of the Magic Strings

In the beginning was the Word – with these words begins the gospel of John. For two millennia, mishearing the proper message, which is that the Word was made flesh [John 1,14], people wanted to know “What was the Word?” instead of “What happened?”. As a result, our civilization takes all properties of the world as entities that could, indeed should, be expressed as strings of letter-characters capable of being manipulated afterwards by formal rules (calculus, logic, grammar, algorithms). We suggest a complementary approach, originating not from formal procedures with virtual (ritual) words but rather from the bodily experience of living beings situated in the real world. Here the nature of knowledge is hermeneutical and is rooted in experience, history, and structures.

Let us start with the first of the two questions above: What was the Word that was made flesh? A mighty name? Some powerful formula? A string of letter-like signs which worked as directions for the construction of a body? Or perhaps the name of a universal procedure, causing all things – including the world itself – to be made [John 1,3.10]? Clearly, it was none of those, as the Word was God and nothing was made, as most translations suggest: the Word itself became flesh and dwelt among us [1.14]. God revealed himself through a bodily form; He made its own exegesis [ekteinos exegesato] not through explanation but through incarnation (ensarkosis) – as a living individual.

Still, it is the Word which has been sought throughout the ages by most thinkers. They struggle to decipher its exact spelling, to extract its creative spell rather than to reveal the meaning of what happened. This kind of the quest still epitomizes the contemporary, scientific search for knowledge and truth. All entities, aspects and properties of the world are viewed as secondary, particular manifestations of some general, abstract principles (natural laws) which can, and sometimes have to,
be expressed formally through structures, formulae, schemes etc. – simply through formalized words put into formal relations. They are regarded as sufficient explanation for all phenomena, and are taken to be true knowledge – i.e. understanding in terms of causes, instructions that Nature “obeys”. All such rational structures can be transformed into strings of signs to be read not only as formal rules (calculus, logic, grammar, algorithms), but also as directions for the construction of devices. Most importantly, they are amenable to syntactic transformations, thus permitting those who know the proper words to “edit” the world and rule it through such knowledge.

The world is suddenly conceived as independent of man. The objective, external world must be explorable in terms of pure reason purified of all so called “secondary qualities” (bodily sensation, spacing or timing, experience of our body, colour, smell or optical illusions, experience of moral, social and cultural ideas or values, etc.) which allegedly are only subject-related, and not directly and exactly measurable or editable. In contrast to objective primary qualities (shapes, size, materiality and weight, motion, etc.) they belong to the “external world” (e.g. for Galileo). They can be quantified only indirectly, through experiments (experience of ideal free fall as everyday motion, experience of thermal oscillations as warmth, electromagnetic frequency as colour, etc.) Secondary qualities surely don’t belong to science proper.

Thus modern man took a fateful step from the natural and everyday, from the lived and experienced world of antiquity and the Middle ages, into the framework of causal exploration of nature and world construed in terms of mathematical-geometrical structure. The God of modernity created the world in accordance with mathematical principles, measurable and editable. And, because we are ens creatum, we inherited the feeling of mathematical principles: that is why we can objectively examine and detect the principles and laws imprinted on nature. Living beings become machines. Descartes made an exception for humans, but later La Mettrie applied this mechanical conception even to them.

Such is the world of modern (mathematical) science, the world expressed by models, the world of objective reality, knowable by definition. Being synchronous and transparent (Cartesian clare et distinete), it is presented to the modern intellect as a ready-made package, independent of any contexts of our lived world and history. Accessible to everyone, but inhabited by no one: no living body could dwell in it since it is devoid of interiority, subjectivity or meaning. Since nothing takes place there is no place for bodily shapes and forms. Ta physica, the science of Nature (phasis) and of the natural existence, became modern physics – the knowledge of the denaturalized world. Such was the achievement of men like Kepler, Galileo, Descartes, and Newton. Other sciences followed, fascinated by this calculus-like view of reality, as it were. In the life sciences it has led to the de-vitalization of life.

Contemporary physics has largely abandoned this heritage of modern science. It is striking, however, how it is carefully cultivated in most contemporary biology. As a result, biology subjects the bodily existence, organic development, and evolution of living forms and all life phenomena (including social, psychological and cultural ones) to the genetic text and the calculus of coding and permutations of the code.

A casual illustration of such an approach is provided by E. H. Davidson (2006) in the very first sentence of his textbook on evolution of development: “For about 40
years we have been engaged in the effort to perceive how development is encoded in the DNA, and thereby how animal evolution happened”. He continues: “By the end of the 1950s it was clear that the causal differences between the body plans of a fish and fly, or a sea urchin and a mouse, are somehow encoded in their DNA genomes”. Thus, from the very beginning, a single interpretative framework is imposed on the reader, to be applied to all experimental data. It suggests that development is coded in a static script, and not only that: the same static script will even reveal how evolution took place. Differences between body plans are causal, and it is clear that this causality is, again, encoded in a string of signs that themselves have nothing to do with causality. The text is rich in phrases like “mechanisms underlying differentiation”, “hardwired developmental program built into the DNA sequence”, and in questions like “In what sequences of the genome do in fact reside the causal differences responsible for morphological diversity, and how exactly do they function?”

A random search of modern biology textbooks will reveal many other examples of such mantras. Again and again we come across efforts to declare living bodies, their genesis (development), variability and changes of life forms, as results, or rather by-products, of repeated production according to a hereditary set of prescriptions (genetic programs) consisting of chains of chemical “letters” – strings of coding signs. Thus living existence is nowadays generally regarded as submissive to an alien, heteronomous law of quite a different nature than are the living beings’ bodies those laws are supposed to “cause”. Those “words” do not become flesh: they are but directions for the construction of bodies through which they are perpetuated. Such “commandments” are considered to be alien to living processes and are treated differently. It is not their form, shape, structure or composition which is relevant, but solely their syntax – the sequential arrangement of the four letter-signs in the DNA alphabet. “Laws” have no semantic content: they are not understood and accepted by any subject, there is no partnership or reciprocity; moreover, laws are imposed once and forever – no precedent “legal system” is conceivable. The bodies built upon these rules are not expressions of their contents. They are supposed to be merely devices and their behavior is controlled by these prescriptions. Consequently, evolution itself is not the transformation (metamorphosis) of living, bodily forms: it does not take place in flesh. Rather, it reflects mere syntactic transformations of characters – changes in their order, their position in the string. This book says a resolute “No” to such approaches.

Contemporary biology places life-phenomena in the causal world of objective reality governed by heteronomous, general laws, independent of actual, individual existence and unaffected by their applications, or by individual occurrences. Laws which may be expressed formally by means of calculi, perfectly known, applied for specific purposes. Molecular genetics is generally thought to have discovered, in genetic information, the calculus of life; hence its successes and near-total acceptance. Authors of alternatives to this view, putting emphasis on the morphological (eidetic) aspect of the living, tend to protect their “scientific credibility” by looking for general laws of form (e.g. d’Arcy Thompson 1995; Webster and Goodwin 1996). They try to bring living shapes under the norm of transcendental, model forms
tending towards Platonic ideas, by analogy with the established laws of physics, chemistry and other objective sciences. However, all such pre-established harmonies are abstract bodiless entities that put constraints on both developmental and evolutionary processes. They have no relation to the past experience and actual needs and aspirations of living forms. Ideally, such laws of form might (and should) eventually be expressed in formulas – again, easily transformable into strings of signs – to establish the objectivity demanded by science.

Do alternatives exist to such deterministic worldviews, where whatever happens is due to the magical spell of words? Can the world – *physis* – become emancipated, to reach a re-enchantment analogous to the pre-Socratic or Renaissance worldview, say, in which dependence on a written program, calculus or code, is nil or minimal, turned into a matter of mere spelling? Or, if we take into account the impact of string-symbolism on the performances of the world (as our everyday experience proves again and again), then does it make sense to contemplate strings of signs not as programs, calculi or codes, but as *texts* interpretable by the bodily world? In other words, is life, or even the world, of a semiotic or hermeneutical nature? Can the hegemony of *explanation* be replaced by *interpretation*? We believe that the answer to such questions is yes. But it is impossible to blindly transplant schedules from the past; we should build a vocabulary and construct images taken from our present experience, even as we carefully analyze similar efforts in the past.

Firmly convinced that, by striving to be objective, the sciences of the living totally miss their subject – nature itself – we set out on a different path: that of incarnation taken seriously. The word becoming flesh was not meant to be understood prescriptively. It was intended to be heard and received not as an instruction but as a revelation and a summoning inspiration. It is always to be understood (interpreted) individually, always anew. Such understanding is not to be expressed only in words but also in flesh. *The Word of life* [1John 1,1] is not to be put down into meaningless characters and transmitted as a string. The Word is a sign (*signum*) of a living meaning, through which *life was manifested* [ibid. 1.2], it is a *symbolon* (i.e., wholeness) of an event of incarnation in its own, unique way. As such it does not require any single, definite meaning. Rather, born out of the fullness of time, a body-sign is meaningful: the word made flesh both implies and expresses (manifests) the whole of the past experience. Bodily presence is intentionality incarnate. The particular meaning revealed is always new: it is revealed (comes into existence) as it is conceived (accepted, understood, realized) by *those who received him* [John 1,12]. We regard every development (becoming-body) as a hermeneutic feat, a gradual process of *exegesis* (self-manifestation) consisting of genuine choices and decisions among various understandings of the past knowledge, both in “script” (if we stick to the textual allegory of genetic information) and “tradition” (bodily and cultural continuity). Bodily development (becoming flesh) does not proceed through a chain of determined stages according to a general scheme (as it might appear to an external observer) but, rather, through a hermeneutical circle as a truly generative, exegetic process. Its meaning is grasped anew at every step through an incessant “dialogue of forms” between various organic parts, which takes place at all levels of significance. In such mutual communication (or rather organic communion), bodily formation
morphogenesis) finds its objective expression in an exchange of innumerable interactions (signals, stimuli, potentials, etc). That is how, for us, the life was manifested, and [how] we have seen it [1John 1,2]. Conceived, however, as such a network of information transfer, exchange and processing, it appears more complicated, entangled and structured, the more one tries to follow and distinguish between its various elements. Finally, the traditional view dissolves into chaos. These are the limits of the objective approach to the basically semantic nature of living. In contrast, the hermeneutics of the meaning incarnate is not to be found at the level of chemical processes and molecular mechanisms but in the bodily self-expression of living forms, likeness and behavior.

We have seen [it], and bear witness to it notwithstanding how different our attitude in matters of faith and belief in the Gospel may be. Despite the superficial dissimilarities in our fields of study, in the nature of our quest for knowledge, and in our scientific background, our view of nature is very similar, or at least our perspectives are largely overlapping. We agree that the theme, motive, symbol, myth, idea (or whatever one prefers to call it) of incarnation is the richest guide to grasp the heart of reality, and provides the deepest insight into the nature of physical existence, that is, into the “nature of nature”. Ensarkosis dwelling in the very heart of our cultural and spiritual legacy is an appropriate name for the place where we met, a rich source of inspiration, and the actual basis of our undertakings bearing various names, such as the hermeneutics of the living, eidetic biology, philosophy of nature, the significance of the physis of the Ancient.

A fertile field, largely unexploited, has lain fallow for thousands of years. Yet the spiritual experience of incarnation has hardly affected our general attitude towards earthly, material reality. This is despite its enormous impact on Western religion, culture and history. Christian tradition, even the learning of the Renaissance (stimuli provided by the hermetic tradition), does not offer much relevant support for us (apart from some scarce but stimulating exceptions). And, obviously, both modern, scientific rationality and contemporary religious spirituality are very remote from our researches. Apparently, at least “in naturalibus”, our civilization missed the unique opportunity it was offered (revealed or reminded) to elaborate an ontology of becoming-flesh. Pregnant with such a tradition, it has problems evaluating one of its greatest discoveries – evolution – because of difficulties with thinking about genuine novelties born in the realm of physis.

Now, in the present climate of ideas, provided with the necessary actual epistemological experience and with new instruments, we have another chance. We believe we should seize it.
Today, we are in possession of detailed and multifarious material concerning the structure and function of organisms; at the same time we witness a practically absolute absence of any attempt to grasp life – both in its singularity and in the manifold of its expressions.

S. V. Chebanov 2005, 347

In this chapter we focus our attentions on archaic Ionian thinking, and will seek the roots of the dichotomy between rational and hermeneutical thought. Before doing so it is necessary to take a short terminological detour. We have already given an account of what should be understood by “rationality”. But we owe the reader some hint concerning the complementary notion of hermeneutics. We shall understand it in terms of contemporary phenomenology: each cognitive circle starts with some pre-understanding, which can only lead to explanation and understanding. Any newly-achieved understanding becomes ammunition for the next hermeneutical circle. “The essential feature of the circular movement of philosophy does not lie in running around the periphery and returning to the point of departure. It lies in that view of the centre that this circular course alone can provide. The centre, that is, the middle and ground, reveals itself as such only in and for the movement that circles it. The circular character of philosophical thought is directly bound up with this ambiguity, an ambiguity that is not to be eliminated or, still less, leveled off by means of dialectic.” (Heidegger 1995, 187).

Contemporary inquiry into hermeneutics of the living, as a counterpart of rational approach, can be plastically depicted against the background of archaic thinking, sensitive to the differences and variability of nature. For example, the tradition of the Ionian “Presocratics”1 is neither philosophy nor science in the sense of how later centuries developed both concepts; yet its ways of thinking became, in the classical period, re-incorporated into the history of European philosophy and science. This tradition of thinking takes transformations of nature as self-evident, and is en rapport with both evolution and the individuality of all natural entities. At the same time such thinking, which does not differentiate between mind and body, or even between

1We mean the lineage from Thales to Hippocrates, with Heraclitus as its outstanding representative.
cause and effect, may help also to open an interpretation space for later, more rational topics. Some of the archaic motifs will be confronted with later overlays like the idea of corporeality, or the concept of species (in both logical and biological meanings of the word). Our aim is to address questions felt to be extremely difficult for contemporary hermeneutics of the living, such as:

(1) To what extent are natural entities specific, self-contained, and able to take care of themselves?
(2) How are we to avoid speaking about the corporeality of living beings in terms of mechanisms – i.e. as non-living constructs brought mysteriously into a living state?
(3) To what extent can we assume the existence of non-human beings, which would be capable of interpreting their own situation, their potentials (e.g. genetic ones), or their environment?
(4) How can we understand the ontogeny of living beings and evolution of species, and how the category of species helps our thinking?

Hermeneutics of the Natural, or how Things Arise

Our understanding of the living depends on how we perceive nature and naturalness, i.e. what the Greeks called *physis* and the Latin-speaking world *natura*; in other words how humans, animals, plants, and non-living things give themselves to us. Our points of departure may be practical and utilitarian, cognitive–scientific, or religious. Depending on the starting points, different presuppositions of our understanding will be accentuated, and will become mutually conditioned and interpenetrated in different ways.

Some of our approaches can be deliberately swapped; as when walking through a Central-European wood we may or may not contemplate both scientific and utilitarian aspects of the same forest. But in what sense is it “the same” in such complementary discourses? “The same” forest can be perceived as an object, as an emotional space, as God’s creation, as divinity of nature etc., with all such descriptions being mutually interpenetrating, incompatible, or exclusive. What, then, is the “true”, genuine *nature* of a forest? Is it some invariant of all such relationships? Or does there exist some privileged, basic, description of a “true” forest, be it led by our emotional sensibility or by rigorous reason? Is the forest such as humans see and feel it, or just a mere sensory perception evoked by an agglomeration of rationally describable elements, i.e., in the last resort, of elementary particles? Or is it of yet a different nature, with the descriptions mentioned above belonging simply to the limited repertoire of human cognition? Such perspectives are particularly important for humans as different individuals in different situations and cultures, but we should not forget the perspectives of various inhabitants of the same forest, or perhaps even stones. At

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2The topic is to a great extent elaborated by J. von Uexküll; e.g. 1956 (two works from 1934 and 1940).
this point, critical thinkers will raise the objection that, as a matter of course, reality should be approached rationally; therefore animals are not rational by virtue of being incapable of thinking, trees lacking eyes can hardly develop viewpoints, and stones simply exist and suffer erosion (see also Chapter 2). They will argue that a rational viewpoint can only be human, and that there may exist just a single view – that of the reason; after all, they say, reality herself is rational.

We are not advocates of irrational standpoints: after all, should “reality” lack any important rational facets, our cognitive enterprise would be a mere wordplay. It is not clear, however, how to distinguish such a “rational standpoint” from all possible views, to decide whether it is exclusive or not; neither do we know what the role is of irrational points and to what extent they also reflect something “real”. Of course, our investigation should proceed rationally, and all the better if we reveal, in the end, some rational construct in “reality” herself. Physis cannot be identified with this or that interpretation and cannot even be considered to be something “under” or “beyond” phenomena or rational constructs: physis is the very space enabling all those interpretations, mediated by multiple genres. This allows us to admit that physis would exist even without our presence, that the nature of some entities is independent of the existence of observers (divine, human, or animal). At the same time, however, we are not forced into a statement that things are such as we actually perceive or contemplate them.

Nature, physis, reveals herself as floating. Whatever is natural will spring up and perish, will emerge as something already heading towards annihilation. Such a swirling, of course, does not lend itself to being seized by the reason: it does not supply our reasoning with any single, firm, always valid boundary – hence the comparison of nature to a streaming river.\(^3\) In spite of this, to be able to navigate in our world, we incessantly seek such boundaries; nowadays we call them natural laws. We take their validity to be independent of any human observer or contemplator; as they were discovered by human reason, we take reason to be the utmost, single and sovereign measure of reality. Is it, then, possible to admit that a human being is not a single gauge for reality while not at the same time leaving the field of rational discourse? Such an elevation of man was popular at least in some periods, as demonstrated by the famous sentence of Protagoras (485–410 BC) reflecting a view that was commonplace in his time: “Man is the measure of all things: of things which are, that they are so, and of things which are not, that they are not” (B1).

The alternative to this thesis was not a claim that animals or stones should serve as measures of entirety, but the idea of divine privilege (however complicated in polytheist Greece) on one side, and the demands of the world, of physis, on the other. Protagoras, a moderate sophist, most likely intended to say that it is us, humans, who should agree on whether reality is what we perceive, or rather what we logically

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\(^{3}\) See, e.g. Heraclitus (B 91): “You cannot step twice into the same river; for fresh waters are flowing in upon you”, and a similar quotation in Plutarch (De E apud Delphos 18, 392b): “It is impossible to go into the same river twice’, Heraclitus said; no more can you grasp mortal being twice, so as to hold it. So sharp and so swift its change; it scatters and brings together again, nay not again, no nor afterwards; even while it is being formed it fails, it approaches, and it its gone.”
Roots of Rationality and Hermeneutics

contemplate. By doing so he could at least partially neutralize the Eleat claim (e.g. Parmenides, born about 515 BC) that unequivocal reality can be ascribed exclusively to objects of our thinking, in contrast to sensory perceptions, mere “conjectures of the mortals”. Protagoras’ attempt at emancipation from the Parmenidean goddess of Necessity (the guarantee of all thinking) led, however, to the gradual award of this same god-like position to man, or to some of his key characteristics, such as reason or even labour.

In modernity, such an exclusively human monopoly of human measures in explaining our world could be overcome only by Christian God, or by our sensitivity towards nature, i.e. to the wholeness of the world. We definitely do not rule over these two realms – divine and natural – but we can decide not to recognize them, not to take them into consideration! The question of whether animals or even stones might be our partners in interpreting the world looks then absurd: the question will be rebuffed by the argument that no “subject” can exist without commanding reason and free will, and, as everybody can see, those attributes belong exclusively to humans (and, as a relic, also to neo-scholastic God).

Our relationship towards \textit{physis} will, however, not be completed by some abstract determining the adequacy of our terms in relation to non-human natural objects; it also has a direct implication for natural sciences. To what extent, for example, do we take literally the phrase “mechanism of functioning”, especially as it concerns living beings? Can we admit the existence of perceptions in non-human entities, and if so, in which entities and to what extent? Can non-human entities care about themselves, about their progeny and environment?

\textbf{Religious Preconditions and Contexts in Comprehending \textit{Physis}}

Today it is not usually considered appropriate to point towards the religious context of naturalness. Such a position springs from the widespread conviction that religion deals with some “supernatural” domain which exists beyond nature. This concept of “supernaturality” is the heritage of Latin tradition, both pagan and Christian. In addition, many people believe that religion involves miracles, and modern science is, of course, not possible in a world allowing substantial deviations from regular, “lawful” behaviour of the world. To complete the list, from the 19th century we inherited the famous controversy of “science vs. religion”, in which all conceivable arguments have already been used by both sides, and often the same arguments have appeared under both banners.

Such remnants from the past obscure a broader picture that encompasses connections between religion and our understanding of nature, including scientific knowledge. For historical reasons we are unable to recognize that religion in a broader sense (including different brands of atheism) formulates an environment by moulding the very assumptions supporting our understanding. What should be done is simply not to confuse this broadest meaning of the word “religion” (sensu \textit{eusebeia}) with some particular religious teaching; this would bring the above-mentioned
assumptions into a timely and narrow context (e.g. dogmatic or moral). In order to renew the broader perspective we shall present some conceptions older than Latin culture and the Christian version of rational theology, conceptions which traditionally played an important role in the acquisition of understanding.

(1) The expression *physis* springs from archaic Greece; it was extensively used by Heraclitus from Ephesos (ca 540–480 BC; fragments B 1, B 3a, B 106, B 112 B 123), but the word is probably even older (see *Odysseia* X, 302). *Physis* is ever-changing; it emerges as something which necessarily dies out, without, however, exhausting the potential of the world’s turnover.4

*Physis* is the realm of Artemis, but in fact it is the area where all gods participate, because the world is not a district of any particular god; they alternate in reigning and organizing it. *Physis* herself has divine attributes (as has the world, *kosmos*), whereas particular natural appearances reveal at most their reflections, being finite, i.e. exhaustible and timely or – in case of living beings – mortal. But even such a final natural creation enters into many-sided relationships with the world, becomes its organic part. Later, such an understanding will get labels like “panpsychism” and “hylozoism”, which allegedly emerged from “polytheism” and leads towards “pantheism”. Such a position allows individuality of natural entities: about Thales, for example “Aristotle and Hippos say that he attributed souls also to lifeless things, forming his conjecture from the nature of the magnet and amber”, and he also said “that the world had life, and was full of daemons” (Thales A1 from *Diogenes Laertius* I, 24; I, 27).

Within that realm of human thinking which sought to understand *physis* and which later acquired the label “philosophy”, this stream is represented by the Ionian branch of so-called pre-Socratics, i.e. a line of thinkers from Thales (625–547 BC) to Hippocrates (460–377 BC). The religious context of these teachings is obvious and is applicable to cognitive processes. They do not, however, represent any religious doctrine: the role of theologians is played by poets and oracles, by their poems and prophesying. This kind of esteem towards *physis*, however, does not allow the emergence of science (in the sense of *episteme*); it does not allow formal proofs except in geometry, because there is no reason why *physis* should be *subordinated* to any rules that could be somehow proved. Hence the issue is in the understanding skill or art, not in a cumulative construction of data and methods. Such demands would be brought only later by innovators from Greek Italy: Pythagoras, Xenophanes and Parmenides (see Preface and below), and in definite form they will be corroborated in the modern age. We see the main problem of the exceptionally inspiring Ionian line as the very absence of formalism and the *impossibility of passing the teaching on*. Because of this the teaching looked very clumsy for anybody who tried to resurrect it in later times.

(2) Creation enters the religious beliefs differently. God, as revealed by religions of the Book, represents a different kind of divinity; He is the creator, not a mere producer and ruler over the world. Only later did a change of perspective – involving

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4 A notion of Anaximandros (610–547 BC); he, however, apparently did not use the word *physis*. 
the exchange of creation for a product – allow the Europeans to develop a rational, but at the same time exploitative, relationship towards the world. Those who seek a Biblical justification of such a shift will find it in Gen 1, 28: “God blessed them and said to them, ‘Be fruitful and increase in number; fill the earth and subdue it. Rule over the fish of the sea and the birds of the air and over every living creature that moves on the ground.’”

It is, of course, true that according to Genesis human beings are created according to the image of God, and the whole plot is centered to human race. But it is also true that neither production nor a technomorphic view of the world is to be found in it: it is definitely not legitimate to interpret Creation as the outcome of a production line. Undoubtedly those who wish to see **physis** and **creation** as synonymous have full rights to do so.

(3) Still different religious outcomes are represented by intellectual deities introduced by various thinkers since the end of the Archaic period. The Spherical One of Xenophanes is entirely Mind, while also being perception: “The whole [of god] sees, the whole perceives, the whole hears” (Xenophanes B 24). On the other hand, the goddess of Parmenides (probably Necessity, **Ananké**) absolutely prefers thinking, which is parallel to being. **Physis**, for such captives of reason, becomes but a realm where it is impossible to speak about truth; one can utter only judgments similar to truth. According to these thinkers, **physis** is not an existence but a superposition of things both existing and non-existing. This curious view has a formal reason: for Parmenides, real is what is identical with itself in a logical sense – and ever-changing **physis** could not fulfill such a criterion. Hence the peculiarity of **physis** is counterintuitive and cannot be clearly formulated.

We can proceed, according to this line of thought, from Parmenides to Platonian **demiurgos**, who constructs the world from triangles, and to the Aristotelian First Mover who himself is unmoving. Neither of these gods enjoys religious reverence (if the doctrinal rituals of intellectuals are not taken as such). In all cases we have a situation in which religious outcomes are substituted by an intellectual divinity playing the role of the guarantor of both the functioning of the world and of the epistemic method. **Physis** can be perceived only in a “denatured” condition – a line of thinking that takes into account only generalities, not cases, and that becomes a foundation for science (sensu **episteme**).

We perceive as fatal for the constitution of the later European intellectual world the fact that Greek intellectual gods were identified with the Hebrew God of Creation, or for Christians the Father of Jesus. We can follow such a move in many Church Fathers, e.g. in the exegesis of Xenophanes by Clemens,\(^5\) in the Platonism of Origenes\(^6\) and Augustine (see Preface), or in the Aristotelism of Thomas Aquinas. At least two motifs are here interconnected. First, what the god of intellectuals and God of Hebrews have in common is that he is always “one”. Second, adopting an

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\(^5\) Clemens of Alexandria, Stromata V, 109–110.

\(^6\) For Origenes, God was an unconditional, eternal, atemporal, non-corporeal, and therefore unknowable “being”, the ultimate cause of all being and becoming.
intellectual god for the explication of Christian faith allows the application of formal rationality, thereby helping to eradicate paganism and to overcome myths. When moralization and the cult of the supernatural (see above) join the party, understanding of an autonomous life of physis will fade away. Heidegger (1995 [1929–1930], 176–177) summarized the situation as follows: “The most familiar aspect of the problem reveals itself in the distinction between God and world. The world is the totality of beings outside of and other than God. Expressed in Christian terms, such beings thus also represent the realm of created being as distinct from uncreated being. And man in turn is also a part of the world understood in this sense. Yet man is not simply regarded as a part of the world within which he appears and in which he takes a part. Man also stands against the world. This standing-over-against is a ‘having’ of the world as that in which man moves, with which he engages, which he both masters and serves, and to which he is exposed. Thus man is, first, a part of the world, and second, as this part he is at once both master and servant of the world.” We return to this theme in Chapter 2.

A further important moment comes with the intellectual interpretation of Genesis 1,27: “So God created man in his own image, in the image of God he created him; male and female he created them.” God’s image is present, according to this view, as intellect, and such an understanding will enable the adequacy concept of truth. In voluntaristic interpretations it is free will that makes man comparable to God. To articulate the teaching, which has persisted since the Middle Ages, in modern terms: Homo sapiens is specified, i.e. becomes species, by possessing reason and will. All other natural entities are “lower” than the man-that-is-similar-to-God, whereas “supernatural” is even higher than his reason and his will.

Where the medieval Schools operated by the concept of “God”, most atheist teachings of later times would have used the term “natural law” (or “moral law”, or “explicative principle”). They might not have been aware, however, that “natural law” was originally meant simply as “law” imposed by the (intellectually interpreted) Creator on His creation.

Finally, in modern times, only romantic works (and also Nietzsche) granted some hearing to physis, or spontaneity of nature; otherwise the common denominator of the Scholastics and of the rational majority of atheists has been the abandonment of myths, an intellectualization of reality and often the subjection society to moral rules: motifs identical to those found in Xenophanes. The turn away from myth, narrative, and imitation was thus followed by abandonment of physis. Only evolutionary teaching, which cannot fit into such a scheme (because evolution is a narrative not formula, a mythos not algorithm) would in the late 20th century give rise to an

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7 “Veritas est adaequatio rei et intellectus. This can be taken to mean: truth is the correspondence of the matter to knowledge. But it can also be taken as saying: truth is the correspondence of knowledge to the matter. Admittedly, the above definition is usually stated only in the form veritas est adaequatio intellectus ad rem (truth is the adequation of intellect to thing). [...] Throughout, veritas essentially implies convenientia, the coming of beings themselves, as created, into agreement with the Creator, an ‘accord’ with regard to the way they are determined in the order of creation” (Heidegger 1993a, 117–119).
idea that rational science may be but the unifying myth of modern understanding, that “the core of scientific materialism is evolutionary epics” (Wilson 1982 [1978]).

In the frame of such an epic, is it possible nonetheless to view natural things as actors, to admit that they can represent the creators of laws they impose unto themselves?

**Nature Loves to Hide**

How neat and romantic would it be, to be able to seize physis “in action”, in flagranti, and to document her inconvertibility to a mechanism! But such a move leads always, inevitably, to a reification of physis, and every way of realising such a documentation will inevitably tend towards yielding a mechanism of some kind (see also Chapter 2). In spite of the fact that our knowledge can grow beyond any limits, the depths of physis remain hidden. Both knowledge and physis are inexhaustible: but it does not follow that our knowledge will be asymptotically approaching physis. Mostly our knowledge simply creates more and more complicated models, which more and more correspond to intricately processed relics of physis (as specimens, traces, values). Undoubtedly such knowledge is highly valuable, but towards ends that are quite different from achieving an understanding of physis. Besides its technological contribution, it testifies to those ways of approaching physis which principally bypass all that makes physis natural, i.e. different from a product or a cognitive model. Science is an extremely interesting activity, but it definitely does not clear the way towards knowing attributes of physis.

The Heraclitean dictum about physis finding a hiding place holds at many levels. Somehow, she is even hiding from herself by undergoing metamorphoses; older phases cease to be apparent, but they leave traces – sometimes conspicuous, sometimes hardly noticeable. For living beings this holds at both ontogenetic and phylogenetic levels. Physis also finds her cover behind the very attempts to grasp her – behind all those specimens, slices, photographs, graphs, and readings. But if we take physis in the sense developed above – as a space allowing for interpretations in different genres – statements about the hiding of physis can also be understood in such a way that every attempt at interpretation can be undertaken only in frames of a certain genre (field, discourse, method etc.). We are left, then, with this single interpretation of ours, until we undertake a new search. Any such exploration will uncover yet another screen behind which physis dwells! Moreover, physis herself, by growing, ageing, or evolving, also interprets her ways, directions and environmental conditions – and we, in our turn – can see only one distinct interpretation (ours) of all that live turmoil. This is an interpretation that depends on the angle

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8Later, however, the same author engages reverse gear, by saying that science even has the ability to “devise laws of history that can foretell something of the future of mankind” (Wilson 1998, 215).
9Heraclitus B 123.
of our approach, on what traces of former shapes we are looking for and how we handle them.

The last sentence raises an important question: can we admit the conjecture that forms of *physis* of a different nature to that of a human being (or better: an intellectual member of our society) could also command interpretative properties? If the answer is yes, then it should follow that *physis* is endowed with understanding, and rules over alternatives – and is not just ruled by omnipresent necessity.

But there is no room for interpretation in a deterministic world – such an effort here undergoes immediate collapse towards deduction or conclusion. The possibility of hermeneutics has therefore, in the tradition of the humanities, always been linked with the uniqueness of being human, with the possession of an intellect, liberty, history, i.e. with all the attributes we gradually usurped for ourselves and denied to any other kind of *physis*, even to human corporeality.10

The scope of hermeneutics is also traditionally bound up with human speech as the environment where thinking takes place. We do not doubt that human speech is endowed with very specific traits, and that human attitudes towards both human and non-human nature is peculiar. But speech is also connected with the existence of the body. We do not have in mind any “materialistic” interpretation, but simply the fact that the bodily aspect of language communication has been traditionally overlooked – an outcome of the way human nature (*physis*) dwells in hiding behind her intellectual interpreters.

She gets to hide not only behind illusions about us, but also behind unwittingly used metaphors. The phrase “raging storm”, if used in this text, would be understood as “anthropomorphism”, or even “psychologism”, if it were meant literally and not as a mere “image”. A dispute about whether the fox likes or hates hares would arouse a smile. We are, however, much less critical when confronted with social and economical parables like competition for resources as “true” descriptions of evolution. Perhaps such a description is ingenious and important indeed – or perhaps these days we simply take the social and economical as being more legitimate. By doing so, however, we fail to realise that even the most fitting myth – evolutionary description of the natural dynamism – remains hidden behind the screen of social and economical images and interpretations.

**Product**

The most obvious and favourite parable, behind which *physis* has long hidden, is the metaphor of a *product*, be it a thing, object, or even nature. A product, as far as it reveals some activity – inside or towards its environment – can be understood as a mechanism. The platitude of product-thinking will appear with a cruel clearness during a philosophical talk in a lecture room. The speaker would like to point towards

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10Chebanov (2004, 341) appropriately states that most of contemporary medicine is, in fact, merely veterinary medicine of the species *Homo sapiens*. 
some instance of *physis* – but instead he sees only products everywhere! Even the tree behind the window represents *physis* tamed; cultivated, grasped in some characteristic way (moreover, it is outside the room). Only people in the class room are not products – in spite of the fact that they underwent domestication, school training, wear produced clothing and do behave culturally. They may thus represent the only examples of *physis* in the neighbourhood, but, well, it is somewhat embarrassing for the lecturer to point to individual people. As a result, properties of things are demonstrated by reference to products or firmly grasped and tamed natural instances, i.e. by mere traces left by *physis*. Just recall all those traditional examples of “things”! Any such example may become by unfair treatment a counter-example, but even so the heap of objects, from Platonic and Aristotelian “deckchairs” up to the standard “cups” of philosophy courses, is embarrassing.\(^\text{11}\) Of course, when nothing more appropriate can be found, such items *can* be used for demonstration, but who in the audience will realize that this level of description is the poorest possible one? As a result we take things as items produced in such-and-such a way, one that allows for the possibility of being touched by hand. (We know that a wasp can also be taken by the hand, but the impression is somewhat different). Most of such projections are visual or palpable.

Because most items around us are products we are accustomed to experience everything as products or as materials for production and so we treat them as such too. People tend to explain *physis* as a product presentation, i.e. show how and from what material it was constructed, or (in case of dynamic objects) what is her “mechanism of functioning” (See Heideggerian *Gestell* in Chapter 2).

We are of course able to turn such a perspective upside down and say: a thing is *physis* grasped in a specific way, and production is an especially radical method of accomplishing such a seizing, in which we see that properties of the product will fulfill some given requirements. In the process of production, the bodily (corporeal) traits of natural things serving as input materials represent only the “material”, bidding certain possibilities and in specific ways resisting the processing. Yet most of us would be shocked to contemplate human body parts as mere material. Our respect towards animals, however, does not extend so far, and “non-living things” enjoy very little respect indeed. Such a hierarchy deserves attention: with great certainty we consider non-living things to be objects composed from parts, *as if they were products* of some material we can transform further. The view starts to stutter somewhat when it comes to living beings, when we become surprised by the phenomenon of life; sometimes the discomfiture occurs only in the case of people or even friends, because we must acknowledge their similarity to ourselves. Maybe this is why philosophers hold our species *Homo sapiens* in such high esteem: in the experience of ourselves and of close people we still can enjoy the experience of *physis*, which we do not intend to reduce to a mere structure of material.

\(^{11}\text{But for exceptions. For example, Descartes in his famous parable (Meditations, II, 30) takes the wax as what is a complement of something “out there” and something in one’s mind. Similarly, Husserl takes the “fragrant rose” as his beloved example, instead of cups.} \)
and mechanism of functioning. Non-living nature represents the opposite pole of such experience, and is associated with a great risk of confusion with somebody’s product. Somewhere in the middle of the scale resides the experience of the phenomenon of life, which on the one hand we know personally, and on the other know in many different guises from our experience of individuals belonging to different species.

**To Discriminate According to Physis**

For, although, all things happen in accordance with the account I give, men seem as if they had no experience of them, when they make trial of words and works such as I set forth, dividing each thing according to its nature and explaining how it truly is. (Heraclitus B 1, middle part)

Living beings are peculiar in that they openly manifest their naturalness, e.g. through their metabolism, growth, mortality, and reproduction. Their mortality, i.e. individuality, is manifested especially in sexual forms, as if the triad individuality – sex – mortality, gave an easily accessible meaning in this very configuration, intuitively supplying a good definition of what an individual is.

Sexual beings are also markedly differentiated into species – even a layman is able to distinguish many, to say nothing of biologists. Commonplace with which we anticipate a species-specific differentiation for our orientation, is quite astounding: after all, many instances of almost indistinguishable species are also known. Moreover, in many cases, especially in the context of evolution, it is not possible to take species as disjunctive unities. Traditionally, however, science operates with the concept of species, or with inter-specific relations in the context of even more general taxons. Taxonomy is a perspicuous example of our basic orienting ability, thanks to which we do not get lost in the world; it exemplifies our ability to differentiate according to structures recognized by a discovering grasp. The world is not an amorphous fog for us; rather it presents structures, among which we see the form of a community of species. The ground of every phenomenon is difference, in the given case a difference in the properties of particular natural beings that allows their depiction in terms of species. The archaic sage might compare such a differentiating ability to the impact of a prophecy uttered in order to allow better orientation.

Differentiating according to *physis* attempts to respect perceived item boundaries: classification proceeds according to such boundaries. It means that particular classes are not given a priori, but instead copy the structure of sensed differences. It is difference that allows orientation. Of course, it does not mean that such differences are “eternal” or that they set up distinct species. Scales with different kinds of gradients suffice entirely for our orientation, provided that they change slowly enough compared with the duration of our lives or the traditions of our knowledge. In a similar way we also distinguish differences that have nothing to do with (biological) species. Euripides, for example, speaks about the “differentiating natures” [fr. 494] of say, men and women. Self-evident too is the notion that “nature is given
to each by birth” [fr.1113], without ruling out, however, a development of new properties or the retreat of older ones.

**Generations**

One always grows up so, another (another time?) otherwise, with regard to what is deficient (for it?) at the moment. (Heraclitus B 126b)

For the way in which Heraclitus introduces the notion of naturalness, physis, the difference between generations is principal. It is the difference in terms of something similar, in a way almost identical, yet *different according to its nature*; and from some point it is also a difference between mortal and immortal, between an individual and the whole context of tradition passed-down. For the sake of clarity in relation to modern humans we shall limit ourselves to the generative understanding of the *physis* of living beings, as *physis* reveals herself especially well in this generative difference – even if it gets hidden at the same time, behind expressions like “just like his dad!” or “genetic endowment”. The newly emerging natural being takes on such determining similarities or even identities and works with them, often in a direction that surpasses any superficial expectations. Transformations occur at the level of both individuals and general trends – and from the perception of trends it is not far to the formulation of the evolutionary idea.

A new generation will replace the old one, but somehow differently: besides the continuity of life we observe also its changes, and only through such changes is continuity possible. Individuals, species, and whole communities not only replenish themselves, but also fulfill new possibilities. They take over the space of such possibilities and at the same time they participate in the formation of that space. They participate in what will be possible in the future.

**Necessity and Chance, Destiny and Freedom**

The generative character of natural instances is hard to understand in a world described as deterministic. Whereas in such a deterministic world a state A is always followed by state B, the explanation of generative change allows, besides inevitable manifestations of hitherto hidden possibilities, changes that are accidental and non-deterministic. As soon as we introduce a deterministic description as a single possibility for explaining nature we must also introduce a probabilistic explanation of chance, irrespective of whether the phenomenon in question is, say, evolution or the statistical thermodynamics of a gas. This is a very efficient method in modern science, but we argue that it offers insufficient possibilities for understanding the nature of living beings.

What would happen to the interpretation of chance and, at the same time, to the possibility of comprehending authenticity, if we were to return to an older understanding, one that in place of a deterministic system recognizes fate? At first sight
it would seem that there would be no room for human freedom either – it would be crushed by the fickleness of fate. Even Zeus is confronted with the consequences of his doings, as is every man – even in cases where such doings are unintentional or unwanted. Gods and humans are thus equivalent in having to confront the consequences of destiny, i.e. in the necessity of linking up different, logically inconsistent narratives.

Such a view would be correct, however, only if we understood freedom as a mere volitional deciding based on recognized possibilities; moreover, such freedom would have to be understood as being bound only to human spirituality, somehow emancipated from nature taken to be deterministic. It holds that one who is more fit will cope better with destiny, but what kind of fitness will be required is by no means apparent in advance. (Compare this with the contemporary concept of exaptation in biology.)

Determinism is a rational interpretation of fate that enables the mathematical interpretation of nature at all levels. As F. Engels said: “But chance is only the one pole of a relation whose other pole is named ‘necessity’. In the world of nature, where chance also seems to rule, we have long since demonstrated in each separate field the inner necessity and law asserting itself in this chance. But what is true of the natural world is true also of society. The more a social activity, a series of social processes, becomes too powerful for men’s conscious control and grows above their heads, and the more it appears a matter of pure chance, then all the more surely within this chance the laws peculiar to it and inherent in it assert themselves as if by natural necessity.” (Engels, 2001) The famous book Chance and necessity by J. Monod (1979) is written in a similar spirit.

Where mathematization is not required, one can work with a more archaic understanding of fate and contingency.12 Contingency (tyche), is not describable in a combinatorial manner. Tyche is simply that which happened, independent of guesses about whether it is the result of somebody’s intention or not; contingency is a manifestation of the power of fate (also tyche).13 Fate is a victorious, triumphant contingency that, as soon as she has occurred, turns into necessity. Fate is a name for the interconnectedness of a story (personal as well as cosmic), as the world evolves as a story, woven from the events that happen. The nature of the world is not given from outside – from some supernatural, non-temporal realm; its order is not given “in advance”. What happens is not given “necessarily”, shackled by a ruthless logic of mutual associations. Necessity is identical with fate because it does not mean predestination in the sense of determinism or causality of the late antiquity. Necessity was originally understood as a victorious contingency, as it literally took the place of other possibilities, thus defining a new situation which opens new possibilities, different from those which would occur if another kind of contingency were to win the “place that was taken”. Hence tyche; from the verb tynchein – i.e. happen (even

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12 We take this word by order to differentiate from ordinary, statistical, random “chance”. Contingency is a chance recognized as a challenge to undertake something.

13 See, e.g., Sofocles, Oedipus tyrannus, 1080, 1527, etc.
with the same connotation with “happy” as in English). What once happened cannot be denied or redressed, otherwise it would not be real: the real world cannot ignore what has once happened, because every event opens a new horizon to head towards. Natural reality means incessant birth (hence *natura* from *nascere*), the realisation of new events that are born of stories and contingencies — and *this* is her fate! It is this natural approach to the order of necessity (fate) that was rediscovered with the evolutionary teaching. In archaic times such an approach was natural to the extent that it did not even get a name. Only later development has led to a new, peculiar and unnatural conception of reality based not on becoming but on something done, defined, stated, and lawful. Only such a kind of “reality” could be named and transformed into an *object* of knowledge and a *subject* of consciousness; such knowledge appeared as revealed once for all — at the expense of life, which was pushed into the background. The evolutionary approach requires a reversal of both attitudes again — it is complementary to the objective one.

Early Christianity undertook a vain attempt to repudiate “logical” understandings of fate, but later even Christians would consider providence, in the sense of the deducibility of the future from the present. Dante places Democritus, a defender of necessity excluding chance, among the blessed who dwell in the Elysean fields, whereas his follower Epicuros is to be found in the abyss of infernal torment, because he “grounded everything on the chance”, i.e. on unpredictable deviations from strictly deterministic movements of Democritean atoms. Both Christianity and modern science united in introducing strictly deterministic ways of thinking.

To conclude: fate means acknowledging that future possibilities are influenced by ancient points of departure (even unknown), as well as by recent actions, intentional or not. Fate is also a name for the catenation of different stories and their mutual influences and penetrations. Of course, narratives that are close to each other will also become linked to a greater extent; the point is, however, that such closeness is not always apparent at first sight; often it is not known or even decided in advance. Therefore, taking fate as triumphant contingency and as the interconnectedness of stories would offer an excellent heuristic in the realm of evolutionary thinking (compare, in the next chapter, with the concept of the biosphere leaning out into the adjacent possible). Moreover, as — in such a framework — acting does not necessarily involve deliberate behavior, it would provide a concept capable of supporting emancipated thought and the free action of different natural entities.

But wouldn’t such a retreat towards an archaic understanding of the powers of destination threaten rationality and moral?

**Physis, Mathematics, and Moral**

The deterministic interpretation of the world allows its mathematization and, at the same time, it limits freedom and morality to the realm of human consciousness; reason, for its part, is somehow detached from the deterministic description of the “bodily” dimension of *physis*. Mathematical objects have no flesh; they face no
Physis is Temporal and has a Memory

Natural instances emerge and afterwards steer towards extinction, but during their lifetimes they strive to achieve their characteristic likenesses, behave characteristically, and are able to learn and remember. The last two abilities deserve comment, as they belong to the very nature of human beings. Indeed, humans were often characterized as beings having memory and learning as their basic traits. But are not memory and learning ability common to all living beings, enabling them to survive and more besides? Certainly, if we define memory as a conscious reflection of the

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14 Even then we cannot speak of total application of rationality as we have witnessed it since the 17th century. For example numerals, besides being simply “numbers”, they represented also deeper symbols behind particular letter-signs: “1” symbolized a point, “3” a plane, “9” justice, “10” deity, etc.

15 With repeated attempts to derive moral laws from the laws natural; see, e.g. Monod 1979.
past then we shall not look for it beyond human species, as consciousness is taken
to be a specific property of our own species. The same holds for learning, as far
as we define learning as, for example, a conscious search for evidence. Such spe-
cific competences are not inherited: they must always be acquired de novo, but their
acquisition can be helped by prior experience, in order not to be impelled to dis-
cover again and again what is already known. A human being knows the history of
its own life, as members of a culture know how knowledge got acquired in course of
history.\textsuperscript{16} Should we not know our life-stories our orientation in the world would be
much more difficult; but it does not mean that unknown and unconscious stories can
have no impact. The past, even when we do not know it, still co-determines the nar-
rative. The whole difference between human history and evolution, then, may reside
in the fact that we understand history as something at least partly reflected, whereas
 evolution proceeds unreflected upon (except in our discovery of the process).

Undoubtedly the past of all living beings influences their fates, even when they
may not know about the fact. They “know” the past in the sense that they arise from
its bidding and limits; new possibilities are based on the old ones and outshine them,
but at special occasions even such old and “forgotten” (unused, hidden) layers may
resurface and gain in importance again\textsuperscript{17} (although “layers” may be an improper
metaphor in this context). It resembles the paradox of memory in humans: how
is it that I know that I possess a memory that I am not able to recall at this very
moment? And: how is it that I may finally recall it again? Take such a situation as
an analogy of an unreflected memory in other living beings: the memory itself is not
reflected, but reflection can work with its contents anyway, and value its adequacy
within the context of other components of memory, as well as of the ambient world.
In this way even such “abandoned” strata of memory can participate in the actual
conduct of a living being. Such participation of (or confrontation with) memory
contents from different memory layers accomplishes the learning process without
the need for conscious processing of those layers. Similarly, a mere mimesis is a
way to learning – and again the very process of reflection may not imply a genuine
becoming aware of what has been imitated or why (a child learning to walk performs
no theorizing). There may exist no unbridgeable gap between the pre-theoretical
tradition of many human skills, and the ability of various kinds of life to raise similar
competences.

Knowledge about aspects of our past, and knowledge of parts of what we under-
stand, enables humans to remain as if beyond such possibilities, to look at them
“from above”. Thanks to this we can think methodically, describe and communi-
cate our thoughts, and even put them down in written form. The ability to interpret
is a prerequisite of communication, and reading texts potentiates such a claim. We
should not forget, however, that our abilities as well as our limits are primarily
remembered (or inscribed) in a more essential way than in written texts, however

\textsuperscript{16}See the concept of being-together [Mitsein] elaborated by Heidegger and discussed in the next
chapter.

\textsuperscript{17}See numerous examples from biology – from atavisms to mimetic phenomena (Chapter 6).
welcome the possibility to reflect parts of them in textual form might be. For example, a story about an injury suffered long ago may be continuously open to new interpretations, whereas an old scar is here without any discussion – it may be embarrassing, and we do not know how it will behave in unexpected contexts. Corporeality represents, amongst other things, a naturally emerging and naturally interpreted record of the individual’s or species’ past. Some human cultures also introduced the script – a record, interpretation and reflection of events – requiring new interpretation and reflection during the process of reading. In this context it may not be surprising that modern science discovered, in the structures of living beings, the sequence of nucleotides in DNA, or that science interprets this as a written record. It is highly probable that the genetic text is indeed taken by cells as a script that can and should be interpreted in a species-specific, i.e. cultural, way:

Many different cultures are known that have developed from common roots and are based on identical or very similar generic, canonic texts. How many cultures have arisen based on different interpretations of a single canonical text – the Bible? We will find no difficulties here, because, along with the text, people (or peoples) also transmit the way to interpret it… But who is the interpreter in a biological species? In addition to the canonical text – two versions of genome inherited from our parents – we also inherit a small but very important piece of body: the egg cell itself. This is the agent that reads the dead text of genetic inscription and transforms it into information, technical documentation that can be consulted according to the situation. And this arrangement is the clue to the species-specific interpretation, that is, recognition of the text and of signals from outside on the basis of the history, experience of the cell, cell lineage, and species. The fertilized egg manipulates the genetic text according to rules inherited from countless generations of its predecessors. Driven by this tradition, it builds the specific morphology. I maintain that a species can be understood as a culture; it follows that the emergence of new species may equally be a matter of the mutation of the text (DNA) and/or changes in the rules for manipulating it. Markoš (2002, 42).

**Physis is Flesh**

Our intellectual skill is, of course, capable of handling the corporeal aspects of many natural instances, and we are also well aware that this should be done from a somewhat different position than those offered by virtual (mathematical or similar) objects. Corporeality can respond by her actions to the activity of other corporeal instances, including herself; interpretation (albeit extra-linguistic and unconscious) in this case means the examination of possibilities, of new ways of orientation, and of the past (however unconsciously reflected), all assessed in a different way. Besides mutual interactions, every instance of *physis* has also an element of self-reference: otherwise even non-living natural object would only “exist” as a kind of amorphous mist. The instinct of self-preservation belongs to this realm, together with all pleasantness or discomfort connected with bodily functions. Such self-referential abilities (like those of flames or vortices) are apparently also beyond the reflective potential of our consciousness. The unreflected self-reference of living beings is a kind of “body thinking” which, in humans, is to a great extent overlaid by superstructures of reflective consciousness, but which in plants may
represent the main component of their being in the world. The non-reflected self-reference becomes revealed in bodily processes and leaves traces in them, whereas the reflected one is manifested by thinking and becomes manifested as utterances, concepts, definitions, or texts.

We can, then, interpret some aspects of corporeal appearances as texts; it gives us a new angle of approach and an important source of knowledge. We should not, however, confuse the notion of a text with that of a code (which is only the way how we are able to “read” it); to do so would obscure our sensitivity towards the fact that living beings interpret bodily and not intellectually, and their interpretation goes apparently to many realms beyond the mere code. When we lack suitable terms for referring to all such aspects of corporeal self-reference we often revert towards old notions of, for example, vital forces of some kind, or soul.

Above, when we referred to human consciousness, we showed that “life” and “soul” are words borrowed from pre-scientific metaphors, and deliberately drew our speculations to the very threshold of “materialism”. But there is also an important difference here: we do not interpret nature (\textit{physis}) as a product which consequently becomes a mere source for our narration. We understand levels like “real”, “living”, “conscious” as traditional classes characteristic for different instances of \textit{physis}, but we do not suppose that any of them should become a level that provides a point of departure for explaining other levels. In particular discourses or genres we of course play reductive games, but they can be played only in one direction; but we realize that they are nothing but games, interpretations, functional images. No dilemma about “matter” versus “spirit” will appear, because we neither reduced corporeality to space stuffed with material, nor soul to a spectre. On the contrary, we draw on the possibility that living nature needs no division into the body and the soul; such a unity was typical for archaic proto-philosophical and proto-scientific thinking.

After all, such a division, even to Aristotelian scholastics, had a different meaning from that which is often foisted on it today: soul was understood as \textit{forma substantialis corporis}. Descartes is usually considered to be the thinker who introduced the modern form of dualism, but closer inspection of his work reveals that his conception is parallelism rather than dualism: “It is not sufficient that it [the soul] be lodged in the human body exactly like a pilot in a ship, unless perhaps to move its members, but that it is necessary for it to be joined and united more closely to the body, in order to have sensations and appetites similar to ours, and thus constitute a real man.” \textit{(Discourse on method, Chapter 5, final paragraph)} “Nature likewise teaches me by these sensations of pain, hunger, thirst, etc., that I am not only lodged in my body as a pilot in a vessel, but that I am besides so intimately conjoined, and as it were intermixed with it, that my mind and body compose a certain unity.” \textit{(Meditations, 81)}

Archaic thought is not the negation of systems that would come later, it simply does not have a need for the expression of “body”. It is remarkable that especially those old teachings that, in the modern age, have frequently been labeled as “materialism”, had no words for “body”, “matter”, or “substance”. Such terms
first arose in the 5th century BC in a medical environment, i.e. in an entirely practical context, and only later were they transposed into philosophy and became a source of problems there. “Body” in a philosophical context becomes a very strange thing, especially when it is “my body”. If we do not regard ourselves or other natural instances as “things” (sometimes such a perspective may be, of course, advantageous), there is no need to speak about bodies, because we have in mind a particular instance of physis, a real being. The corporeality of a real being is a guarantee for us that we don’t dwell in a fantasy, be it emotional or intellectual. Consequently, no problem arises with “what to do with the soul”: spirit (pneuma) in archaic texts means simply a “blow” of the wind, of divine nature, or a thought. “The soul is like air in its nature”, says Anaximandros (Aet. iv. 3; Dox. 387).

Nature is Sufficient for All in All

The old principle of Hippocratic medicine pronounces not only the priority of “natural healing”, but also the very priority of nature (physis) above all purposes we ascribe to her when we need something from her: reality and life have priority over our plans and rationalized (or moralized) purposes. We are instances of life – however peculiar as exemplars we might be – and life is a constituent of physis, peculiar again. The power of physis was originally understood as self-sufficiency: we can, even should, take care of this or that instance of nature, but essentially she is not dependent on us. In contrast, our peculiar condition requires steady care. Such an insufficiency of the human condition, characteristic for our survival in the world, for its prospects and requirements, for our nature, was poetically interpreted, for example by the Promethean myth about the insufficiency of our muscles, teeth and nails, which must be complemented by the gift of fire. Our fragility is also exposed in the myth about the primordial fall of humans and of the need for “redemption” (charis, gratia), that is, a divine gift. We recognize this combination of insufficiency and special endowment from our personal experience. We generally fail to perceive that other natural forms are able to take care of themselves, are self-sufficient and self-referential sui generis (albeit not in the manner in which an intellectual, or even all individuals of Homo sapiens, are self-referential).

The principle of self-sufficiency is not directed against religion; on the contrary, in Ionia it is part of the Asclepian cult. Neither is it directed against the religious image of creation, because, first, it does not recognize such an image, and second, creation can be reinterpreted in the frame of religion as a self-sufficiency of the created, in contrast to the insufficiency of artificial products.

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19 “If you leave me, I won’t perish; if you leave me, you’ll perish” – says Mother Land in a Czech patriotic poem.
Species and Logical Ideals – Possibility of Logical Articulation

The hypothesis of ideas is constitutive for conceiving the notion of a species – in both logical and biological senses. It gives us the opportunity to discuss ideas with biological connotations.

It is true that a species in a logical sense is different from the biological conception – it is sharply defined, disjunctive against other species and non-temporal – but we can speak about the biological meanings of the term only by using logic (see “ideas and IDs” in Chapter 6). The Greek word for species – *eidos*, as well as its Latin counterpart – *species* can be translated as “appearance”; the precise synonym of *eidos* is *idea*. Hence, the notion of ideas can also be developed from the concept of species. This identification of species with ideas allowed for the development of descriptive and classificatory science, but at the expense of the ability to conceive of species existing in flesh (or in fossils). They were turned instead into non-corporeal and non-temporal units like Platonic ideas. Living beings were transformed into mere “exemplars” – incidental existences fulfilling, to a different extent and in different ways, the perfection of their particular, one and the same, idea. Thanks to this we can distinguish them according to constitutive traits of their species but, at the same time, we are forbidden from speaking about evolution, or even about the self-reliance of such individuals turned into exemplars: the genuine being is possible solely in the realm of ideas. Such possibilities and, at the same time, restrictions, had an impact far beyond the sphere of Platonism: the consequences can be traced not only to medieval disputes concerning universalia (i.e. the reality of general terms), but also to the biological concept of species and higher taxons. (Moreover, we should mention at this point that the hypothesis of ideas as proposed by Plato is a rational transformation of a certain general religious concept, a move specific not only to the Greeks.)

Constitutive for the mythical experience is the relation to originality, ideality. The modern science of religion provides a plethora of attempts to define myth; it always attempts to relate our accounts to something independent of us, to what we can only refer to – as to an origin or a paradigm. For example, each anvil is an imitation of that of Hephaestus, but is only an imitation. For it to function properly it is necessary to keep its form as close as possible to the Hephaestian image. An anvil which is not similar to it at all is not an anvil and will not work. Similarly, marriage and sex represent an imitation of *hieros gamos*, its partial realization in time and within human limits – and all their requisites and inappropriateness are perceived in such a context. A myth recognizes “eternal archetypes”, extra-temporal examples of whatever proceeds in time, either cyclically or, sometimes, as a continuous decline. Repeated returns to these archetypes, and our measuring everything against them, serve to enable our orientation in relation to the world. These aspects of myth are commonly alleged to represent “pessimism” and insensitivity to anything new. This, however, is arguable.

20 Strictly speaking, there exists a single exception from the synonymy when Plato speaks about the very idea of the Good (*to agathon*); in all other places, however, both words are interchangeable.
We want simply to highlight here the fact that a straightforward relation to certain non-temporal archetypes may underlie one important motive of our intellectuality, i.e. the concept of species and the species–genus relation. Logic and its applications in other areas of human life are grounded in the principle of the logical tree. It is therefore obvious on the one hand that we cannot do without taxonomical categories and on the other that such categories do not represent anything natural, as taxonomical categories refer to standards (paradigms, archetypes), not to their imitations.

As long as myths remain myths, subordination of particular natural instances under their eternal archetypes will not lead to their reduction to simple examples, because through their likeness to the archetype, the archetype imposes its impact; actually, only through different natural instances can we remember such eternal images. A singular natural being is not a “mere imitation” of its archetype, but is really a being that develops the potentials of its species – this is, after all, how we recognize such potentialities. As soon, however, as the myth becomes rationalized to some consistent teaching, it is up to us whether we keep that consistency at the level of logic (archetypes, species), or at the level of experience (ever-changing and temporal natural instances). To make use of logic, however, requires the development of some relation between the levels of the rational and those of experience. Various possibilities of how to do so are to be found in the medieval dispute of universalia, as well as in modern versions of methodology of science.

**Plato’s Divided Line as a Map of Relations Between Archetypes and Imitations**

The parable about the line (Plato, Republic VI 509d–511e) represents an example of the rationalization of the structure of the relationship of the mythical towards the world, and has been a standard exemplar of Platonic explanation since the classical era (Fig. 1.1).

The vertical line of the drawing represents a map for relations between what is more real, because linked to the mind (nus), and that which is less factual, because only available for the senses. The more real available to the mind (noeton) will be put on the upper part of the line, because the mind represents, thanks to its wholeness, a relation towards the real. Anything else, i.e. whatever is sensible (aistheton), will be projected onto the lower part of the line; it is less real because temporal, contingent, and thus mutable and unreliable. We can only have an opinion (doxa) about the sensed, because knowledge (episteme) is assigned only to real things, i.e. to things that are stable, identical with themselves, and unchangeable. The upper part thus indicates age-old, traditional archetypes, whereas the lower part points towards the turmoil of temporality. Up to now, the single novelty introduced by the parable is that knowledge (episteme) is not religious, but philosophical or scientific.

For the sake of clarity, in modern textbooks the description starts from below. This perceptible area (aistheton) can be divided again into two: on the upper part we find things deserving trust or faith, because the common sense (pistis; fides in
Latin), ordinary life, takes them to be reliable. On the lower part there are items even less real – mirror images, projections, reflections, shadows (eikasia) or imitations (mimesis; in Latin simulacrum, assimilatio) of what is to be found in the realm above. The Platonic tradition assigns this lowest rank also to all artifacts or products. The next highest step (i.e., pists) contains roughly what we call “things” or “objects” (except artifacts) or, more precisely, individual natural instances. This category includes anything that is temporal and variable but which still bears some reliability and individuality, albeit to a degree that is insignificant when compared with the “higher” part of the line.

The upper area, comprehensible only by the mind and where objects of knowledge dwell (noéton), can also be subdivided into a higher area of ideas, and a lower realm of mathematical objects. Mathematical objects are related to reasoning (dianoia; ratio, cogitatio); they are non-temporal and unequivocal, but there is still something above them, something even more real, that Plato calls ideas (including the idea of species). This is the realm of nus, i.e. mind or intellect (intellectus, intelligentia), or reality itself. The relation between nus and the bodily objects in whose existence we trust is the same as between the objects of faith and their shadows or imitations.

Having paraphrased Plato’s text, first we notice that even a rationalist like Plato will not propose that mathematics concerns reality itself, but represents only
something lower, rational, that provides a foretaste of what lies in the realm “above”, which is not itself of mathematical nature. (“To mathema” has a much broader meaning than our “mathematics” – in this sense Plato’s statement is to be understood as asserting that only those good in mathemata can be allowed into his Academy.) Reason (dianoia; by Ficino ratio, cogitatio) is also related only to this lower region. Simply, in contrast to the general conception of non-temporal mythical archetypes for everything that is natural, a realm of mathematical rationality became as if inserted between both – what it has in common with such archetypes are its unchangeability, its unavailability to the senses, and its having a non-emotional nature – but still it is not as real as archetypes themselves. From this it follows that mathematics is a very useful science but cannot serve as an arbiter about what is real. The same holds for logic, another case of formal non-empirical science.

The second line would be to follow Plato’s optimism concerning what he calls dialectics, i.e. the basics of logic. He takes logic to be a genuine noetic discipline, and ideas are its objects. Religious or traditional knowledge – related to age-old archetypes – should be replaced by philosophy of a certain type, whereas the lower realm, still more real than whatever it is that deserves our faith, is reserved for science working mathematically. In such a scheme we may decipher the foundations of both philosophy and science.

We shall now focus our attention on the fact that a specific old way of thinking became transformed into a species – in a logical, but later also in a biological, meaning of the word. Were ideas not identified with objects of dialectics, we could still take them for mythical archetypes today – but then it would not be possible to establish science that goes beyond the statistical. Without the structure of the logical tree, phenomena escaping rigorous conception in terms of mutually disjunctive and eternal species would hardly be describable in a way that is common today. A biologist would be unsatisfied with the ambiguity to which a Platonic conception would give rise, and with the strict boundaries it would put on systematics. A theologian meanwhile would be puzzled by the optimism with which logic is taken to be an arbiter at the highest level of reality. Such an approach supposes for one thing that what is real must be unequivocal and decidable; this is in agreement with classical science, but not with religion. Hermeneutics experienced a collapse into calculus, into transcription – and particular instances of nature become mere exemplars.

In the next chapter we make a great leap forwards to modernity and investigate whether and how non-metaphysical thinking allows us to think physis and living beings.
Chapter 2
Co-creators of the World

If Dasein-with remains existentially constitutive for Being-in-the-world, then . . . it must be interpreted in terms of the phenomenon of care; for as “care” the Being of Dasein in general is to be defined. . . . But those entities towards which Dasein as Being-with comports itself do not have the kind of Being which belongs to equipment ready-to-hand; they are themselves Dasein. These entities are not objects of concern, but rather of solicitude.

M. Heidegger 1962, 121

So far we have seen how the “Western tradition” of thought has always been flanked by two mutually incompatible conceptions of the world. The mythological worldview has always been rivaled by a belief in the deity which is one, immovable, rational, and moral. Such a deity became the guarantee that the world is governed by eternal, always valid (i.e. non-temporal) and decipherable laws, based on logic, mathematics, and clear concepts of what is going on. The world, in its turn, became dead; it became a machine blindly “obeying” imposed rules. History or experience was dropped from such a well-behaved and constructed world, in which memory was reduced to material or digital imprints available for inspection to anybody. Only we humans are allowed to break out from this world-cadaver and put ourselves “outside” it to assume a god-like, supernatural position, from which we can inspect all the minutia of this deterministic, machine-like, predictable world; this observatory position is a gift from our Creator. Such a framework enabled the foundation in modernity of the natural sciences and technology, and the establishment of the metaphysical worldview we inhabit today. Science later simplified this scheme by deleting morality and by replacing deity with impersonal Nature and her “natural laws”.

In History of biological theories by E. Rádl (1913, 148) this narrative is expressed even more succinctly: “Modernity had put an end to feelings of solidarity with nature; a clear conviction would instead prevail that a thinking human being was

A modified version of this chapter appeared as a contribution to Introduction to biosemiotics (Markoš et al. 2007). Part of the topic presented here was also discussed in the context of the umwelt teaching of J. von Uexküll (Markoš 2004).
essentially alienated from nature. It’s only him who thinks in the most proper meaning of the word, whereas nature, with no exception for plants and animals, is actually dead, or if alive, then it leads life whose innermost movements are shut forever to us. Man, according to such a mechanist and empirical interpretation, is able, at the most, to uncover particulars only, and summarizes them according to principles of his mind – under general laws. He calls them natural laws, but in fact they imply only subjective statements about nature. Such a conception of nature did not appear at a stroke; neither was it acknowledged by all scholars. For the Modernity, however, it is as characteristic as naive vitalism was for the Antiquity.”

Natural laws became laws divine – hence they ought to have replaced the Scriptures in situations where Christian humankind was unable to reach a consensus concerning their interpretation (not to speak of the “infidel”). Nature seemed to be present before our eyes in her totality, accessible to everybody, independent of faith, language, or culture. This new scientific picture of the world, however, never fully replaced the parallel or complementary concept of the world as narrative, evolution, fate, etc. We simply cannot go beyond our own history and examine it from a god-like position, because we are, and always have been, embedded in it. Our past is a player in never-ending interpretative, hermeneutic circles which define the state of our world as it is here and now, i.e. not as the outcome of impartial, eternal laws. This part of our heritage, however, was expelled from “true” science to be consigned to a dustbin called humanities, with a more or less implicit addendum that a day may come when this or that stuff can be recycled and given the status of independent, i.e. scientific, knowledge (e.g. Wilson 1998; Markoš 2002).

Living beings, however, were put to one side, left in a shaky position half way between science and the humanities dustbin. Initially, the Cartesian concept of animal-machine suggested that biology will eventually become fully aligned with physics and chemistry. Such a physicalization of biology culminated first in Lamarckian biology, and afterwards in the physicalism of 19th century which in turn gave birth to the lineage that ends with contemporary physiology and medicine.

However, the mechanistic conception of the living has always been punctuated by ad hoc assumptions lacking firm scientific credentials. One of the principal difficulties lies in the absence of well-defined initial and boundary conditions needed for accurate physical description of the system (see e.g. Kauffman 2000). If there are no clear-cut beginnings then you cannot calculate and are compelled to “fabulate”: your models will always develop shimmering, fuzzy contours. Lamarck (1994 [1809]), for example, postulated initial conditions to be specified by a set of germ particles [tissue cellulaire] which, driven by ordinary physical forces [fluids], realize through spontaneous generation the lowest organisms [infusoires]. These primitive creatures embark on the (fully deterministic) trajectory of evolution, with humans as the necessary and inevitable culmination of the process. Initial and boundary conditions, plus a trajectory in time, determined by laws – the whole pattern mirrored the ideas of the then emerging science of chemistry. The single difference was that chemistry was later capable of providing reasonable justifications for its initial assumptions (atoms, molecules, chemical affinities and reactions, etc.), whereas Lamarck’s speculations could never be reified, directly or indirectly. By introducing
hidden variables in this way even he, a strong adherent of the Cartesian method (as he undoubtedly was) fell into the trap of vitalism.

We can witness the trap springing again and again, even on scientists who themselves would avidly rail against such an unsavoury label being connected with their names. Either they supposed, as in the case of Lamarck, some initial structures that cannot be fully described in terms of physics; after which they jumped back to physics and left their structures to be moulded by ordinary physical forces (see, e.g. Barbieri 2003). Or they invented some agency capable of affecting the ordinary physical world. What connects all these – usually excellent – biologists of their time is that they never raise doubts about the basic presupposition of the Xenophantian-Cartesian scheme: that the world, even living beings as part of it, is a machine-like contraption blindly obeying rules implemented from outside. The world, and life, has no say in the course of events, it is the result of pushes and pulls applied to an initial setting of “principles”, “conditions”, “things”, “forces”, or “programs”. Even the crown of creation – the human being – is but a vehicle constructed to pass on its genes and memes to the next generation. Today, politicians, TV and supermarkets do their best to make the image true.

Not much help comes from the humanities, either. Linguistics, hermeneutics, psychology, history, philosophy, phenomenology and, of course, theology – became anthropocentric, judging the world according to our, human, values, silently assuming that the concept of the animal-machine for the non-human world, and life, is fully in order. The diction of many disciplines abounds with life, lifeworld, etc., but they have had only a negligible impact on biologists and biology; indeed, these disciplines are only marginally interested in the problems of biology, if at all. Some leading biologists switch, when retired, into a “philosophizing” mode, and write memoirs that serve for them as self-confirmation, and for their students as an endorsement of their way of doing biology as the best one. Needless to say, such literature usually receives very little attention in the circles of scholars in the humanities.

Singularities and Darwin

The scientific tradition does not allow for singularities or novelties to be brought to life: whatever can exist has already been present from the very beginning, in a latent, hidden but recoverable, calculable, deducible form. The whole tradition takes time as a simple monotonous ticking; history is expelled (see also next chapter). Defenders of such a world take as axiomatic the existence of immutable laws and a finite set of entities which can change only in a predictable way, according to decipherable rules. No real novelty is allowed, or even imaginable!\(^1\) Physics, chemistry, physiology, morphology, and even older theories of evolution (like that of Lamarck) were built on the assumption that such eternal principles, rules, types, and concepts exist behind, and beyond, the incessant milling of phenomena in the sensible

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\(^1\) Later, we explain why we do not consider so called emergence to be a genuine novelty.
world. The beginning of the 19th century witnessed even the birth of historicism, a conviction that even human history would, beneath the layers of seemingly random events, reveal a recognizable order. This is imposed, again, from a supernatural realm and prescribes the moves of the world. For rational people of the industrial revolution it was apparently unbearable to think of peripeteias of human history unwinding simply “just so”, without the intervention of any “higher” ideas, rules, or long-range processes. No branches of natural history had the slightest doubt concerning the existence of some agency ruling life processes according to principles (laws) imposed from outside.

In such a deterministic atmosphere, which was shared by rational science, rational theology, and historicism, it came as a shock when Darwin cancelled all such axioms by stating the single rule “laissez faire, laissez passer, la nature va d’elle même”. Indeed, Darwin’s theory does not require a single “natural law”! It states – after centuries of absence – that living beings build their existence themselves, by negotiating their fitness, i.e. the status of their “here and now” in their community. This negotiation depending on the experience of every lineage, back to the dawn of life. Life itself came into play again and was given a word in moulding the world. Living beings do care – just leave them alone!

The creation of novelties thus became a third factor joining the two millennia-old ways of thinking that had become typical for Western culture. It is not surprising that the whole intellectual potential of contemporary scientists and theologians united against this new teaching, that dared to deny any ideas of order and laws that could rule the world; they would rail viribus unitis against the heresy of supposing the world to be ruled “by itself” and, moreover, by “mere contingency”, in an unpredictable manner.

The first party to seemingly defect from this united anti-Darwinian front was science. We say seemingly, for we shall explain below and in the chapters that follow why we think the change of sides was only apparent. The visible demonstration of science’s turn was that the fundamental clash of ideas epitomized as “rules versus contingency” acquired the form of “science versus religion”, and in this very form its tsunami splashes our shores today, often in very comical ways.

A similar line of thinking, protesting against historicism and the world-machine belief, was developed at the same time by F. Nietzsche. His impact in philosophy cannot, however, be compared with that of Darwin in science, and we shall not follow this line.

A short notice from the Czech daily Lidové noviny (February 6, 2006) headed “Britons hesitate between science and faith” can serve as an illustration of such a benign wave: “Four out of ten Britons support the idea that religious interpretation of creation should be taught in schools, as an alternative to Darwin’s theory of natural selection. Such is the result of a poll undertaken by BBC. . . . 44 per cent of respondents require teaching also of the Biblical version of creation, and 41 per cent supports teaching about intelligent control or intelligent design of the world. . . . Several scientists protested against such views. . . . [For example], Sir David Attenborough said that scientists should defend the borderland between science and belief and explained that science is based on exact proofs, whereas religious belief is not.” Why such an argument “either (science) – or (faith)” should go on at all is nobody’s concern. Even more perplexing is the fact, that some scientists feel it as their duty to “protest against such views”. See also Chapter 4.
The “science against religion” myth is thus of a later date, when science found methods to tame Darwin’s message and enchain it in this or that form of Darwinism (see also Chapters 3 and 4).

Science indeed paid lip service to Darwin, but decades after Darwin it was marked by a feverish effort to reconcile the science of biology with the accidental nature of life history. The solution was ingenious: living beings were again deprived of their autonomy. Evolution became today the matter not of games played by living beings, but of random misspellings of genetic “texts” — sequences of nucleotides in nucleic acids. Texts, everybody would agree, do not belong in the realm of the bodily world, nor are they able to care, let alone tell stories. After such a doctoring of its subject, biology rightly perceives itself as a life science with a monopoly on all aspects of the living; hence any statement about life that is incompatible with the teachings of biology cannot be true. Besides evolutionary teaching, even psychology and medicine have an ambition to claim — and deserve — the status of outgrowths of biological orthodoxy.

The autonomy of the creatures of this world is definitely not on the agenda of biology today, and only a handful of scientists today consider living beings to be truly independent players in the game of evolution, and try to reconcile their view with science (e.g. Kauffman 2000). The rest is normal science, where “laws of physics and chemistry” reign. However, we would like to lead readers exactly in the opposite direction: to persuade them that living beings have actively participated in forming and developing their world, and that it is they who were, and are, the driving force of evolution. If science is not helpful to our efforts then we should look for support in philosophical theories that could facilitate the development of such ideas. For historical reasons, but surprising anyway, none of the Christian theological denominations are of great help, since they mostly cleave to the “intelligent design” scenario. In order to direct the reader’s imagination in a particular direction we have therefore selected parables from five distinguished 20th century thinkers. We underscore the point that what we suggest are parables, and all but the last of our thinkers keep in their focus the human condition, not life as such. They would probably protest against our broadening the scope of their teachings to encompass all living beings. The conclusions, then, are solely our responsibility.

The Sphere

The common denominator of our investigations will be the image of a kind of superposed sphere. All of our theories will start with a complementary or “superposed” state containing the community of extant living beings; their version of the world would emerge from such a superposition through the semiotic games played by its “inhabitants”.

Superposition, however, may suggest the idea of a stack of transparency slides: of course we cannot see anything, yet we know that they are there, in the heap, unchanged and unmoved by our treatment, ready to be inspected one by one, at any
time. This is not our intended meaning: inhabitants of the superposed sphere are active participants of the game. For these reasons we shall omit from our considerations of such concepts of biospheres and noospheres such situations in which living beings are not agents but are merely passive pawns manipulated by external goals or forces.

A better parable is perhaps the image of superposition as it occurs in quantum physics: “Things” would precipitate upon manipulation, but the sphere does not contain them in advance – they jump into existence as a consequence of internal games or external manipulations, as the expression of contexts. Hence, the sphere is a field of possibilities which will react to such-and-such a situation by producing a given set of phenomena, each with a given probability.

But even this parable is not exactly what we have in mind: the range of phenomena produced in the previous example is finite. By repeating the experiment again and again we will get an ever sharper distribution of probabilities, but no new phenomena; the number of glass pearls in the kaleidoscope is given, and in the patterns produced they only occur with different frequency. As our concern throughout this treatise is with novelty, we should also attribute to our spherical field the possibility for negotiating new states – as if the sphere were capable of speech of some kind, such that its utterances were not present in the background in some ready-made depository or even dictionary. Such “speech” is the superposition we are looking for.

What we have in mind can be compared to Heideggerian going-along-with others [mitgehen], to be transposed [versetzt] into one another, or to resonate: “Such going-along-with means directly learning how it is with this being, discovering what it is like to be this being with which we are going along in this way. Perhaps by doing so we may even see right into the nature of the other being more essentially and more incisively than that being could possibly do by itself” (Heidegger 1995, 202). Yes, such a condition is defining the situation of the Dasein, and Heidegger may have his reasons for not broadening it to include all living beings. Yet in our context his words seem to us to fit what we are struggling for.

It is impossible to dwell forever in such a superposed state: its internal dynamics as well as external influences will ceaselessly produce “collapses” that become canalized into things, or even “objects” (see below the distinction), present here and now, to which you can point with your finger, and about which you can utter sentences and sayings about something.

In order to make such games possible, all players in the Sphere have to understand – in their way – the nature of the others. All must share at least some communication channels as well as some interpretation keys for the messages transmitted. In the case of the bio-sphere, understanding should be possible, first, thanks to the common origin of all lineages (their various degree of kinship and common historical experience – “tradition” in the proper sense of the word); and second, to an intensive and incessant “horizontal” crosstalk or exchange of messages. Such mutual understanding – involving semiotic systems of many sorts – needs continuous attention and tuning (in contrast to hardwired coding systems, which can be executed even by inert machines that are indifferent to the situation; see Markoš and Švorcová 2009),
By “superposition”, then, we mean that no recognizable “wiring”, pathway, or script of any kind is decipherable which would reveal the “anatomy” of that state; in such a going-along-with, solutions are suggested, stored, and negotiated; only afterwards will decisions be made and actual states (utterances and stories) be precipitated. As soon as habits have been negotiated, rules settled and “artifacts produced” one can distinguish “this” from “that”, and recognize rules, habits, or even objects. Hence, the whole potential of the living being (or the community) is present in a superposed state that is inaccessible from outside; the concrete ways of the living being must appear as outcomes here and now, and only such outcomes will become exposed for the observer(s).

Our “superposed state” is close to the nature of language as Heidegger understands it. The essential nature of language flatly refuses to express itself in words, or through saying, in his terms: “Saying will not let itself be captured in any statement” (1971b, 134). And in greater detail we are told that: “Only because in everyday speaking language does not bring itself to language but holds back, are we able simply to go ahead and speak a language, and so to deal with something and negotiate something by speaking” (1971e, 59). Language is the superposed sphere of our parable here, but it incessantly brings about collapses into the “here and now”, to the “physical” world with its everyday life, physics, metaphysics, art, and words. “No thing is where the word is lacking, that word which names the given thing. What does ‘to name’ signify? We might answer: to name means something with a name. And what is a name? A designation that provides something with a vocal and written sign, a cipher. And what is a sign? Is it a signal? Or a token? A marker? Or a hint? Or all of these and something else besides? We have become very slovenly and mechanical in our understanding and use of signs” (Heidegger 1971, 61).

But there is also feedback: states negotiated in the Sphere do not rely on mere autopoiesis taking place in splendid isolation, as it were: they get influenced too by its former “precipitates” – hence the negotiation of each “adjacent possible” (Kauffman 2000, see below). All subsequent “precipitates”, each statement uttered, will take into consideration all the previous doings of these peculiar systems that constitute the world; they will coin the future through the matrix of memory, experience, actual states – and language games. New precipitating states will prove their fitness by influencing the whole “ecosystem”, thus changing the very field of negotiation. Thanks to this activity the world is not just sitting around, passively waiting to be indoctrinated and moulded by forces coming from without (this “without” may not necessarily designate deity, since abstract “laws” and rational calculi also appear as if “from without”).

Let us now turn our attention to living beings who, in our investigation, will be subjects of the above-mentioned “worlding” (a Heideggerian term) and, at the same time, the very catalyzers of the whole process. It is they who were, and are, the driving force of evolution, negotiating their “descent by modification” and gambling with their future when facing natural selection. The five parables below are intended to tune the reader into the proper mood for thinking about them. It is their version of the world which emerges from superposition, through semiotic activity (or games), of the sphere’s “inhabitants”. Such games are possible only when all
players understand the nature of the others, when all share at least some communication channels as well as keys for interpreting transmitted messages. Understanding is possible, as already stated above, thanks first to the common origin of all lineages and, second and much more important, to the intensive and incessant “horizontal” exchange of messages, through a genuine communication and understanding the others that is founded on their likeness.

Warning again: the systems below (all except for the last one) were developed as tools with which to understand the human condition in the world; the presence of language and culture is a presupposition. Our ambition is to corroborate a similar world having all living beings as its denizens; we are, however, far from daring to re-interpret such established and respectable teachings. We simply take them as tools with which to arouse in the reader a particular way of thinking. Our examples concern (1) the appropriation of the world by M. Heidegger; (2) cosmic dreams by G. Bachelard; (3) hermeneutics by P. A. Heelan; (4) the semiosphere of Y. Lotman; and (5) the biospheres of S. Kauffman.

Appropriation

To get a closer look at the concept (or better, event) of appropriation [Ereignis], we shall follow Heidegger’s explanation as given in The way to language (1971b). What is important here is the contrast between appropriation and framing [Gestell].

Appropriation, in beholding [Er-äugnen] human nature, makes mortals appropriate [ereignet] for that which avows itself from everywhere to man in Saying, which points towards the concealed. Man’s, the listener’s, being made appropriate for saying, has this distinguishing character, that it releases human nature into its own, but only in order that man as he who speaks, that is, he who says, may encounter and answer Saying, in virtue of what is his property. It is: the sounding of the word. The encountering saying of mortals is answering. Every spoken word is already an answer: counter-saying, coming to an encounter, listening Saying. (Heidegger 1971, 128–129)

We would like to extrapolate these strange-sounding words (even stranger when translated into English) so that they hold for all mortals; to show appropriation to be the realm of all living beings. We need to re-interpret the meaning of language, of “the sound of the world”, to broaden it to encompass all natural abilities for mutual understanding, co-evolution, recognition of likeness, etc. Here the metaphors of clearing the way [wegen] and proceed through the landscape [Gegend] are very inspiring. We shall return to this motif below when discussing the Kauffmanian “fitness landscape”; here we follow Heidegger:

The way to language belongs to Saying determined by Appropriation. . . . To clear a way, for instance a snow-covered field, is in the Allemanic-Swabian dialect still called wegen even today. This verb, used transitively, means: to form a way and, forming it, to keep it ready. Way-making understood in this sense no longer means to move something up and down the path that is already there. It means to bring the way . . . forth first of all, and thus to be the way. Appropriateness appropriates man to its own usage. (1971b, 129–130)

4Likeness is one of the key notions of our text; it will be developed in Chapters 3 and 4.
And now, let us try thinking of “evolution” instead of “wębogen”, and “life” instead of “language”: “This way-making [Be-wębung] puts language (the essence of language) as language (Saying) into language (into the sounded word [an individual being]). When we speak of the way to language now, we no longer mean only or primarily the progression of our thinking as it reflects on language. The way to language has become transformed along the way. From human activity it has shifted to the appropriating nature of language. . . . But this means also: the way to language as we first had it in mind does not become invalid; it becomes possible and necessary only in virtue of the true way which is the appropriating, needful way-making.” (1971b, 130)

To venture a fairly direct paraphrase: “Evolution [way-making] puts life (the essence of the living) as life (likeness) into life (bodily creation [an individual being]). When we speak of the way to life now, we no longer mean only or primarily the progression of our thinking as it reflects on life. The way to life has become transformed along the way [ . . . ] – it has shifted to the appropriating nature of life. . . . But this means also: the way to life as we first had it in mind does not become invalid; it becomes possible and necessary only in virtue of the true way which is the appropriating, needful way-making, evolution.”

We again have become entangled in the Saying that comes upon us as speech, only here life (instead of speech) as self-evolving evolution issues new and newer appearances (in its evolution): “As Showing, Saying . . . is the most proper way of appropriating” (1971b, 131). But what was said above holds for natural language. We, people of the technological age, became used to understanding language the other way round – as a rational construct: instead of towards Appropriation we stream for Framing [Gestell].5 “Because Framing challenges man, that is, provokes him to order and set up all that is present being as technical inventory, Framing persists after the manner of Appropriation, specifically obstructing Appropriation, in that all ordering finds itself channeled into calculative thinking and therefore speaks the language of Framing . . . Within Framing, speaking turns into information. It informs itself about itself in order to safeguard its own procedures by information theories” (1971b, 132). Framing turns beings and things into objects which can then be treated by rational procedures.

Natural language, in contrast, has a nature of physis, “which in turn is based on the appropriation from which Saying arises to move. Information theory, then,

5Framing or enframing are English translations of Gestell. In Heidegger (1993b) we can read: “Where do we find ourselves, if we now think one step further regarding what enframing actually is? It is nothing technological, nothing on the order of a machine. It is the way in which the actual reveals itself as a standing reserve.” (328–329). . . . “[T]he setting-upon that challenges forth thrusts man into a relation to whatever is that is at once antithetical and rigorously ordered. Here enframing holds sway, regulating and securing of the standing-reserve mark all revealing. They no longer even let their own fundamental characteristic appear, namely, this revealing as such. Thus the challenging-enframing not only conceals a former way of revealing (bringing-forth) but also conceals revealing itself and with it that wherein unconcealment, i.e., truth, propriates.” (332–333) “It is precisely in enframing, which threatens to sweep man away into ordering as the ostensibly sole way of revealing.” (337)
conceives the natural aspect of language as a lack of formalization. But even if a long way could lead to the insight that the nature of language can ever be dissolved in formalism to become part of calculations, so that we accordingly must say that ‘natural language’ is language which cannot be formalized – even then ‘natural language’ is still being defined only negatively, that is, set off against the possibility or impossibility of formalization.” (1971b, 132)

Thus we return again to motifs of the preceding chapter – physis and destiny (tyche): “All true language, because assigned, sent, destined to man by the way-making movement of Saying, is in the nature of destiny.” (1971b, 133)

We spent a lengthy passage quoting Heidegger just now to show how in his thinking the appropriation of the world dwells in “languaging”. Our technological civilization, however, turned language into information and then forgot about the fact of that transformation. The same process, however, is demonstrated by Heidegger again and again, and not only in the realm of language. For example, in “The thing” (1971d) he similarly demonstrates how things of the world (physis) that are capable of “thinking”, and which are active participants in the world’s affairs, can turn into dead “objects”. Paraphrasings like that above could be performed on practically any of Heidegger’s work, especially that originating in the 1950s or later.

The challenges and inspiration posed by Heidegger are rooted not only here, but also of course in his earlier work, especially that in which he discusses our position in the world. From this early period comes the very concept of “superposition” – that of Dasein which is always in a state of Being-in-the-world and Being-with-others. We are not born as isolated, self-conscious subjects or closed monads, which only afterward somehow clear their way towards the world, towards beings, things and other humans. Quite the opposite: we have been thrown into the world in the sense that we always have been in it, with things and “others”; we have a fore-understanding of the world, we participate, and we have an interest, a concern [Sorge] in its further affairs. (It follows, then, that rationalization and objectification of the world is secondary and requires a special effort.) The concept of Dasein steering towards truth, to the supreme event, appropriation [Ereignis], is a beautiful cosmogonic image, one that takes us back into the centre of events as actors and playwrights of the world’s affairs. Our being alive, our corporeality, and our language, seize us – and we seize them.

Beings (Seienden), things, appear in the world and enter the relations of being thanks to a concern (and they disappear behind the horizon due to lack of concern); this concern not only allows them to come into being, but also enables their manifold transformations in the world. Things, throughout their being, gain the status of a time-pattern. It is Dasein which allows them to appear in the world and manifest the concern that enables their being in the world. Without Dasein and its concern, the world would be but a pile of entities. It follows that the whole edifice of the world holds together only thanks to the active concern of Dasein: only Dasein possesses the attribute of being “here and now”, which interprets its history and develops a plan for the future. Both the layout of the past and the plan of the future are the subject of incessant concern; otherwise they fade out, together with the whole edifice of the world.
But Dasein is and always has been in the world; it is itself a being with all attributes of a genuine being. It is always with others in a “biosphere” (or noosphere?). The quote which will serve as an inspiration at this point comes from Being and time and refers to the situation of being-with (Mitsein) and Dasein-with (Mitdasein): “In clarifying Being-in-the-world we have shown that a bare subject never ‘is’ proximally, nor is even given. And so in the end an isolated ‘I’ without Others is just as far from being proximally given” (Heidegger 1962; §25). It follows that if beings appear in the world thanks to the concern of Dasein, Dasein itself also arose through the concern of other Daseins (otherwise we should resort to a transcendental creator of Dasein, who himself is not part of the world). This being-with (Mitsein) is crucial for the whole conception: it constitutes an “ecosystem” of Daseins which is being-in-the-world. Hence, the world is not a product of the concern of a single solipsist Dasein but rather is negotiated by the united concerns of all of them. Yet Dasein is not synchronous with the others, despite the fact that – as we saw above – it is thrown into the world; it always already has been in the world and hence, always and at any time, has an understanding of it and contributes to this understanding in the form of implicit or hermeneutical pre-understanding. The asynchronicity of the players is due to the fact that Dasein is finite and one day it will disappear from the world; moreover, it is aware of its finality, and organizes its being in acceptance of the fact that the game will have its end. Due to the finality of Dasein, new and newer variants of concern get the chance to realize and articulate as a result of the being-together of an ever-changing community of Daseins in the ever-changing world. 6 Only thanks to this is the world at any time in statu nascendi – in a state of being created. The community of Daseins creates history and develops a layout for the future. Both layouts – of the past and of the future – are subjects of incessant concerns; otherwise they would fade out, together with the world-edifice itself.

But how are we to grasp the very essence (Wesen) of the Living? Is there a chance for us other than in the realm of our experience? In such a case, understanding is always ours; it cannot be based on something which is outside the human sphere. We understand the Living implicitly, before any proposition about it. Yet before we begin to ask questions about life we must somehow understand what it is to be living; otherwise we could not have asked. This pre-understanding is an ontological structure that anticipates every research. Our difficulties may reside in our approach to life as such: “Throughout the long history of the problem of life we can observe how the attempt has been made either to interpret life – that is, the kind of being that pertains to animals and plants – from the perspective of man, or alternatively to explain life by means of laws adopted from the realm of material nature. Yet both of these erstwhile forms of explanation produce an inexplicable residue which

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6In our history, even the most sophisticated coalitions of people (Dasein) who aimed for the petrification of their own version of the world beyond the limits of their own existence could not succeed for longer periods of time. Petrifaction would mean cancelling time, i.e. depriving heirs of the possibility of concern, and hence robbing them of their state of Dasein. All kinds of utopias play with this idea.
in general is simply explained away. What is lacking in all this is insight into the necessary task of securing above all else the essential nature of life in and of itself and a resolute attempt to accomplish it.” (1995, §45, 191–192)

Heidegger (1995) therefore confines himself to the essence of animal or animality. First he shows anew that the basic condition of Dasein is being-together; it does not need any form of “empathy”, because it always already is, has been “empathized, transplanted, put into another’s shoes” (versetzt) and this “stretching out towards others” is its basic state. This is similar to what we called a “superposed state” above. If “having world” means to have access to beings, then “this immediately supplies us with a concept of world: world initially signifies the sum total of beings [Seienden] accessible to man or animals alike, variable as it is in range and depth of penetrability. Thus ‘poor in world’ is inferior with respect to the greater value of ‘world-forming’”. (Heidegger 1995, §46, 284)

An animal, in contrast to the Dasein, is “captivated” (benommen), or is driven in the world, but never has access to beings as beings. Its existence “is not an apprehending of these things as feeding place, as sun or whatever, but rather, one is tempted to say, as something else. No, it is not an apprehending of something as something, as something present at hand. There is no apprehending [Vernehmen], but only a behaving [Benehmen] here, a driven activity which we must grasp in this way because the possibility of apprehending something as something is withheld [genommen] from the animal. And it is withheld from it not merely here and now, but withheld in the sense that such a possibility is ‘not given at all’. This possibility is taken away [benommen] from the animal, and that is why the animal is not simply unrelated to anything else but rather is taken [hingenommen], taken and captivated [benommen] by things. The captivation of the animal therefore signifies, in the first place, essentially having any apprehending of something as something withheld from it. And furthermore: in having this withheld from it, the animal is precisely taken by the things.” (Heidegger 1995, §59, 240)

Hence, Heidegger, unluckily from our point of view, saw a deep gulf between the Dasein that is world-forming [weltbildend] and animals (to say nothing of other creatures) which have a different status of being “world-impoverished” [weltarm].

We take this perspective as a challenge: is it possible to develop from it a theory in which what counts for Dasein holds for any living being? Dasein’s picture of the world, understanding of the world, is deeply rooted in historicity, speech, and the knowledge of its temporality (finality). 7

We should start at this point – with other living beings that share the world with Dasein but which do not have the status of Dasein. We hesitate to state that they also appear in the world thanks to Dasein, for while it is evident that they too express concern, they apparently lack some of the qualities which define Dasein, such as awareness of one’s death, and the capacity for speech. We encourage the reader

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7 Admittedly, Heidegger had good reasons for his definition of Dasein, and in particular he was himself compelled to simplify what would otherwise have been somewhat knotty analyses. For example, he bracketed out some categories of human race (like children or the mentally challenged), as well indeed as the rest of the biosphere.
to try gedankenexperiments by replacing “Dasein” with “any living being”, and to contemplate a broadening of the slogan “We the people” (with reference to the analysis of Dasein) into “We the living beings”. How far can and should we go beyond Heidegger in developing a new view of the phenomenon of life?

Let us approach the problem from the statement that Dasein (which has the world) is characterized by being transposed (versetzt) into all others, so that the ways of Dasein mean being-with (Mitsein): “Yet here where man is concerned we cannot even make such an assumption concerning the intrinsic possibility of one human being transposing him- or herself into another human being. The reason we cannot make this assumption is not because other human beings forbid the possibility of our transposing ourselves into them by their very essence, as was the case with the stone. Rather it is because this possibility already and originally belongs to man’s own essence. Insofar as human beings exist at all, they already find themselves transposed in their existence into other human beings, even if there are factically no other human beings in the vicinity. Consequently the Da-sein of man, the Da-sein in man means, not exclusively but among other things, being transposed into other human beings. . . . For the being-there of Da-sein means being with others, precisely in the manner of Dasein, i.e. existing with others. The question concerning whether we human beings can transpose ourselves into other human beings does not ask anything, because it is not a possible question in the first place. It is a meaningless, indeed a nonsensical question because it is fundamentally redundant. . . . Being-with belongs to the essence of man’s existence, i.e. to the existence of every unique individual in each case.” (Heidegger 1995, 205–206)

We shall investigate possibilities for transposition in the biosphere in the second part of this treatise (Chapter 5); for this moment we leave the question open and turn to the second parable of our list.

**Cosmic Dreams**

Our second inspiration comes, perhaps quite unexpectedly, from the *Poetics of reverie* by Gaston Bachelard (1971). He states that images that arise spontaneously during daydreaming (reverie) do not correspond causally to any hidden archetype or model in the subconscious: they precipitate into the conscious from the superposed state which has been present even before our ability to speak. Reveries should not be mistaken for the dreams we experience in our sleep: whereas the latter we cannot but follow without being able to interfere with the plot, as if they were a kind of movie, reveries and daydreams allow our active participation. New images – hypotheses about the world – are born and materialize in the world where they subsequently prove their fitness.

But this is not the whole story: our daydreaming is but a shadow of a deeper process of reverie – similar to our Sphere: “We shall see that certain poetic reveries are hypothetical lives which enlarge our lives by letting us in on the secrets of the universe. A world takes form in our reverie, and this world is ours. This dreamed world teaches us the possibilities for expanding our being within our universe. There
is futurism in any dreamed universe. Joé Bousquet wrote: ‘In a world born of him, man can become anything’.” (Bachelard 1971, 8)

Imagination, memory and poetry constitute a cosmic childhood; a child is born situated in this cosmic reverie that is inherited and shared by all human beings, and only later is it led, step by step, “out” by its mother and other members of the culture, to construct a meaningful – and unique – image of the world where it can live. “From the time a child reaches the ‘age of reason’, from the time he loses his absolute right to imagine the world, his mother, like all educators, makes it her duty to teach him to be objective . . . He is stuffed with sociability. He is prepared for his life as a man along the lines of the ideal of stabilized men. He is also instructed in the history of his family. He is taught most of the memories of early childhood, a whole history which the child will always be able to recount. Childhood – that dough! – is pushed into the die so that the child will follow closely in the path of the lives of others.” (107)

The “superposed” state of a cosmic reverie collapses (under the canalizing influence of mother) into the state where life is possible – for reverie is not a place to inhabit permanently. But there is always a chance to return to that primordial state – at least for a short time – in the personal reverie: “How can we say, in front of all offerings which the World presents to us, that man is rejected by the World after first being thrown into the World?” (178)

Now, suppose that such an original superposed state of “cosmic dream” may be shared by all living beings – due to common origin and billions of years of mutual cohabitation in the world. “Yes, before culture, the world dreamed a great deal. Myths came out of the earth, opened the earth so that, with the eye of its lakes it looks at the sky. A destiny of height arose from the abysses. Thus the myths found the voices of men immediately, the voice of man dreaming the world of his dreams. Man expressed the earth, the sky, the waters. Man was the word of his macroanthropos which is the monstrous body of the earth. In primitive cosmic reveries, the world is a human body, a human look, a human breath, a human voice.” (188)

It is here that the state of biosphere is being continuously decided (or, better, co-decided) and negotiated by all actual players of the game. To be a player requires understanding of common rules, common codes, or a lingua franca of some kind. Perhaps this is the state of Heidegger’s (1995) captivation [Benommenheit] in which all living beings save Dasein dwell throughout their life.

This bring us again to Heidegger and his parable of the region [Gegend] and a clearing of the way (wegen). Region can be taken as isomorphic to Bachelard’s realm of the reverie: “But in thinking, the situation is different from that of scientific representation. In thinking there is neither method nor theme, but rather the region, so called because it gives its realm and free reign (die Gegend gegnet) to what thinking is given to think. Thinking abides in that country, walking the ways of that country. Here the way is part of the country and belongs to it. From the view of the sciences, it is not just difficult but impossible to see this situation. If in what follows we reflect, then, upon the way of thoughtful experience with language, we are not undertaking methodological consideration. We are even not walking in that region, the realm that concerns us.” (Heidegger 1982c, 74–75)
We maintain here that similar linguistic framing (languaging) is the state of the whole biosphere-in-evolution. The future is “cleared” in the fitness landscape by the *active* effort of all creatures living in that landscape. This idea is *quite* isomorphic to Kauffman’s theory of evolution (1993, 2000): evolutionary processes, as understood today, take place in a fitness landscape. The question “Whence organisms?” should therefore be complemented by that of “Whence the landscape?” The answer is to be found in the co-evolution of both, with a clearing and cultivating of the landscape being accompanied by a transformation of the organism according to the terrain.

**Complementarity of Scientific and Everyday Language**

The superposition of equally valid and complementary states in quantum physics inspired the physicist and theologian Patrick A. Heelan (1998) to propose what he calls “quantum logic”. This is the sphere of speech where, in superposed states, all possible utterances about the world (or its different realms) dwell. Any such utterance will bring about a collapse, or projection, of one particular statement; a whole set of mutually incompatible, yet true, statements can be uttered in different regimes of language (scientific, poetic, philosophical). Heelan suggests a method whereby all such statements can be pieced together into a lattice (Fig. 2.1).

He proposes the “context-dependency and quantum logic” of speech, which can be characterized as an unformed and inexplicit sphere of lived speech and thinking where, in superposed states, dwell pre-understandings of all possible utterances about the world (or its different realms). The superposed language $L_{ab}$ makes possible an idea how for theory-laden ($L_a$) and praxis-laden ($L_b$) languages fit into a higher-order picture or language of Being. Any such utterance will bring about the “collapse” of a superposed manifold of truths about an object, appearance, event etc. The projection of one or any explicit and articulated particular statement $L_a$, $L_b,$

![Fig. 2.1](image-url)  
*Fig. 2.1* Complementarity of language modes. **a.** Language “$L_{ab}$” includes two basic descriptive languages, $L_a$ and $L_b$, and the elements, $L_o$, $L'a$ and $L'b$, that link them together as descriptive of the same thing.” Hence, $L_{ab}$ universally “expresses the contemporary story of Being as available hermeneutically to someone immersed in modern culture” (Heelan 1997, p. 118) **b.** Relationships between context-dependent languages (Heelan 1983, p. 183)
Lec etc. can represent incompatible – yet true (on the basis of content and praxis) – statements about any object and can be uttered in different regimes of language (i.e. scientific, poetic, philosophical). Such a mosaic of utterances, while far from being a reconstruction of some original superposition, gives an idea how they fit into a higher-order picture of reality. Heelan demonstrates the application of his approach to complementary, theory-laden and praxis-laden languages, each of which represents the “collapse” of superposed manifold truths about the “object”.

Heelan takes such collapses to be “isomorphic”: “By isomorphism is meant a one-to-one translatability of any statement in one language into a unique statement in the other language. The two context-dependent languages refer to the same things but from different, often interacting and mutually interfering, perspectives. I have argued that these languages are related among themselves within a lattice structure.” (Heelan 1998, 282)

Again this brings us back to Heidegger and through his treatment of language to life. As could be seen above, we take “languaging” to be the principal determining feature of life; we feel free to take inspiration from Heidegger even if he himself would not say such things. The complementarity of the triad “corporeality – life – language” is, for us, a common characteristic of all living beings. But “If we put questions to language, questions about its nature, its being, then clearly language itself must already have been granted to us. Similarly, if we want to inquire into the being of language, then that which is called nature or being must also be granted to us. Inquiry and investigation here and everywhere require the prior grant of whatever it is they approach and pursue with their queries. Every posing of every question takes place within the very grant of what is put in question.” (Heidegger 1982c, 71)

If we, living beings, put questions to language, then we should take language to be primary, and from these heights allow coding systems that are useful for the automatic life processes of everyday metabolic functioning to crystallize (collapse).

**Semiosphere**

In this parable it is texts that serve as an example of our Sphere. The Russian semiotician Y. Lotman (2001) notes that in attempts to reduce natural languages (and texts) to mere codes in some formal language (i.e. to reduce natural phenomena to natural laws as defined in natural sciences8), whatever is beyond the code is ignored. Such an approach, says Lotman, assumes that the user of language is interested only in receiving the relevant messages, by specific selection out of the background noise. All other aspects of the text, its multiple and variable relation to the context, is ignored. The recipient is “hardwired”, and the text plays the role of a mere carrier of transmitted messages; the single goal of a semiotic process is, then, adequate transmission of the message. It is taken for granted that the meaning of the text remains invariant with regard to the transformations of the text itself. Upon this assumption

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8See, e.g., models of information processing provided by molecular biologists.
rests most of the reasoning concerning the relations between text and meaning: the
codes are frozen, texts represent only combinatorics, a kaleidoscope of code usage.

But, argues Lotman, natural languages are very poorly equipped to fulfill such a
role. It assumes that the sender and the receiver of a message have an identical table
of codes, or in other words that they are identical, with new information changing
neither the receiver nor the context. A shared natural language is not a prerequisite
of code identity. On the contrary: this fact in particular hinders the achievement
of sender–receiver identity! It follows that the identity of codes can be achieved
only in special cases, to serve very specific purposes, at a price that the language is
no longer natural. “For a total guarantee of adequacy between the transmitted and
received message there has to be an artificial (simplified) language and artificially
simplified communicators: these will have a strictly limited memory capacity and
all cultural baggage will be removed from the semiotic personality. The mechanisms
created in this way will be able to serve only a limited amount of semiotic functions;
the universalism inherent to natural language is in principle alien to it.” (Lotman
2001, 13)

Thus artificial (formal) languages model not language as such, but only one of its
functions: the ability to transmit a message.9 Natural language becomes, however,
deprived of its additional, and essential, functions, and after some time such func-
tions would become even forgotten: language would turn into a sort of algebra and
its function would scarcely differ from a mechanical cause–effect relationship. The
creative function of language is the most important factor that this picture sweeps
aside, for a text works not only as a transmitter of messages, but also as a gener-
ator of new ones. Neither unambiguous transmissions nor mathematical solutions
can be characterized as new messages. Artificial languages are but a special case
lying at one extreme of an imaginary continuum, states Lotman (in agreement with
many others, of course). At the other pole we find forms of language in which cre-
ative constituents are emphasized – as in poetry. In such cases the reception and
translation of messages are creative acts. In special cases the codes cannot even be
translated at all. Lotman provides an example of a canvas showing a scene from the
Gospels. The image cannot be translated into the particular text of the Gospel, and,
of course, neither does it follow that reading the text will bring to mind that very
scene on the canvas.

From the semiotic point of view, it is important that new meaning can originate in
the process of meaning extraction from the text (collapse towards a particular mean-
ing again!). The language precedes transmitted messages, and is an integral part of
them (see also Heidegger and Heelan referred to above). Great cultural deeds are
often followed either by enthusiastic reception or, on the contrary, equally boister-
ous refusal, simply due to the fact that listeners may not understand the language
of the message – in spite of the common cultural tradition of all participants of
the discourse. As time goes by it may happen that such a novelty can end up in a
kind of machine meta-language (cf. habit in C.S. Peirce, or Gestell by Heidegger).

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9See also Eco 1995; Hofstadter 1980.
Only then will information be communicated as codes given beforehand – but this does not mean that natural language becomes transformed into a machine language. Although transmitted digital messages can be quantified objectively in a machine language, nothing like this is possible in a natural language. Well, of course, a written message can be digitized, says Lotman – but this simply means that, in the process of reading, it is always for the receiver of the message to decide whether he takes the text received to be a code or a message. This double function of the text enables even the petrified truths of religious, cultural, or scientific communities to escape canonical (i.e. coded) interpretation and allows the emergence of novelty. Such truths may breach the narrow hold of previous clichés and again start circulating in broader contexts. Since a living language never excludes a new interpretation even of very canonical codes (habits), it may resist the evaporation of information from texts with time; and if the text is active in a culture, it will ceaselessly pick up new meanings. Lotman gives a Shakespearian parable: “Nowadays Hamlet is not just a play by Shakespeare, but it is also the memory of all its interpretations, and what is more, it is also the memory of all those historical events which occurred outside the text but with which Shakespeare’s text can evoke associations. We may have forgotten what Shakespeare and his spectators knew, but we cannot forget what we have learned since their time. And this is what gives the text new meanings”.

This happens again and again in cultural evolution – but is biological evolution different in this aspect?

What Lotman says about autocommunication is also of great interest. He here upbraids semiotics for preferring communication between subjects (I – you) and neglecting the question of how novelty can emerge in the mind of a single subject (I – I communication: superposition again – of a single mind). Again and again he returns to examples that show how a thinking subject introduces new levels into already established codes – generated endogenously or evoked by the environment. We can even try to generalize to the whole culture: “The laws of construction of the artistic text are very largely the laws of the construction of culture as a whole. Hence culture itself can be treated both as a sum of messages circulated by various addressees […] From this point of view human culture is a vast example of autocommunication.”

Culture is therefore a function of paired communication systems (I – you, I – I), and what emerges is a collective personality having a collective memory, mind, and history. Lotman named this entangled web a *semiosphere*, by which he meant a system integrated across all levels of its organization (compare with the Kauffmanian *biosphere* below.)

The importance of this idea becomes apparent when we compare it with two other ideas that have come out of natural science and that allow us to grasp organization: the atomic and dissipative-structure models. The atomic (or reductionist) system aims to explain organization from a single basic level. Other levels (it is strange that their slavish position is labeled as “higher”) only reflect the behavior of elements at the basic level, according to pre-established and immutable “laws”. The communication between levels (if it can be called *communication* at all) is one-way only: the lower level determines phenomena at the higher one(s). But the very expression
“communication” denotes that which is in common – commune!\textsuperscript{10} Across domains, the flow of information should be, and is, reciprocal. What really takes place at the interface is communication, a semiotic process, not simple decoding. (We shall return to this problem in connection with emergentism, in the second part of this text.)

It is, however, very difficult to manage – or even think about – such entangled hierarchies in the context of our culture. Even if we succeed in distinguishing a “basic element” in a cultural continuum, we cannot avoid paradoxes. This is demonstrated by the concept of a symbol, which indeed is one of the most durable elements of such a continuum, albeit not durable in the sense typical for “atoms” of basic levels of description in science. This is because the symbol is never synchronous – its memory goes deeper than the memory of its (non-symbolic) context. The symbol exists before the text; the user literally digs it up from the deepest layers of his culture. Like Heideggerian words which perform “wording”, symbols carry with them a load, a halo of their previous meanings and usages. The sensory and communicative potential of symbols is therefore always broader (sphere) than what arises in any particular actualization (“collapse” sensu Heelan). Thanks to symbols it is possible for text and topics to be transferred across different levels of organization, thus preventing the fragmentation of meaning into different cultural layers.

Lotman compares the function of symbols in a culture with the genetic memory in a body. Such a comparison invites a reciprocal comparison from the biological side. Could “symbols” be replaced by “genes”? Genes are also among the most durable elements of the continuum to which cells, individuals, species, and the biosphere belong. They are not synchronous: the user, i.e. the living being, receives them from the thesaurus or memory of its “culture”. (By culture we mean, as already mentioned, species or genealogical lines.) Individuals existing at the current endpoints of such historical chains thus govern the whole experience of the line, i.e. both genes and directions for their use or interpretation. The impact of genes cannot be localized to a single concrete realization – most of the genes become engaged in a plethora of topics and their effects cannot be sharply demarcated (e.g. Dawkins 1981). Finally, thanks to genes, topics can percolate across different layers (domains). We shall return to these ideas in the second part of this book.

How, then, do texts/symbols (and genes) work? What laws determine their different engagement in different contexts – temporal or cultural? Or better: what game do they play?

Let us take seriously Lotman’s assertion that language, culture, and texts are “living”, participating in an endless transformation game. All participants of communication – living beings – enter the game with a certain background of experience and memory. Neither biosphere nor semiosphere can originate de novo in the manner of simple dissipative structures such as a flame or a vortex. Lotman

\textsuperscript{10}I. Prigogine (1980; Prigogine and Stengers 1985) upset this hierarchy when he showed that each of the particular domains of description has its autonomy. Communication between domains is bi-directional, but at the price of non-canonicity: the change of language between domains always brings about losses as well as gains. See also Havel 1996.
compares the semiosphere to a museum hall that is full of visitors, where one finds a
semantic overlap of dinosaur bones, teachers, clay tables bearing cuneiform script,
school children, an old china collection, etc. A text, says Lotman, has an internal
drive towards becoming a unique long word, thus opening a multidimensional space
that influences, in a feedback loop, the meanings and morphology of the language.
Such transformations from the discrete (digital) into the multi-dimensional (analog)
do not take place at a single interface – the same game happens again and again at
different levels of organization (or domains). Articulation of a topic by means of a
language that is typical for particular domains helps to disclose its nature. A semio-
sphere is indeed a generator of new knowledge.

Let us return to the game and to its antipode – the law. Lotman states that if a goal
is given in advance, there is no room for liberty: “As the reserve of indeterminacy
becomes exhausted, the degree of information drops, falling to zero at the moment
when it becomes entirely redundant, i.e. totally predictable (227). [. . . ] When we
can predict the next link in the chain of events then it follows that there was no act
of choice between equal alternatives. But consciousness is always a choice. So it
follows that if we exclude choice (unpredictability which the outside observer sees
as chance) then we exclude consciousness from the historical process. And historical
laws are different from all others in that they cannot be understood without taking
account of people’s conscious activity, including semiotic activity.” (234)

In other words: if the trajectory of a thrown stone can be predicted to the tiniest
detail, i.e. if nothing unpredictable can happen during its flight, there is no need to
throw it. If this holds, then history would be superfluous, indeed God would not
play dice. He would be merely watching a ready-made video recording – and not
even that, since He would be able to see it all at once. But in a culture, the less
expected a phenomenon is, the greatest impact it has, and the same probably holds
in other areas of human activity, even in science. This is why linguistic topics like
interpretation, translation, evolution of novelty, etc., enter nowadays all sciences; it
indicates the end of a belief in timeless laws. Moreover, dichotomies such culture
– species or evolution – and history become blended. We cannot avoid the strange
feeling that Lotman himself does not fully allow for such a blending: phrases like
“historical laws are different from all others” or “people’s conscious activity” sug-
gest that in spite of all his ambitions he remains in the realm of human affairs. A
more consequential attempt at such a blending comes from the sciences (e.g. Wilson

Order for Free and the Expansion into Adjacent Possible

Stuart Kauffman, mathematician and biologist, has experience with mathematical
models as well as with their bodily “incarnations”. In the latter, an ideal mathe-
atical map becomes a mutable and living landscape in which eternal, timeless laws
give way to physis. In the preamble to his book Origins of Order we read: “Sim-
ple and complex systems can exhibit powerful self-organization. [. . . ] Yet no body
of thought incorporates self-organization into the weave of evolutionary theory. No
research program has sought to determine the implications of adaptive processes that mold systems with their own inherent order.” (1993, vii)

The last sentence could be the epigraph for Kauffman’s lifelong scientific activity. Where does order come from in nature and in living beings? He does not adopt the neo-Darwinian explanation, which is rooted in frozen accidents sieved by natural selection and shared by genealogical lines. Organisms come out of such an image as passive, ad hoc contraptions: they represent the outcomes of historical contingency, their ontogeny being determined by “blind” genetic programs. Evolution is seen as opportunistic and no room is given for the spontaneous emergence of order. Kauffman, on the other hand, has an ambition to prove that order is for free, it is here not because of natural selection, but in spite of it. The greater the complexity of the system, the less power selection has to change its properties; order emerges not by a random walk but as a result of a system’s internal dynamics.

Even more advanced in this respect is another treatise by Kauffman, Investigations (2000). Its crucial idea is that properties of a system cannot be stated in advance, by providing a list of a kind. It follows that deterministic laws of physics that allow us to calculate the behavior of a system (its configuration space) are not general, but special cases. They work only if we can state initial and boundary conditions for the system. Newtonian or Einsteinian physics thus cannot be applied in evolving systems, where this condition cannot be fulfilled: general laws for such systems cannot be stated at all. Kauffman, however, asks whether they cannot be found at least for a special class of systems – the autonomous agents.

The definition of an autonomous agent looks at first quite bizarre: it is a system acting on its own behalf: “All free-living cells and organisms are autonomous agents. But a bacterium is ‘just’ a physical system. In its Kantian form, my core question became, What must a physical system be such that it can act on its own behalf? The stunning fact is that autonomous agents do, every day, reach out and manipulate the universe on their own behalf. Yet that truth is nowhere in contemporary physics, chemistry or even biology. So, what must a physical system be to be an autonomous agent?” (Kauffman 2000, x)

It must embody two features, says Kauffman: auto-reproduction and the ability to perform work cycle(s). The last condition is crucial and distinguishes an autonomous agent from the dissipative systems described by Prigogine such as flames or tornadoes. To perform work in a cycle means to have a contraption – a machine, which is able to return periodically into its initial state. Thus, cyclical processes lie at the heart of the non-cyclical and, at the same time, historical process of evolution.

To perform work, the autonomous agent must be able to build a machine to reduce the number of degrees of freedom available for the dissipation of energy. Making a machine, however, requires an investment of work. Agents are thus characterized by a cycle (or spiral) of work, and the work extracted may be utilized to reproduce the system or to increase its organization (e.g. by building new machines allowing new kinds of work cycle). It can also be used for mapping the surrounding
universe in an active search for resources utilizable to perform work. The author thus leads us towards a kind of hermeneutic circle in nature.

This aspect becomes even more accentuated when it comes to communities of autonomous agents – *biospheres* in his wording. By expanding from the actual state into the adjacent possible (defined as a state one time-interval from the actual; time interval being defined deliberately) the biosphere explores the field of possibilities and then accomplishes, or decides in favour of, one of them. The two states may differ in terms of the number and/or quality of new, unpredictable structures (perhaps creating new ones never seen before in the universe). Due to this uncertainty and novelty it is not possible to predict the evolution of a biosphere, even in the single time interval that separates the present from the adjacent possible.\(^{11}\)

Biospheres are thus characterized by a ceaseless flow from the actual into the adjacent possible, *en passant* increasing their organization: “Biospheres, as a secular trend, that is, over the long term, become as diverse as possible, literally expanding the diversity of what can happen next. In other words, biospheres expand their own dimensionality as rapidly, on average, as they can.”\(^{12}\) (Kauffman 2000, xi)

How, then, do the biospheres construct themselves? Autonomous agents are continually measuring selected parameters of the surrounding universe (which is a co-construct of the whole biosphere), detecting the resources utilizable to perform work and canalizing it via machines built for this purpose. This means that they acquire useful, relevant knowledge – not just information of any kind. To look for the right kind of knowledge, it is necessary to fish the most useful (or at least promising) data out of the “garbage”, and this requires interpreting the signs of the surrounding world. We are already amidst semiotic problems: how does Kauffman’s “agent” come to know how to build an appropriate machine able to canalize that very type of the energy gradient? The universe offers an unlimited number of qualities that can be distinguished from the background and measured. Only some of them, however, are *relevant* in a given context – leading to the recognition of a utilizable energy source that can be coupled to the extraction of work by a machine. The agent actively breaks symmetries, looks for and discovers new ways of canalizing energy (and at the same time, of course, puts at stake its own integrity or even existence). By doing so, the agent extracts meaning, and constructs the adjacent possible. By definition autonomous agents are *endowed with endogenous activity*; they are by no means merely passive substrates moulded by external forces. The co-evolution of autonomous agents then drives them into the adjacent possibles along a trajectory that is non-deterministic but determining, i.e. is selective. By doing so, they create a larger space of possibilities. The definition of the autonomous agent is at the same time the very definition of life, says Kauffman. We – autonomous agents – are co-constructors of our universe.

\(^{11}\)Compare this with deterministic systems in statistical physics, which allow such moves both into the future and into the past. The solution does not lie in shortening the time interval between the actual state and the adjacent possible, for we would only end up in the realm of the uncertainty principle.

\(^{12}\)This quotation holds as a definition of the “4th thermodynamic law”.
But how do we perceive our “autonomous activity”? Kauffman provides an answer: “Story is the natural way how we autonomous agents talk about our raw getting on with it, mucking through, making a living. If story is not the stuff of science yet is about how we get on with making our ever-changing living, then science, not story, must change. Our making our ever-changing livings is part of the unfolding of the physical universe.” (119)

The story is the most adequate, and maybe the only way, to store experience. Problems, situations, tasks never repeat themselves exactly the same way. But problems successfully solved in the past may be of enormous help when one is confronted with a similar situation again. This is not because of what is constant, invariant, or equivalent, but because of the similarities, analogies, and correspondences that arise when dealing with novelties – with how to mutually respond (co-respond!) to new challenges. One must first be “versed” to be able to con-verse in the context of the changing rules of the game. Such experience in versatility cannot be provided (or represented) by static data. Instead, it is the “tune” – the course of the change that makes one tuned to the changing world according to its past trajectory modifications (both gradual and sudden) – that matters. Thinking in terms of stories, then, seems to be a type of “information processing”, which became most effective in evolution. The bounty of life around us represents the players of winning strategies in natural games.

The aim of this chapter has been to present recent ideas that might help us to grasp, in a contemporary context, the notion of *physis* as a kind of superposition of memories, dreams, suggestions, meanings, experience, etc. that allows us to decide the “adjacent possible” of our world. We shall discuss such superposed biospheres in the second part of this treatise. Before that, however, we need to address more deeply a pressing problem that divides society at many levels. This problem is quite difficult to think about clearly, let alone express in words. It is the question of how novelty can appear in the world, and we devote the next chapter to its analysis. The chapter that follows it has essentially the same theme, but focuses on the peculiar, often serious and sometimes ridiculous dispute between “creationists” and “evolutionists”.
Chapter 3
Novelty Wherefrom?

And he that sat upon the throne said, Behold, we make all things new. And he said unto me, Write: for these words are true and faithful.

(Rev 21, 5)

So the biosphere, it seems, in its persistent evolution, is doing something literally incalculable, nonalgorithmic, and outside our capacity to predict, not due to quantum uncertainty alone, not deterministic chaos alone, but for a different, equally, or more profound reason: Emergence and persistent creativity in the physical universe is real.

Kauffman 2000, x

What does it mean when we say that something is “new”? Not just “new” in an ordinary sense of “another one”, “the next one”, or “the latest”. The truly new in question is here meant in both the strong and the narrow sense of a radical novelty not only unheard of, or unknown yet, but positively non-existent before it started to be. All attempts to put into words the most ordinary meaning of what is “new” are doomed to fail. “New” is anything that has not been before, or that did not exist prior to its coming into existence. This is the kind of newness we shall deal with here – the kind that turns the world (a realm of reality) into something different, in a typical case into something richer than it had been before.

Note how testing it is to attempt to convey precisely what is meant by one of the most ordinary words for a seemingly most commonplace living experience, the very stuff of it. After all, newness is the most natural thing in the world. Indeed, according to Aristotle, nature itself – the physis, the being of everything existing by nature – means a permanent coming-into-existence, becoming new. That is the very way nature is. But no need to call for authorities: such a statement is supported by both self-experience and empirical evidence.

Science and Novelty

The new is by no means supported by modern science. Although it is (allegedly!) dealing with the study and understanding of nature, the whole of scientific endeavor consists precisely in finding, for everything that appears to be new, a place
among the old. Science makes new fit into a matrix of what has already been known or – in critical cases – by adjusting the grid itself.

This general dislike of the new is particularly striking in the case of mainstream biology based on evolutionary principles. From Darwin onwards, we can follow attempts to explain evolution by the selection of insignificant variants of the same life form. For most scientists, such deviations from the type simply represent some of the numberless possibilities that were already present, in potentiam; theoretically, they could have been anticipated beforehand. Natural selection allows some of such variation to prevail; thus, all evolutionary novelty turns out to be but the mere by-product of a preferential choice from what has been already extant.

The neo-Darwinian synthesis pushes this aversion of science against genuine novelty, against becoming, even further. Here, the sources of variability on which natural selection exerts its power are not genuine alterations of the bodily form as such. The causes of variability dwell in merely formal permutations of a genetic text at the level of its syntax (writing order), reflecting the statistical probability of mistakes and rearrangements with no relation to what is “evolving”. The scenario turns evolutionary events into mere epiphenomena of chemical events, i.e. changes in the linear order (or permutations) of four digital signs that do not even much affect the molecular structure of their carrier. Alternatives to the neo-Darwinist mainstream, such as vitalism, organicism and structuralism, while not held in high esteem by contemporary scientists, fare no better. They simply reject the dreary mutation/selection creed by postulating special laws to account for changes; by doing so they suppress genuine novelty even more consistently (for more detailed discussion see Markoš 2002).

How to learn, in biology, to accept genuine novelties? A good opportunity would come, perhaps, from a closer coupling with the so-called “humanities”, especially with disciplines dealing with what is historically and culturally unique. The unique is a result of a single, unprecedented event – a case of the new. Therefore one might presume that in the humanities the new would not only be acknowledged but also understood and properly dealt with, using appropriate theoretical concepts. Since every life form, every species and all evolutionary events are as unique as cultural phenomena and historical facts, life sciences should adhere to methods similar to those of the humanities.

This programme, however, has a serious drawback: the a priori assumption in the humanities that novelties are not only matters of fact but also are “matters of theory”, and that they are able to account for the becoming or coming of creative changes and the onset of that which is new. Such an assumption, however, appears to be mistaken! As shown in previous chapters, almost nowhere in the human sciences do we meet a genuine understanding of true becoming, or any sincere welcoming of novelties. Although the humanities obviously do accept the phenomenon of the new as a fact (in the same way that the fact of evolution had to be admitted in biology), actually it is not considered real – at least no more than in biology. The whole of the present chapter is an attempt to seek ways out from such an unfortunate state.

1 See discussion of emergentism in the preamble to the second part of this book.
The Grave of the Soul?

There is an old Greek saying “soma–sema”, ascribed to Orphism, and therefore usually translated as “the body is a grave (for or of the soul)”. However, sema means not just “grave”, but also, more precisely, “sign”! Thus, we may read the saying soma–sema as: “the body is the sign” (of or for the soul). These two interpretations characterize the difference between the traditional science of objectivity and the science of semiosis.

A cloud in the sky may at first look like a camel. Gradually, as it changes its shape, it might become more and more difficult to see it this way – until suddenly one realizes that it is not a camel after all but a weasel. Before this moment, however, it ought to have been a weasel already, somehow, for some time! The transformation itself – the appearance of an appearance which did not appear before – can only be stated by the observer as a matter-of-fact. Precisely, for him it is only a “fact” – a factum, something already done, not an event of becoming. One almost feels like having been mistaken from the onset – in taking a weasel for a camel.

Such a moment is what makes thinking of the new so weird. The becoming seems to be neither a process nor an event. Of course, in the case of a cloud, one may protest that nothing really happened! After all, during the whole observation it was but the same strip of vapour, slowly and smoothly changing its cloudy shape, quite unaware of its form and indifferent to its appearance. Just note the heavy metaphorical load carried by the allegedly prosaic and objective statement “the same strip of vapour”! Did anything change at all?

What really did change was the interpretation by the observer – this was the only “event” that occurred. But such an event was merely subjective – precisely because an interpretation is considered not real (in re) but mental (in mente). That is why words like “semblant”, “semblance”, “appearance” and the like tend to assume the meaning of something only apparent, not real – a disguise, a travesty, a fake.\(^2\)

From clouds and weasels let us move to molecular biology. Unlike the cloud, one cannot reasonably doubt its coming into existence “from scratch”: before its triumphant advent in the last century, molecular biology did not exist at all. Its coming was quite unprecedented, not even considered, and it therefore can serve as a model of a radical novelty. Similarly, Shakespeare’s plays did not exist before having been written. On the other hand, nucleic acids, allosteric proteins, the genetic code, regulation of gene expression and protein functions are deemed to exist independently of molecular biology – they were always around, before their discovery and clarification by molecular biologists.

Entropy may serve as even better an example: it is also believed to “exist” without and prior to thermodynamics. Entropy is a physical quantity conceived as a ratio, or proportion, of other magnitudes – so far, it is a purely mental construct – an interpretation. It requires a subject to put certain kinds of values (data obtained

\(^2\) Moreover, in the Shakespearian parable above, both the previous and the new likeness represents animal shapes familiar to everybody: thus indeed nothing is new after all!
by a precisely defined kind of measurement) into a particular relation. But being a mental construct, its introduction into physics may be regarded as something radically, genuinely new. However, the same holds for an enzyme or a gene! From a biosemiotic standpoint, they too represent kind of relations, of signification chemically expressed. Such an expression reflects an interpretation of reality. As far as those molecule-signs are viewed as real, something really new – a radical novelty – came into existence through the evolution of such concepts.

Thus, what may have a claim to be new is not the thing (item) known but the knowledge – that which in its various expressions, articulations and applications through thoughts, habits, words, laws and artefacts is allowed to arise de novo. They are “allowed” to come into existence precisely because, in fact, they are nothing but various kinds of interpretations of what already is – and always has been around. Accordingly, what is being investigated in the realm of cultural history are rather various modes, ways and means by which the one, same and unchanging world became shared by various peoples. They are accounts on how the “one, immovable, rational and moral” became reflected by various peoples in the course of the history of mankind.

With the onset of modern science, this allegedly unchanging world of human dwelling became bound even tighter by the straitjacket of the uniform objective reality. Within this universal frame of reference, what is considered real (i.e. worthy of knowledge) and therefore true, is data – objects, texts, figures, numbers, statistics – anything that can be counted, quantified or at least classified. This is how exact science proceeds in order to reach objective knowledge consisting of proportions and ratios expressed in absolute numbers and precise terms. Connections, successions and cycles (sequence patterns and repetitions) of styles, schemes, structures, and paradigms are highly appreciated.

Knowledge within social, historical and similar sciences then consists in the recognition, identification, characterization, and distinction of various types and human ways of dealing with reality, in order to build lists, maps, sequences, chronologies and other kinds of inventories used for comparison, sorting, ordering, and correlating. At times, such rules and patterns are even regarded as laws of some kind, analogous to the so-called “laws of nature”. We might be tempted to call the kind of knowledge described in the paragraph above “ecology of ideas” (in the sense of Bateson 1980). We might consider (and justify!) these historical and cultural investigations as studies of human “memes”, elements of reproduction and propagation through imitation (for discussion of the “science of memetics” see Dawkins 1976; Blackmore 1999). But, alas, memes are not “real enough”, in an objective way – at least not in the sense that molecular “replicators” (genes, viruses, and similar DNA-stuff) are real.

Let us look closer at that last example, of memes. They have, by definition, a reality of their own – distinct from the “meme machines” that are the human brains they inhabit. The machine is used merely for the reproduction and propagation of memes, through imitation. But memes are neither conceived nor born! They come out of serendipity, through trial and error or just as a “lucky guess”. Hence, memes and their aggregates (memplexes) do not truly evolve: rather, they either compete
or combine, to contend or conspire. Memes do maintain continuity but they do so neither through individual memory nor collective history. Obviously, the same arguments can be used in the case of genes. Neither do genes “evolve”: only allelic frequencies shift endlessly to and fro. From the gene’s eye point of view, evolution is but an illusion!

Clearly, within such an epistemological frame, there is no room for novelty. Counting, classification, ordering, identification… all such procedures rest on sameness – the very contrary of the new.

Unde Novum in Philosophy

In this respect, philosophy is not of much help, for novelty has never been honestly sought, thought or taught; as we saw in Chapter 1, philosophy is a product of the introduction of rationality into Western thought. Like science to which it gave birth, philosophy is concerned with the one, unique, exclusive, and ultimate truth – or with denying any such truth, or at least denying the possibility of knowing it (a temptation to which science never fell prey). Rarely has a truth-in-becoming been considered by philosophers. At most, and reluctantly, it was admitted and reflected upon – usually with the conclusion that becoming is but a becoming-true, i.e. becoming reality. Thus, a new reality results from the realization of some pre-existing potential; it is but a “fulfillment”, the emergence of what has always already been there, or the filling of a vacant place – a patch! In order “to take place” there must be something (somewhere, somehow) to take it. The “place” to be taken is said to be assigned; it can even be created de novo in an act of signification. The outcome – a semiotic relation between a sign and an object – appears as something radically new, both by definition and by necessity. If the “something” that takes place is itself conceived as a sign, we have a case of coming out of something truly new. Its becoming is a coming (into existence) literally out of nothing (creatio ex nihilo) and from absolutely nowhere.

Since Aristotle, however, semiosis has been dealt with in the topica (topos – “place”); it follows that what is “out of place” is improper, i.e. lacking a proper place within a semiotic space, and therefore meaningless (atopos, i.e. “stupid”) or pointing to no sense (pointless). What has a “meaning” in such a system is identical to itself, confined to an isolated, private (deprived of anything else), solipsistic Ding-an-sich kind of existence. Such a deficient manner of being is commonly (though wrongly) named “objective reality”. In this light, of course, the genesis (becoming, birth) of what is different from what has been seems to be just a different manifestation of the “same”. What seems to be a new reality reveals, in reality, just an unsuspected possibility of reality that might have been expected. Novelty is, at least in principle, just evidence of our prior ignorance. Hardly any other kind of truth concerning becoming or a different way to understand the new – the nature of novelty – has ever been proposed.

One, more recent, example: though for Hegel truth has a historical dimension, the Hegelian “becoming-true” is a mere “revelation” in time, not a genuine “cre-
ation”. For Hegel, a future (next) truth is implied by the previous one as a necessary further step toward the “ultimate truth”, which lies in the final self-identity of the Spirit (or the “absolute mind”; see Chapter 1). As this blissful stage\(^3\) approaches, the past “intermediate” truths are gradually cancelled (dissolved, rather than included) by the following ones, that themselves achieve an ever higher synthesis. Again we have here revelation of the “absolute” in the sense of being pre-ordained, inevitable, necessary, not “absolute” in the sense of a sovereign, supreme source of free and genuine creation. The same may be said of Teilhard’s “Omega Point”, the “ultimate goal” evolution heads towards, and of many similar, albeit more “scientific”-looking theories of *orthogenesis* in biology (e.g. Lamarck 1809; Eimer 1897; Berg 1969; Conway Morris 1998, 2003) or sociology (K. Marx and his followers). Obviously such teleological concepts of evolution owe their popularity to the denial or at least to taking the edge off the New, thus making evolution “digestible”.

This state of ideas can be followed even by authors who realize that the concept of *meaning* needs to be somehow introduced into biology. “Biological meaning” either has something to do with survival or it points to an effect of a signal. Other meanings of “meaning” are forbidden – at least in contemporary, orthodox biology. Attempts to introduce it end up, as a rule, with the simplistic conclusion that meaning is something that always has been there or at least was produced, and could have been produced at any time, according to (decipherable) rules of “contrapunct”. That is the case of such otherwise incomparable authors as, e.g., J. von Uexküll (e.g. 1958) and M. Barbieri (2002). *Meaning* stripped of its hermeneutical dimensions, produced according to rules, becomes the simple decoding of signals. This reduction to a stimulus/response scheme is but a pale ghost of how *meaning* is generally understood by common sense – not to speak of hermeneutics or poetry! What all such activities have in common with “objective” science is their taking of living beings as passive pieces on the chessboard of nature, pushed and pulled according to rules imposed from outside.

In spite of this, many authors praise von Uexküll for his bold protest against mechanistic biology, and some even consider him the founder of biosemiotics. But Uexküll frames his protest in terms of an absolute denial of evolution and by closing living beings into a ready-made bubble of *umwelten*, perfectly prepared in advance for them by Nature: “Since we humans are used to leading our affairs with effort from one goal to another, we believe that animals live in the same manner. That is a basic error, which so far has misled all research. [...] Therefore our first concern must be to quench the will-o’-the wisp of a goal when observing Umwelten. [...] [Animals] are controlled directly by a plan of Nature, which determines their characteristics (Merkmale).” (von Uexküll 1958, 60–62)

At many points, Uexküll compares the workings of nature to a performance of a symphony or even to a glockenspiel, every tone of which is already written down in the score (by external nature, of course). The only “freedom” allowed is individual variation, as when the same symphony (score) is performed by a different conductor

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\(^3\) *Status Spiritus* in the 13th century terminology of Joachim da Fiore.
and/or orchestra. No improvisation, no new melodies; indeed, how could such a
dead, strictly creationist scheme ever provide room for semiosis?

But is it at all possible to make a science of something that cannot be subordi-
nated to any strict rules? We believe not – that is why we state below that objects of
scientific knowledge do not refer to the world. It is a fact that only two historical –
that is, not objective – events were ever allowed into science: Darwinian evolution
and the cosmology of the Big Bang. We speak of Darwin and Darwinism in the
next chapter; as to the second, real creation of novelty could not be denied either,
but all the rules were settled in the first blink of an eye after the Bang. History was
happily – and indeed quickly – over, and nothing really new, anything that could not
be foreseen in advance (or ex post), has happened in 13 or so billion years.

If such colossal breakthroughs as the Big Bang and biological evolution were
quickly camouflaged and rendered harmless, we should not be surprised that a simi-
lar story unwound directly before our eyes. In 1977 the Nobel Prize was awarded to
I. Prigogine, originator of a school of non-equilibrium thermodynamics that deals
theoretically with the emergence of so called dissipative structures (like flames, tor-
nadoes, stars, or galaxies; see e.g. Prigogine 1980; Prigogine and Stengers 1985). He
showed that where thermodynamic disequilibrium reigns – i.e. practically whenever
you look in our universe – macroscopic, dynamic structures arise spontaneously.
Their birth and trajectory in time cannot be calculated in advance, and neither can
they be reconstructed retrospectively: whatever we look at has its evolution, never to
be jailed fully by the laws of physics. As far as we know, the challenge this poses has
not been fully taken up in science, and still less in biology. Thermodynamic equi-
librium remains the gold standard against which all else is compared; the second
law of thermodynamics is regarded as one of the supreme achievements of science.
Meanwhile basic courses in thermodynamics hardly mention Prigogine.4

Our dismay over the startling absence from lofty knowledge and thought of an
understanding of novelty, together with the general lack of interest in the truly new,
is only intensified by the finding that, surprisingly, even general wisdom and com-
mon sense also have no sense for what is most common. This is the experience of
the new, the becoming-true, and the truth of the coming-into-being – or, in summary,
for nature, for the being-in-evolution.

Language

Common speech provides little assistance for dealing with becoming or coming-
into-being, or for expressing our experience of the new. Indeed, language in gen-
eral (including learned vocabulary) is appallingly ill-equipped for the task. Even
an appropriate, unequivocal word for the new is lacking (hence the awkward

4 Of course, exceptions can be found to the dismal status of modern knowledge (e.g. in thinkers
such as F. Nietzsche, H. Bergson, or M. Heidegger), but they have never had the impact necessary
to change profoundly the path of either science or philosophy.
The term “novelty” is usually understood as mere innovation, or as something unusual, modified, different or deviating from the ordinary or accustomed ways of the world’s behaviour. The same holds for terms like “genesis”, “origin”, “inception”, “birth”, “advent”, “event”, and the like. The meaning of both “evolution” and “development” actually suggests unrolling, unfolding, unpacking, unwinding, or unwrapping – and this holds for all European languages. As for “advent” and “event”, both come from “coming” (Latin: venio); what arrives or comes does so from somewhere. At least “from the future”: somehow, it had to be there, in that future! In science, especially in biology, when pushed hard we might use the term “emergence”, but a look in the dictionary will reveal that the verb “to emerge” really means “To rise up out of anything in which a thing has been immersed or sunk; to appear in sight (from below the horizon or from a place of concealment); to become apparent; to issue from a state of depression, suffering or obscurity.”

Hence, our vocabulary points towards things or events that are already present, somehow due or ready to pop up, to come into view. It is virtually impossible to speak of a future that is not! Generally, such terms apply to what is done, relate to facts already accomplished, or point to events past or expected.

Rarely, if ever, do words refer to something that is, yet was not before, to what appeared by itself, became itself through its own becoming or is in becoming (in statu nascendi). That is, something whose existence is in steady renewal – always new and not only “not yet true”, nor “still to come” or “about to appear”, but truly and thoroughly not at all – at least not the way it was, and what it would or might become is not a part of its present or even remote possibilities. Yet, this is the very prerequisite for any genuine evolutionary thinking: here lies a deeper root for the general misunderstanding of what evolution is about and why it is so difficult to grasp – deeper than ignorance, prejudices, etc. Note that some of these features discussed pertain to the very notion of the Greek physis (nature) taken as a process of becoming or as something which is evolving. But, significantly, the Greeks also considered nature as “that-which-is-not” (to mé on), precisely for the reasons mentioned above. Thus, most pre-Socratic treatises are reported (by Aristotle) under the general title peri tú mé ontos é peri fyseós – “Concerning What Is Not, or About Nature”.

Clearly, the new in the sense of unheard-of, unthinkable or inconceivable is out of reach of our usual words or at least outside their common usage. Admittedly, there is a lot of good sense in such general reticence in speech towards the new, for how could one conceive of what is inconceivable? How could the inconceivable be born?

Having so headed a conclusion, we must put the question anew: why does the new resist so obstinately both verbal expression and mental conception? Is it just because of self-evidence – such that the new does not need to be spoken about,

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or even named? Why do science and reason, and even common sense, prove to be utterly blind to that which provides the very stuff of our nature as well as of Nature itself – especially of living nature from which the very nature of every living being is made? The answer is simple: science is not about nature! Rationality refers to the timeless, and speech deals with what is changeless. The structure of language – the words and grammar – apparently evolved as instruments for picking up on certain invariant elements and general features of the chaotic turmoil of experience and fixing them by reliable rules. The scientific worldview and the technical environment of modern humanity filter the natural world, the world of signification, away. Only when shielded from physis by all kinds of artificial device could modern man conceive her nature as “inner” and closed, and against such a background regard his own “subjectivity” as something special: spiritual, disembodied and extraordinary, it seems to lie outside the order of nature and therefore appears transcendental and supernatural. Here springs his superstitious and preposterous claim to a monopoly on meaning in the universe, and his monstrous folly in considering himself the only and exclusive origin of it.

Clearly, there must be something fundamentally wrong with our conception of the new and hence with our present quest! There cannot be any reasonable doubt that the radically new is an essential, steady, integral part of our everyday experience. In defiance of all the contrary evidence mentioned above, whether it comes from science, philosophy, language, or common sense, we call for the testimony of myth. “Mythology” means story-telling. Even mythology has its “logic”; even myths pertain to logos or “order”. Theirs is not the discursive logic of philosophy and conceptual thinking, nor the rational logic of modern science (that of formal calculi) but a logic of narrative.

Certainly, myths do deal with the new. Their various kinds of “-gonies” (theogonies, cosmogonies, etc.) relate mostly to geneses and the generation of gods or the world; or to the origins of men, trees and beasts; or to how this or that or everything came to be; or to other “how it came to . . .” tales. All tell us about unique events, which happened “once upon the time”, i.e. only once, not repeatedly. Rightly we assume that the origin of myth lies in imagination, for imagination does admit the new. Imagination, fantasy and narratives are set in “images” – that is, they play out amongst forms, likenesses and shapes. This kind of “eidetic” existence requires understanding, offers meaning, and is channeled into stories.

We speak about “free imagination” because interpretation is free. Eidetic space – the space of likeness and signification – provides freedom of becoming and a place for the new, where becoming takes place (a new Place as a tendency to be, i.e. to signify).

Now, evolution is about the becoming of living forms, and it consists of stories consisting of unique chains of events; its knowledge too is expressed in a narrative form. All forms of life exist as individual bodies, each unique in likeness, shape

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6 Cf. Heideggerian Gestell in the previous chapter.
7 See canalization of superposition in the previous chapter.
and the process of its becoming that makes it part of a likewise original life story. Finally, the evolution of these life forms proceeds by building up these bodies again and again. The living, by nature, is new.

**Signification**

Biosemiotics is directly and explicitly based on the assumption that signification, communication, cognition, interpretation, understanding, etc., are real, simply because living beings such as worms, mushrooms, trees and birds do exist. They make their living by producing and manipulating signs, they must understand them in order to communicate, and they must do these things in order to attain both mutual and self-understanding. This semiotic aspect of living beings is precisely what makes for their being-alive. The nature of the living existence is semiosis.

Such an understanding takes the “living matter” (i.e. the matter of life, what matters in life) as semantic stuff, and the living body as an embodied meaning – meaning in flesh. Seen in this light, life processes consist in self-interpretation – call it “organic stuff” or “mind-stuff”. Between brain and muscles there is a difference for sure, but all functions, or rather all dimensions or aspects of bodily wholeness, operate and co-operate on the basis of signification.

This inner propensity towards integrity, coherence, fullness and wholeness implied by the “intentional disposition” of the living body to be meaningful, corresponds to the Aristotelian understanding of the soul as the essential form (εἶδος) of the body, i.e. its form or way, style or pattern, logic or strategy of being-in-movement. Below we shall call it dynamic form or likeness. Like the biblical authors, biosemiotists need not distinguish between life (ζωή) and soul (ψυχή), i.e. between the life of the body and the life of the mind, or between physiological and psychical processes. Psyche is the traditional and convenient term for the “life principle” or the individual life. It refers to the body’s “physiology”, though in the original sense of the term, indicating the dynamic nature of corporeal existence (dynamis as potentiality, potency, ability, power and might). Thus, in calling the individual embodied life a “soul” (ψυχή, anima) one puts an emphasis on its autonomous tendency to form and change by itself. This self-formation (autopoiesis) from within we may call in-formation (or morphogenesis, contrasting with today’s technical concept of information as an instruction from without) and the process of change corresponds to re-formation or trans-formation (metamorphosis).

Biosemiotics, then, opens a way not only to understanding organisms as kinds of exceptional objects having the privilege of being provided with sign-manipulating devices such as genetic apparatus and humoral, immune and neural systems and associated sensory apparatus, but also to conceiving of life as being “semiosis incarnate”. Living bodies, then, are expressions of this organic semiosis – its signs, signs of signification. This more radical understanding of biosemiotic endeavour may provide a solution to the riddle of the new. What follows are but hints, outlines, pointers in the direction of what such a solution might look like.
Body as a Sign – Compared to Letter-Signs

The body is a sign, but a very peculiar one: its signification is neither arbitrary nor necessary. A body is not a sign for something else. It does not stand for, represent or refer to anything but to itself. A body is no reproduction, simulation, substitute or imitation of anything (with the exception of mimicry – see Chapter 6); neither is it a map, a model, a symbol, a name or a label. It presents and represents its own original – the real thing itself. It cannot have any object of reference – although many and various signs and things may refer to it. The body-sign is not a representation but presentation: the sign of the presence of the original living reality. Hence, the body is its own sign, its signifier and the object signified (but not a name or index). By not being an object but rather a subject of signification, the body carries out all these semiotic functions at the same time (and place) and at once (in one expression), yet these aspects of living signification do remain distinct. The body is the expression of their coincidence, not of their confusion. It is a symptom of the organic unity of embodied semiosis.

To understand better the paradoxical semiosis of the body-sign, let us compare it to more familiar letter-signs, to marks or signs such as the letters (a, b, c . . .) or digits (1, 2, 3 . . .) we all use in writing down words or numbers. A letter-sign is a separate unit, a member of a closed set (like the alphabet). The set (usually rather small) is tightly ordered in a canonical sequence (alphabetic order), so that any member (letter) has a unique place in the succession by which it may be unequivocally defined. In the process of writing, letters may be ordered at will in any arbitrary sequence, by putting one (any one) next to the other in one direction.

Letter-signs are indifferent to their neighbourhood, they are context-free. This means that they remain unaffected by permutations: in any combination they conserve their identity. This property, once recognized, has been borrowed also by other realms of human endeavour. Atoms, particles, genes and markers, and even bodily features and properties used in taxonomy and classification (for example in studies of heredity in genetics and evolutionary kinship in cladistics), as well as the behavioural patterns defined in ethology – all these elements have been credited with a similar “letter-like quality” of indifferent self-identity. Such absolute (autistic, isolated, self-contained), immutable existence is ontologically essential for objectivity – both for objective existence and for objective knowledge. The status of objectivity excludes any kind of meaningful relation to other things, to surroundings or context, and even to both the past and the future. This excludes true memory and experience, as well as any purpose, projectivity or intentionality.

Letter-signs have another essential feature. They do not refer to anything and bear no similarity to anything whatsoever – as in the introductory statement that appears in many novels, to the effect that “any resemblance to actual persons, living or not, is purely coincidental”. The letter identity in no way depends on the actual shape: B remains B, the immediate successor of A. Thus the way letter-signs are written is entirely arbitrary and irrelevant; a letter may assume any form, provided it remains distinct from other letters. We appreciate this essential aspect of letter-like signs whenever trying to recover a text in an electronic form corrupted or made
illegible due to an erroneous manipulation or a wrong conversion. A text like “t?e scr?pt was co??upted by undue c”?ing” can be restored to its original state, since the alphabetical positions of letter-signs themselves did not change; what changed was merely their familiar appearance which is in principle irrelevant. The number of fonts in which letters-signs may be stored (written), retrieved (read), or transported (sent), is unlimited – a letter’s shape is just a matter of coding: with respect to the sign itself, the appearance is immaterial. (This startling property of letter-signs – the absence of both form and matter – is something that has apparently escaped many scholars, from Aristotle to Dawkins.)

Our point is that letters are not signs of speech and they do not stand for sounds: they are not used to record the phonetic form of spoken word. In all languages that use a so-called phonetic script (except Sanskrit) the relations of letters to their phonetic value may be very loose (as is particularly obvious in English). Whereas the identity of a letter is context-free, the way it reflects (and affects) pronunciation largely depends on several contexts, in a rather intricate and complex way. The same applies to digits: “2” as such does not mean “two” or “second” by itself, automatically. Depending on the particular case, it can signify “twenty”, “double”, “twice”, a “pair” or “squared”, “February” or “fourteen” (military time), and can participate in writing down “a dozen”, or signal a phone number or denote a particular tram connection (neither of such meanings being derived from “twofold” or “second”). Nevertheless, “2” is a sign for “second” by self-reference, being the second sign, following the first digit “1”, in a decimal code.

Self-Reference of Letter-Signs

In addition to the absolute indifference of letter-signs to shape, there comes another essential feature that is peculiar to letter-signs, and one of a much greater importance, their self-reference. As already stated, a letter-like sign refers to nothing whatsoever apart from itself: an “A” means only “A”, and nothing else.

It would seem that this property of self-reference is shared both by letter-signs and body-signs. Bodies, too, as signs, do not represent anything but themselves: body-signs are signs of self-expression. But this is precisely what letter-signs are not, for they do not express anything, not even themselves, as they have no “self” to express. The self-referential semiosis of letter-signs is exactly opposite to the self-referential character of body-signs. The former rests on an absolute self-identity, whereas the latter consists in a natural self-similarity. This contrast is fundamental for our quest in relation to novelty, and it was in order to stress this contrast that we have taken pains to introduce letter-signs and explain their essential character.

The so-called “interpretation” of letter-signs does not refer to meaning. It consists solely in decoding, that is, in the identification of individual letter-signs through unambiguous recognition, i.e. telling them apart. (Hence, decoding can be executed in formal operations and may be mechanically implemented.) And since meaning is a kind of instruction (indication or relation), letter-signs, by definition, are meaningless.
This is, however, no drawback but their enormous privilege: unhindered and unaffected, meaning may be attached to them from the outside. Letter-signs are used as kinds of sign-variables: (i) as universal signs in any signification, usually of phonetic values (as elements of so-called phonetic script); (ii) for small numbers (as digits); or (iii) as places in a succession (as index-signs).

For the purpose of writing, reading, counting, listing, addressing, ranging, classifying or identifying (e.g. speech, quantities, numbers, data, melody...) meaning is “implemented” (encoded) into the syntax or ordering of letter-signs. That a linear sequence of meaningless signs may bear meaning by virtue of being aligned – since letter-signs may be (ideally) ordered in any (arbitrary, free, unrestricted) way – makes their introduction one of the greatest achievements in the history of human culture.

Likeness

Now we proceed to another, still more paradoxical semiosis of self-reference; that based on self-similarity (rather than auto-identity). It is this structure that forms the basis of the body’s being a sign – albeit one wholly different from the signals, lights, letters, words, formulas, schemes, blazons, symbols, and icons we usually mean by “signs”. But it is a sign nonetheless – being significant and signifying something, bearing and imparting a meaning through referring to something else. Here, the reference is similarity and the something is the signifier itself.

For the sake of a better understanding, first we introduce a fundamental concept for which – for want of a more appropriate and lexically established expression in English – we choose the term “likeness”; the concept is equally vague and elusive in most languages. To explain what likeness is means explaining key distinctions between two kinds of form: static and dynamic. By a static form we mean a definite (solid, steady, “stiff”) unchanging shape, like a boulder, closed or limited by its outlines: the boundaries need not be sharp or clear-cut as is the case with geometrical figures or solids, provided they give rise to at least a quasi-static appearance, one definable from without (like the cloud-weasel discussed earlier). Dynamic forms, on the other hand, are not defined from without, but somehow from within: they are (or are taken for) expressions, manifestations of their being such and such, looking this way and not some other way. Dynamic forms are a means of showing “what it is” by reference to “what it looks like”, implying that there are other ways of looking-like, if only because we refer to “looking unlike”, to what a form is not.

Static forms include all kinds of figures and schemes, all kinds of typography (characters, fonts, marks, symbols) stamps, casts, cuts or masks, and all kind of marks, logos, emblems, flags, archetypal icons etc. Of course, drawings, pictures, sculptures, embroideries, prints, fossil records, all kinds of reproductions, or even stuffed animals, fall also into this category: all are changeless and impassive. Practically, however, such effigies, despite their motionless shapes, are misleading examples of the essence of static forms. We cannot resist seeing in a stuffed animal the animal itself (that is why it is exhibited), to skin the skin, so to say, to its shape. As
an iconic sign of the living animal, the dead object looks like a living being, about
to move, its appearance suggesting that it might prove itself otherwise. And this is
a characteristic of dynamic forms! A static form of an object becomes a dynamic
form when awakened in the mind. We are again back to our parables from a previ-
ous chapter, talking of dynamic superposition and static outcomes. It seems that our
culture has forgotten how to distinguish between them.

Instead of providing further examples of dynamic forms it would suffice simply
to say that everything else belongs here – clouds, landscapes, mountains, stones,
leaves, tunes, spoken words, stories, pictures, perceptions, facial expressions, rec-
collections, visions and dreams . . . In other words the term “dynamic forms” encom-
passes literally everything and anybody we encounter in the natural world (but not,
note, the technical one!), or that we meet in our natural experience, or that are
present in our mind as mental images, ideas, notions, or narrations. It includes our
knowledge, which is linked to imagination, memory, and intentionality; but it does
not extend to cases of objective knowledge, based on rational constructions.

It seems, then, that to be a “dynamic form” is the most obvious way to be, to
be perceived or known. So obvious indeed it is that we have trouble even conceiv-
ing of it as something and to find an appropriate expression for such a laboriously
won, seemingly prosaic conception. (These are the same difficulties we encountered
above in the case of “becoming” or “being new” – something that is not perceived,
imagined or expressed.) For how and why are we to perceive, reflect, imagine or
express the common, “default” way of being of what is perceived, to which most
of our concepts and names refer to? As we shall see, the two cases are deeply
connected.

Such difficulties notwithstanding, there exists one outstanding category of
dynamic forms: organic bodies. These are whole and alive; they are the way they
look, whether squirrel, orchid, or dragonfly . . . We might compare this one partic-
ular squirrel posing in front of me, its appearance perceived as expression or even
self-presentation, with the squirrel in the mind. The way we know and recognize
the latter is as a dynamic form too: the way it looks, moves, behaves, its habits and
habitus, are attributes of its dynamic form within one’s knowledge, recollections,
and ideas. This is why we used the word “appearance” for what we shall, from now
on, refer to as likeness.

The Greek equivalent of likeness is eidos (a synonym for idea). The word pro-
vides modern languages with the adjectival form eidetic, or pertaining to likeness,
which permits expressions like “eidetic variation”, “eidetic nature”, “eidetic exis-
tence”, “eidetic memory” and “eidetic biology”. Although eidos is our favourite
term, we have refrained from using it here, in order not to give the false impression
of something ideal, abstract or lofty, when in fact it denotes common experience and
common sense.8

8 Still, to mention eidos here is appropriate because of its anonymous presence in the
suffix “-oid” in many words (such as crystalloid, ovoid, anthropoid, colloid, asteroid) indicating
likeness, resemblance or similarity.
We decided instead to use the term likeness for the looking-like of the dynamic forms, so as to put the accent on the semiotic nature of their dynamism. We understand likeness – the central concept for the whole argument of the present treatise on the new – in terms of its two meanings, which relate to the how and the what of the looking-like.9

A dynamic form changes its shape yet maintains the same appearance by conserving similarity. Its incessant change is a means of finding the right way or ways to express the kind of likeness an appearance signifies (points to, is about), and to refine or develop it further. Both bodily forms and mental images, as much as electron orbits or molecular shapes are of this variable nature; they are variously quivery, shaky, vibrating, or swarming.

Likeness is thus a manifestation of the dynamic nature of living forms. It refers to their semiotic aspect. It points to various ways of how to look alike, while expressing variability. It is part of the very polysemy that is apparent from the way a living form looks. Likeness expresses the ability, potentiality, inclination or readiness to change – by pointing towards such changes just by the way it presently is; they are aspects of its existence and contents of its signification. These intentional motions are displayed by likeness in the same kind of way in which a face displays its emotions while remaining motionless (one can recognize emotions even from a photograph).

However, likeness is not a synthesis or summary but a superposition of likely forms or appearances related by being either alike or like someone or something. Likeness is a semiotic category, not a physical, logical or formal one; it is a category of form and formation. We may connect it to morphology – likeness is a kind of specific rule or “logic” of form, in which formation and transformation are based on being alike, on sharing similarity, correspondence, and suitability. Likeness thus conceived is the main concern of morphological studies, since it refers to the manifold proneness, propensity or inclination of a living form, and especially of a developing body, to transform itself into other forms. This holds not only for body shapes, but also for electrons, proteins, minds and all natural “objects” – which may all be assimilated by the “sphere” parables of the previous chapter.

Likeness is not just an appearance or a relation. It is complementary in the appearance and the relation, both of which are aspects of likeness that contribute in concert to the semiotic role of a body-sign: likeness as the bearer of significance. The rules and criteria it provides (or presents) are basic principles of orientation for finding cues in the search for (and the genesis of) the essential. Those rules are both specific and unspecified; they are not set or stated and they are not even conscious. They are shown and suggested by the sight of an observer and through his insight. Rules of likeness are not laws or norms to be obeyed with respect to what is right.

9 The third meaning of likeness – as an artificial imitation (such as a portrait, effigy or image) in no way fits the concept presently elaborated. On the other hand, the connotation with likeliness, seen in words like plausible, suitable and even probable (cf. likely, in all likelihood), is in tune with the concept we seek of likeness affecting its semantic field in the right way.
but, rather, are morphological features and aesthetic views to observe.\textsuperscript{10} Likeness may be compared to a morphological landscape or to its horizon.

\section*{Likeness as a Totality of Features}

Through this dual nature, which is quite naturally united in knowledge and perception – and, according to our thesis, organically united in the course of bodily metamorphosis – likeness covers, both conceptually and verbally, not only the morphological properties of a living body, but also the essential specific features, or the characteristics of a species. Likeness refers to the global sight of the living body; as shown in the second part of this book, likeness is also that feature of a given form that is perceived by other, unrelated forms. The shapes of the natural forms reveal the process of their becoming: they are signs of their coming-into-being. In this sense bodies are signs of themselves. Unlike the reflexive signification of letter-signs which is based on passive self-identity, living bodies achieve their self-signification through an active, dynamic and directed tendency or propensity towards being-alike. This intentional self-reference is neither a goal-directed process nor a function driven from behind. It is a process of signification – a semiosis.

What makes the body into a sign is the likeness – its looking-like. Looking like what? Like itself. But what does it mean to be like itself, or rather like its self? In order not to get bogged down in tautologies or nonsense, let us finally face the self-similarity of body-signs. After all, the concept of “likeness” has been introduced and accurately elaborated precisely in order to understand the self-referent semiosis of body-signs and to get to grips with the paradox of their being like themselves.

Indeed, likeness which makes the body into a sign, a sign of its likeness, provides meaning to seemingly meaningless statements such as the above “the body is like itself” or even “like its self”. Put in use, likeness gives them meaning: a body is like its likeness-itself, that is, like the superposition of the likeness of all the expressions the body ever assumed in the process of its development. This process of development is the living being’s becoming what it is, i.e. its nature. It includes the whole course of its life, from its conception to the present stage – the way it is and makes its living and finds its way through life. In referring to nature we must take the expression “way of life” in its literal meaning; that is as a true way, meaning that we understand it as a course, a journey, a process, not just a cosy substitute for manner, kind, style or type. Obviously, neither is it to be taken for a path (already trodden by somebody else) or a road (build-up and ready-made to be used as a transport-channel); a way of life is a living way, thus it is decidedly not a track to follow according to a prescribed (programmed!) procedure or method. Likeness is the result of both clearing the way across the region, and of the formative power

\footnote{That is why an expert (in butterflies, say) can recognize the species of single and even atypical specimens at first sight by their likeness, and still not know how and why: he can “tell the difference” but cannot tell what actually is different.}
of that region (see previous chapter). In the same sense can the fitness landscape of evolutionary models be understood (especially the concept developed by Kauffman 1993, 2000).

Being “a way” means to comprise, everywhere and at any point, all other places of the “region” – especially through time, which is the case with the way of life. Hence it cannot be reduced to any single now and here. On the contrary: at any stage and in any station, the whole past course and “time behavior” are perforce included. That is what a way of life consists of. Also, it is implied by a way’s being a manner, a style: it has to have a form, a face: a likeness, in brief. Likeness is not a written form consisting of letter signs but a body-sign itself. It is not a substance (a kind of substrate as a receptor for static forms, such as impressions or traces left by past events), nor a particular form deformed and bruised through the injuries suffered. Likeness is a bearer of a message concerning its nature, a message about what it means for the being to be like itself.

But the way of life was not always the way it is now! It probably changed a great many times – and not only by evolving gradually, from one style to another, in a more refined manner of self-realization. Instead, the way of life no doubt took the most sharp and unexpected turns and changed in the most unexpected, unlikely ways. At the level of species, long periods of frozen habit may be followed by sharp turns in ways of “performance” – from extinctions up to new, genuine inventions in evolution (Flegr 1998, 2008). “In reality”, so the saying goes, “nature does not change”. But natural existence is not being “in reality” but rather “in actuality”: its being is actually being-in-movement – that is, the modality of being as continuously changing-itself. As for living nature, her being-in-change is becoming; that is what physis actually means – as well as natura and creatura: life is nature in the proper sense, an exemplary kind of natural existence. Inquiries into the “nature of life” are therefore meaningless. Likeness refers to the coherence of nature seen as a life-story – the semiosis of narrative.

**Genidentity and Entelechy**

When discussing living-in-time one might resort to the term “genidentity”, which was introduced in 1922 by K. Lewin; see also Koubová 2009. He posed the seemingly trivial question of how we can know that the stone on one’s desk, a star in the skies, or a human being, remains the same despite the possibility that they may have undergone some change during the period of observation. What is the essence of the unity of objects in time, which allows us to recognize them as the same? It is this identity in time that Lewin called genidentity. Genidentity is neither a causal nor a logical relation; neither is it the relation of simple identity. What, then, is that same-ness that we can recognize, and which enables our basic orientation in the world, but which also allows the existence of sciences like physics and chemistry? In some cases, we simply rely on the labels put on specimens (test tubes, laboratory organisms, cars), believing that such labels will retain their genidentity; or we follow a
contingent linear succession of phenomena in time – as in the movies. Genidentity applies to a time-sequence, chosen to follow either arbitrarily, or on account of some invariant features, or with respect to the meaning they are supposed to display.

But what is the essence of the genidentity of two texts, of different descriptions of the same thing, landscape, child, or situation? Such questions become important in the reconstruction of genealogical lines where no label can be placed on the predecessors, and we are left with learned guesses based on paleontology and other traces. A similar situation is encountered in comparative biology, where we must believe the notions of experts.\footnote{Even in such an “objective” branch of bioinformatics as the comparison of DNA or protein sequences.} What, then, connects “the same” in different times and situations? A possible parallel notion to genidentity is entelechy. In Greek, entelecheia suggests an inner (inward) propensity towards a goal (telos), holding it, aiming at it, or simply behaving in a “goal-like” manner. Entelechy comes very close to likeness or eidos.

The problem we face immediately, however, is the Aristotelian approach to eidos, i.e. likeness. Aristotle took somatic development (in fact, any physical movement – kinesthai fysei) as a teleological, goal-directed, targeted, process. Its goal is usually the final state, which – when reached through a succession of intermediary changes – marks the end of the movement. This end-point or telos is usually taken as something fixed in advance – as a kind of morphic attractor or as a condition reminding computer programs: “if [condition] – then stop – else continue”. For Aristotle, this telos is an ever-present cause steadily keeping the physiological activities involved in motion. It is thus construed as a mover: a propeller, a drive (motive), or a driver (charioteer) of developmental movements, directing the changes in form.

For Aristotle, all developmental stages of, say, a rose, represent but different appearances (aspects) of a single eidos (species) – namely that of the rose. The essential form thus includes all various ways of the plant’s looking, which – with respect to the very essence of the species – were thus regarded as merely accidental, and dependent on the age and season.

Aristotle coined a very odd expression of his own – to ti en einai (that which was to be) – to refer to a being’s change in likeness through being the same being all the time. A rose is a rose both as a seed, a shoot and a hip – all are the very same plant, various forms under which the particular exemplar appears. What unites all such mutable life-forms into the single concept of a rose is what we would call today a life cycle. Aristotle introduced ingenious analyses of natural existence as a particular kind of being of its own (conceived as becoming), one that does not cease to be potential through its realization (energeia; that would cancel it as potentiality – dynamis) but rather through its accomplishment (entelecheia). A potentiality accomplished or applied (put into work) may be conceived as power (same word: dynamis).

With his conceptions of both the natural and of movement, Aristotle broke radically from the traditional ontology of the Greek thought. To one ontological
feature – the self-identity of the being – he stuck, however. For him, the only way to assign self-identity to natural existence is to think of natural processes as cycles: any “way of life” must lead into its own departure. Nature – the being-in-becoming – is unique and changing, and might therefore be an obvious candidate for a womb of the new. As, however, Aristotelian becoming moves in a circle, it is not an open story, but a closed form – a time-form. The turns taken in individual life stories may be quite unexpected and unprecedented, but still nothing new would come of any of them; they are moved by their destiny in a characteristically Greek tragic style. Bodies may vary in form, but these are but accidental variations of embodiments. They are but aspects of the one and the same likeness, which, though being a time-form, is timeless. It remains the eidos of the philosophers, the Plato’s idea naturalized. Hence, the hopeful and lucky early conception of being – as eidos – had been sterilized in the cradle. Useful as it was in so many ways, as a natural category it remained fruitless. The concept of “likeness” proposed here is not the eidos of the philosophical legacy: an unlike likeness is not the same likeness.

To be Like Self

In the light of what has been said concerning “ways of life”, we may venture to rephrase the above answer to what it means for something “to be like itself” as follows: A body is the sign of its self; it points in the direction of all the likenesses of the body displayed by the embodied self during its life-story (which makes the being what it is alike).

Needless to say, the ever-deeper sense in which the unlike is a like must refer to a novel way of being-alike. Its genesis or enactment is a new hermeneutic feat. The relation between subsequent likenesses is semiotic; it is about signification, and all significations are connected by way of interpretative inclusion. When embodied, an interpretation of a body-sign finds its expression in the likeness of a body-sign – in being-alike. Provided it is a right interpretation. That does not mean the only interpretation, but “right” in the sense of being true to what is interpreted, i.e. true to the sign. Thus, the last foundation for the semiosis of the living might turn out to be truth – another elusive, awkward and embarrassing notion, rather as are “becoming” and “likeness”, also bases for our enquiry.

An erroneous interpretation becomes a wrong instruction for formation, an obstruction of development. If the wrong interpretation is pushed through, it will fail to drive the growth in a right, meaningful, organic way, instead leading it to take a different course with respect to the general and generic one, away from a kind or genus (hence “degeneration”) of formation (a “malformation”). Such a deviation from the usual and useful pattern of development, if not obviated (e.g. by resuming the hermeneutic “tradition” of likenesses) will remain a hindrance unless (or

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12 See the similar conception of von Uexküll mentioned above.
until) the error is successfully incorporated (by a stroke of luck or ingenuity), i.e.
is inserted into the lore of developmental experience as a true part of the genuine
tradition.

In that case a new-born being represents a new truth, a new way of truly become-
ing – or of being-true-to-itself in a new way. This means in accordance with a new
exegesis (signification) of body-signs interpreted in bringing-forth body forms from
(and with respect to) a new likeness. Born out of a mistaken interpretation within
the previous exegesis, this quondam deformation has been picked up as information
thanks to happy (or skilful) changes of hermeneutical context and has risen from the
status of a malformation to that of likeness. Thus the new truth rests on signification
of the new body-sign, a new kind of likeness. This is the way new life-forms appear.
And an evolutionary event marks the birth of a new truth revealing a new likeness.

The truth in question then is a kind of natural truth, not a truth of statement but
a truth of existence – a truth of becoming flesh. By “natural truth” we don’t mean
merely a way of true becoming, but also truth which is in becoming, or a truth born
from an error, in which that which was mistaken was taken to be right, i.e. accepted
and acknowledged (accepted as real, acknowledging the right to be when seen from
the right perspective).

It pertains to the heart of natural truth that it may be born from falsehood: an
entirely new truth – a truth which was not (not even false!) may happen, i.e. come
to be, quite naturally, by itself or “by mistake” as the case may be. The mistake
becomes a felix culpa – “happy guilt” as it is called in Christian theology, and there-
fore a “happy end”. After all, any interpretation is a kind of novel truth – a new
insight, a realization of an unexpected, unpredictable kind of relation or correlation,
of aspects and respects of relevance.

Whence the New?

There is, however, one comforting circumstance, auspicious for our enterprise. The
concept of likeness, as it has been established as the basis of our quest, is by no
means unprecedented. It is not even as sophisticated and purpose-built as it may
seem when one looks at the pains taken to elaborate it. It was not so much hammered
into shape as dug out from under layers of forgetting and ignorance. As it turns out,
what we have found is but a new way of stating the obvious in semiotic (or would-be
semiotic) terms. Natural forms resulting from their active self-formation represent
in-formations materialized. Genuine natural objects (those not damaged from the
outside by influences accidental to their nature, such as pebbles or igneous rocks)
are “all navel”, i.e. they are “scars” of their genesis or witnesses of their becoming.
Every natural form is – by nature – self-referent, since it has its origin within itself:
its eidos betrays its nature, its becoming-in-time, as Aristotle has already pointed
out. Thus again, nothing new!

Or, almost nothing. Although our likeness referred in the first place to what holds
for any natural form, it was coined in relation to the way living beings appear. Only
to these kinds of natural forms does the semiotic approach seem justified. Besides, conceiving of life as semiosis implies the recent ways we think (or includes what we now know, if one prefers to put it this way) about development, evolution and the organization of “living matter” (its structure, composition and function). Likeness is richer in signification than the Aristotelian *eidos*. It is precisely this surplus of meaning which enables it to do what *eidos* could not do: to assess novelty and to account for the new.

*Likeness refers to the bodies both as living-forms with respect to their looking-like and as the body-signs their likeness makes them into.* The signification of body-signs implies not only their individual becoming – their being-informed by particular processes of self-organization – but bears witness also to their evolutionary origins, to the genesis of the species and genus the living individual belongs to. The very semiosis of signification – its *style* of interpretation and expression – is itself a sign of its origins and genesis through generations of ancestors. It tells us about the genesis of this particular kind (style, type or strategy) of organizing-itself, and about how such a life-form managed to establish itself and how its various procedures, strategies and tricks are spread and shared by other species related to it to various degrees (see also Chapter 7).

The evolutionary purport of likeness accounts nicely for the connection between the relation of likeness in its broader and usual lexical sense, of similarity or resemblance of two or more individuals, and the relation of likeness in the narrow, special sense established here, as *reflexive* relation (self-similarity) that refers to a single individual. This narrow sense thus corresponds to *likeness* in its absolute sense – of looking-like (appearance, semblance) and at the same time referring to the *nature*, or being-like, being-itself.

**Classification**

Nevertheless, *nature* as originally conceived (as *physis*) is *always* unique. By nature, a bird is primarily itself; the nature of its self coincides with its becoming. A salient feature of living bodies is that the way they look like reflects the way they are. And they are what they became, as well as how they became so. Their nature consists in bodily development and finds its expression in likeness.

It follows that nature does not allow for classification and likeness, and does not admit comparison. This seems decidedly odd and counter-intuitive, since it is the very same likeness we refer to in connection with the kind of common experience of obvious phenomena that make us say that, for example, all sparrows are alike or that a crested lark is much like a sparrow but for certain features. Thus likeness *has* to be related to specificity in some way: for a bird, being a sparrow is obviously essential to its nature!

As already pointed out, similarity is no guarantee of likeness, since it might rest on merely accidental resemblance. This is tantamount to saying that it has no bearing on their relation in *nature*. Kant was aware that similarity does not have an objective
basis: likeness or semblance does not refer to objectivity. That is why in his Critic of Judgment he wrestles with the puzzle of why, nonetheless, some likenesses are more real than others. To what sort of “reality” do such kinds of judgment refer?

Evolutionists believe in providing – at least in the realm of the living – an objective counterpart: the common ancestor. For them, similarity is real only so far as it reflects a phylogenic relationship of what is similar. All the rest is “subjective”. For some people an eel looks like a snake, a hummingbird can be regarded a bumblebee, and a mushroom may remind one of a snail. For others it may be different: for the beings deemed similar, all this is accidental, not founded in their nature – and is therefore merely illusory. This is, of course, an oversimplification, for it does not take into account functional analogies, convergent evolution and co-evolution, ecological roles, physiological needs, morphological constraints and similar factors contributing to similarities not based on kinship but still acknowledged by most biologists as real. We shall return to the topic in Chapters 6 and 7.

The Latin word species refers to the “looking-like” i.e. to the way something is seen when looked at (see also aspect, respect, spectacular, conspicuous, spectacle, etc.). It shows that specificity (a characteristic that makes something look as it does and like what it is) belongs to likeness in an essential way and why likeness expresses the “species” in a biological sense. Species (with other taxonomic categories) corresponds to likeness so much that it may enable the “identification” of a single specimen of an unknown species, guiding an expert (in reading the respective body-signs) to “locate” it within a kinship structure.

Similarity lies in bodily development – that is what likeness is about. Individuals are alike when (and insofar as) their bodies are built according to some common exegetic principles of understanding and body-sign expression translated into the likeness of a bodily form. The more semiotic principles are shared by two different species (that is, actually applied) the closer their likeness resulting from the process of becoming. On the other hand, as principles of development, i.e. becoming, they belong to the unique nature of each individual. Any process of development is an individual matter – and a unique event. No aspect of it may be abstracted and shared. Remember, they are principles of interpretation – kinds of experience, perspectives or understandings, not operations, steps, procedures or know-how. In the hermeneutics of becoming they are not applied but rather are spontaneously (i.e. naturally) referred to. Hermeneutics is an art and not a method. Accordingly, every becoming is a creative action and not a production (let alone a reproduction); it is rooted in a fore-understanding (sensu Heidegger).

We are led to conclude, then, that individuals related through likeness are, in a way, of the same nature. And the only way we can see to share that which is unique, is if origins, lineage, cognation, kinship and the whole of ancestral legacy are seen as part of the living being’s individual nature, as well as its own body and the whole of its life experience. My kinsfolk are me, or at least a part of my self, albeit to various degrees. Clearly, those specific (generic, genealogical, ancestral) dimensions of any individual nature seem to contribute to the constitution of the being’s self in a peculiar way of their own, different from the import of the life experience of development (physiological, genetic, morpho-, psycho- and cosmo-
genetic). Also, the relative contribution to the likeness may shift at any stage and with every transformation. However, the same holds true for all other dimensions of nature, including those of private origin, such as a child’s early experiences, which may turn up at later stages to take control of the individual’s psychical life (see Bachelard, previous chapter).

Therefore, provided that the genealogy of an individual (both in terms of ancestry and whole evolutionary origins) is part of its nature, and thus contributes to the expression of that nature through its likeness, then likeness in its ordinary (and conceptually broader) sense, of a similarity in bodily appearance between two or among various individuals, may be regarded for our purposes as a special case of self-similarity (rather than the other way round).  

As with the new, with the process of becoming, and with dynamic forms and likeness, so is it with being-like-itself. This kind of existence is most readily manifest in what is most familiar in our experience – so-called mental images. Translated into words borrowed from quantum physics, mental images exist in a state of various degrees of likeness, as in superposition (see also Sphere in previous chapter). Their different “strata” of likeness come forth through the others, and each is inherent in all the others. Every manifestation (peeping-through) of a likeness modifies both the way the mental presence is given and the likeness itself. Indeed, the term “existence” is nowhere else more justified: mental images exist precisely in the way that the term “exist” means to rise up from a ground by itself. Here, such ground is the ground of the particular likeness (the basis of being-alike, the frame of resemblance) and all the “ideas” – various presentations and representations, images and imaginations – exist in a dynamic state of their steady change on the ground of being-like. We suggest calling this existence *eidetic semiosis*, which we regard as the prototypic experience of the new we are seeking to characterize.

Admittedly, this hardly seems surprising, nor does it sound very promising since it bears on only mental phenomena. In relation to them, creative change has been granted but reality has been denied. To us, however, the phenomenology of mental images is both relevant and revealing, since it is not just a convenient illustration (like the camel/weasel shape of a cloud) but also exemplifies the nature of likeness – directly accessible as a donné immédiat – to the consciousness as living experience. Whereas the change in the way a cloud looks is accidental, i.e. independent of its looking-like, the variability of mental images is implied by their likeness, changes take place with respect to it and further change proceeds according to its results. The motive of their mobility (metabolism) is not a shape or a particular appearance (original or subsequent) – mental images have neither shape nor appearance. Their existence rests upon their looking-like. And it is precisely this “-like” that provides the motive and the drive for the autonomous and spontaneous changes that occur. Not from without, however; the “-like” of the “looking” is precisely the focus – the central point of the image’s existence pointing towards itself. It brings that something

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13 In this chapter we do not go into phenomena like imitation, although they are undoubtedly germane to discussions of likeness. We discuss the topic in Chapter 6.
that exists in the mind to what it is – a particular mental image, unlike others (otherwise its existence as a mental image would be pointless!), and like itself. The very same focal point acts as a center of outward radiation – an emanation pointing towards self-transcendence, to an expression of meaning, a signification.

Clare et Distincte

A note is appropriate at this point, reminiscent of our analysis in the previous chapter. There is one class of ideas marked by clear and distinct existence – that is the way they are given to, and present in, the mind. This category is distinguished by the excellent property Descartes called realitas obiectiva. It means that they are real, owing to the sole fact of their mental existence, which is such that it includes all their being; they are given as an object of knowledge (objectivity), and such a givenness represents and includes the whole of their being (reality). Precisely such exceptional ideas (granted the status of objective reality) are not like themselves. It is because they do not refer to anything, and thus, deprived of likeness, they are left to their static (though conveniently reliable) self-identity – in exactly the same way as letter-signs. In fact, letters or digits might be regarded as paradigmatic exemplars of objective ideas, i.e. those credited with the outstanding feature of realitas objectiva; they also are truly elementary and basic and, at the same time, much more illuminating examples than the ones cherished by tradition and quoted ad nauseam, such as geometrical figures and mathematical truths. Since Descartes, such ideas – context-free and semantically indifferent – have been highly esteemed as the only adequate elements of objective (read: exclusively true) knowledge, used as the components for rational construction, the scaffolding of scientific theories. This is why so much attention has been paid to them, whereas the dynamic character and self-similar structures of other kinds of ideas has remained unappreciated. They are not granted a reality of their own, and this, as we shall see, is justified not because of their lack of self-identity but because of their lack of corporeality. On the other hand, they are related to the reality of nature (which is not objective) through the same kind of phenomenological existence as bodily likeness.

What is it Like to be Me?

To make the above description of the phenomena of genuine mental images convincing we invite the reader, by means of a simple mental experiment, to awaken his or her awareness of what it is like to be like itself. And since this is, as our discourse supposes, the way we exist (each of us as a living being and like any living being), it is what we are conscious of most of time anyway, for it is our modus existendi. “What is it like to be me?” In exactly this way did D. R. Hofstadter and D. C. Dennett (1981) rephrase Nagel’s famous question “What Is It Like to Be a Bat?”, which echoes the divine challenge “know yourself!” that has accompanied
the whole of Western thought from its inception. Still, it is but the trivial part of the
task, put in biosemiotic terms, a first step at the threshold. Obviously, we (and every
“me”) know what it is like. The true challenge refers to the being or nature of such
kinds of existence.

We dare to propose now to undergo the mind’s experience of becoming aware of
its “like-itself” existence with a simple, ordinary mental image (an idea, a notion,
a piece of memory or knowledge), preferably, with the imagined likeness of an
animal or a plant you know from your own experience – as an individual or as
a sort or species. It has nothing to do with introspection or self-contemplation:
such an image of what a being looks like is not even an actual bodily likeness.
But it is a likeness and a body-sign all the same, albeit in an “intentional mode
of being” (esse intentionale as it was labelled by the Schools), provided that one
does not let its form freeze (by substituting the mental image for a snap-shot from
memory or for a photograph). Neither should it be dissolved or diluted into a kind
of abstraction such as a vague idea (satisfied by the mere fact of knowing what
it is), nor to some kind of objective knowledge. That “mental something” should
be left to itself – to its dynamic nature of likeness. Its dynamics will remind us
that it is not just an image or an idea, a notion, a concept or knowledge, solely
a memory as such or a story. You can see at once that whatever you might have
imagined is not limited to a representation, a thought, an experience or a feeling,
and that it is not an object either. On the other hand you may soon realize that
the likeness you started with – a camel or an oak, perhaps – is nevertheless in a
way all this at once: an idea, knowledge, a concept and a story. Yet it is none of
it really, just exhibiting, suggesting, implying, hinting or pointing at from all the
perspectives, views, directions and standpoints it may be seen – and in all the forms
it may appear to be recognized as being like itself. These occur together with all
kinds of modalities and variants of its being alike – the respects in which it might
look different. We might come to the conclusion that in fact it is neither an image,
nor a notion and so on, but just a peculiar state of mind, which we might call (for
want of a better word) a “cameloid” state.

But even this conclusion would be a mere construction: we are well aware that
it is not a state as such (i.e. not static) but rather a flow (a dynamic experience of
our mind of a camel form), a kind of going-on with rudimentary hints to a process
of development in which every stage at any time should involve all the preceding
ones. Soon, however, it would turn out that it is but an impression, an illusory faire-
semblant, since it has neither a body to fix a likeness in a binding way, nor a self to
be bound, responsible and intentional. The whole “spectacle” is doomed to descend
into chaos.

This illustration should suffice to convince and remind the readers of what they
have always been familiar with: the nature of likeness. Still, one might have become
aware that its dynamic existence as such has no need of the usual gnoseological
paraphernalia of mental activity, no mental images such as understanding, recon-
struction, representation etc., as if it were an achievement from our part. As already

14 Not an easy task – recall Heidegger’s struggling with, going-along-with, Chap. 2.
stated, there is no “re-” in natural existence. And if events like eidetic variations, imagination, and creativity do take place, they are not our activities but those of the likeness itself: any natural form is both the origin and the cause of its own movement.

**Abstractions**

Before we quit the intermezzo of practice altogether, we should like to put our finger on yet another aspect the reader might have glimpsed or at least be ready to agree upon in retrospect, something worth noting about our instantaneous experience of the “like-itself-existence”: there was no trace or hint of anything which might seem to result in an abstraction, construction or classification, or to refer to some phenomenon that would appear as general, universal, logical, rational or formal.

Indeed, every attempt to think of some abstract or general subject (say, a moral truth, a chemical formula, the genetic code, principles of evolution, or the very concept of “likeness”) in terms of likeness we have to turn into something concrete in order to observe its looking-like (in the double senses of “to observe”: to contemplate how and what it looks like and to respect its being-like–itself). Only then can we raise questions like “What is electricity?” or “What’s new?” This turning into the concrete (known by the Schools as the *conversio ad phantasma*) does not mean to substitute a general principle with an arbitrary chosen, particular case, or to replace it with a wanton metaphor. Rather, it requires finding a true approach (true to the thing-itself, that is, faithful to what an abstract form or a general formula is about) or a right standpoint to make the thing appear in a perspective in which it may “exist”. This means to find for it a natural place where it can display all its modalities, e.g. to unfold a space of its possible single cases, or to suggest an arsenal of suitable parables and similes of its own, or even to offer a net of meaningful contexts etc. Otherwise, in remaining abstract, it is only an inert tool or a rule indifferent to its uses and abuses – just a sign of know-how, but not an expression of understanding. This applies to most scientific notions and topics – especially in the more exact sciences. Phenomena of life, bodily beings, on the other hand, do not require any prior finding, guessing or discovering a true perspective of knowledge (but must get rid of preconceived abstract schemes); by themselves and on their own, they appear (show themselves) in their own perspective as a part of themselves. This is what their likeness is: a perspective embodied, a body-sign indicating the right way to be understood the way they are, or the way they are like themselves.

Thus far, observation based on the phenomena of being-like and the absence of the abstract may seem limited to mental existence of likeness only. Nevertheless, we feel entitled to expect that the same holds for the bodily likeness of living beings as well. Concepts like likeness, semiosis, hermeneutics or interpretation, sign, signification, etc., suggest a kind of connection or even coincidence between being and meaning, being-like and looking-like, existence and appearance etc., thus pointing to a close epistemological relation between phenomenology and the ontology of the living.
Being a body consists in being concrete. Concreteness implies an autonomous, individual existence that is both material and perceptible by virtue of having a shape, size and place, that is, a “where” and a “whence” of its presence and a “how” and a “like” of its presentation. It is this that makes a being (something which is) into a body. Concretum (to synolon), as originally defined by Aristotle, has been conceived as a union of form and matter, the form referring both to the outer shape and to the material quality of the inner “stuff” responsible for the stability and solidity of the particular concrete existence. Thus any concretum may be expected to be a body with an outside surface and an inside content, usually hidden. The content is seen as a kind of “volume” or “capacity”. In addition, concrete existence is traditionally taken to be entirely real and actual: it does not refer to the possible, potential, able or capable.

None of these criteria apply to living bodies (at least not neatly or in the usual sense). We have already noted that it is impossible to tell between matter and form, or shape and quality. While the inner, intimate inward dimension is the most prominent characteristic of bodily existence, it is nevertheless virtually impossible to speak of its exterior and interior. In the same way, the distinction between actuality and potentiality breaks down in living bodies: their reality consists in actual potentiality or potencies. Bodies are potencies made flesh (caro, sarx), for which the virtual is virtue – by virtue of incarnation: they are stable while being able – to act. Their actuality is not given, but taken. Within this line of thought, “simplicity” (haplotés) implies indivisibility. The “simple” is not to be divided: “in-dividuality” pertains to living bodies. They cannot be divided without ceasing to be what they are. Moreover, to be simple or to exist simply (haplós) is the opposite of what is composite, i.e. to consist of parts. As we have seen, a living body is all form (as pointed out before), and it is simple even in this respect. Its form has been identified by Aristotle with the soul (anima forma corporis) – the principle of life, which is simple too. Everywhere in the body, the soul is wholly present in its integrity. Thus, both elementary and living bodies are – each in their own way – distinguished by their simplicity. No wonder that living bodies resist artificial conceptual distinctions made for artefacts, such as form/matter, exterior/interior, shape/structure, appearance/quality and the like. Their simplicity – despite their complexity – makes living bodies into single signs, in defiance of the polysemy of their signification and the complexity of their self-referent semiosis.

Logos Incarnate

Once it is admitted that there is a meaningful and illuminating (albeit imperfect) analogy between the likeness of a mental picture and that of the body-likeness of creatures living on their own, we can usefully refer to our mental experience. What has been but hinted at and suggested in the mind, in the body is ordered, responsible, intentional and reliable; it is kept “anchored” in the flesh. In a process of bodily development, every interpretation finds its expression in a binding bodily
form. Or, in better words, the interpretation *consists* in the formation of body-forms or in transformations of their likeness. In development, the exegesis and its result – understanding – are but one process of growth and differentiation, through which successive interpretations find their expression in the new likeness.

A growing plant, a developing embryo, a budding limb, a maturing individual, a looking face, an expressive countenance, an impressive behavior... all change, behave and evolve in steps or phases that are bound and connected in and through likeness, and that are implied on (arise from) the ground of being-alike. This is the way nature exists. And since parental lineage belongs to the nature of the living, we venture to say that this holds for the existence of species and tribes. Here too, generations are mutually connected through likeness. Children look like their parents, though both their similarity and likeness itself – the way they look alike – varies. Thus, living individuals, populations and species grow and develop through sequences of transformations in such a way that every increment and each developmental step looks much like the previous one, that is, preserves similarity by means of a true interpretation of likeness, each one peeping through all the others by taking account of all of them.

At any moment of development a body-likeness may be seen as an interpretation become flesh and may legitimately be called “logos incarnate”. An embodied interpretation is *reliable* both as true and as binding. It is *true* in being a right interpretation – true to the previous likeness: incarnation is creation and verification at the same time. It is also *binding* as a commitment: as a step, gradually more irreversible, of development, as a part of the bodily form (a segment, a component, a feature, a stage) partaking in its organic integrity, as part of its formation. To express an understanding (which is what interpretation is!) means to put it in a certain way; once put as part of a story, there is no easy way to take it away. *Evolution* – transformations of living forms through generations – might be conceived in a similar way: evolution of living forms is a hermeneutic process as well, bearing on the *specific* aspects of morphogenesis or on the very nature of the particular exegesis. Thus it is a kind of meta-development, that of a particular type of semiosis of the living.

**Semiotic Coherence**

This newness is involved in the semiotic consistency that holds between each successive interpretative step in body-creation or morphogenesis and also between subsequent generations of a lineage, i.e. in the successive generative steps of the pro-creation of progeny. The new is the principle of semiotic coherence among both the levels of bodily organization and the strata of generations of bodily forms. Semiotic coherence manifests itself in the organic wholeness of body likeness and in the relatedness of living forms revealed by “family” likeness. The new is not to be caught in the act, literally *in statu nascendi*, for one cannot assist at its birth or follow becoming as a process; it is similarly impossible to witness an event of genesis. In the realm of knowledge this accounts for the enigmatic character of its discovery. As
the constitutive principle of bodily existence, the new disappears behind the body’s appearance – and we shall see why.

We already possess some clues, however. We have reasons to suspect that nature or becoming is based on the semiosis of organic coherence. The new is generated through a specific kind of signification, in a certain style of sign interpretation, and by a particular way of understanding that is applied in the semiosis of likeness. Body-likeness is both signifier and interpreter and its likeness is both the subject and object of its semiosis. The semiosis of the body’s becoming generates the new; the body even consists of the new. All this comes from the basic structure of the relation of likeness as such, from the elementary semiosis of similarity. The existence of such strange and paradoxical types as self-reference, self-similarity and being-like-itself that we found in the dynamic forms of mental images and the likeness of living bodies are not extreme cases or curiosities connected with some mystery of life, but rather are direct logical consequences of the semiotics of the simple relation of similarity or being-alike as such.

The fine structure of “normal” likeness or similarity is already peculiar enough. A relation of “being alike” (to be similar to, to be like) is devoid of all the properties one might intuitively expect. It has neither transitivity nor symmetry, and it even lacks reflexivity, or at least it does not require such properties. The non-transitive character of similarity implies that when something (an A) is similar to something else (a B, thus A>B), a thing which is similar to yet another something (a C, thus B>C), A is not necessarily similar to C (that is, A>B and B>C does not imply A>C). The lack of symmetry is even more surprising. It says that sometimes the “similar to” relation may not be true the other way round (thus A>B does not necessarily mean that B>A), and indeed often it is not. (We do not say “the father is similar to the son”, or at any rate such a statement sounds unusual.) The last assertion, to do with the lack of reflectivity, implies that not everything is similar to itself; this seems the most absurd and inadmissible. In view of what we already know, especially concerning the difference between identity and similarity, identity is not an extreme or limiting case of similarity (a “perfect” or “absolute” one) but represents a quite different category. We know that nature does not admit of the identity that holds for letter-signs (which may not be similar at all!). The non-reflexive character of likeness accounts for the prolific dynamics of self-similarity.

So does asymmetry, which provides the dynamics of self-transformation with the possibility of evolving and not coming to rest, trapped between a pair of mutually alike appearances. They might switch back and forth in a kind of “likeness-shift” (by analogy with the kind of gestalt shift involved in cases like the Necker cube), but more probably their wobbling would dampen sooner than noticed as the likeness narrows down. If embodied, likeness-asymmetry is the very condition of development, which is a directional process. Although likeness is both an interpretation and a sign to be interpreted, these two aspects are not interchangeable. Even when one might say that a body-form plays both semiotic roles at the same time (when the two sides of semiosis are conceived as two sides of the same time-form) they do not act the same way. They face opposite directions: an interpretation included cannot be true to the including one.
But the main driving principle of change in becoming and thus of the genesis of the new is doubtless the first feature of the relation of likeness, its non-transitivity. This main and best-known feature of similarity reflects its essential relativity in both of its meanings. Likeness is relative, since it admits “more” and “less”; however, such “mores” and “lesses”, referring to how close or remote the similarity is, cannot be compared (still less measured) and therefore cannot be ordered in a defined and unique way. This disqualifies similarity, likeness, resemblance and the like from constituting objective knowledge, and connects them to dynamic forms. But much more important is the relativity of likeness in the second meaning mentioned above: likeness is always relative with respect to something or in view of something. It is meaningless to speak (or even argue) about similarity, resemblance or analogy without stating, knowing or meaning to what the relation refers to. Something can be like something only (always and necessarily) in a particular sense or in a certain way, and not merely in a general sense! Likeness is relative because it is a respective – it involves a meta-relation. It transcends that which it relates. The precise sense in which something is alike is the meaning of the sign and the way in which things are similar; it is the direction the likeness-sign indicates as a guidepost.

Becoming

Let us now have a closer look at becoming. At first, its origins may not be apparent. Remember the cloud. Slow changes of its shape were smooth: at any moment its appearance was quite similar to that in the moment before. Indeed, the resemblance was as close as to be indistinguishable (at the limit of similarity it would be impossible to tell two subsequent frames apart). On the other hand, the change of likeness (from the cameloid to the weasel-like) was sudden and in a sense retrograde with respect to development. (We may call this backward effect eidetic hysteresis.) The abrupt switch (a leap or metamorphosis) pertained solely to the likeness, to the way the various parts (aspects of shape) belong together or gather. It did not disrupt the continuity of the shape’s smooth change.

In the case of a cloud, likeness is only apparent, not real, since the process of changing shape is indifferent to how it looks. A cloud has no real likeness but only an appearance – the way it appears to an outside observer (who makes its perception into a likeness to a mental image). However, a developing embryo exhibits a similar pattern. The change in form of its developing body is no less smooth than the change in the shape of the cloud. Although the rate of change may vary (according to a specific pattern) during development, at any stage a sufficiently short interval may be chosen which would make the subsequent snapshot indistinguishable. The close local similarity results in the same appearance. Here also changes in body-likeness may pop up suddenly, but they too appear only in retrospect and, as a rule, do not affect the locally smooth continuity of the developmental process. All this reminds us of the phenomena of cloud behaviour, in spite of the fact that in the case of an embryo, changes of shape proceed with respect to what it looks like. It is a process
of development through a sequence of transformations of body-form: the formation of the body literally “formulates” the interpretation of its actual likeness, in a process of its recursive exegesis. Thus, growth and development of organic forms are both continuous and discontinuous; they are rightly referred to as both stepwise and gradual. Although at any particular moment the subsequent changes in likeness are too insignificant for the individual steps or grades to be told apart, or at least to deserve different names, at different times the slowly changing likeness is decidedly and even radically different; recall stages like morula, gastrula, etc.

### Speciation

As long as development proceeds with respect to the same likeness (i.e. does not cross the horizon of the one “eidetic landscape” or “eidetic space”) we perceive it as growth or as an increase. But whenever it leaves as a result of its transition according to different criteria and starts to become like itself in a different respect, we call it metamorphosis, differentiation, segmentation, transformation and similar names. By analogy, at the generic level (bearing on evolution rather than development) we may distinguish proliferation or procreation from speciation (evolutionary differentiation). We see continuation through progeny generations as procreation of living beings from the perspective of the majority of descendants, who continue to create their bodies within the limits of the same species-specific exegetic principles. Whenever the hermeneutics of likeness amongst the progeny within some line (tribe, population) happens to deviate from that of their ancestors and the rest of their kinsfolk to such an extent that they no longer consider themselves relatives but strangers, we refer to speciation. The estrangement rests on the fact that the progeny no longer share the same way of life or world (niche) as the rest of their kin.

Although animal development corresponds better to the picture of gradual transformation of bodily likeness through recursive semiosis, it is fairly difficult to follow. Developmental processes are much easier to follow in higher plants. In typical cases, development proceeds by the addition of segments, so that (roughly put and at least at one level of design) the expression of every round of interpretation is anatomically preserved (this circumstance has made plant morphology a favourite discipline since Goethe’s time). At any time we can immediately see all previous expressions of the likeness and actually follow the sequence of its recursive interpretations and trace the course of its hermeneutics. Every actual form is a time-shape (Zeitgestalt) of the individual life-story. It is as if multiple semiotic levels of likeness, all implicitly involved in the actual one, were materialized in a visible format: the plant looks like an unwound tape or a route-map for its exegesis. We don’t need to read it out – it suffices to look and see the wonder of self-creation that is displayed before our eyes to be “read” and understood. The objective of our exegesis is to get an insight into how any likeness understands itself so as to result in the next likeness. The transformation is displayed by the difference between the two segments.
At first glance it seems that even a layman can distinguish growth from metamorphosis. The segments of the stalk are similar until the plant begins to flower. In principle, however, the change of exegetic strategy that results in something truly new cannot, when followed in time, be recognized – “qu’après coup”, so to speak. It is always in retrospect that one finds out that something new and unprecedented happened.\(^\text{15}\) This applies not only to the outside observer but to the subject itself. Seeing something (or oneself) in a different way actually precludes becoming perceptive to the difference!

It takes time to acknowledge the new, but both its birth and its acknowledgement (epiphany) are somehow sudden and timeless. They are events that just happen, not natural processes of becoming through growth and development. The events take place in time but take no time, i.e. time does not enter into their structure. (Their contingent duration refers to other processes that support the event.) What takes place is their execution – the stages of becoming, growth, maturation, establishment that mark the course of their life story and way of life.

Precisely this invisibility of change and retroactive structure (related to the recursivity of natural semiosis) accounts for the paradox of novelty and for the amazingly elusive nature of origins in general. By the time the new appearance becomes apparent [sic!], the change in appearance (or shift in likeness) has already taken place. And yet that is the suspected “something” that – from the start – seemed wrong with our quest for novelty. We looked in vain for the emergence of the new in time. A true novelty, i.e. something really (radically) new, we would not be able to re-cognize anyway.

There can be no repetition and therefore no “re-” in the realm of the living. Every living nature – we stress it again – is a unique case. An individual creature is what it is through its becoming such-and-such. And it is the way it is, precisely what it became, during and through its own individual life story of dramatic self-creation (or self-organization as it is called nowadays). Thus every individual has a nature of its own: it is not just another instance of a particular life form (species, genus). An organism neither results from re-production, nor even as a result of re-creation through re-formation.

The concept of reformation refers to amendment or betterment. But nature means gaining the original form through self-formation from the very beginning.\(^\text{16}\) Similarly, “recreation” nowadays means refreshment or recovery. The formation of the body is neither a refreshment of the species’ memory nor a recovery of evolutionary experience through somatic development. However, such a refreshment and recovery of the past out of its signs requires a radically new creation: a creation out

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\(^\text{15}\) One may accept it, yet one can always also deny, and denial too requires a hermeneutic feat! At the time the extraordinary is seen, it is already part of the (newly) established order. Hence the invisibility of scientific revolutions and the mystery of missing links in evolution.

\(^\text{16}\) Every growing form is original: it was formed through growth out of its origin and will give rise to other origins. A growing form is actually the form of the growth, a form of formation or of becoming; that is what nature (physis) means. Thus any natural form is the Form of its own being (esse), the essential form (forma essentialis or eidos) itself.
of nothing, nobody and no one into something. That something is a living body of some one and entirely new unity or wholeness arising through the self-creation of an autonomous subject – a subject of its own creation, a *someone*. Hereditary endowment and parental legacy are neither a thing nor a body, and they are not one, but a stratified sedimentation of signs: a multiple, diversified semiotic substrate to be used as the basis for a meaningful embodiment.

Such a one–and–whole being, an individual, is both the creature and the creator of its uni-verse (literally “one-ward”, i.e. concentrated around a single theme). Any living thing gives rise to a world of its own. This is a subjective world, which its subject both displays and, at the same time, converges to. Such a surrounding world is *both* specific and generic and *special* and general (universal). Every becoming is a cosmogony of its own, a genesis of the most radically new. It is a new world born out of hereditary experience stored in signs and turned into a living experience by a semiotic process of somatic interpretation through the development of the body, and it is this that reveals its meaning.

**Every World has its Own Time**

To repeat: the revealing process is the development of the likeness, whereas the revelation itself consists in its changes, or switches in its way of being-like. It may take time to get used to the likeness changed, but the change itself is timeless. Hence, the origins of what is new are themselves timeless. The saying “*nature loves to hide*” (Heraclitus B 123) concerns origins. The realization (becoming aware) that something truly novel did happen or occur – the epiphany of novelty – is sudden and timeless as well, in that it does not *take* (need, require) time. Still, it takes place in time: it has a “when” (its *kairos*). It is an event of sudden revelation and the “evident” aspect of nature (the one nature delights in manifesting!) But it may take time, however, both to seize the opportunity and to see what is manifested.

What takes time – the duration or *chronos* – is nature itself: the processes of becoming, growth, maturation and evolution (all meanings of the word *physis*!). Those are not processes taking place in time. Nature is timeless – eternal, perennial. Still, it is temporary, being made out of time; time is the very stuff bodily shapes are made of. Bodies are not made out of matter;¹⁷ matter merely flows *through* the body, it is the shape of the flow that makes up its essential form or its likeness.

*The likeness of the body is a form of time*, of the time the body took to grow and become, the time shaped by nature (*physis*). The natures of living forms are thus time-shapes, or the form of the experience embodied; they are the narrative display

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¹⁷ To confuse flesh and matter, and to privilege the body’s materiality, has been a mistake of western thought that has had enormous and disastrous consequences. To understand the nature of life, of the living, of ourselves, one felt obliged to turn one’s back on the body, to ignore it altogether, or to separate from the body its essential form, the *soul* that is the principle of life – or to take up invoking spirits! Biosemiotics is the way to break this thousand-year curse and end such an unfortunate state of affairs.
of every life-story made out of various kinds of likeness including all their alternatives – the variations and transformations the semantic nature pointed to by the body’s logic of the formation; they are its morphology. The body is a superposition of the dynamic forms it has assumed, and it is made out of the dramatic events the embodied being experienced, i.e. the situations, blind alleys and unknown cross-roads it found itself in.

**Vestiges of Creation**

The curious thing is that not even growth itself is not directly manifest, despite its essentially temporal character. It is as invisible as time itself. What may be perceived, what nature shows to us, what is truly apparent, are vestiges. These are not “mere” vestiges – traces of the past, footsteps left by what has already passed away or gone with the wind. Rather the vestiges left behind, that constitute the visibility of nature, are embodied. They are body-signs or semeia, signs of the logos incarnate, the meaning of life becoming flesh through every individual life-story. This, of course, is old stuff – some of the most ancient – whereas the changes and transformations that give rise to novelty are out of time, being in the mind!

A body-sign is the shape of lived experience, stored in the eidetic format of likeness and the narrative format of parables. From the semiotic perspective, what we have just called body, embodied past, layers of likeness, or respects or aspects of being-alike and their superposition, resides in a deeper, semantic kind of likeness. Such a likeness (pattern), connecting all past dynamic forms through time, G. Bateson called relevance. Semiosis is about relevance, we believe. That is what makes anything a sign.

The sign character makes a bodily shape into a form of its shaping – a form of time. Time opens into the future. Thus, the immediate next (adjacent possible) of the dynamic form belongs to its actual likeness and does not fall under categories referring to the future, such as possibility, choice or decision. Neither “What will the being do?”, nor “In what way will it change?”, but rather: “What is it about to do?” Such is the question, the biosemiotic way of asking. It is this “about” of which the body is a sign. Surely, a sign of a future, but as such it is first and above all the sign of the body itself. The body is the presence of its future: it presents all that it is about to be – its intentional surrounding, the world of its intentions. The body as a symbol – an embodied meaning – is about what? It is about itself: its likeness manifests its striving to be more like itself: in the good shape, in a good story, in the shape of time.

We always wondered, in what sense can one reasonably speak about the memory of organisms (both individual and evolutionary) and how one should conceive of their historicity’. Their form is not merely the result of what happened to their bodies in the past but is embodied memory. A true memory does not consist of scars (engrams, records). Memory is a point of access to the past and historicity is the awareness of it. How does the historicity of a present state differ from structural
features such as the chemical composition of DNA and the setting of its decoding devices? Our answer is that since a living being is not a *state* but a *likeness* it includes all the past ways of being-like, together with all their respects and aspects. It includes them by expressing them in ever new, unprecedented forms, as part of all the other events and likenesses it did not assume but merely considered as alternatives, into which the once-actual likeness was likely to change. Past opportunities are vestiges, too, but they are not body-signs, being instead story-signs of what could have been. That is what narrative is about. The embodied meaning of life is the life-story itself, addressing the questions of what it was all about and what it is about to become.

Through its being “about-to-become” the body is a sign of its future, pointing from the layers of its historical substrate toward something which the body never was. This is the whole point. It is the meaning of life.
Chapter 4
Aut Moses aut Darwin. Creation Versus Evolution

Heidegger (1971, 175–177)

The Questionnaire

The Czech revue Prostor organized in 2005 an opinion poll entitled Creation versus evolution. The editorial call to participants contained the following lines of explanation:

An extensive discussion is under way amongst theoreticians of science, philosophers and theologians; it concerns the origins of the universe, age of the Earth, origins of life, and descent of humans. This serious debate often ends in a clash of ideas between the defenders of the Darwinian version of evolution (evolutionists), and advocates of the ‘creation’ theory that infers the emergence of the universe as well as the origins of life from the act of Biblical creation (creationists). The Darwinists maintain that their opponents represent a return to religious fundamentalism, this time under the cover of scientific rhetoric. Their opponents, in their turn, suspect materialist science of gasping for breath. Some optimistic researchers see in this ferment of opinions a new phase in human knowledge and thinking.

The very rhetoric of this proclamation deserves deeper analysis. First, what is “under way” is mostly for show, with what is sometimes tasteless shouting resembling the pre-election wrestling of political parties, and aimed at the general public in order to gain popularity points. Such a “debate” cannot be “serious”; after all, most poll answers represent responses to a somewhat stark proposition. Moreover, it seems that the general public, and even biologists, take the “Darwinian version of evolution” as a self-contained doctrine, which limits the perceived room for manoeuvre for anyone who has problems with the current version of Darwinian teaching. In addition, it is not clear what could be a “non-Darwinian” version of evolution, because often it is the very word “evolution” that is the cause of outrage. Finally, by
“creationists” the proclamation picks out people who defend one special and narrow way of interpreting the Biblical “act of creation”, one perhaps unpalatable even to those who by no means belong to the Darwinian camp. The possibility that both “evolution” and “creation” may be almost synonymous in some systems of thinking obviously does not occur to the pamphlet’s authors.

The questions proper were formulated according to the logic of the introduction quoted above and divided into three groups; briefly: (i) What side do you take and why? (ii) Can “post-modern” movements help to bridge the rift between natural sciences and theology; and (iii) Why has the controversy started anew in our times?

Answers (about 15) were published in 2005 in a double volume of the journal (Prostor 65–66). None of the respondents filled out the questionnaire; they sent shorter or longer essays instead. With two or three exceptions, no biologists, philosophers or theologians were amongst the authors. Most of the contributions were a predictable collection of simple and extreme answers, often linked with angelology, anthroposophy, verbatim readings of the Scriptures, or the alleged discovery, with the help of this or that esoteric theory, particular trends, rhythms or cycles imposed on the world from – how else? – “without”. The main concern of this group is “Who is ruling the world?”, as if the “obvious” opposite – a world without a ruler – would just lead to chaos. In short, the answers mostly represent variations of old Paleyan arguments that have been repeated ad nauseam for 200 years, and revealing a deep mistrust towards the world (i.e. creation). The people who rehearse these arguments require a ruler, a planner, a “great engineer” or some angelic intelligence behind it all, otherwise the impotent world (i.e. creation) could not be expected to proceed towards any meaningful end. This leads them to a conclusion that world history cannot be mere history: it must be lawful, deterministic, predictable, etc. Very often their contributions deploy quasi-scientific arguments that have obviously been acquired from Sunday newspapers, supplemented by accusations that science wants to explain everything, and making it responsible for all the human misery of the 20th century. Frequently the author takes some Cartesian version of a deterministic and mechanistic world for granted, and then proceeds to argue along the lines of syllogisms like “if, as we can see, the world is such, then it must get instructions and enchantment from outside”.

The whole event of the poll would not deserve attention here, were it not for the fact that one of co-authors of this book (Neubauer 2005) answered the call with a long philosophical essay. That response forms the core of this chapter. First, however, the poll.

Answering the Poll

1.a. Which party do you incline to, and why? The bipolar world suggested in the question is not our home. We do not incline to any party in this debate – not because we want to be impartial, but because we want to retain a many-sided position. We

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1“If it were not for evolutionary teaching we would not have had two world wars (or a decline of morals, or bird flu, etc.)”
prefer, of course, not to change our standpoint without good grounds; nor do we wish to manifest a snobbish relativism, unconcerned with how things are “in reality”. On the contrary, the very reality must remain in our focus – the living, natural (i.e. evolutionary) reality, comprising worlds of all species. The same holds for ideas, investigation, understanding, and viewing: different “species” do not fuse either logically nor physically – they compete and wrestle with each other – as different appearances of will towards power. But they also cooperate, communicate, and understand each other. This mutual understanding evolves, and species evolve with it.

1.b. What is, after all, the reason for the existence of the living world? A very weird question – its authors are apparently awaiting simple answers like “Creator” or “chance”– and they got them in most answers! They are not expecting answers like “Because, primarily, the living is more natural than the non-living”, or “The world cares”, or “We, living beings, are here, we are alive, and the reason of our existence is our very presence”.

1.c. Are you convinced of the evolutionary transformation of living organisms during the long time periods of ages past? Yes – we, living bodily beings, by our very existence witness the self-transformations of the living. We are embodiments of the experience of all the ancestors, and yes, we believe that such an experience extends very far into “long time periods of ages past” (see also Chapter 3).

1.d. What is your opinion concerning the “driving forces” of evolutionary processes – do they have a goal? The driving force is provided by such processes themselves. “Evolution” or “development” is a good articulation of the very nature of every being, and this nature represents its own driving force for its movement and self transformation. Their goal is living beings themselves, and each living being is self-creation, embodied intentionality.

1.e. Is a human being different from other creatures – if so, how? Do humans play any special role in the world – if so, which one? Each living being is different from other beings; in this context human beings are able to reflect their essential differences, and to understand them as instances of naturalness.

1.f. Comment on whether theology and science can become united in their views of creation and evolution – is it possible, unthinkable, or inevitable? Modern versions of theology and science already are united – against such a question: both “creation” and “evolution” are unthinkable for both! We feel entitled to give such a strict answer – see the conclusions we draw in this book (Chapter 1, and what follows).

2. Questions of creation and evolution are being discussed also in spiritual sciences, anthroposophy, hermetism, or sciences inspired by the New Age (authors like Pribram, Capra, Sheldrake, Grof). Could the ideas and discoveries from these disciplines bridge between natural sciences and traditional theology? In what respect; if not, why? Firstly, no bridging is necessary – see previous answer and below. But to the movements mentioned: if they cease to be “spiritual” they indeed may help to bridge the gap – the gap between the above-mentioned traditional look of both modern theology and science, and their post-modern variants. Initiatives coming from non-scientific or marginal movements and schools are invited to formulate anew the
original and basic questions, because such movements deliberately maintain their distance from the modern rationalist tradition.

After all, evolutionary teaching began as a similar – even if unreflected – attempt to return to the Renaissance ideal of knowledge: by turning attention from what is general and typical, to what is natural, unique and individual; and by replacing measurement with observation and comparison, hence restoring confidence in the senses and personal experience. The theory followed tangible metamorphoses, not abstract and untimely regularities, and it re-discovered the importance of history—forgotten since the Renaissance.

This attempt to introduce evolutionary (i.e. natural) thinking as an antonym of rationalism took place, however, at a time of hegemony in modern scientific rationality, when “reality” was exclusively understood as “objective”. In such an atmosphere evolutionary theory could not do anything but also lay claim to the status of objective knowledge, even when factually challenging it. Only by assenting to such a compromise could evolutionism be allowed to establish itself as a science. The compromise, however, prevented it from being fully consequent and from extending the evolutionary approach to the whole of reality. It was unthinkable at the time that not only living nature but the whole of reality, even our knowledge and truths (even science and evolutionary science!) are subject to evolutionary processes,\(^2\) that the history of the world means narratives that are open-ended. It was unthinkable too to state that as the species evolved, the evolution of knowledge (with science being no exception) does not approach – even asymptotically – some definite understanding (it does not even recognize any preferred direction towards it). It would be scandalalous to announce that directions, goals, topics and motifs of acquiring knowledge become re-defined again and again with every new piece of knowledge, theory, or teaching; that the horizons are littered with newly formulated truths; to admit that the evolution of a species is but a special case of evolution, where every newly appearing individual opens the field of possibilities differently, and often in new directions.

Just such a regrettable atmosphere governs our thinking even today: consequences of the evolutionary approach still appear for many to be too big a chunk to swallow; and for proponents of traditional science it remains indigestible, because obviously it denies the very core of objectivity. This may be the reason why, at least to our knowledge, among the founders of evolutionary teaching nobody drew such consequences. In contrast to the situation in the 19th century, the contemporary alternative movements mentioned above have much better chances of success.

In biology, the evolutionary approach is nowadays becoming continually weaker (in spite of the lip service paid to it under the banners of the neo-Darwinian gene-centric revolution), but, paradoxically, the whole of nature – even inorganic – has fallen under its spell. Mass – in the recent past but a mere filling of shapes, a passive

\(^2\)With the exception of thinkers like C. S. Peirce, F. Nietzsche, or H. Bergson – but they by no means belonged to a mainstream.
substrate of evolution – and even the whole universe are today viewed by physics as the results of long and complicated evolutionary processes. The same holds for our own history, including the history of religion – and also that of science.

Such a development is related to a contemporary decrease in the monopoly the sciences enjoy in relation to knowledge. The scientific conception of reality as something objective ceases today to be regarded uncritically as the self-evident reference point for human thought. It follows that new developments and discoveries need not be interpreted exclusively in the light of a single, scientific rationality. They can refer also to other traditions of knowledge, e.g. the Christian or hermetic, and they can return to the origins of modern science and then follow alternative directions, paths that became forgotten, ignored or discredited because they were hard to integrate into the traditional corpus of science. Such developments can also become part of cultural experience and understood more deeply. Above all, however, this favourable atmosphere allows for the rehabilitation and re-evaluation of evolutionary thinking, which once represented the first important, radical, yet influential and generally accepted worldview, but which was ahead of its time.

Hence we maintain that what became fatal for Darwinism and its derivatives (before all, Haeckelian monism), was its obstinate effort to express itself as an orthodox science. Mechanistic determinism and reductionism, attitudes sincerely but groundlessly held in most cases, led to its transformation into “neo-Darwinism” (i.e. neo-Darwinism of the fin de 19e siècle, not its extant form), and this entailed a return to the formalism of objective knowledge (especially thanks to A. Weismann). Its hylozoic materialism, incompatible with mechanicism, its atheism and positivism bound to materialism, all this declined finally into mere declarations (but the clash with religion was complete by that time).³

3.a. Why has the controversy emerged just now, why do we experience new beginnings and ends especially in our time, and what are the broader spiritual, cultural, and social connotations of this situation? Well, our conclusion above – that evolutionary thinking was ahead of its time – was meant literally, as the coming postmodern age is the right and due time for an evolutionary approach.

3.b. Is the discussion prolific or just flogging a dead horse and persuading the persuaded? The contemporary atmosphere favouring the experience of new beginnings and ends and deeply corroborating them indicates that modernity, with its futile approach based on mutually exclusive beliefs, is coming to its end, and an age of mutually complementing testimonies is coming. The main danger of all such new movements, however, is dilettantism; in which case they will soon be exterminated either by the actions of their organized opponents or by mere indifference.

3.c. What are the positives and negatives of such a discussion? Questions raised by evolutionary theory concerning origins and nature are eternal and will be asked even after the twilight of modernity. It is noteworthy that such questions are being

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³A similar trend can be followed among the well-known proponents of contemporary alternatives, e.g. Sheldrake or Capra. Their original radicalism has yielded to the objectivist bigotry of traditional scientism.
posed today and that they are posed as urgently as in the past; after all, one might have supposed them to be antiquated, exhausted, uninteresting, and hence brushed off. What is, however, highly alarming is that such questions are being put down in the same words, and supported by the same naive and superficial arguments as in the 19th century! Apparently at that time they were simply rebuffed: what was brushed away in the name of evolutionism was creationism, i.e. a view of the world as a creation. And now they are in danger of being put aside again, together with modernity, the age which ignored physis in both her dimensions – formation and evolution – and consequently did not allow us to see nature with such double optics. Both views, however, are complementary: one without the other will represent only testimonies of the convinced, but does not provide a convincing testimony about reality.

Having completed the questionnaire, we now proceed to the main body of the chapter.

The Controversy Around Darwin as a Symptom

In the previous chapter we showed that the becoming (of whatever – universe, life, man) is impossible to grasp, i.e. to think, understand or deduce, by logos (ratio). Logos is unable to express novelty, let alone explicate it; it is based in relationship, but being and non-being cannot be commensurated, put in ratio or rationalized. The very essence of beginning and becoming (physis, natura), all development in time, is in this respect, irrational. Every conception is “virginal”, untouched by descent, intention, and bearing no burden of causes (aitia). It simply happens, by chance, freely, spontaneously, without any cause, “just so”. From nothing there arises something, standing for itself, self-confident and natural. The beginning of what exists by itself (to fysei on) is the foundation of any creative action unwinding from inside, of self-formation.

Nothing of what arises by simple appearing and becoming can enter the contents of knowledge (as logos), especially in the light of scientific rationality and objectivity. “What has been will be again, what has been done will be done again; there is nothing new under the sun”, says the prophet [Eccl. 1.9]. Beginning and conception are not items, objects, articles lying perfect before our eyes, as facts in the world. Their nature concerns subjects, stimulants, and events that furnish chances for implementing something that proves its fitness. Moreover, novelty is in principle unrivalled, unrepeatable and unprecedented, like any natural thing. But de singularibus non est scientia, as holds the age-old precept; exact science is neither casuistry nor factography. A true subject of science can be generalized and put under some rule or law; science is knowledge of things having “objective reality”, i.e. concerning objects (obiectum). Scientific knowledge is an endeavour that focuses on causes of whole categories of things, to reveal how things are “in reality”. Therefore, it must first transform a thing into an object because only such objects become the very material (subjects) of knowledge. This rational base also provides an explication of the things themselves, their raison d’être – it explains why the things
exist at all, and what the essence is that is represented by this particular exemplar. Only objective reality makes such an item real, because absolute and mandatory knowledge is possible only where objective reality is concerned.

**Things and Objects**

“Science always encounters only what *its* kind of representation has admitted beforehand as an object possible for science”, says Heidegger in his famous essay *Thing* (1971, 168). His diagnosis continues as follows: “Science’s knowledge, which is compelling within its own sphere, the sphere of objects, already has annihilated things as things long before the atom bomb exploded. . . . The thingness of the thing remains concealed, forgotten. The nature of the thing never comes to light, that is, it never gets a hearing. This is the meaning of our talk about the annihilation of the thing. That annihilation is so weird because it carries before it a twofold delusion: first, the notion that science is superior to all other experience in reaching the real in its reality, and second, the illusion that, notwithstanding the scientific investigation of reality, things could still be things, which would presuppose that they had once been in full possession of their thinghood. But if things ever had already shown themselves *qua* things in their thingness, then the thing’s thingness would have become manifest and would have laid claim to thought. In truth, however, the thing as thing remains proscribed, nil, and in that sense annihilated. This has happened and continues to happen so essentially that not only are things no longer admitted as things, but they have never yet at all been able to appear to thinking as things.”

What, then, is “the nature of the thing”, what is “thinghood”, and what is “thing-ing of the thing” and “worlding of the world”, topics which are developed further in the essay? The thing is part of the world, its affairs and contexts, part of its “presencing”, i.e. emanating, revealing the presence. It is a symbol that takes on meaning in an ever-lasting multi-contextual game. Things are part of our lives, while objects are not: objectivization kills life, and “objective reality” does not refer to notions like world, development, life, meaning, or emergence. No naturally existing things exist objectively, and therefore they are not available to exact scientific knowledge. At the same time, natural experience concerns exactly such natural things, actions, or events transformed into familiar knowledge and understanding. Even the very process of acquiring understanding (including the objective sort), i.e. the emergence of truth, acquaintance with world and with the self, is of such a nature. An individual experience is not an object of understanding but its subject. Knowledge is part of the content of such an experience, and vice versa – experience, not objective reality, lies in the background of knowledge. In other words our natural experience does not consist of data and items, but of ideas and events based on imagination and narratives. We think in stories, i.e. in myths, and their stuff consists of likeness, analogies, archetypes, symbols. Natural reality is of the same nature (stuff) – she is not something that is to be accepted as ready-given by textbooks. She is *the* presentation,
gained by passing and by tradition: stories beget more stories. We also participate in this world – we are as real as the embodied experience we incessantly chase after, continuously understanding it anew and in a new likeness. Evolution – unfolding from inside the self – is therefore a basic, natural way of our being-in-the-world; it is the “a priori form” of our experiencing reality, in which we ourselves are given (defined) as its part.

Hence, evolution looks elusive and counterintuitive, and resists commonplace understanding, not because of the contents of knowledge, but because of the way in which knowledge is acquired and becomes contents. Because of its fundamental character, evolutionary thinking is very hard to transform into reflected cognizance; it is rather an attendant awareness. Evolution – the course of metamorphoses, the very reality in statu nascendi – is an experience which cannot be transmitted, but only participated in; it is not based on common knowledge, but on personal acquaintance. The evolutionary dimension of reality cannot be made a matter of common consciousness, but rather it enables our separate minds to be partners and mutual witnesses in shared knowledge and in the adventure of discovery. In this way we become coevals, successors, shareholders and heirs of parallel life courses, historical trends, and cosmic events (see Chapter 2). From them the tissue of the world is woven – as the common dwelling-place of related, intimate creatures, naturally kindred by virtue of their origins, life stories, communication and cooperation. The natural, evolving world thus exists as a commonly acquired experience of individuals with nature. The world is not a framework, a goal or the source of absolute (i.e. objective and indifferent) knowledge; rather it is the vanishing point of the process of relative, contextual knowledge (see Chapter 5). The natural world is built of boundaries, encounters, and commitments that unify its dwellers, in much the same way that cells become unified in a tissue.

Contest of Likenesses as a Manifestation of will to Power, i.e. the Struggle for Life

The quest for the origins of the universe and life is a streaming towards verity or natural genuineness. Natural truth is urgently pressing towards its realization; its nature is a Nietzschean will for power: “Life must again and again surpass itself”. Living means the self-transcendence of the opportunities available for a living being, the chances it can command, and the potential, disposition or schedule embodied in it. Life is not an object, but a projection; it is embodied intentionality. To live means to develop, i.e. to expend effort, to overcome some resistance. That is why life can

\[\text{4} \text{F. Nietzsche, Thus spake Zarathustra II, 29.}\]
\[\text{5} \text{Self-transcendence is a comfortable, but precarious and misleading expression. It points towards self-understanding – a self-referring hermeneutic capacity, a capacity to escape from the existing circles of understanding, and thus capable of providing a change in understanding and explication which (in retrospect) will be taken as a change, as something new.}\]
be thought of in terms of development, evolution\textsuperscript{6} of its own powers, or potential struggling to come up, get through, and excel. This is the nature of the “struggle for life” – the mutual contest and competition of living forms.

A short digression: For biologists who are not native speakers of English, it comes always as a surprise when they happen to look up the word “struggle” in a dictionary. This is because European languages translate “struggle”, as in the expression “struggle for life”, unequivocally as “fight, battle, combat”.\textsuperscript{7} But in Websters Collegiate dictionary (1991) we read: “1: Contest, strife; 2: a violent effort or exertion: an act of strongly motivated striving”. The entry “to strive”, then, informs us that the original meaning was “to endeavor”, from which today we have: “1: to struggle in opposition: contend; 2: to devote serious effort or energy: endeavor”.

Such warlike translations (prescribed, of course, by the exegetic tradition established in the late 19th century) have the potential to distort one’s whole understanding of a single word-meaning. We tried to read “struggle for life” as “endeavour to live” – and we encourage the reader to do so too – and in that way we obtained a particular insight into Darwin’s \textit{Origin of Species}.

Each species (in Greek: \textit{idea–eidos}) is defined by its specific appearance (again \textit{idea–eidos}). A living being is thus an embodied likeness (\textit{eidos}; see Chapter 3) of a specific “survival strategy” driven by many generations of predecessors, and this was a successful strategy if it survived to the present day. This is how Darwin should be read: his \textit{Origin of Species} does not treat the question of the \textit{birth} of species, but that of their descent and the lineage of bodily appearance, i.e. of forms of the living. Their diversity is but a \textit{by-product} of repeated selection of those forms that endeavoured and succeeded more often than others to pass on their generic traits to their progeny, i.e. to inform their progeny about \textit{their} version of body likeness. Each living form represents a specific relationship towards the world, a surviving strategy, both stretching out towards the horizon of the species and focusing on the centre by being directed towards its likeness.

A human being is able to build a multitude of relationships and dwell in a manifold of worlds, if not bodily (generically), then in mind: he/she is able to survey the horizon of actuality from many perspectives and take diverse stances. These stances represent surviving strategies of our species; thus, the strife between creationists and Darwinists also belongs to the natural march of events. The dispute has survived for many generations and has reached into our time almost unchanged. It often involves cunning, and it is in its nature that it often proceeds with little regard to the point at issue, to truth or to the rules of scientific polemic. Reality itself evolves in such

\textsuperscript{6}Expressions like \textit{development} or \textit{evolution} are quite clumsy and testify to the poverty of European languages, that originated in our millennial forgetfulness of nature. Such expressions clearly evoke an idea of unwinding something that was, up to now, rolled up, scrolled, hidden in a bud; of coming up with something pre-existing that was \textit{already and always there}, only hidden in its own “plies”. Recall that the theory of preformism bore, in its heyday, the name “evolutionism”; only after Darwin came the word evolution to mean something almost opposite to its original sense.

\textsuperscript{7}German “\textit{Kampf ums Dasein}”; Czech “\textit{boj o život}”; Russian “\textit{bor’ba za sushchestvovanie}”; French “\textit{lutte pour la vie}”, Hungarian “\textit{harc életre és halra}”, Italian “\textit{lotta per la vita}”, etc.
clashes – and so does truth. Yes, in the struggle of creationists with Darwinists what is at stake is indeed reality and truth. As shown below, such reality and truth is natural not objective: the question is not “what is it?” but “in which direction does it develop?” The natural reality originates, and resides, in strife. The very rules of the contest are continually changing and the truth will change with them, because truth is not the result of cooperative search, but a child born out of the match. This “ecological” truth will be the central point of our continuing quest, not a “logical” truth that presupposes common and well defined outcomes. Ecological, natural truth springs from the struggle of ideas and is loaded with emotions – in contrast to the objective disputations of experts (disputations prescribed by objects not viewpoints). Should it be the motor of the evolutionary game, it must concern not the truth about the world, but the world itself and its reality. Such a truth should care about its own likeness and its form of survival. Its very existence (I am) testifies to the facticity of both species-specificity and a movement of ideas.

**Genesis and Phylogenesis**

What is the philosophical background of the “battle between the supporters of the Darwinian view, and adherents of the ‘creation’ theory deriving the origins of both the universe and life from the act of Biblical creation”? *Theoria* originally meant a spectacle, i.e. an unengaged way of looking; it referred to a particular perspective available to the spectator – therefore “theory” in the sense of view, approach, or attitude. In science, “theory” came to mean a rational construct, a tool of systematic explanation, or a manual on how to identify and classify the phenomena in question, showing how to differentiate or amalgamate them according to theoretical (i.e. general and external) criteria and how to put them into mutual relations, links, and dependences. *Theoria*, as vista, view, way of looking and observing, has turned to “theory”, an instruction relating to systematic work, a compilation of facts collected into proportions and relations that to bind them all into a closed rational construction.

If we take the second meaning, a sovereign divine “act of creation” cannot become, of course, a part or foundation of any theory. Reality can be regarded as the World of God – as a manifestation of His wisdom, goodness, and sovereignty. One can marvel at the performance, admire God’s work and praise Him, but from the “fact of creation” no other fact can be derived, and neither is it possible to insert external facts into it. Creation provides the auditorium, not the starting point – the emergence or origins of anything else do not follow from the very act. It is characteristic that the Scriptures, when mentioning the three acts of Biblical creation (Heb. *bara* – Gn 1.1; 1.21; 1.26), never speak about the origin of the “world” or “life”, let alone give their rational explanation. Such notions, questions and problems are anachronisms leading to inadequate claims. Once again: no rational theory is able to

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*We are of course aware that the right English spelling is “phylogeny”. In the ongoing context we want, however, to point towards the meaning “genesis” that is hidden behind the current form of the word.*
explain origin and descent, because beginnings cannot be – ex definitione – included into any kind of relations.

Creationism, however, justifies this way of knowing the world with the help of rational theories. It does so because it is a theory in the sense of “view”: it takes reality as something that is here in its wholeness, closed into itself, ready, deprived of its origins and ends and similar discontinuities, i.e. devoid of rational gaps. The “act of creation” is truly the negation of descent; it questions the naturalness of the world and asks it to be rational.

But the Biblical revelation does not correspond to such “theoretical” demands. It rather lays groundwork for an “ecological” understanding of reality. Instead of narration it provides merely an exposition of stage settings, the scenery for future stories. The plot is the world itself, with its evolution proceeding according to the “evolutionary game” between man and God, between the chosen people and other nations, and between individuals. Creation thus denotes a cosmological event in which all humankind has it roots.

While the Biblical entry provides a sketch or framework of future events, the evolutionary doctrine explains the present situation as the outcome of past events. Its very content is a myth disguised as scientific explanation. As convincingly shown by E. Rádl (1905–1913; excerpt in English see Rádl 1930), Darwinism is by its nature irrational; it represents a protest against the rationalism of traditional science: “The goal of the new theory was to describe the natural events which give rise to new species (describe, not understand!). [. . . ] Darwin’s demands are diametrically opposed to those of his predecessors: instead of endeavouring to capture the manifoldness of nature by general terms, his goal was represented by dissolving such understanding into particulars. Formerly, the reason (ideas, noumena) was considered the only eternal reality, whereas appearances (phenomena) were but fleeting reflections of that reality. Darwin proceeds the other way around: he ignores reason and ideas and is interested only in the ways in which things happened. Whatever looks to be an idea, abstraction, logic, is rejected: he has no understanding for the theories of his predecessors and contemporaries. [. . . ] He enjoys pointing out the tremendous interdependence of living conditions of organisms. His whole theory rests on the diversity of cause and effect.” (Rádl 1909, 137–138; English translation 1930, 25–28; here, however we prefer our translation)

Rádl refers to the crisis of Darwinism and predicts its rapid decline. This is not, as it may seem, an unfortunate mistake, nor a manifestation of the author’s prejudices, but the result of a thorough analysis and diagnosis of contemporary Weismannian neo-Darwinism as a factual denial of Darwinian reformation. Original Darwinism tried to transform biology into a historical science, whereas neo-Darwinism was a retrogressive rationalization, a re-channelling of evolutionary thought back to the realm of objective science. This trend has continued throughout the whole of the 20th century: biology in our day, founded on molecular genetics, has ceased to be science about living reality and has lost its connection with natural experience (see

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9Biblically, “world” is called “age” (olam); “world”, or even “creation of the world” is nowhere to be found – at least not in Genesis 1–3.
also Epilogue). Contemporary neo-Darwinism is rational indeed – at the price of Heideggerian “forgetfulness of nature”.

**Empirical not Rational**

Darwinism did not declare it openly, but nevertheless it imitated the self-stylization of science as an empirical knowledge. However, science is not empirical, but experimental: its knowledge is based not in experience but lies in attempts to transform phenomena into data which will fit into a rational framework or scheme to fulfil theoretical expectations. Scientific observations are supposed to satisfy empirical methods, but only when we understand them in this way. Therefore they focus on phenomena that can be expressed as numbers (expressing amount, size, or order): scientific observations usually consist in measuring, counting or determining frequency, i.e. status (from a small number of discrete possibilities: yes/no, presence/absence), e.g. of a trait. The advantage of such an approach is the possibility of (i) undertaking mutual comparison of data (independent of what is observed); (ii) transmitting it (in a manner that is observer-independent); and (iii) publishing (independently of knowledge). Thus, scientific data can be both easily conveyed and applied, independently on any experience or knowledge.

In contrast, evolutionary knowledge is rather an enquiry. It is oriented symptomatically not systematically, and its procedures are heuristic and exegetic – they reveal and explain. To understand what is going on now, it is interested in the concrete plot of what took place in the past. Reconstruction of the past in this way allows understanding of the present, and to succeed in such an endeavour it is necessary to interpret present phenomena as witnesses, traces, indications, remnants of life in the past. Such circumstantial evidence enables us to put together a story, to trace the courses and coincidences of processes that finally ended up in the present world and thereby make it understandable. The same goes for the history of a species (or even an individual): the evolution of form (and the life history of an individual), in its predecessors and their relationships to others, trends in the transformation in lineages traceable back into the deep past – all this provides a sufficient explanation of its present appearance, properties, development, behaviour, variability, population density, similarity to other species, etc. The origin of and the reason for the present (and every following) state of the world resides therefore in its previous state, and such a relation cannot be based on any general rules and principles. The question “Why are things so-and-so?” has for the evolutionist a simple answer: “Because it happened like this!”

**This is not Science**

Well, legitimate objections arise immediately, of course: This is no science! It isn’t. We should, however, add immediately, that this is, in contrast to science, the way natural experience evolves: it ignores inner causes, deeper reasons, distant goals and higher perspectives, and sticks to the general feelings and impressions left by the
past, revealing the present, and laying contours of what will come next. As discussed in Chapter 1, such thinking was in antiquity labelled as doxa, i.e. meaning, likeness referring to forms, because it remained with the phenomena and did not penetrate to the very essence, in contrast to the true knowledge or episteme. Of course, it can be stated (as Darwinism did) that evolution is limited to this very unimportant level of phenomena. For example, views emphasizing the role of sexual selection and ritualized rivalry often come to the conclusion that to “make an impression” may be the very goal of evolutionary games. Should knowledge based on arousing impressions then be considered adequate for understanding evolutionary processes?

It is obvious that this sort of knowledge does not place such rigorous demands on the form of data as scientific practice. In this respect, evolutionism was very accommodating towards biologists, because a piece of biological knowledge and its associated data did not need to meet the standards of objectivity too much in any case. E. Rádl showed that taxonomists, morphologists, physiologists and embryologists, accepting Darwinism, did not need to change their methods; what changed was simply the perspective and motivation, the explicative framework. We should add, however, that motivation was especially important, because the evolutionary viewpoint liberated biologists from feelings of inferiority and bad conscience towards “true” sciences like physics.

Evolutionary teaching can be considered as a narrative to a much greater extent than can Biblical revelation. Natural history replaced the creationist revelation, functional teleology displaced the Christian supernatural history of salvation, and evolutionary ecology took hold instead of theology. Indeed, what happened was a return to the original sense and vocation of scientific knowledge: to replace the Bible – the Book of Revelation, by Nature – The Book of Creation.

Modern (natural) science, however, came on stage at a time when Christianity was already unable to unite Christians – either by mutual agreement or by force – on a single interpretation of the Scriptures. Hence, after the Thirty Years’ War the expectations of Europe became fixated on that second – Galilean – “Book”, in the hope that this text would not require any interpretation – because it was “open”, i.e. accessible to everybody and readable by anybody, clare et distincte. Moreover, this was the only Book which was single and common to all, in which the world was shared, rational and understandable, and self-explanatory and understandable in itself (interpres sui). What is written is also given: the “text” is not just about the reality, but also represents the very reality. For nature to be a text requires that it does not exist “just so” – it must represent a rational whole, and it must represent a whole constructed (written, prescribed) by a rational creator – the “author” of the book of nature. Around this time the Creation became perceived as a system and as a construct, and the Creator turned into an engineer, (a supreme watchmaker at that time, perhaps a programmer today). This blasphemous if ancient image of the Creator as a producer (demiurge)\(^\text{10}\) was bound to forgetfulness about nature: the world became

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\(^{10}\)There exist very old hymns worshipping Him as mundi Factor or Auctor, i.e. Originator, Author of the world; the world, in its turn, is taken as a mere mundi machina – the World Machine!
commonplace, free of contradiction, unchangeable, exact, accurate and sharp, fully transparent and present here-and-now. In short, it was given “objectively”.

Such a view suggested a new general alliance with God, and also became promising as the beginning of the attainment of harmony within mankind. Perhaps because of this, knowledge of nature also gradually took over the functions of religion. Knowledge, disseminated as a “scientific worldview”, turned into a redeeming theory, and such a perspective supposedly allowed us to see and depict the whole of reality in a single framework: this was the scientific image of the world.

Quickly it became apparent, however, that “reading” the Book of Creation is a task as difficult and equivocal as was previously the interpretation of the Book of Revelation. Clear images of reality “as it is”, mediated by science, became more and more complicated and confused, in no way simpler than the previous exegesis of God’s secrets. Its supposed unity (a priori according to Kant) was only rational, formal, abstract, based on mathematics and logic. And such a unity is of course only spiritual, i.e. invisible and impossible to demonstrate. It supplied a form of a “worldview”, but did not provide any orientation whatsoever in the world. Moreover, with the progress of knowledge, the proclaimed unity became more and more obscure and inaccessible even to specialists, let alone laymen. Again, as in theology, what remained was a mere belief in its worldview! In science we trust!

Evolutionary teaching was supposed to remedy this dreary state of affairs. A historical perspective of nature enriched the scientific worldview by adding the dimension of time. As the spatial dimension of the Copernican system restored order to the celestial realm, so the Darwinian perspective introduced a kind of order to natural manifoldness. But with it came also a new perspective, different from that offered by the scientific worldview. While also swearing at the altar of mechanicism and materialism, the evolutionary view introduced a much deeper turnaround than did the famous Copernician revolution. Although it repeated the mantra of an objective and rational approach to reality, it meant more than the reconstruction of the world that occurred with heliocentrism: in the evolutionary view the world lost whatever architecture it might have had before! This implied danger for the very scientific ideal, inspired (wrongly) by the Greek episteme and consisting of a quest for exact, definite, and evident knowledge. An exact, nomothetic natural science was to be transformed into an idiographic, casuistically historical science, dwelling in, and dealing with, particulars, contingencies, and unrepeatable events explicable only on the basis of what happened before. And we should keep in mind that such evolutionary trajectories could have looked different: the accidental fall of a planetismal interrupted the age of reptiles and initiated the age of mammals, which in turn enabled the advent of humans. Such explanations (even of our own existence!) were in future to replace all objective explications based on theoretical constructions mirroring eternal laws; all this was in danger of yielding to historical reconstructions, to narratives that could make the present understandable.

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11E. Haeckel (1875) explicitly made just such a blatant claim. In the beginning of his lecture “Goals and pathways of contemporary evolutionism” he dealt with biology not as an exact, but as an historical and philosophical, science.
The Return to Natural Understanding – Evolutionary Nature of Science

Hence, evolutionism indeed means a return to “etiological” myths like “Why do elephants have tusks?” or “Why don’t cats and dogs like each other?” From the viewpoint (or self-stylization?) of both the spiritual tradition of the West and the ideals of modern science such a move means a regress, a decline towards archeaic forms of knowledge and ways of acquiring knowledge. The evolutionary approach has been a challenge to logos construed as rationality and the capacity for rational understanding and explanation. For it praised myth, seen as narrative, tradition and a generalization of miscellaneous anecdotal stories and episodes, ad hoc examples and motifs, and serving as the source of unsubstantiated analogies and habits underlying vague fantasy and fuzzy impressions about “the ways of the world”. This type of folk wisdom represents the direct opposite of scientific truth based exclusively on rational principles – on reason, intellect, and an immediate view.

The evolutionary theory did indeed cast doubt on the exclusivity of logos in science. Darwin’s contemporaries felt it intuitively, Rádl delivered a deep analysis of the problem, and our contemporaries acknowledge the thesis openly. For example, E. O. Wilson (1978) freely admits that evolutionary teaching (“scientific materialism” in his terminology) has the structure of narrative (evolutionary ethics) or myth: “But make no mistake about the power of scientific materialism. It presents the human mind with an alternative mythology that until now has always, point for point in zones of conflict, defeated traditional religion. Its narrative form is epic: the evolution of the universe from the big bang... through the origin of elements... to the beginnings of life on earth. The evolutionary epic is mythology in the sense that the laws it adduces here and now are believed but can never be definitely proved to form a cause-and-effect continuum from physics to the social sciences, from this world to all other worlds... and backward through the time to the beginning of the universe. Every part of existence is considered to be obedient to physical laws requiring no external control... Most importantly, we have come to the crucial stage in the history of biology when religion itself is subject to the explanations of the natural sciences. As I have tried to show, sociobiology can account for the very origin of mythology by the principle of natural selection acting on the genetically evolving material structure of the human brain.” (p. 200–201) In the last chapter of the book called characteristically Hope, we read (p. 209): “What I am suggesting, in the end, is that the evolutionary epics is probably the best myth we will ever have. It can be adjusted until it comes as close to truth as the human mind is constructed to judge the truth. And if that is the case, the mythopoietic requirements of the mind must somehow be met by scientific materialism so as to reinvest our superb energies. There are ways of managing such a shift honestly and without dogma.”

Similarly, in the preamble to a book by three contemporary Czech evolutionists (Zrzavý et al. 2004) we read that the “evolutionary explicatory principle” resides in the reconstruction of the past from phenomena observed in the present, whilst at the same time we try to understand those phenomena from their history. This circular
explanation “resides in a narrative called evolution. Evolution is a story invented for better explanation of our observations” (p. 11) – hence, a definition for ethiological myth. The authors are also aware that: “Darwinism is immensely attractive, because it allows us to weave stories explaining the shape of our world, plots set on a cosmic time-scale […] but at the same time remains sensitive towards what we humans feel as important – survival and proliferation.” (p. 18)

**Logos as a Historical Contingency**

But much more is at stake than merely the exclusivity of logos! If we grant the evolutionary approach scientific status – i.e. see it as having a claim to truth, with all its consequences – then the question is not a matter of mere political correctness in the form of “equal epistemological rights for all the narratives”. The consequences of evolutionary theory relativize logos as such. The theory explains that human beings, i.e. beings disposing of logos, and even the logos itself (language, mind, and intellect), arose as the results of natural selection! Logos is here because it somehow contributed to the survival of the human living form, not because of its absolute truth or the validity it claims for itself! The forms, appearances and displays of logos are as contingent and secondary as any species and life forms. All the so-called “achievements of spirit” (linguistic, religious, cultural, social, juridical, ethical, etc.) appeared in an evolution whose trajectory could have easily headed in a quite different direction, in fact in infinitely many directions! It is thanks to this that we witness multifarious ways of thinking: historical, cultural, or local appearances of logos are mutually exclusive and contradictory. This is also the reason why they compete with and combat against each other. Science privileges one face of logos, objective rationality. The emergence of science as a result of a singular coincidence of historical events cannot be doubted: many civilizations did exist without it.

Various forms of scientific truth seem similarly contingent and historically (environmentally?) qualified. Its sinuous progress, its diverse methods of data collection and selection, and its dependence on the data, suggests that all scientific knowledge could have been achieved via a plethora of different pathways, and today we could have witnessed another version of science. If this is so, however, then it is not much different from other kinds of teaching and religion that have suffered from having many equivocal interpretations. Yet, as we saw above, science has aspired to be unique in that it has claimed to be able to provide an unequivocal explanation of the world. If so, does this not also hold for evolutionism itself?

Such a question was not legitimate in earlier times, when it seemed that science was a form of logos that relies on reality itself. Everybody is welcome to test it and become persuaded, independently of her/his stance, opinion, or circumstances – provided of course that reality is objective, i.e. corresponds to the objective rationality of scientific knowledge. An evolutionary perspective, however, shows that reality itself is a result of chances turned into necessity, a result of evolutionary games (see also the outlines of both kinds of thinking throughout the centuries, Chapter 1). The
consequence of evolutionism is a resignation from belief in logos, the greatest pride of humans and humankind and hitherto regarded as guaranteeing the reality of the existence of being and the truth of knowledge, because it presented a sufficient and principal reason (principium rationis sufficientis) for all things. Evolutionism has denied that facet of reality which has served as the very foundation of our science. (Here lies the core of embarrassment caused when evolutionism was applied also to humans, who solely enjoy the privilege or gift of logos entrusted to them. Before Darwin the evident relationship of humans with apes was taken as a matter of fact and did not raise any alarm or conflict with the Church authorities.)

Few before Rádl have expressed the radical importance of the dilemma: logos contra mythos – ratio versus narratio? – logic or epics?; generality and necessity of laws and principles, or contingency and episodicity of events and circumstances? The dispute around Darwinism is a dispute concerning the shape of knowledge. Thus it is not an “irreconcilable struggle between (progressive, enlightened) science and (reactionary, obscurantist) religion”, as it has often been portrayed. This and similar struggles – between materialism and idealism, truth and error, rationality and obscurantism, progress and regress, education and superstition, or between defiance and piousness, infidelity and belief, etc. – represent only substitutes that in the past served as a disguise (albeit important and indicative), and which passed anxiously by the very nature and core of the problem. This is also why the causes of its persistence and stubbornness will remain obscure, if we do not realize that the whole dispute at the level of “aut Moses aut Darwin” is essentially a struggle over rationality. Before Darwin those who would become his future opponents did not care about the Revelation, and did not mention God. “God” became a mere cipher for objective reality and served as a proxy for “beginnings”, which were otherwise in principle incomprehensible to logos!

**Evolutionism as Reformation and Renaissance**

Why “God” became such a label has a good and easily traceable reason. Christian theology of the time did not correspond to the original meaning of the word theologia, i.e. the art of explication of divine omens arriving as shouts of oracles, dreams, etc.; the art consisted in translating such omens into comprehensible sentences in a metric verse. In contrast, for Christians (as for Jews) it was the writ that became the principal, even single, format of the “word” of God. Some even maintained that the Revelation came to an end with the death of the last apostle: the seed of scientific deism was sewn quite early.

Theology then became an intellectual, scientific discipline, based on the conception of a rational God, as adopted from Greek thinkers (see Chapter 1). Disputes with pagans and Jews (and later also with Muslims) were led at a speculative, dialectical, even juridical level, and consequently they became increasingly formal – ending often in mathematical and logical arguments. Such were the beginnings of the scholastic (academic) traditions that embraced under theology all areas of
knowledge, until finally, with Cusanus, God and rationality simply merged into one. From Descartes on, God became the guarantor, for mortal minds, of the universal validity of rationality. For Newton, God was the personification (or impersonal principle?) of the geometrical nature of the world and of the mathematical foundation of all reality. Finally, the Guarantor Himself became literally “taken for granted” to such an extent that it became unnecessary even to mention Him, let alone to profess and confess. God withdrew into the backstage, as the suppressed but ever-present foundation of objective reality, i.e. the essence and rational basis for reality. Here starts a science in accord with the Parmenidean “For the same thing is for thinking and for being” (B3). As we have seen (Chapter 1), this concept of being was identified with God very early in history. In its modern version it provided a safeguard that the true objective, i.e. scientific knowledge of anything that objectively exists, can be expressed in writing, i.e. as a string of characters, as terms, definitions, formulas, equations, functions, numbers, data, etc. – in short, in a syntactic form of stored information. Whatever cannot be transformed in such a way does not, in fact, exist: it is but a contingent, secondary appearance of what really exists. Such, however, is the very nature of all bodily forms and living beings. Species, let alone individuals, cannot be defined, transmitted, explained, or deduced; they must be pointed at or at least depicted (image, model reproduction). We learn to know them from personal experience “stored” in the format of images that are accessible to our imagination. Such knowledge can neither be transformed into data (mathemata) nor learnt. Therefore it “does not exist” and represents only a haphazard causes of some general regularity or rational essence.

**Evolution as Religion**

This unmoving, ghostly world of science and theology was suddenly shaken by the advent of evolutionary theory. It was based on a conviction that the shapes of living bodies are real and constitutive! They are self-reliant in both their evolution and development, and the peculiarities of individual variation become the very substrate, the very cause of evolutionary transformations! Yes, the status of objectivity, lawfulness and mechanical causality reigning in living forms is acknowledged as before, but only as an unchallengeable article of faith in the nature of reality, not as a basis and subject of knowledge. The evolutionary approach has no need of a warrant for their existence, because reality is whatever proves itself as appearance, likeness, a specific way of self-building, self-presentation, and struggle for life. No universal rules or formulae exist to describe the ways and episodes of such creations.

Evolutionists do not refute objectivity – it simply recedes into the background, in the way that the god of rationalists did before. They certainly do, however, refute god – the external, heteronomous, supernatural agency which should be the cause,

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12 By paraphrasing the famous book by Mary Midgley (1985), we pay homage to this extending philosopher.
guarantor and reason for evolutionary change. In contrast, they take such change as natural, because both its cause and reason reside solely in the immediately preceding state(s) of nature. Now, faced with truly materialistic (because bodily and natural) religiosity, rationalist scientists and similar adherents of rationality recollect and retrieve their forgotten deistic base of objectivity and, as a matter of course, speak of it as of “god”. These scholars, however, do not realize the religious nature of science and would never admit such a thought. As a consequence, the struggle for the nature of reality has become a fight between science and religion. Hence, under the cover of a religious war of the faithful versus the infidel, we witness a confrontation that aims to answer a single question: is reality constituted as objective, i.e. metaphysically as given and set up once and for ever, or rather is it “natural” (in the sense of *physis*), i.e. as a process of endless becoming, coming into existence, or in short *creation*?

Rádl exposes this drama as a clash between rationality and narrative, i.e. between logos and myth. The clash, so unexpected in modernity, is, however just the latest outburst of an age-old, titanic battle concerning the very nature of existence, i.e. of being itself. This explains all the passion, stubbornness and persistence, so typical of religious wars. And a religious war it is – a war between different religions taken in a broader sense, i.e. between forms of “religiosity”. This word, freed of all ties to God or other deities, is a natural denotation of relations between human being and reality; it surfaces as a form of reverence for truth shared by a community. In this sense, science assumes the role of religiosity in the modern age. In contrast to Christian religiosity based on creed and belief, scientific religiosity is based on discovery and knowledge. It has also encountered a similar fate as long ago did Christian religiosity: institutionalization has made it a victim of rationalization, cutting it away from sincere, unaffected beliefs and lived experience.

From this point of view, evolutionary thought can be seen as being analogous to renaissance movements or to the reformation movements of the Middle Ages; they represented, respectively, efforts to return to ancient knowledge or to primeval Christian religiosity. Both movements indicated the advent of modernity.\(^\text{13}\) In evolutionism we can also discern an effort to return to the original points of departure. First, it is Renaissance thinking that, for modernity, plays the role of antiquity. Second, it is the Renaissance form of scientific religiosity, i.e. hermetism, that is sought. Hermetism turns away from virtual worlds and focuses on the real world, moving from supernatural to natural, from general spiritual principles and rational theological terminology towards the concreteness and uniqueness of bodily and sensory experience. Scientific religiosity, however, quickly abandoned it and fell into the tenets of rationalist fundamentalism and mathematical abstractions, as in the case of Christian theology.\(^\text{14}\)

Scientific religiosity in its original form never became popular in the sense of “folk religiosity”. During the Enlightenment it was a pastime of nobility and higher

\(^{13}\)In this respect, to call E. Haeckel the “Luther of science” is not as unreasonable as it might seem.  
\(^{14}\)Undoubtedly such a development was influenced by the rationalist theology of the School (scholastics).
society, and after the French revolution it became a sentiment of snobs and learned
societies. Among laymen it was first disseminated by various forms of public edu-
cation, and finally became compulsory for everybody through the school system. In
our day it has remained as a revered (but lukewarmly professed) mandatory “cate-
chism” rather than an expression of lived reality. Scientific rationality and popular
slogans mediating scientific knowledge among laymen do not satisfy the format of
natural experience. Until Darwin, scientific religiosity existed mainly as rationalis-
tic spirituality, as part of the intellectual make-up of the learned or as an ideologi-
cal commitment of the half-educated; maybe for this reason the religious nature
of science remained hidden, and the popular view takes science and religion to be
opposites. Only thanks to evolutionary teaching – disguised as science proper! – did
the scientific worldview turn into a living, lived and commonly shared religiosity,
encouraging and inspiring its advocates to act like militant zealots. In this way the
nervous irritability so typical of all sciences became in evolutionism highly exag-
gerated. But even this trait reveals the religious nature of science, for every living
religion represents a specific form of life – as do biological species. When a new and
viable form of species-specificity (or religion) comes into existence, it embodies a
way of demarcating itself from previous shapes as well as from their extant variants.
Its task is to implement its own specificity, to push across and become a new norm.
Hence it is understandable that religiosity – an expression of sincere belief – turns
its advocates against competing forms.

The Turn of Evolutionism Towards Naturalness: Discovery
of Corporeality and of History

Evolutionism represented a peculiar denomination of scientific religiosity, and as
such it held a mirror up to traditional science (which considers itself non-religious).
And now a paradox arose which contributed to further confusion with regard to
our theme. First, the evolutionary teaching was successful to such an extent that it
became acknowledged as scientific. Even more: it became considered to be an exam-
plary, paradigmatic scientific theory, the very touchstone of scientific approach, and
something of a scientific creed. (Remember at the same time what we showed above:
that it has very little in common with modern science.)

Evolutionism professes adherence to the objectivity, rationalism and reduction-
ism of the exact sciences, but in fact they remain, as we have seen, foreign to its
nature. It also maintains that the evolutionary approach is not only compatible with
the worldview of traditional science, but even that it is deducible from this world-
view, that the theory is part of the same “scientific image” of the world.

But the persuasiveness of evolutionary religiosity springs from its difference: in
contrast to the rational knowledge of the exact sciences it deals with visible nature
in her multifarious and unique phenomena. The goal of true science is the oppo-
site – to transform the whole diversity into monotony and generality. The declared
subject of evolutionary theory is the richness of forms and variety of appearances,
properties that are ignored by “science proper”. Evolutionists focus their attention on mutability and variation – phenomena traditionally perceived as disturbing, disguising the manifestation of the one, stable, objectively given and absolutely valid. The evolutionary approach focuses on the time-courses of particular changes and the registration of what happened and how – but such activity goes beyond usual scientific research regardless of whether it is exact or empirical, theoretical or experimental, basic or applied. In short, the knowledge accumulated by evolutionary thought is presented in an “eidetic format”, so that reality can be experienced directly and naturally (unlike when it is experienced through terms and laws) and our mind takes them therefore to be authentic because this is the very format of storing and accumulating experience. What corresponds to such a “format” is likeness and narrative, which allow us to construct and review images. The presence of likeness and stories in our experience of fantasy and empathy makes us the subjects of such knowledge: we are able to embrace them and make them our own.

This is probably the reason why so many people embraced evolutionary thought; in it they discerned an attitude similar to their own. It was, however, unacceptable to those who adopted the modern scientific or religious worldview, for whom the perspective of a virtual objective world and a concept of ideal reality became second nature. Finally both parties arrived at a compromise in the realm of science: evolution was theoretically objectified by transforming eidetic variations of bodily form and life strategies into syntactic changes of genetic texts. Practically, evolution became suitable for propagation in the narrative form of evolutionary tales, i.e. etiological myths, with their canonized iconography.

Thank to this compromise, evolutionary thought became part of science. Even if it was impossible to include it as an organic part, it was at least tacked onto the body of science. As part of a modern scientific religion, it found its vocation in touching up the denaturation of reality, as practised by science, and contributed to the self-stylization of science as empirical knowledge based on experience. Thanks to this, scientists as well as the general public have been able to hold the conviction that science is indeed “about” the world, that it is an impartial reading of the “Book of Nature”, and that this is an interesting, even thrilling, adventure; moreover, its genre is non-fiction, i.e. the contents are true and binding for all of us because we, living beings and people, play an active role in the development of the plot.

The evolutionary approach, however, is by no means a representative epistemic method in science. In a Darwinian attempt to reform scientific religiosity we can recognize – today, i.e. ex post – the first emissary of the coming post-modern age. This is the rehabilitation of natural experience, and a focusing of scientific interest towards corporeality and bodiness (i.e. concrete, individual appearance), the eidetic aspects of live reality, and historicity and the dynamics of likeness.

The philosopher V. Bělohradský stated in one of his lectures that “the post-modern age comes perhaps with only a single message: all novelty is part of tradition”. It may look banal before we realize that the modern cult of rationality grew from the opposite stance: it is necessary to get rid of the ballast of the past and build anew all knowledge and social systems according to the rational principle of a universal science. This message stands out in all manifestos of modernity, be they
Rosecrucian or Cartesian: these represent a marked difference from the preceding humanist, hermetic, and protestant movements that aimed at a return to the beginnings, to the original resources of primeval, unspoiled wisdom. From here can be traced the taste of modernity for originality, brilliance, and radical scepticism; for looking for unchallengeable starting points, axiomatically built systems and utopias; as well as a tendency towards reform (of language, society, schools, etc.). From here revolutions, institutions, ideologies and programs, absolutism and totalitarianism, can be traced. Here starts the habit to name textbooks and compendia “Introduction to . . .” or “Principles of . . .”. Zero interest of science in its own past, in its development, history, in the reasons for its inquiries or the sources of its knowledge, are also symptomatic. A prerequisite of the belief in progress is that every new state (“developmental stages” were not in vogue before Hegel and Comte) contains the preceding ones or cancels them: the single reality is the present with the whole reality as self-evident. In short, the past’s tradition becomes incorporated into the present. Compare this attitude with that declared in Zrzavý et al. (2004, 9): “The idea of evolution means much more than ascertaining that everything is in change: it states that past history explains the extant shape of nature. The appearance of organisms, their behaviour and mutual relationships spring from their long evolutionary history; if we understand the history, we understand the world of today.” A post-modern attitude ex definitione.

Considerations of embodiment and history point towards the Renaissance cradle of science. In the Renaissance we can see not only a similar approach towards nature, but also an awakening of interest in, and a different view of, past times and their history.

It can be shown that evolutionism – especially in its missionary period personified in E. Haeckel – came with a revolutionary understanding of science that indicated a recurrence of Renaissance ideals, for which seeing something meant knowing it. O. Breidbach, in his contribution to a monumental Haeckelian anthology (1998), states that: “For Haeckel’s scientific worldview . . . self-reproducing nature opened in mere observation. [This meant for him, that] the truth – and thus the solution of age-old philosophical problems, had all the time been lying before our eyes. . . . What he saw was, to him, real. And now, his science allowed him to grasp this reality in all details, to study it with a microscope and to draw it. Such pictures represented, to him, an exhausting display of reality. Consequently, this approach to nature seemed to him to be the final and supreme way of acquiring knowledge about nature. . . . His drawings of natural objects do not, in his eyes, represent mere popularizing illustrations of his views, but they grip the very essence of his science. His productions are not simply illustrations, but they provide the analytics of the natural.”

Breidbach then shows that telling the story of the whole from particulars presented no problems to Haeckel, as his approach was revolutionary indeed: “The very observation of nature means to Haeckel knowledge. And similarly imaging, not its reflexion (representation) is already philosophy. Knowledge thus becomes simple: the picture mediates not only the basic structure, but contains already manifold connotations which include at the same time not only specific contours, but
also their symmetries and therefore veins of esthetics. . . . The victorious campaign of sciences lead – in contrast to philosophy – not towards new questions, but it brought new answers to old questions. Nature remained thematized as a whole, but its overall structuration underwent re-orientation, new layout of perspectives.” (4, 298B)

**Nature as Narration**

The turn towards nature – with the emphasis on knowledge – gave rise to science, but, as shown above, this very turn paradoxically led to the neglect of nature: nature was deprived of bodiness and spiritualization, and was literally refuted. But what about the second, humanistic heritage of the Renaissance? Did it also catalyze the birth of – among many other fields – modern historiography? One might have expected the Renaissance sense for the natural world to survive to the present day – and indeed to flourish in the human world, with its topicality, historicity, its emphasis on the experience, interest in preserving the past through the metamorphoses of times, and support for the emergence of novelty in moments of creative spontaneity. If that had happened, the principal contribution of evolutionary thought would have been the transcendence of such a worldview to return to nature in her wholeness. In the first step, living beings, then later – in a pan-evolutionary perspective – the whole cosmos.

But it did not happen. True, the Renaissance age discovered nature as well as history, but, as we saw in previous chapters, science (“physics” and natural history), historiography and philosophy treated history in such a way that they finally succeeded in negating both nature and history. It can thus be asserted that only evolutionary thinking – the view of nature as a historical process which culminates in every individual – for the first time acknowledged the corporeality and historicity of nature. Evolutionism first recognized in nature both likeness and history, understood their “naturalness” and granted them reality. This primacy should be recognized in spite of the fact that the Darwinian founding fathers did not develop any corresponding terminology. According to the spirit of their time they regarded a living body as simple material existence, and did not distinguish historicity from the mere chronological succession of events. A living body therefore retained for them the status of a physical (material) object, and evolution was regarded as a physical (i.e. mechanical) process. Mass and the principles of its movement (i.e. the ultimate causes of physiological processes) were common for the whole of creation, and history was seen as the mere past of what exists now.

Hence, with the advent of evolutionism, the objectivity of reality (laws, universality, uniformity, independence of ongoing processes) was not challenged ontologically. An important shift in views concerning reality (especially living) took place, however, at this time: the evolution of forms had its cause as well as its explanation in past forms. What we observe today always had a preceding form, and the
present form entered the present and is different from other similar forms because it is different in its likeness.

The causal links studied and followed by evolutionism thus became totally different from those that interested physiology or classical morphology. Physiology pursues general relations – manifestations of causal principles and forces common to all, i.e. acting generally and everywhere; all changes in body shape and all processes taking place in the body are explained as the effects of such causes. Morphology, for its part, sought a universal, static, paradigmatic form underlying the manifold of actual forms (like Urpflanze in Goethe). Such an ideal, abstract model is necessarily deprived of body – only such a virtual object can, after all, be characterized by general structural principles, in a way as are physiological forces and interactions.

Similarly, for an evolutionist the past is no longer a universal history, and if the past represents the clue to the present manifoldness of living forms then it should be conceived differently. Every living form has its own, unparalleled past which belongs to the story of that form; such a story is only conditional, and is shared to different extents with other forms. Such a sharing has its image in similarities of likeness, i.e. in essential similitude articulating the very nature of the being. “In descent lies thy reason”, is the core slogan of the theory.

For these reasons the evolutionists almost dogmatically stuck to a conception of gradual transfiguration, as opposite to one featuring “catastrophic” scenarios in the events of the past. Catastrophes are events behind causes that can be deduced from evolution itself; they represent external forces that have a general impact or are factors with a universal validity that is independent of the strictly unique course of evolution. In brief, an event that does not encompass the past, a state which does not emerge from the previous state,\textsuperscript{15} does not represent, in evolutionary conception, a genuine “state transition”.\textsuperscript{16} Such jumps were not considered to be natural expressions of the nature of evolving systems, so they do not belong in the plot. In contrast, evolutionism, inspired by geology, is a historical narration in the sense of the above-mentioned “logic” of transitions. Following immediate, direct succession allows evolutionism to deal with concrete, bodily unique shapes. At the same time, however, the narrative continuity ensures that the subjects of its knowledge are not just casualties, accidents or singularities.\textsuperscript{17} What evolutionism is after is not a mere sequence of bodies, generation after generation, but the advancement of likenesses, which are mutually bound together eidetically (i.e. not contingently). Likeness is the essence of a living being – it distinguishes it from mere body shape. The relation of likeness, then, is the very substrate of evolutionary transformation. In this respect, the evolutionary perspective revealed the connectedness of corporeality with history. Such views can be documented also for the Renaissance; the priority of

\textsuperscript{15}It does not follow, however, that the present state was implicitly present in, or even in principle deducible from, the past one.

\textsuperscript{16}But see theories on punctuated evolution (Gould and Eldredge 1977) or frozen evolution (Flegr 1998, 2008).

\textsuperscript{17}Historical sciences erroneously became labeled “idiographic”, i.e. describing singularities; the cementing role of narration seems to have been overlooked by everybody.
evolutionism is, however, in recognizing the link between body likeness and history: both belong to the nature of the living – human or not.

Whatever exists naturally (fysei – living or non-living nature) is distinguished by its corporeality (concreteness) and its unfolding, its changing in time. A body (corpus) is a union (syn-holon, con-cretum) of matter (hylé, materia) and shape (morfé, forma). But the living flesh (sarx, caro) represents also a time-shape (Zeitgestalt), an embodied likeness (eidos) of time, which is given as life experience. The “matter” of living experience – the material aspect of corporeality – has the nature of a personal life story. As is characteristic for such a matter, the story does not reside in the facticity of the past (as it does in the case of a CV), but in lived, experienced, encountered potentialities, in the trials that an individual has gone through. What was “lived through” is not simply “got through”, it is something gained, and that remains as a continuous stimulus, a proposition open to different interpretations. The individual story is endlessly subjected to re-interpretation and re-evaluation, and the outputs of such activities provide, again, new material for “processing” in the process of individuation. This is individuation in the sense of the old scholastic maxim materia est principium individuationis, as it can be applied to the “narrative substance” – the matter of experience.

The second characteristic of lived time is its historicity. Whereas experience has its image in corporeal shape (eidos as looking like such), historicity is reflected in the similarity of shapes as likeness, as eidos in the sense of “species”. The evolutionary approach to corporeal shape revealed these aspects of historicity. Likeness is a species-specific genre of appearance that, in contrast to individual appearance, is a relation to other eide, i.e. it reveals their relationship. From an evolutionary perspective it is an especially genetic relationship.

The specific appearance, the shape in the sense of likeness – is a claim of fellowship based on kinship: eidos – species as well as broader genos – stick together via descendence and genealogy. Such a genealogical approach is a fundamental contribution of evolutionism. Genealogy – the “family line” – is corporeal (the embodied story of the genus, its saga). The true incarnation, however, is realized in every living individual. In its own experience, in an original and unrepeatable way, it also represents the evolutionary experience of the whole line. The individual story is rooted in the experience of the lineage, and individual experience grows from these roots and contributes to the whole edifice. History is an expression of evolution in a corporeal present.

History

This is, however, a different view of history from that usually accepted: history is studied by disciplines called “the humanities”, the term suggesting unequivocally that they deal only with human affairs and human nature. As a consequence, it was granted another, spiritual, dimension; older traditions therefore understood history as being inspired by God, turned to God, and mirrored His intentions. After the
Renaissance such a supranatural cover was no longer required, and human history was viewed as the “absolute history” of humankind, revealing universal, lawful, cosmic truth. History thus became the location of truth, eternal and timeless, and a position very similar to that of science. This represents another return, another disguised manifestation of belief in the one, immovable and rational, as discussed in Chapter 1. Both corporeality and historicity suffered a spiritual projection into the virtual realm beyond the real world, in which they were deprived of topicality, and then in a backward projection appeared as a manifestation of some “supra-time” into the time lived. The meaning of history was perceived as the impact of eternal order onto the sequence of events unwinding in time, mythical sequels in the fulfillment of fate. The lawfulness driving such a spiritual history resembles to a great extent the fatal destinations (moira, hermamene) or divine judgments (fata) of old mythologies: spiritual history reveals and fulfills transcendental reality in time (as revealed in both old theophanies and Hegel’s “phenomenology of the Spirit”).

The similarity between the denaturation of history and that of nature is very telling: modern historiography is quite similar to modern science. “Natural laws” are but a special form of sanctions against deviations from universal, eternal order – the same order that emanates into history.

But the world permanently tends to “break the symmetry” of such a virtual and eternal order, necessity, validity, equilibria, etc., and must be deterred from exhibiting such bad manners, because each violation produces a state of “debt”. Such an idea is already implicit in the oldest known philosophical dictum of Anaximandros, fragment A9: “The things that are perish into the things out of which they come to be, according to necessity, for they penalty and retribution to each other for their injustice in accordance with the ordering of time.” It is true that such deflections are a necessary precondition for anything newly to emerge and thus for any natural existence. But such a state is ephemeral and usually reversible (see e.g. negative feedback), and only when the debt exceeds usual limits can the system become stuck in a “local minimum”. Its return then requires external intervention (to be “forgiven” and released from local constraints), or it can sink into a runaway regime in which the inequilibrium deepens, with a fall inevitably following sooner or later. Only extraordinary remedies can save the situation, otherwise irreversibility brings about a revolutionary turn. But this is the way the world and history should behave, provided that eternal principles are at work.

It is obvious that “history” understood in this way is a specific human way to grasp rationally the course of time, in a form of logical tradition aimed at storing and passing on the common past in a form of shared understanding, through logos. In such an approach history is not rooted in temporal events, but events are simply embedded into a timeless matrix of relations. The interpretation of history, then, is not different from scientific interpretation: historical time is a rationalization of the world’s topicality, as is physical time, i.e. rationalization of time in the form of a measurable and countable quantity, freely comparable with other quantities. Historiography as the seat of logos allows therefore not only philosophical interpretation and/or ideological presentation, but also scientific objectification. Hence there is the
obsession with turning history (and also linguistics, psychology, and many other branches of the humanities) into a science, i.e. to find common patterns, links and regularities in unique events, and to derive general rules that allow us to reduce the manifold of events and stories to a structural identity. Any chronological succession would then be explicable as a causal dependence, using identical, immutable and permanently valid general rules. The opposite, i.e. the refutation of “scientific” explication, would mean, as was supposed, depriving history of any meaning. Such a spiritual, supernatural comprehending of history was obviously the principal cause of many misunderstandings when it came to the evolutionary idea of historicity in nature, which is ex definitione natural, immanent, and existing-in-time.

Paradoxes abounded even after the fact of evolution became generally accepted. The evolutionary approach, of course, excludes the above-mentioned explication of history, natural or human. Yet the heirs of evolutionary teaching did not save themselves the trouble of seeking for general principles – evolutionary laws and “mechanisms” which could encompass and explain all evolutionary events and supplement the existing system of natural laws (and perhaps be explained from those laws). This effort, in its turn, appalled the “humanitarians”: for them history was a matter of spirit, not of its direct opposite, matter! It did not occur to historians (in contrast to idealistic philosophers) that the term “matter” has been, in modern science, introduced and understood in a rationalistic way, i.e. “spiritually”; hence the possibility of explaining “material” reality by general laws, i.e. rational constructs, which are the very essence of modern science. Philosophers, in their turn, joined historians and scientists in taking for granted that living beings represent mere material shapes, be it a special kind of “living” matter or just ordinary matter “organized” in a peculiar way.

The historicity of nature, discovered for the first time in the evolutionary perspective, is linked primarily and typically with living nature. It refers to history from the point of view of the transformation of body shapes, not from the point of view of allegedly “non-living” matter coursing through bodies and taking on those shapes when it builds them. Only such non-living matter could provide the guarantee of laws, from which all evolutionary events ought to be explained one day.

But the history of nature is a history of neither “matter” nor “spirit” but of soul! Evolution should be understood as the history of soul. Soul (whatever attributes we assign to it) points towards the principle of life and, at the same time, is the seat of imagination, of likeness; it is the place of their emergence and transformation, of evolution. Transformations of living forms take place in individual time; therefore the historicity of nature, as a psychical phenomenon, defies any general characteristics such as universal mechanisms, principles, laws, trends, goals etc., and all great temptations for history to be understood spiritually. This, however, does not mean that evolution is “blind”, “haphazard”, “aimless”, or indifferent to itself. Evolution is not a mere result of the action of external forces, a freak of chance, or the passive outcome of natural selection, etc. We tend to consider evolution as such for two reasons: first, because we take the evolution of life to be a material, purely physical process. Second, and more important, because evolution (as we know and interpret it) offers such an interpretation: the evolution of living forms – in contrast to
ontogeny, individual development – reveals no global characteristics, neither coordination nor synchronization of different lineages (but see Chapter 5 on horizontal communication), and still less does it reveal trends towards some common goal. The same, of course, holds for the history of humankind: the history of cultures, civilizations, languages, ideas, morals, etc. suggests no common denominator, no vocation, tendency, progress or goals, despite the enormous effort invested in uncovering, or at least guessing at, such phenomena. Undoubtedly we can decipher some misty indications of periods, stages and cycles, and the existence – but ex post only – of some long-lasting trends.

**Being from the Beginning**

Such phenomena of integrity are, however, possible to follow out of good will also in the evolution of many lineages of organisms, and also in communities inhabiting a common area – indeed, whenever we are dealing with kinship, natural community, common story, or some similar natural “corporation” that reveals the corporeality of historicity. But instead of following such a path we tend to package evolutionary historicity into a single parcel of common past, i.e. universal history, which is the least appropriate approach for evolutionary history, as “evolution” can be taken as a synonym of *physis*. “Nature” designates an entity whose essence is in spontaneous becoming; evolution of the living represents but one of the facets of nature. It follows that evolution is always a unique process, and it cannot be subordinate to any common rules or controlled by external directives, e.g. “genetic instructions” (and even less by distant goals). The reason and goal of living corporeal nature is this very living corporeal nature, the actuality of every single being. Every being, however, belongs to one unrepeatable evolutionary story, and bears witness to it. Its life is re-telling the narration, and every such story, like any being, is as old as life itself – we have never been dead, as R. Ruyer (1974) emphasized. The reality of a living being is this age-old evolutionary experience; it is its own reality, a personification of the whole lineage of progeny. This reality, experience of the lineage, is brought to the fore by the very corporeal form – likeness – of the living being. Likeness is an expression of a generic experience brought up to date by the actual body, which represents an embodiment of that story. Such participation corresponds to mutual relations of ideas (*methexis*), but this correspondence is narrative, dynamic and dramatic, not static and paradigmatic (normative) as in the case of classical ideas. Eidetic relations based in likeness mirror narrative reciprocity and narrative (mythical) entities. Their becoming is not a process of unveiling, or the embodiment of some eternal ideas (typus). This “abolition of essentialism” (E. Mayr) was brought about by the evolutionary approach. Moreover, the forms and likeness of individuals represent the presence of “the story”. They are not mere shades or vestiges, the contingent corollaries of uncounted upshots of equally random circumstances in the past – but this is exactly the picture served up by contemporary neo-Darwinism, like some rationalistic travesty of pulp Platonism. “Pulp” is meant here in the
sense that, in contrast to Platonic shadows, living bodies show no similarity to
their uncounted and miscellaneous “causes”. Their existence is of a fundamentally
different nature to all those evanescent trivialities like chemical, physical, climatic,
geological, ecological, and population processes and conditions, fluctuations and
bifurcations in concentrations, which allegedly stood at the cradle, as causes, of
every living being. “Allegedly”, because such explanations are totally hypothetical
construals – and because they are insignificant. The manifestations of life do not
point towards, and nor do they encompass, such trivial and episodic causes of their
existence; life testifies to such causes as little as do the shapes of pebbles or grains
of sand.

Such explanations do not throw light on our main concern: the living being. They
do not provide a view which would explain the origin and nature of the living. As
a consequence, the contemporary neo-Darwinist worldview presents body shapes,
living forms and their manifestations, as totally detached from the past, as arbitrary
as pebbles, clouds or waves. At the same time, however, they are typical, specific
and incredibly stable, with some of them being older than continents. They not only
point to their origin and descent as if they were records of the past, they actually
embody the past and bring it to the present! Living beings are essential in that they
are not comprehensible as present phenomena or states, but only as manifestations
of the totality of “past” experience and “future” schemes. Only as likenesses, at the
eidetic level, do they point to their origin, which in turn provides their explanation
in the form of evolutionary theory. It follows that approaches that deny living beings
their eidetic dimension cannot be evolutionary. Only with an evolutionary approach
does likeness become history incarnate, the bodily mirror of the soul; soul becomes
a history of forms; forms become embodiments of time. Evolution finally revealed
the true, natural historicity which – as a “concern for the soul” – was according to
many scholars the fate and heritage of Europe. Yet “his own did not receive him”
(John 1, 10–11). Evolution is neither “objective” nor “projective” (Monod), it is
“subjective”. What matters above all are metamorphoses of soul articulated, and
present, in the body. Evolutionary (i.e. psychic) history is internal, intimate and
unique because it is personal. Yet such metamorphoses are shared: that is why they
belong to history, in an even fuller sense than the history of humankind. Because
human history is general, abstract, and depersonalized it is difficult to build our
personal story from it.

The Turn of Ages

As the metacosmesis of the Middle Ages into modernity was accompanied by the
metamorphosis of the cosmic order from Ptolemy to Copernicus and Bruno, the
transition from modernity to the post-modern age announced itself with the cosmolo-
gy of the Big Bang. This new change in our understanding of the universe came
(in contrast to the former one) almost unnoticed. Yet it is much more fundamental.
Indeed it is so far-reaching and radical that the former change from geocentrism to
heliocentrism looks like a mere “castling” in the chess, as a tiny cosmetic adjustment. This new cosmology, quite naturally adopted by all of us, is evolutionary throughout! In its framework, not only the history of humankind and of life, but the whole of nature—the Earth, the solar system, the galaxy, indeed the whole universe—turned out to be evolutionary process. This is indeed a cosmic changeover, one that inverts the relation of Earth to the heavens, and which may be without precedent in the whole of history. Both primeval powers had been, up to the modern age, strictly differentiated, and the earthly order was always subordinated to that of the heavens, the course of earthly affairs being derived from the circulation of heavenly spheres. This can be traced back to Aristotle, who derived all beginnings and ends, developments and metamorphoses, from local movement that does not encompass change, only transfer from place to place. He saw the prototype of such movement in the rotation of the heavenly spheres, which lack even such a transfer. This “movement” was proclaimed as the base for counting time (by counting rotations). As soon as time could be expressed as a number, it was possible (after Aristotle) to define all transformations of physis mathematically, and thus to lay the ground for modern physics.

The trend was completed by the scientism of modernity, which considered both partners—heaven and Earth—to be identical. Cosmic pan-evolutionism reversed this situation: the whole universe became natural, in the sense of having evolution. Earth became a living planet inseparable from the evolution of life, and became part of the universe showing similar properties. The consequences of such a turn have still to be thought through even now.

What we already can see, however, is that our contemporary, completely unprecedented cosmic situation requires a new kind of religiosity from the standard one developed by modernity. Yes, its reputation has improved for some time with the advent of evolutionism, but this happened by an unconscious slip—and by a trick from the side of science. Evolutionism, which in fact was a negation of science, was cleverly adopted, and capital was even raised on the back of its general popularity—and then explained away by the neo-Darwinist, fully rationalist interpretation, that reduced evolution to a matter of chemical combinations. After this move, as we have seen, biology finally acquired the status of objective science, but at the price that it relinquished the possibility of offering an explanation of life, and like other sciences lost its relation to natural experience. The attempt at reformation was thus eliminated, even though “popular Darwinism”, traditional evolutionist iconography and catechist mythology has survived to such an extent that, paradoxically, the belief in evolutionary myth is even today taken to be a true exemplar of the scientific approach, as a true emblem of rationality! Ironically, “scientific creationism”, requesting that science be rational and consequent, is labelled as obscurantist and irrational. Darwinists are right that scientific creationism represents an outbreak of fundamentalism, but we add that this is scientific fundamentalism, not religious. Contemporary science, then, is unlikely to become the resource from which the new religiosity will spring.

Christianity—the religion of incarnation—also wasted, for incomprehensible reasons, the unprecedented occasion and did not support, or even tolerate, evolution.
For 150 years we have been following irrational clashes with no true outcomes – truly a vicious circle.

**Ecological Order**

We witness today the arrival of a novel attitude towards reality, one which no longer has the character of alienated rational knowledge, for which the world was only a passive givenness or a utility item. Science has ceased to be the highest instance of truth, and has become more and more just a mere supplier of useful knowledge, know-how, and commodities; after all, nowadays she herself defines her task as such. The highest administrator of truth has thus turned into a real estate agency trading with objective reality. As such, science must see how to turn a profit from such services. Such a subordinate position, however appreciated, will no more elicit the unchallenged respect science once enjoyed like any religious institution. The sacred stays beyond the criteria of profit, expenses, demands and bids. On the other hand, the idea of evolution, tolerated by science as far as it justified and supported her sacerdotal, prophetic and reigning vocation, enjoys general attention (as can be seen from continuous polemics) and may one day claim a status independent of science.

Reality is our partner and we begin to feel like an organic part of her; we belong to the same story or “sitcom”. Such has been, from the very beginning, the heritage of evolutionary thinking. Now we also realize that we are not only an outcome of evolution but also its active participants, and we begin to feel our responsibility in such a role. This emerging cosmic order deserves the name “ecological”, to stress our attitude to the world as our home (*oikos*), and not only a place of appearance, a place set with furniture, a place claimed or even conquered. An ecological stance means awe and respect, calls for solicitude and uplifting, and calls for esteem; in a word it calls for culture. Our belonging to the world is rooted in natural religiosity: *Re-ligio* means roughly “feedback”, reciprocal ties and mutual respect, and the establishment of an atmosphere of intimate cohabitation and of an understanding community of those who belong to, and together develop, a common plot.

An ecological order of the world resides in the knowledge and recognition of the fact that natural reality and natural experience are disposed similarly. Ecological knowledge, in contrast to objective knowledge, seeks not facts but assurance, not testing but confidence, which is a personal communion that evolves and opens new spaces of reciprocity. To be “at home” in something means to make such a “something” one’s home and provide a home for it; to enter with respect the worlds of other beings and render them home, and to allow their reality to enter one’s soul. Until now, scholars and researchers have, by their thoughts, changed the world; it is time, by changing the thinking, to understand the world.

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18 Those who continue to maintain entirely objective and rational stances, do not in fact defend an evolutionary stance: they defend what science prescribes them to believe.
Certainly one should understand the concerns of fundamentalists – both scientists and creationists – confronted by the rising wave of “irrationality” (if by irrationality is meant the alluring post-modern drive towards resignation regarding any binding and useful matrix of relations which allows one a safe orientation towards experience). We share their misgivings when we encounter the view that knowledge cannot be based in reality, or that knowledge does not tend towards truth, when we see a blasphemous denial of reason and contempt for rationality, or indifference, even mistrust, regarding any transparent, reliable, authentic and unified system of connections (laws) requiring discipline, responsibility and training. On the other hand, when we adopt their perspective we feel threatened by what appears to be the aggressive furthering of an uncritical rationalism, to the exclusion of natural wisdom. Stressing the priority of scientific rationality narrows and endangers cultural traditions, as well as general erudition, versatility, and the confidence in the credibility of one’s own experience.

Rationality is a virtue and a competence; it is an instrument of soundness; it is inseparable from human nature. We should therefore distinguish it from rationalism, a doctrine that reduces rationality to only its instrumental facet and accepts as factual only what satisfies the single rational system that is acknowledged at the time (what escapes it is unreal, untrue, mistaken). Natural rationality, on the other hand, admits plurality (a “transversal intellect”); it is therefore a manifestation of common sense. It allows for a being to be informed in multifarious interconnecting ways, leading to manifold experience. It allows the transformation of such experience into a sensible whole. In contrast to stern “ratio”, with its unscrupulously consequential logic (according to the rule *fiat iustitia – pereat mundus!*), common sense is not only “reasonable” but also sensible and wise, i.e. enormously disposed to understand. To be wise means to have an understanding that interconnects things, experience, and ways of unification, and every such system is internally consistent and coherent, yet incompatible with every other such system. None of them may be wrong, yet neither can claim to possess some exclusive, superior knowledge. Take an analogy from the realm of the living: amongst the plethora of biological species none is more truly right and genuine than any other, and the same holds for lineages and their trajectories. Yet again and again we witness efforts to explain evolution as being directed towards a single final form, towards a single and perfect life-form, even though such efforts violate the very principle of evolutionary thinking (Conway Morris 2003). Similarly, species diversity and their multidirectional trajectories are considered by many to be but many appearances of one single evolutionary principle, of the “evolutionary mechanism” or “algorithm”. Such beliefs belong among the fallacies of rationalistic science to be associated with the belief that scientific knowledge tends towards some single, complete and final truth. It seems that such fallacies prevail in contemporary biology as kinds of regress, as the reaction of scientific and religious fundamentalism that feels endangered by the twilight of the modern age.
Reality is impossible to ascertain from two or more stances at the same time, just as it is impossible to concentrate simultaneously on more than one angle of view (either we observe a snowfall, or single snowflakes), or to observe the same thing from more directions. Such a banal statement, however, does not testify to the relativity of truth, but to the fact that truth represents a relation, a way of looking at and comparing. Truth is not an object that can be seen, and it is not possible to compare different truths or put them into mutual relations.

Only *objective* truth gives the impression that it represents a subject. This could happen only because the modern age supposed a central viewpoint to exist in God, the universal, omnipresent, omniscient and almighty spring of all reality and all knowledge. His view encompassed everything because everything belonged to His perspective; nothing remained hidden behind the horizon or obscured by inwardsness.

“Wisdom is power”: identifying omniscience with knowledge of all alternatives meant that whatever was *logically* (i.e. valid in all times) admissible was for the Almighty intelligence also real. Such a universal focus of knowledge turned everything else “insane” and rid it of its individuality and subjectivity. Science robbed this peculiar construction of God of its perspective, and adopted the same god-like position for itself. This is why the order of objective reality has supposed and demanded uniform rationality and proportionality. The rationalism of science – insisting on the existence of a single and general system of relations – expresses this request for a single perspective of the scientific worldview, ensuring universality of views and commendations. Rationalism is a guarantee that whoever looks at whatever, will be looking, in the end, at the same thing: rationalism excludes discrepancies and paradoxes and represents the promise of a common and universal goal. Yes, objective reality is eschatological: the very beginnings are about the end and possibilities merge with necessity. Objectivity has no degrees of freedom; its very nature excludes alternatives; in its frames it is indeed necessary to insist on the explanation of “how the things are in reality” – well, they can be in one way only. The eschatological mission of science lies in finding out which of the possible universal projects is real, excluding at the same time all the rivals. Moreover, eschatology also incorporates a confidence that the exclusivity of a single view of the world can be proved. Traditional science therefore turns down any possibility of plurality of reason, or even evolution and thus change of the overall scheme, for it is self-evident that any change in relations brings forth contradictions into relations already existing, and perforce such a change – evolution – must be irrational.

The infallible world of rational science has gone, however: we are witnesses to a deep metamorphosis in the comprehension of reality. The fear of fundamentalists, having lost the firm ground, is understandable, but it would not make much sense to share their eschatological panic.
The Archetypal Essence of the Clash

From the vertiginous perspective of contemporary changes, the two parties of the clash – rationalist creationism and mythological evolutionism – have ceased to be viewed as irreconcilable enemies. Rather they represent two competing projects of reality, each seeing it from its own standpoint, from different dimensions of the same experience.

The two stances are by no means independent or indifferent to each other, and their clash was not caused by mere historical contingency, since from the beginnings of Western civilization they have come into conflict (see Chapter 1). The two views of reality – a created state or the outcome of evolution – do not simply represent two different worldviews that, once the historical pretexts are over, can peacefully coexist, in mutual ignorance – or even politely regarding each other.

Many take this naive stance when regarding the conflict as an encounter between religious tradition and scientific progress, i.e. between ethics and knowledge, and interpret it as the difference in subject: between that which should be (the ethical view) and that which is. The advocates of such peaceful solutions usually do not take into account the fact that neither party in the dispute is willing to go to the pains of learning the basic truths held by their opponents – or even the depth of their own position! The proponents of evolutionism (old and contemporary) obviously have not realized just how deep an epistemic turning point was caused by the advent of evolutionary ideas. Otherwise they would easily recognize their ideological opponents for colleagues! Tolerant, accommodating, and impartial bystanders then take the whole clash as an unhappy misunderstanding. They do not recognize in the two views two cosmic (i.e. not particular – scientific or humanistic) appearances of logos. They do not suspect that the barricade is erected elsewhere – between a rational, conceptual worldview and an irrational view of the world as creatio continua, forever evanescent as regards objective knowledge.

Thus from the very beginning the point at issue concerns two incommensurable and mutually opposite positions. The whole conflict symbolizes something much deeper than contingent quibbles about evolution, creation, science, religion, etc. Both positions lie, from the perspective of the opponent, over the horizon, yet both creationists and evolutionists face the same horizon – only from opposite sides!

The antithesis that creation and evolution represent goes to the very roots of lived corporeal existence, i.e. to the heart of life. Life represents, in the unity and complementarity of creation and evolution, the “unity of antinomies”. True bodily form, likeness, is here “from the beginning of the world” – i. e. from its own beginnings. Before, there was no world for that particular likeness; it contains its own beginning together with the beginnings of all its ancestors. The Linnaean dictum species tales sunt, quales ab initio creantur can be paraphrased as “likenesses are such that they create themselves from the beginning”. Each being is rooted in its beginnings, it is an endless beginning . . . Each being is a cosmic focus, from which the world emanates in concentric waves of experience, and to which the world concentrates.

The human being is also such a self-cultivated unity of antinomies, which pulls it towards self-reflexion and self-awareness. One facet of such wrangling is portrayed...
by the clash of “evolution vs. creation”. The vehemence with which it has been pursued from both sides is telling, as is the stubbornness, with which it returns – despite being many times overcome and rebuffed – in more or less identical stagings and forms, for increasingly trivial reasons and arguments that become more and more superficial.

It is eloquent just how little influence is exerted by all the revolutionary discoveries and beautiful facts that have been assembled by science in support of the evolutionary theory. Should we not, then, express doubts about the very subject of the clash? What actually is the topic of the disputation, and is it the same “what” that it was at the outset? Does not contemporary biology face the challenges of creationism so confusedly because this “what”, which when it first announced itself as the idea of evolution enabled great achievements, was later abandoned and suppressed, i.e. the “what” of today is not but a surrogate? As a consequence, biology sheepishly and clumsily pays a lip service to something that was abandoned, and in the meantime silently and subconsciously accepts what the creationists have proclaimed aloud.19

The essence of the argument is, however, not to be sought in proclamations. The idea of evolution arose as a vision in the heyday of the modern age, when scientific rationality reigned. The idea put up its hand in the name of this very rationality, even when it was a revolt against it. It proclaimed itself as real in the sense of “objective reality” and brought liberation from the reign thereof. It did not come to lift the law but to fulfill it, but also introduced independence to the law. It came uninvited and unexpected and in science it was unwelcome and unwanted. It entered our world to help resurrect the natural world of people. The official, established world of objective reality did not accept it, but those who received it welcomed it with enthusiasm – it revealed the vanquished aspiration slumbering in the shadow of blind mechanism and eternal, indifferent laws.

The recognition of space marked the beginning of the modern age, while the recognition of evolution announced its decline, in both science and Christianity. Infinite geometrical space was envisaged by Bruno as an image of the spiritual truth of God as postulated by Cusanus. The mathematized form of space cannon-ized by Newton retains its divine attributes of absoluteness, infinity, immutability, etc. Such a God is absolutely transcendent to the world (an apathetic, omniscient and omnipresent observer) and gives Himself in the world as totally absent.20 Even this residual, defective divine presence, however, was not purposeless: the unpre- sent being of God justified the rational nature of the world – the world became open for rational knowledge, nature received the status of objective reality, and thanks to this, all necessary and sufficient preconditions were fulfilled for the appearance of modern science. Advocates of science therefore stood up in the name of religion

19 Experts who allow themselves to be pulled into the discussion often suffer, because they realize that what they must defend publicly, “in fact”, is but a marginal aspect of their own area of research: their science is elsewhere. It never occurs to them that disgust over their uninformed opponents should apply also to themselves.
20 The unwilling founder of this “theology of the death of God” was B. Pascal.
to defend that residual existence of God even when they otherwise, and before that
time, did not care about Him at all.

Hence, the evolutionary idea suggested first that the “deficient theophany”
described above may not be the final solution. What followed was “physiophany” –
revelation of Nature – and it surprisingly and paradoxically appeared in the frame of
scientific discourse rooted in the theophany of rationalism. Nature revealed itself in
the guise of a scientific evolutionary theory, thereby claiming an objective status for
evolution. Such a scientific disguise cleverly covered the mythical content, but this
very content was the source of the liberating appeal of the new teaching – and hence
the emotional charge of all those learned debates. And this very decadent form of
the debate helps finally to unveil the mythical nature of rationalism – to reveal the
theological basis of objectivity.

But times are changing, and at this period of transition the old clash has come
to life again. However, from the new perspective we can perceive that now the two
participants represent not two words but two different positions before the hori-
zon, each summarizing the living reality in a different cosmic whole. Both forms of
knowledge encompass reality without any limit: the natural world has no limits and
no boundaries of validity.

Evolutionary teaching did not bring forth a revolution of the kind that evolution-
ists have dreamt about up to the present. The ongoing argument, as already men-
tioned, reveals something much more important than a mere paradigm shift. Today,
paradigms can coexist without mutual exclusivity, and enable different worldviews
to be adopted according not only to the nature of the scholar but also to the nature
of the area studied. In such an ecology of paradigms and ideas each explanation can
find its niche. If in spite of this we observe a long-lasting argument between dif-
ferent stances, such as the dispute between creationism and evolutionism, it means
that both belong to the same world, the same niche, and that their horizons must
somehow coexist.

The War of Giants

The arena of this combat is the world of Man, and the whole prolonged, seemingly
fruitless and meaningless drama expresses something crucial for the human condi-
tion. Something more fundamental emerges, to do with questions about ethics, truth
and belief. Undoubtedly such questions are of utmost importance, but (alas!) they
were improperly formulated. The comical dimension of the whole story leads to
an assertion that the true nature of terms like religion and science, belief and truth,
knowledge and revelation, has been totally ignored for a long time by the learned
world. The Nietzschean “last man” compensates for his lack of lived experience by
making embarrassingly naive projections and metanarrations. Otherwise he would
notice that Christianity has long been not a religion of today, but one of yesterday
or before-yesterday; that it has turned into a folk lore serving as a cover-up; and that
whereas true religiosity is represented by science, which at the time of the arrival of
evolutionism was at its peak. It is possible that the diplomatically brilliant but religiously hypocritical disguise of the schism in science brought about by evolutionism led later to a crisis and the death of scientific religion.

Rationalist fundamentalism found its support in a personified spirituality, in a concept of God as a spirit. But spirit (i.e. breath) is the least reliable pillar for what wants to remain unchanged and reliable. Such a god is dead as a spiritual concept and reigns only in the “other world”, i.e. in the lifeless world of objectivity. Hence age-old ignorance did not recognize that the whole dispute takes place inside religion, on the slopes of Mt. Olympus.

The frontline, however, runs across us humans; and around this line the wholeness of our nature must be maintained and fought for, in the tension between two images of logos – narrative and rational. Such a double understanding and inhabiting of the world through logos, through narrative and explanation, is a specifically human way of handling the Janusian nature of life. Evolution gave a new name to naturalness, and the clashes she evoked represent a fight for the human way of being; it is a welcome opportunity for Janus to show his second face again, after the age-long suppression by dualism, deism and objective realism.

In the newly emerging world it turns out that the alleged “Biblical story of the creation of the world” is not a cosmological myth, i.e. a story about the origin of the world, but a presentation of the world’s ecological plan, the order of the whole in the sense of its correspondence, its *eidetic communication*. This is the prerequisite for the birth and continuous creation of nature – for *physis*, as a feature delegated to the world (earth and water). It is also a prerequisite for understanding the place of humans in the world, via logos.

In just this way – through explanation and as a cosmological myth – Biblical revelation is relevant as well as revealing, because it speaks from the very core of human existence. A human being, not speaking of other creatures, does not consider itself the product of some external agency – even if that agency is the “Creator”. It considers itself as an autonomous, responsible, authentic *creature*, as a being encompassing all forms, and as an *event* encompassing all creatures. A human being is its own purpose – as formulated in the Kantian ethical principle.

In contrast to the Biblical explanation, evolutionary teaching presents a genuine narrative. It is evolution that presents the world and human condition in it in the form of a narration – as a comogonic myth. “We think in stories” says G. Bateson, and this is why evolutionism brought, compared to the usual rational explanations, so welcome a change. Yet humans do not understand their situation from just their biological past, no matter how much such narratives are useful for understanding their overall setting in the world’s story, the role they play in it or how they are related to the plots realized by other beings. The nature of the origin – chance or necessity; from apes or not; by the word of the Creator and His reasons for doing so – lie beyond the horizons of our world. We can learn something from the holy books of theologians and from the monographs of biologists, but we shall not truly know.
Part II
The Region Life

Emergence of Pattern

We can assume a primordial form, from which all living beings develop. This progression was not straightforward; it took place along many pathways. Each such lineage produced, again and again, new evolutionary branches into many directions, thus establishing a tree-like branching pattern. All subdivisions of one branch could combine with shoots of other branches, often distant, or of higher or lower rank; and such mergers gave birth again to new outgrowths to numerous directions. All such branching has, however, preserved a certain similarity between organisms and their parts; which allows recognizing their origin from a common primordial form. But some similarity between two forms does not allow a conclusion that the higher form evolved from a lower one. Such a similarity can also emerge between two forms originating on two unrelated branches, through a coalescence of their sprouts bearing the forms in question.

Treviranus 1831–1833, Vol. 1, 29

The slogan of the second part of this treatise should read: life is communication at all levels of description. As a consequence, ontogeny as well as evolution is the result of the interpretative efforts of life itself, not of physical processes driven by external forces or pre-programming (Kauffman 1993, 2000; Maturana 1980; Markoš 2002). This premise will serve to oppose two common understandings of the living: as the embodiment of eternal principles, or as the interplay of external environment and genetic code. If the term information means more than a measurable quantum of bits, it cannot be otherwise. But the biological playground looks cohesive only thanks to the great efforts of the community of biologists; life itself, undisturbed, plays quite another game not constrained by boundaries built by them. To illustrate our thesis, three examples of life’s approaches will be developed. All have a com-

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1 Part of the ideas developed in this Introductory part, have appeared in Markoš et al. (2007).
mon undercurrent in the horizontal\textsuperscript{2} means of meaningful communication that exist among living beings, i.e. in their cultural, eidetic, dimension. We have deliberately left out communication processes in human societies, where the horizontal flow of information between living beings is self-evident.

In Chapter 5 we look at the planetary internet of bacterial biosphere; indeed we have a short excursion towards the “body of Gaia”, the bacterial superorganism. The aim is to show the bacterial world in a Gaian perspective, as a single planetary being (Markoš 1995, 2002).

In contrast, Chapter 6 dwells on the centuries-old problem of homology in multicellular eukaryotes. Are living beings similar because they “crystallize” according to common principles, as supposed by old morphologists? Or is their similarity rooted in their shared predecessor, and if no such founder exists, then is such similarity but the result of mere chance, homoplasy? Or should imitation be listed amongst the basic characteristics of life?

In Chapter 7 we touch on another problem, which is epitomized by the slogan evo-devo and the interpretation, usage, of genetic toolkits to build bodies typical for the lineage. After all, bodily structures have their forebears not in ancestral structures, but simply in undifferentiated unicellular germs (zygotes or spores), who can be considered as the readers of the genetic message, not machines executing programs. What is inherited is not body structures, but capability, the power to build them. Where does such power reside, and how is it transmitted?

All three designs point towards a precarious realm where meaning dwells. We would like to show that understanding of the living is impossible unless we succeed in smuggling – somehow – the concept of meaning into biology. As a prerequisite to this, we believe, first, that understanding one’s own condition is the very prerequisite of being alive. Second, it is necessary that a living being is able to distinguish its partners in the biosphere and to establish contact with them.

We have coined the notion of hermeneutics done by the living, which contrasts with the approach that treats living beings as mechanical devices that do not care at all about their existence (Markoš 2002; Markoš et al. 2007). We would like to demonstrate the incessant operation of symbolic (horizontal) communication networks at different ecological levels – starting with the cytoplasm viewed as an ecosystem of proteins, through multicellular bodies of various complexities and origins, to various kinds of symbioses ending at the level of a planetary communication network. First, however, we should pay a tribute to M. Barbieri and his book \textit{Organic codes. Towards a semantic biology} (2003), which is a good point of departure for our investigations.

Words like \textit{understanding} or \textit{meaning} are quite tricky; recall Lotman’s statement from Chapter 2 that any message can be treated either as a code or as a text, depending on the receiver. The difference between these approaches, and their potential,

\textsuperscript{2} Terminology: “horizontal transfer of information” means transfer of information between contemporaries (synchronous transfer) – in contrast to “vertical”, i.e. diachronous, hereditary, trans-generational transfer from ancestors to descendants.
can be appreciated by comparing Barbieri’s approach with those of ours. The discussion will touch also the problems of biosemiotics (see also Chapter 3).

Semiotics, as hermeneutics, is concerned with extracting meaning. With biosemiotics, several questions immediately arise: who is those who understand, and how do they understand? The most obvious answer, “living beings”, is not satisfactory as it is the “null hypothesis” that should be proved by reasoning that follows. Such an answer would sound very suspicious in contemporary biology in any case, rooted firmly as it is in the “laws of physics and chemistry”, where, as we have already seen, the basic property of the objects studied is being lifeless, inert, and submitting to rules given from outside. ³

M. Barbieri raised a conceptual and lexical scaffolding to support such a biosemiotic discourse. A code can be defined as a set of rules that establishes a correspondence between two independent worlds (like, e.g., the Highway Code, mediating between the rules of traffic and the mind of the driver). Such a set of rules does not follow from the material (physical, chemical, connective) properties of the system: it must be either negotiated within that system, or imposed from outside. As no external conscious agency issuing the code is conceivable (the rule-giver, such as the Department of Transport in case of traffic codes), we are left with internal settings. Accepting the existence of true codes (in addition to matter and information), i.e. rules given by historical conventions, gives biology a new, reliable basis, a platform for putting known things into a new perspective.

Up to this point we have been operating at the level of standard textbooks. The problem of the origin of the genetic code was acknowledged soon after its discovery in the 1960s; it was usually considered to be a historical “frozen accident” awaiting explanation from either a classical “physicalist” or “emergentist” position. Whole cohorts of prominent scientists have devoted their careers to the problem. To locate Barbieri’s approach, we should provide short characterizations of both the approaches mentioned. Physicalism distinguishes one, basic level of description of the world, from which all its features can, in principle, be deduced or computed. In the 19th century, the level of molecules (or better, atoms) and their motion was considered to be such a subject (hypokeimenon), with all other levels of description being but epiphenomena fully explainable from that basic level: “Nevertheless, if our methods only were sufficient, an analytical mechanics of the general life process would be possible. The conviction rests on the insight... that all changes in the material world... reduce to motion. Therefore even the life process cannot be anything but motion. But again, all motions may ultimately be divided into those which

³ As a next step, many authors (especially American) started the vice of using the word “biology” for the science as well as for its object, i.e. life. Take, for example, a sentence randomly taken from recent literature: “This move would make all of biology [sic! life] a manifestation of an inner vitalist drive; and that claim is inconsistent with the practice of empirical biology”. Or a similar example: “Embryologies [sic: embryological developments] are kaleidoscopic, in the sense that mutations may produce complicated effects. ... Mutation is filtered through the existing process of embryology”. Such inconsistencies obscure the whole field and give rise to the feeling that all aspects of life are dealt with in the realm of the biological science (Markoš 2009).
occur in one direction or another along the straight line connecting two hypotheti-
cal particles. Therefore even the process within the organic state must ultimately be
reducible to such simple motions. This reduction would indeed initiate an analytical
mechanics of those processes. One sees therefore that if the difficulty of analysis
did not exceed our ability, analytical mechanics fundamentally would reach even to
the problem of freedom of the will.” These words of the German physiologist E. du
Bois Reymond (1848) would be signed by many even now, despite the fact that in
physics the idea of such a basic level was abandoned long ago. Elementary building
blocks with such-and-such properties from which the world is “composed” – such is
the ideal of physicalists. We actually don’t believe in the existence of such abstract
monsters today, but in a weaker form they can be found everywhere – e.g. amongst
advocates of genetic determinism of many sorts, for whom all properties of a living
being are somehow written down in the sequence of bases in DNA.

Emergentism is an heir of another tradition – of the dialectics of Hegel, Feuer-
bach, and Engels – and is nourished today in science by areas like non-equilibrium
thermodynamics, self-organized criticality, or psychology. “Emergence [sic!] is a
view that new and unpredictable phenomena are naturally produced by interactions
in nature; that these new structures, organisms, and ideas are not reducible to the
sub-systems on which they depend; and that the newly evolved realities in turn exer-
cise a causal influence on the parts out of which they arose.” (Clayton 2004)

Because based on dialectics, emergentism usually recognizes a hierarchy of
newly emerged qualities on the “ladder of progress” from elementary particles
through molecules up to biosphere (in psychology, consciousness or even noo-
sphere). Other authors will speak of “causal domains” (Havel 1996) with no recog-
nizable hierarchy; Prigogine (1980), Prigogine and Stengers (1985) speak about the
mutually influenced triad “atoms – thermodynamics – macroscopic patterns”. What-
ever the system in question, its domains are strictly causal: a random movement of
gas molecules will, under certain conditions (thermal gradients etc.), produce, with
such-and-such statistical probability, the emergent phenomenon of a tornado. The
vortex, once produced, will follow such-and-such hydrodynamic laws, be it here,
on Jupiter, or elsewhere in the universe. Such a lawful, predictable behaviour of
emergent phenomena is the necessary precondition even in domains which would
appear for the first time in the existence of the universe (e.g. micro-processors or
consciousness); only then can they be adopted into the realm of science.

We see that complexity science will not lean out from safe Cartesian science
where everything is ready and clear – if not for us, then surely for some brand
of a Laplacean demon. There is no room for the idea of law as mere negotiated
habit, as defined in Peircean semiotics. Hence, emergence is not the kind of nov-
ельty we discussed in Part I, for it is understood as the appearance of some structure
which is “constructed” as one of astronomical numbers of possibilities already and
everlastingly present in the virtual world of mathematical combinatorics. Emergent
structures are not novel, they only surface, come up from the virtual where they
have dwelt since the beginning of ages; they are embodiments of mathematical con-
structs, not creations of physis. Thanks to the astronomical number of possibilities
involved it is true, however, that such embodied structures emerge indeed for the
first time in the whole existence of the universe; in this respect they really represent genuine novelties, albeit in a different sense of the word. Such “novelties” are different from true historical, evolutionary events as discussed in Part I: the advent of dinosaurs or, say, the Russian revolution, or, for that matter, biology, are novelties of a different kind than those discussed in the science of emergence.

This interlude devoted to physicalism and emergentism has been necessary in order to identify the key point in Barbieri’s system: there are no virtual rules given in advance to the domains emerging in the evolution of life – such rules are negotiated within such domains, and necessary preconditions for their existence include memory, development of codes, historical experience, ways of processing this or that piece of information, interpretation of newly occurring data and situations, etc. Once again: domains as defined by emergentism (flames, vortices, clouds, stars, galaxies, etc.) will pop up (with such-and-such probability) whenever favourable conditions are met for their coming into existence. In contrast, phenomena like cells, viruses, mammals or antibiotic resistance result from genuine evolution, and their coming into existence is a question of changing the very inventory of the universe. They represent singularities that change the “state space” and cannot be foreseen even in principle, irrespective of statistical considerations (see Kauffman 2000). We can model their behaviour – and we do so – with physical and emergentist approaches, and can learn a lot from such work, but we are not able to create them de novo.

Let us follow Barbieri’s argument in the domain of basic information-processing events in the cell: DNA replication, transcription, and translation. The first two processes deal with the copying of DNA into DNA or RNA, respectively. Basic chemical rules essential for the process can easily be recognized: they relate to the affinity of nucleosides (A-T, G-C, A-U). Replication and transcription are simply chemical reactions, albeit taking place in highly structured environments. Not so for translation: here the code connecting nucleotide triplets with particular amino acids is not chemical, but arbitrary, it is embodied by the set of tRNAs and of enzymes called aminoacyl: tRNA synthases – the code having been established in evolution. The same holds for enzyme catalysis and enzyme regulation, for cellular and extracellular signalling pathways, for morphogenesis, for language, etc.

The key point here is information: how to recognize it and how to extract meaning from it. To be utilized, argues Barbieri, information (taken, for the sake of simplicity, as a string of letter-signs, e.g. “0” and “1”) requires also a memory matrix equipped with a set of rules (codes) explaining how to handle the string. Such a memory resides in bodily structures inherited maternally – i.e. not in the form of digital, virtual information; its structural transformations are functions of species-specific conventions on how to handle affairs. The memory with its codes is the third factor – besides genotype and phenotype – that enters into the game, mediating between the first two. At the molecular level, then, genotype is represented by the reading frame in nucleic acids, phenotype by the protein coded by the frame, and the third factor is the ribotype which indeed is a prerequisite for the transformation of coded information. Such triads can be demonstrated at any level of description; phylotype, discussed in Chapter 7, can also be understood as the third factor, mediating between the embryonic and adult form. Meaning is what comes out of such a ternary
interplay: “Meaning is an object, which is related to another object via a code” (Barbieri 2003, 5). This suggests that hardwired codes are not a derived situation but the very basis of meaning. Of course, this is a very technical use of the term, but as we shall see, it enables Barbieri to remain in the realm of natural science. More sophisticated usage of the term meaning, however – as intention, purpose, spirit of the told (or written), interpretation, signification, etc. – would point towards the conclusion that meaning cannot be the subject of any coding table or context-independent rule. But such a modest design of his theory (as concerns meaning) allows Barbieri to define life as an activity of “artefact making” – and still remain in the realm of biology. Strictly speaking, his theory is not semiotics, but semantics, and semantics is, or can be developed into, an objective, logical science with clearly stated codes, code-translation matrices, and rules (grammar). Semantics can be a matter of the computer world with its hardware and software, or even the world of Jacquard weaving looms with their punched cards. Contraptions of this kind have a meaning imposed from outside, and all their doings and outputs will reveal meaning only for the users and makers (of machines and of programs). Moreover, as coding systems are supposed to be – even should be – complete, a problem arises for ontogeny: how to reconstruct, in real (and very short) time, the enormous burden of coding systems implied in, for example, morphogenesis or learning a language. We shall not go into such problems, but we acknowledge that Barbieri has erected a solid platform – within biological sciences – for approaching some problems not previously within biology’s reach.

According to Barbieri, the platform could have evolved by bottom-up evolution, from simple molecules. Yet we consider the result – agents moving on the platform – to be robots, or zombies, rather than genuine living beings. Beings dwelling in this realm resemble the Heideggerian (1995) “world-impoverished” creatures we met in Chapter 2. The world is withheld from them, they are simply driven, taken and held captive by forces that are forever foreign to them; they can never truly comprehend the world. Their communication is not speech, because “To speak to one another means: to say something, show something to one another, and to entrust to one another mutually to what is shown. To speak with one another means: to tell something jointly, to show to one another what that which is claimed in the speaking says in the speaking, and what it, of itself, brings to light.” (Heidegger 1982b, 122)

As we explained in the previous part of this book, we would like to see living beings speak. We chose therefore a top-down approach, starting in hermeneutics, and hoping to be able to land safely on Barbieri’s platform and thus connect both realms of knowledge – science and meaning. We proposed in previous chapters that meaning, evolution, morphogenesis, imitation, mimicry, pattern recognition, understanding signals, patterns, or symbols found in other beings, the ways that lead evolution into new dimensions, creative invention of novelties, etc., represent facets that are an integral part of the bodily existence of living beings. These are beings who care about their being, and who maintain uninterrupted corporeal lineages from the very beginnings of life on our planet. They unite the extant biosphere into a single, dynamic, semiotic space, which is kept together by the mutual interactions and experiences of all its extant inhabitants. Hence, the codes sensu Barbieri are,
in our view, negotiated “from above”, from shared language(s), as a useful tool for automating activities that can be relied on, that need not be negotiated all the time (like translation on the ribosome, or the walking of a healthy person). Negotiation means communication with... – with whom? With sexual partners, with bacteria in our alimentary tract, with colleagues abroad. Communication allows equivocality, defocusing of all phenomena and all forms of reference to them, to precipitate from the field of possibilities, sometimes as well-entrenched patterns, sometimes as genuine novelties. At the same time, the existence of this superposed and commonly shared sphere or field allows mutual games of understanding, misunderstanding, cheating and imitation at all levels of the biosphere, e.g. the precipitation of actual versions of the fit – in Darwin’s usage of the word.
Chapter 5
The Living Planet

SCHOLAR: You spoke of ‘a’ region in which everything returns to itself. Strictly speaking, a region for everything is not one region among many, but the region of all regions.

TEACHER: You are right; what is in question is the region.

SCIENTIST: And the enchantment of this region might well be the reign of its nature, its regioning, if I may call it that.

SCHOLAR: It seems a region holds what comes forward to meet us. [...] So the region itself is at once an expanse and an abiding. It abides into the expanse of resting. It expands into the abiding of what has freely turned towards itself. In view of this usage of words, we may also say ‘that-which-regions’ [Gegnet] in place of the familiar ‘region’ [Gegend].

Heidegger 1966, 65–66

Some years ago, in the 1980s and 1990s, we witnessed a heated debate around the Gaia hypothesis as proposed by J. Lovelock (1975, 1990). The fuss was nourished by the fact that about the same time the “selfish gene” concept announced itself in neo-Darwinism. The two views could not be more remote. If we want to show in this book that one of the basic features of life is “being-together”, we should devote a chapter to the Gaia theory, especially when – as we believe – the Gaian mode of affairs has prevailed throughout the history of life.

The basic idea of the Gaia theory is that processes taking place in the upper layers of our planet – atmosphere, hydrosphere, lithosphere, and biosphere – are so closely interlinked that to speak of one of them without reference to any of the others is practically impossible, and moreover such an interdependence must have started very early in the history of the planet.

Thus Lovelock argues that the composition and maintenance of all three “inorganic” layers is the result of life’s activity: hundreds of metres of sediment, the salinity and composition of the oceans, atmospheric gases and their dynamics, ores, perhaps even continental drift, circulation of whatever component (except, perhaps, volcanism), the temperature of the Earth’s surface, etc. – in the whole manifold of such parameters life works as a causal force, catalyser, and maintenance crew. To describe just three examples:
(1) The luminosity of our star has increased by one third during the last 4 billions of years – yet Earth surface temperature has remained in a narrow interval of about 50 degrees centigrade, where water remains in a liquid state and is not too hot for life to teem. It is life, argues Lovelock, that delicately regulates the percentage of greenhouse gases in the atmosphere and the planetary albedo. Moreover, if we take the uninterrupted lineage of life from the very beginnings up to the present for granted, then life has accomplished the miraculous task of being able to maintain the planetary thermostat throughout vast time expanses – and never fail at the planetary scale. Compare the conditions on Earth with the extreme temperature conditions found on the nearest planets and one gets a sense of the task, and of the stakes should such thermal regulation ever fail! One can also recognize and appreciate the enormous amount of work involved in re-working not only the atmosphere with its greenhouse gases, but most of the rocks, sediments, chemical composition of waters, regimes of weathering, etc.

(2) It seems that the oxygen content in the atmosphere has remained constant – at about 20 per cent – over the last 500 million years. This period corresponds to the age of animals – and animals would not survive were the level of oxygen to drop below 13%. At the opposite end of the scale, if it reached about 26%, every lightning strike or spark would cause catastrophic fires across whole continents – even in rain forests! Lovelock shows how delicately the optimal level is being maintained within quite narrow limits, by the burial of organic carbon, sulphate respiration, and many other processes.

(3) The banal fact that it is raining (or snowing) at most locations on the planet is not a result of some automatic “inorganic” process. Clouds and raindrops can arise only in the presence of great numbers of impurities in the atmosphere, which act as condensation nuclei. In a pure atmosphere, water would remain in gaseous state up to enormous level of hypersaturation, with extreme downpours occurring from time to time due to random instances of atmospheric pollution (e.g. from a volcano or as a result of tornadoes bringing dust and aerosols to higher atmospheric layers). Lovelock has shown how the production of condensation nuclei and clouds is primarily governed by oceanic plankton producing gaseous dimethyl sulfide on the one hand, and by the covering of continental rocks by vegetation on the other.

We are not going to go here into the elaborate arguments and models, and enormous bodies of data, and could be discussed in this context. Instead we shall look briefly at two crucial debates that have moulded current views of the topic: the nature of cybernetic feedback loops and criticism of the Gaian concept from the neo-Darwinian position.

**Feedback and its Embodiment**

An enormously complex Gaian system working far from thermodynamic equilibrium and maintaining its steady state for long periods of time will constantly tend to escape into two regimes which are much more probable than other states. One is represented by burn-out, followed by a quiet death in thermodynamic equilibrium. Such is the surface of Mars: spontaneous chemical and physical processes came to their
end long ago, and whatever activity we observe on the planet can be explained by the passive reaction of the surface to the circadian and/or seasonal changes induced by solar irradiation. Whatever energy goes in is quickly expelled into the space again, without having any more profound effects than heating rocks and driving atmospheric circulation. Not so in the case of our planet: before incoming solar energy is allowed to escape it is canalized into myriads of working cycles such as photosynthesis and respiration, oceanic streams, coal and peat deposits, weathering and sedimentation, El Niño phenomena, etc. Viewed from outside, the Earth represents a powerful energy capacitor constantly recharged by the solar input; this battery then drives all other processes we observe on our planet. (In other words, the power of this capacitor is incommensurable with that of Mars.) The question then arises: what is the nature of the planetary capacitor?

The second tendency in the behaviour of a complex inequilibrium system has something to do with the very existence of such a capacitor. Capacitors are prone to discharging their energy in a catastrophic bonfire to end up near thermodynamic equilibrium and either remain there, or start recharging again. Such runaway effects are proportional to the capacity of the “device”.

Clearly, the Earth system has no tendency towards thermodynamic burn-out either way. Rather the “capacitor” has been working reliably for 4 billion years, and its occasional malfunctions have (at least so far) always been corrected before a complete decay has been able to take place (even if the eyewitnesses to such events might not have been too happy).

The central question then is “What are the controls that enable the peaceful and efficient operation of the capacitor?” It seems that before Lovelock all explanations were rooted in “inorganic” processes; the long-term maintenance of many parameters within bounds tolerable to life was indeed often compared in statistical terms by planetologists to the likelihood of a jackpot win (Williams 1997). Somehow, by chance, it happened that the Earth never embarked on the path that leads to fully deterministic, therefore anticipatable, regimes as those on Mars or Venus. Only with Lovelock did living beings enter the stage as protagonist, as the conditio sine qua non for the Earth system, as its creators, maintenance crew – and beneficiaries, of course.

Lovelock, a physician by training, started with a physiological parable; indeed “geophysiology” is a more “scientific” name for Gaian science. A human body maintains its temperature (or, say, the level of glucose in the blood, or potassium ion levels in the cytoplasm of all its cells) within a narrow range, independent of age or actual activities, and across a broad range of external conditions. As for body temperature, there is a sensor in the brain set to a given value, and all deviations from the set point are immediately corrected by a plethora of physiological mechanisms (sweating, thermogenesis, ventilation, shimmering, exercise, etc.). Similar circuits are found in relation to other functions that are maintained near constant values. The keyword is negative feedback, a concept borrowed from cybernetics and given a body in many disciplines. Such a regulatory mechanism, as a part of a larger system, has a sensor for some value in the environment (e.g. blood temperature or pressure), while at the same time effectors belonging to the whole system are under its command. The regulator compares the value obtained by the sensor
Fig. 5.1  a. A simple feedback regulating some preset value. b. Time-course of a regulated function (e.g. temperature in an air-conditioned room) as a function of external values of that function. Note the interval of a stable regime, instabilities at the borders of that interval due to inertias of the system, and a total breakdown at values even more extreme.

with that pre-set in its memory, and depending on the difference measured it sends a command to the effector(s) whose function it is to maintain the system within the range tolerated by the sensor. As soon as the values return to the preset interval, the regulator switches the effector off again. Note in Fig. 5.1b how the functioning of the circuit becomes unstable as soon as the regulated function deviates too far from the preset interval.

The feedback concept became very fruitful in physiology and biochemistry, and indeed in all disciplines where the main goal is the maintenance of some steady state (or switching, in a controlled manner, between two or more steady state regimes), and in building machines that work in self-stabilized regimes, such as gas engines or refrigerators. Geophysiology or Gaia science sensu Lovelock is thus an extension of very useful biological concepts to the whole planet.¹

¹There may be a technical drawback here, however, in that the phenomenon of Gaian feedback might encounter difficulties when it comes to its reification. It is one thing to have a circuit with
What follows may be taken as an amusing but instructive interlude, rooted in the fact that a concise definition of life is lacking. Of course, it is advantageous to model some life functioning as the output of feedback circuits: much of contemporary medicine is based on such models. But it is another step to claim that because a system has a feedback property it is alive: nobody takes a kitchen refrigerator to be a living being. But what if living beings are involved in the functioning of such self-stabilizing systems? In the case of a human body, which obviously has many functions that can be modelled in terms of feedback, we have many other criteria for recognizing it as alive, so there is no need to make silly claims rooted in the existence of feedbacks. In case of Gaia, however, exactly this has happened. The original argumentation was sound: (1) the planet demonstrates feedback in respect of some its parameters; (2) it is living beings who work as regulators and effectors of that feedback; it follows that (3) the planet, to be able to carry out such functions, must be teeming with life. This was well-supported by a parallel, and solid, argument: (4) life (save very short periods at the beginning) can persist on a planet only when a Gaian (geophysiological) regime is at work. Life cannot exist in isolated oases, because in such a state it is unable to control and prevent multiple runaway catastrophes in ambient conditions, one of which would necessarily kill it soon.

It happened, however, that the third argument was often reformulated as (3’) the planet is alive. Such a statement, of course, arouses a lot of both positive and negative excitement due to the fact that the very notion “to be alive” admits of many, often wild, interpretations. We shall not go into the history of such arguments. We believe that the planet is alive, but we also maintain that it is not possible to draw such a conclusion from the original Gaia theory. Our views are explained below, but at this point we continue our interlude by sketching the positions of leading evolutionists.

**Neo-Darwinism and Gaia**

The Gaia theory was born just as a new version of neo-Darwinian theory based on the theory of games was attracting great attention. The theory was developed in the 1960s by Hamilton and Wilson, but became epitomized by The selfish gene, published by R. Dawkins in 1976. The theory received a favourable reception, and contemporary evolutionary theory, ecology, and anthropology are largely rooted in it.

To remind the reader, seen from this perspective, selfish individuals aspire to the survival of their own lineage, they interact with other individuals – of their own and other species – and as a result we observe the emerging behaviour of a community. All cooperativity, or even the superorganism, are but epiphenomena, products of the “invisible hand” of natural selection or games played in ecosystems. Once one or several sensors and effectors, and another to have billions of them as in case of the biosphere. How can they be coordinated into concert of a single integrated system? What is the nature of the wiring and setting mechanisms for all these tiny elements? We shall not follow this particular problem further and will take Gaia as if it consisted of a single regulator – single effector circuit.
again, to speak about experience, goals, or cooperation in order to achieve something is nonsense according to the framework of this theory. All such phenomena are mere by-products of primary activities of individuals: “It must be borne in mind that nature itself does not seem to care about the self-identity of anything beyond the organism. Our concern about self-identity reflects our demands on nature. We might feel uncomfortable with the position that ecological units mainly exist in our minds, but at the present stage of ecology we should accept this position as a null hypothesis that helps sharpen our thinking.” (Grimm 1998, 299)

But not even that! What we observe at the level of individuals is also but an epiphenomenon – individuals are simply driven by the coalition of programs inscribed in their genes. Bodies are vehicles arising de novo in each generation – what is eternal are only the programs, which enter eternal kaleidoscopic recombinations of genotypic teams in each individual. The behaviour of individuals or supra-individual aggregations is, thus, a question of games with rules set in advance genetically. The output of each such game is unknown just because the system is too sensitive to initial conditions; moreover, the environment, the playground for such games, is ever-changing. From a neo-Darwinian viewpoint the Gaia theory, even in its thermodynamic version, is a pure nonsense, because apparently “evolution” is nothing but the current version of neo-Darwinian theory: “The fatal flaw in Lovelock’s hypothesis would have instantly occurred to him if he had wondered about the level of natural selection process which would be required in order to produce the Earth’s supposed adaptations. Homeostatic adaptations in individual bodies evolve because individuals with improved homeostatic apparatus pass on their genes more effectively than individuals with inferior homeostatic apparatuses. For the analogy to apply strictly, there would have to have been a set of rival Gaia’s, presumably on different planets. […] The Universe would have to be full of dead planets whose homeostatic regulation systems had failed with, dotted around, a handful of successful, well-regulated planets of which Earth is one. […] In addition we would have to postulate some kind of reproduction, whereby successful planets spawned copies of their life forms on new planets.” (Dawkins 1982, 235–236)

After a quarter of a century the positions held are almost the same. The parameters of planetary surface remained favorable simply through chance (perhaps with oxygen as a single exception), and what counts in living beings is their ability to ensure propagation of pieces of DNA that are fit enough to program “their” bodies properly.

**Gene pool, Communication, Body**

I have been trying to think of the earth as a kind of organism, but it is no go. I cannot think of it this way. It is too big, too complex, with too many working parts lacking visible connections. The other night, driving through a hilly, wooded part of southern New England, I wondered about this. If not like an organism, what is it like, what is it most like? Then, satisfactorily for that moment, it came to me: it is most like a single cell.

Lovelock’s Gaia, like other feedback machines, has no memory: “solving problems” means buffering adverse effects coming from outside. She cannot make use of experiences gained in, say, the Holocene or even Permian periods. This distinguishes her from ordinary kinds of living beings as we know them – even neo-Darwinian models possess an enormous amount of information gained from the deep past, as inscriptions in DNA. As we explain below, a more realistic picture also takes into account the uninterrupted lineage of bodies communicating “horizontally”, and may allow a much deeper insight into evolutionary games. This is because bodily existence is the factor that allows not only the storage of information but also its interpretation, and permits remembering and forgetting, the spinning of fables and the establishment of cultures, and the possibility of confronting one cultural worldview with competing ones. Could Gaia be taken as such an individual, a truly living planet?

One of us (Markoš 1995, 2002) argues that the answer is yes, that the body of Gaia is represented primarily by the prokaryotic biosphere coherently interconnected by a fluid gene pool, by universal signals shared by the whole community, and by the very “stuff” of structures represented by the cells and extracellular matrix. Seen through this prism, we too are part of this enormous living structure almost as old as is our planet.3

Indeed, prokaryotic lineages are probably the oldest life forms on earth, dating back perhaps as far as 3.8 billion years. They are ubiquitous; occurring at amazingly high densities and in great diversity in both water and soil, and all the data available suggest that this was the case in the past, too. While most people are familiar with only the bacteria that cause disease, it seems that this particular group may be derived, and the least interesting component of the planetary economy. It has been shown that the typical prokaryotic way of life is as diversified, communal, multispecies groups with characteristics not exhibited by individual cells.

Before we begin to speak about interspecific gene transfer in prokaryotes, it might be useful to define (1) the concept of species and (2) diversity in the community. The notion of well-shaped, well-distinguishable species is quite unfamiliar to the prokaryote world. After all, the definition of species is not clear-cut even in sexually reproducing multicellular eukaryotes. Yet one may be surprised by the following definition for prokaryotes: “The phylogenetic definition of a species generally would include strains with approximately 70% or greater DNA-DNA relatedness and with 5°C or less shift in melting temperature. Both units must be considered.”4

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2By using “prokaryotes” we encompass both kingdoms living today (Bacteria and Archaea), as well as any possible prokaryote-like forms that might have lived in the past.

3Just for the sake of this historical aspect, and for simplicity, we shall mostly focus on just the prokaryotic biosphere here. In contemporary communities, however, eukaryotes play an in separable role as well. For example, soil communities cannot be understood without also taking into consideration protists, fungal mycelia, and the plant rhizosphere. It is believed, however, that pure prokaryotic communities are some 2 billion years older than the mixed ones of today, and the type of information processing necessary for a Gaian economy is their invention.

4The definition is based on the fact that double-stranded molecule of DNA when heated to about 90°C dissociates into single strands (melting); the temperature is typical for a given specimen.
Thus two strains are different species if less than 70% of their DNA will reassociate and the decrease in melting temperature of the reassociated DNA is greater than 5°C. Of course such a definition is of help only when we are dealing with closely related species where similar criteria are of no help. Recently, in the genomic era, cloning of whole genomes and sequence comparison will replace such empirical criteria.

Bacterial diversity of a community generally refers to genetic diversity, i.e. to the heterogeneity of the total DNA extracted from such a community. Diversity is a function of two components: 1. the total number of species present (species richness) and 2. the distribution of individuals among those species (evenness) (Margalef 1968). Diversity indices characterize the species composition of the community at a given site and a given time (Legendre and Legendre 1998).

The traditional view of evolution ever since Darwin is of a tree-like genealogy of lineages. This image, however, underwent a minor cosmetic amendment when the symbiogenetic origins of mitochondria and chloroplasts became known. It was not until after the genomic sequences of numerous prokaryotic and eukaryotic organisms became publicly available that the traditional tree-based evolutionary model was seriously challenged, when it turned out that prokaryotic evolution may instead follow a network-like topology (Maynard Smith et al. 1993; Fig. 5.2)

The turning point was when finer data about the structure of nucleotide frequency and codon usage became available. For example, some Escherichia coli genes exhibit codon frequencies that deviate significantly from those of the majority of its genes (Tsirigos and Rigoutsos 2005). Also, the genomes of Aquifex aeolicus and

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When the sample is cooled again, the strands tend to re-associate and zip into double-stranded form again. Theoretically, if such a re-associated sample is re-heated, it will melt at the same temperature as before. In practice, not all strands will find their counterpart and re-association will be incomplete, with many partial zippings or mismatches, or with single strands left without complements. (Therefore we find a 70% limit for re-associated strands) Such incomplete and mismatched strands will be more unstable and will melt at lower temperature when heated again – therefore the melting point of the sample will be lower than originally, but by no more than 5°C. If, however, two samples from different sources are mixed (e.g. isolated DNA from two species, cut it into suitable portions), many more mismatch events will occur, and both the re-association percentage and melting point decrease will go beyond the limits just stated.

5 Compare with the magic number 98, indicating the percentage of identity in genomes of humans and chimps.

6 Nucleotide frequency: bacterial species have a typical average ratio of (A+T)/(G+C) in their genomic DNA. Have a species characterized, say, as having 40% average content of G+C; if you find, within the genome, a segment containing 65% of these bases, then the suspicion arises that the segment might have been acquired recently, from another species for which high GC content is typical.

Codon usage: In protein-coding areas of the genomes (open reading frames, ORF) the sequence of amino acids in proteins is coded by nucleotide triplets. The code is, however, degenerate for most amino acids: some may be coded for by as many as 6 different triplets. It does not follow that all possibilities are ordinarily used in a given species – usually 1–2 codons are preferred in such cases. If an ORF with atypical codon usage is found in a genome, it may indicate a recent transfer from a source characterized by different codon preferences.
**Fig. 5.2** Clonal and network-like structures of bacterial clones. **a.** Mosaic structure of a single bacterial gene of the same species. Above: in a sensitive strain; below: in several strains resistant to the antibiotic tested. **b.** Mosaic structure of bacterial proteins. (after Maynard Smith et al. 1993)

*Thermotoga maritima*, two hyperthermophilic bacteria, support the hypothesis of a massive gene transfer from archaean organisms with which they shared the same lifestyle. If symbiogenesis put aside (i.e. the merger of whole cells belonging to different lineages), three common ways of horizontal gene transfer can be distinguished:

1. Transformation, i.e. the uptake and expression of genetic material encountered in the environment. The source of such exogenous DNA is dying or decaying organisms, and its concentration, in an aqueous environment, can be increased by adsorption to solid particles. Bacteria may be literally grazing on such genetic material, and occasionally incorporating it into their chromosomes.
2. Transduction, the process by which bacterial DNA is moved from one cell to another by viral (phage) infection.

3. Conjugation, a process in which one living cell transfers genetic material to another via a cell-to-cell contact. Both chromosomal and plasmid\(^7\) material can be transferred in this way.

The frequency of genetic transformations (of whatever type) may be quite high: it has been estimated that about 5% of marine bacteria become transformed within their lifetime (i.e. between two cell divisions; Thomas et al. 2007).

All such transfers may or may not be revealed by some kind of signature in the genome, or by a bias against the global average of some genomic parameter, as briefly described above. It has been found that genetic material can easily move between lineages that are taxonomically very distant; even eukaryotes are involved in this genetic flee market, although the frequency of exchange may – especially in multicellular groups – be very low.

The floating, dynamic horizontal gene pool came to be of extreme importance in the strategy of microbial pathogens. Finely tuned cassettes – containing either a set of “pathogenicity islands” or bearing multiple resistances towards a whole group of antibiotics – can be assembled within a single mobile unit, or integron (Fig. 5.3). Integrons can be inserted (by recombination) into plasmids or genomic DNA and become part of the lineage, from which they can jump again to other uninfected lineages.

The high level of genetic exchange in the biosphere can be viewed as genetic “promiscuity” between myriads of genomes, or as a way of maintaining the integrity and coherence of a single planetary genome distributed amongst the creatures bearing their individual genomes. In a time of need, any population can profit from

\[\text{Fig. 5.3} \quad \text{Structure of an integron cassette. The lowest line represents part of bacterial DNA, upper levels zoomed-in elements combined according to momentary needs. (after Amábile-Cuevas 1997; Thomas, ed. 2000)}\]

\(^7\)Chromosome: the main genetic thesaurus of bacteria – usually its “length” is of the order of millions of nucleotides. Plastid: non-chromosomal pieces of DNA (tens of thousands nucleotides long) which co-exist and replicate independently of the chromosome, and which can be readily exchanged with other calls. They can also be incorporated into the chromosome.
having access to this enormous thesaurus and to particular genes within years. This brings us to Gaia again.

The first to come up with a consistent theory based on estimates of genetic flows was the Quebecois microbiologist Sorin Sonea and his group. In a series of articles and books beginning in the early 1970s (e.g. Sonea and Panniset 1983) they have argued in favour of taking all prokaryotes as but a single, global species. In the beginnings of life “lateral gene transfer mechanisms appeared and were progressively improved, furthering the development of diversity. The prokaryotes’ constructive evolution resulted in the formation of a worldwide web of genetic information, and a global bacterial superbiosystem (superorganism).” (Sonea and Mathieu 2001) Many similar conceptions have appeared since.

To sum up: horizontal gene transfer, in particular in the prokaryotic realm, is a well-proven and traceable phenomenon, which has apparently persisted during the whole history of life. We can suppose that even “the [last universal common] ancestor cannot have been a particular organism, a single organismal lineage. It was communal, a loosely knit, diverse conglomeration of primitive cells that evolved as a unit, and it eventually developed to a stage where it broke into several distinct communities, which in their turn became the three primary lines of descent (bacteria, archaea and eukaryotes). In other words, early cells, each having relatively few genes, differed in many ways. By swapping genes freely, they shared various of their talents with their contemporaries. Eventually this collection of eclectic and changeable cells coalesced into the three basic domains known today. These domains become recognizable because much (though by no means all) of the gene transfer that occurs these days goes on within domains.” (Doolittle 2000). The genetic pool of microorganisms can be – and with high probability is – commonly shared up to the present day. The pattern of sharing is in all likelihood the same as the distribution design of the huge majority of other natural networks – the so called small-world, “superorganismal” pattern.

Mathematical models of such networks will be discussed below; here we shall shortly deal with one important precondition for the existence of such a network – the constancy of the genetic and other codes. If a global communication network is to exist, a true lingua franca must be available. The universality of the genetic code, for example, has been usually interpreted as a frozen accident which appeared, nobody knows how, at the very dawn of life. But could not it be that the code has been actively maintained during all that time, in order to profit from the advantage of communication throughout the world? Keeping the universal alphabet and grammar essentially constant may be just a prerequisite for the existence of a language. Does such a language exist? At the contemporary level of knowledge we can conclude only that there exits a (super)organismic, coherent gene pool on our planet. Maybe the very concept of an organism, an individual, may blind our view of this living realm which is whole. Perhaps we can assume indeed the existence of a whole-planetary microorganismal superorganism, “wired” and interconnected by different mechanisms of lateral gene transfer (and other means of communication, see below), sharing data via the first and biggest world-wide-web. Thus we obtain
a very different scheme for organized existence than that we are used to – as old as life itself, flexible, non-hierarchical, embracing and persistent.

Communication Networks

The exchange of genetic messages (mails) within the planetary genomes requires, of course, bodily structures in which they may be implemented. Such structures include cells and supra-cellular structures (multicellular bodies, extracellular matrix, multi-species consortia and mats, the soil rhizosphere, intestinal communities, floating particles, etc.). Here we shall discuss some of the known ways in which communication maintains the bodily integrity of our planetary network.

Bacteria produce a multitude of diffusible extra-cellular signaling molecules, to monitor their own population density and to coordinate the expression of specific sets of genes in response to cell density. This type of cell-density-dependent gene regulation is termed quorum sensing, and the set of signals is, as in the case of genetic code, understandable across a broad range of species; some may even be universal. Quorum molecules are constitutively synthesized in minute amounts, and their concentration in the cell surroundings is monitored. At low cell density they become diluted in the medium, but at sufficient population densities their concentration will rise toward some threshold which gives a message that a change of behaviour is required.

What is the function of quorum sensing? Obviously, it can work as an early warning for exponentially growing populations that the resources may soon become depleted due to cell density; the signal will initiate a different survival strategy, e.g. “stop growing, start sporulating”. Similarly, pathogenic bacteria will start secreting exotoxins only after they learn that they have massively colonized the host, in order to overwhelm its defences (Costerton et al. 1999). Of course, many games are being played in bacterial communities, based on releasing false signals for the neighbours or, on the contrary, joining forces in order to achieve particular goals. What is emerging is, we believe, but the tip of the iceberg; an intricate network of communication networks lies unexplored. To give an example: our large intestine contains a system of about 400 species of microorganisms which are in a constant mutual communication among themselves and with their human partner. Such communication avoids excessive growth by any one member of the community, avoids invading the human host, stops occasional pathogens from entering the alimentary tract, and induces specific behaviours by the host. The same holds for such intricate systems as the soil rhizosphere, sediments, and similar communities.

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8Examples: the family of homoserine lactones or special oligopeptides. Note that such molecules are not metabolites but genuine signals fulfilling semiotic functions – like hormones and pheromones in eukaryotes.

9For example, gene expression in the intestinal epithelia will respond to the needs of symbionts by producing special nutrients in the intestinal mucus. Germ-free animals maintained in the laboratory differ from normal inhabitants of Gaia in both gene expression and mucus composition (and must be fed by many extra nutrients to survive).
Multicellular and Multispecies Structures

Prokaryotes almost never live individually or in shapeless suspensions, as for their well-being they need close contact with many different organisms arranged in intricate shapes. Examples of such communities are consortia such as colonies, biofilms, mats, plaques, soils, many kinds of sediment, stromatolites, microcolonies in various tissues, etc. (Fig. 5.4); with the exceptions of colonies all such structures are results of multispecies cooperation processes. Here again extensive signalling processes should be envisaged. For example, Davies et al. (1998) showed that a mutant bacterium *Pseudomonas aeruginosa* unable to synthesize one kind of lactone signal was able to initiate a biofilm similar to that built by the wild-type cells, but the result was simple continuous sheets lacking the differentiated architecture with microcolonies and water channels.

These mutant biofilms were sensitive to detergents, in contrast to the wild-type structures. Adding particular signalling compounds to the medium resulted in biofilms similar to the wild-type structures. Further studies show that there exist signals promoting different types of biofilm architecture or initiating dispersal phase when swarms of bacteria leave the structure to colonize new substrates.

Such results are but the first attempts to reveal the regulation and ontogeny of biofilms, which can be characterized by a variety features such as surface attachment, ultrastructure, genetic diversity, community interactions, and the architecture of the extracellular matrix, a network of secreted polymers that keeps the whole system together and is decisive for its structuring. It protects the cells and enables specific forms of communication, e.g. via water channels. Cells inhabiting the structure differ strikingly in many ways from free-floating bacteria. A mature biofilm with its complex architecture provides niches with distinct physicochemical conditions, differing in oxygen availability, concentration of diffusible substrates

![Biofilm Diagram](image)

**Fig. 5.4** Biofilms. Scheme of a biofilm ultrastructure. Long arrows indicate the flow of nutrients, wastes, and information.
and metabolic side products, pH, and cell density. Consequently, cells in different regions of a biofilm can exhibit different patterns of gene expression (Costerton et al.). Mixed-species biofilms can contain niches with distinct groups of bacteria in metabolic cooperation. For example, Kuchma and O’Toole (2000), or Watnick and Kolter (2000) state that a mixed-species biofilm is a dynamic community harbouring bacteria that stay and leave on a purposive basis, and that compete and cooperate, share their genetic material, and fill distinct niches within the biofilm: “The natural biofilm is a complex, highly differentiated, multicultural community much like our own city”.

In addition to prokaryotes, other organisms such as fungi, diatoms and other algae, amoebae and ciliates can be found in biofilms, in quantities dependent on the specific environment. The soil rhizosphere deserves mentioning here, because it is an example of a new kind of consortial cooperation established after multicellular organisms entered the game. It has been reported that up to 20% of organic matter produced by plants is secreted by roots into the soil. Besides simply influencing the physical properties of surrounding mineral particles (compactness, water capacity etc.), this matrix serves as a provider of signals for other plants sending roots into the area, to fungal mycelia to establish different kinds of mycorrhizal communities, to bacterial consortia to control their development and cooperative modes, and even to insects living in soil. When Sonea and Panniset (1983) claims that a soil particle has an ultrastructure as complicated as the structure of human liver they are by no means exaggerating.

**Small World of Complex Systems, and Their Modelling by Graphs**

As we have already stated, we intend to explain the planetary biosphere, the “body of Gaia”, as an informed, coherent network. We shall approach the topic through now popular mathematical models of so-called “aristocratic” networks, and with this as our optics we shall consider the communication networks in bacteria.

The expression “It’s a small world” has become part of everyday speech. Yes, we start with what has become an old chestnut in recent years: the demonstration by S. Milgram (1961) that our social world is held together by surprisingly short chains of acquaintance. He picked at random volunteers from American Mid-West cities, and asked them to deliver a parcel to another person. They were not allowed simply to mail it; instead they were asked to send it to somebody with whom they were on first-name terms. The intermediate was supposed to continue in a similar way with her/his first-name acquaintance. The chain continued until the parcel came to somebody who knew the final recipient personally – only such a person was finally allowed to deliver it. Experiments starting at different places, and with addressees from the opposite sites of the continent, showed that the packages found their way in a strikingly small number – on average six – of steps. “Six degrees of separation” has become part of cultural folklore ever since. The experiment also motivated theoretical work about complex systems – with mathematical models of the “small-world phenomenon” (Amaral and Ottino 2004).
“Complex system” is a term used in physics for systems containing a large number of constituents, interconnected by a similarly large number of mutual interactions between them. As a consequence, systemic, emergent behaviour can be observed in such systems. Such is the behaviour of materials like magnets, glasses, or granular systems (Allia et al. 2001), with cooperativity, competing interactions and non-linearity serving as key words for characterizing them. In certain cases, the details of interactions become unimportant: seemingly very different systems can be described by identical mathematical apparatus. There is good reason to believe that the approach can be extended to a much broader set of systems, and also to systems far beyond physics.

Complex network theory is rooted in the theory of graphs, network systems defined by nodes mutually interacting via edges (lines or links).10 Models of networks with different architectures have found application in the study of natural as well as man-made systems such as the Internet, in relation to the interactions of proteins in cells, the spread of epidemics, bonds of friendship in human groups, and the connectivity of the web pages we browse daily. The goals of such studies are varied, e.g. to avoid systemic breakdowns, to prevent major diseases, or to benefit from emergent phenomena.

The very first application of graph theory can be found in the 18th century, when L. Euler (1736) applied his ideas to the city map of Königsberg, divided into four parts by the river Pregel (Fig. 5.5). Until recently, graph theory remained a branch of discrete mathematics dealing only with peculiarities like that in our example; it has experienced a burst of activity only in last four decades (de Sola and Kochen 1978).

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10Structures consisting of points and connecting lines are ubiquitous in many scientific fields. In mathematics they are called “graphs”, with the points described as “vertices” and the lines as “edges”; in computer science they are usually called “networks” with “nodes” and “links” or “connections”; in physics such structures are “systems”, which have “sites” and “bonds”; and finally, in sociology one usually refers to a network of people, or “actors”, and contacts, friendships, or “ties”.

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**Fig. 5.5** City map of 18th century Königsberg
The central question of graph theory concerns the measurement of distances between the vertices in a graph, where the distance is defined as the length of the shortest path connecting two vertices. The goal is to find an average, and ideally even the maximum, distance between any two vertices (the graph diameter). The most common model (Erdős and Rényi 1959; Solomonoff and Rapoport 1951) takes a set $V$ of vertices, and connects each disjoint pair of vertices with a probability $p$ (i.e. all vertex pairs are connected with the same probability).

Such completely random graphs, however, are seldom appropriate for modelling the networks observed in nature: delivering a parcel would go through a very long chain of intermediates in such a graph. This is because while having a low diameter, they lack an important property of most networks observed in the world: clustering. The term reflects the property that two vertices sharing a common neighbour are more likely to be connected than two vertices chosen at random from $V$; the clustering coefficient $C$ has a value 1 for a complete graph, 0 for trees, and $p$ for random graphs. Non-complete graphs with higher clustering coefficients can be constructed quite easily through so called nearest-neighbour graphs (Fig. 5.6).

A small-world graph (Watts and Strogatz 1998) combines the small diameter of random graphs and the heavy clustering of organized nearest-neighbour graphs. It starts with a structured, clustered graph, such as a nearest-neighbour graph; and then a proportion $q$ of the edges becomes “re-wired” by changing one end to a uniformly random destination. For a large proportion of $q$ values, the resulting graphs would have both properties identified as characteristic of the small world. We get a scale-free network with high-degree nodes (hubs), which become much more frequent here than in a network in a single-scale graph. The hubs sew together the scale-free network, whereas in the random graph they are infrequent and do not play any particular role.

A wide variety of real networks (almost certainly including the social world like that studied by Milgram) both exhibit small-world behaviour and can be modelled by networks where high local clustering coexists with short global path lengths.

Fig. 5.6 Regular, small-world, and random graphs

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11.“Small diameter” suggests that that the diameter should grow logarithmically with the size of the graph; “heavy clustering” means that the clustering coefficient will not diminish when the graph grows, i.e. the number of edges per node remains constant.
Small World of Complex Systems, and Their Modelling by Graphs

(Milgram 1967; Pool and Kochen 1978; Kretzschmar and Morris 1996; etc.). Such models help to understand the relationship between the dynamical properties of complex systems and their underlying structural characteristics (for example, the presence of small-world connectivity dramatically affects the extent and speed of disease transmission during epidemics).

Real-world networks like the Internet or biological networks are very large – sometimes with millions of nodes – and therefore they are studied by methods of statistical topology. Moreover, as many real networks are growing objects, the dynamic aspect has also been a major ingredient of this renewed interest in graph theory. Similarly wave-like behaviour, for example as associated with the spread of viruses, can be also modelled by such tools. The concept of phase transition also enters the discussion as some network models allow a parameter to be tuned between different topological regimes or phases. In all such cases, the idea is that behind every complex system there is an underlying network with a non-random topology (Barabási 2001); the challenge is to uncover the pattern hidden behind millions of nodes and links.

There is broad empirical evidence that a wide range of unrelated networked systems show very similar topological complexity. This immediately raises questions such as whether a small-world or scale-free pattern is crucial for the functioning of certain systems such as the brain, and whether they lie at the roots of processes such as the spread of diseases. Equally, one can wonder whether or not the observed topology of these systems is the result of some common organizing principles. Let us address these questions with an example.

The Internet – the place where computer viruses spread – can be considered a scale-free network; therefore there will be always a finite number of virus-infected computers in the net (Kaufman et al. 2002). This is because the threshold of the infection rate below which the epidemic dies out spontaneously, is zero – due to the hubs, whose presence enables viruses to penetrate the entire network efficiently. The lessons we learn from the topology of the net, however, also give us clues for immunization of the network: the epidemic threshold becomes non-zero only if high-degree nodes are immunized (Pastor-Satorras and Vespignani). Hence, it is the scale-free architecture of the Internet which makes it resilient to random failures, yet very fragile with respect to intentional attacks (Guillaume et al. 2005). In simple terms, if a randomly chosen small fraction of nodes is cut out, these nodes most likely have few connections, resulting in no major change in network structure. On the other hand, if high-degree nodes are selectively removed, the network fragments into several isolated parts. (In contrast, in a single-scale network where most nodes are of the same degree, an intentional attack is less dramatic, but it is more vulnerable with respect to random failures.)

As the reasoning related to the robustness of scale-free networks applies equally to biological networks (e.g. for a metabolic network in which metabolites – chemical substances – are connected through chemical reactions), the Internet example might suggest that evolution has applied selective pressure tending to favour the development of a topology that is optimal given certain environmental or spatial
constraints. In other situations, an optimization of topology can result either from design or from self-organization.

In model examples, the total number of nodes tends to be fixed. This is in contrast to many real-world examples, such as the World Wide Web. Many websites are created every day, and connected to existing sites through hyperlinks. Not all sites already present in the Web are equally likely to acquire a new incoming connection. Yet, if the number of hyperlinks pointing to a given website is used as an indicator of its popularity, a newly created website might preferentially establish a link to a popular one rather than to a site to which few others point – the “winner takes all” phenomenon (Buchanan 2007). Simply put, the idea of preferential attachment provides us with a model which is able to reproduce a power-law degree distribution.

In some situations, e.g. in the case of protein interaction networks, it has been argued that such an attachment rule results from the laws governing their evolution (Dong Li et al. 2005). These networks grow by copying existing nodes, borrowing some of their links and adding some new ones. But the preferential attachment rule requires that the newly entering node knows the degrees of all the nodes already present in the system; and this is certainly not a reasonable assumption in many contexts. It is therefore necessary to keep other possibilities in mind as to how scale-free networks may emerge when no growth is involved, such as the idea that links between nodes are established according to a deep organizing principle.

The small-world pattern is possibly the best way to link a wide network in order to get high robustness and efficiency at a low cost. The network can – at least mathematically – account for the high fitness and appropriateness of the small-world pattern in network evolution. To model evolutionary processes, network science uses the concept of emergence – with all advantages and limitations of that approach, especially regarding novelty, as discussed in the introduction to Part II, above).

We have undertaken this excursion into graph theory because we believe that the microorganisms of our planet are well-connected in a small-world pattern. The resulting pool of connected germs represents a complex and robust system with a number of emergent features. Three crucial aspects of such the planetary conversation can indeed be characterized by the concepts of small worlds, emergence, and complexity.

Fitness Landscapes and Regioning

In addition to other topics, Kauffman (1993, 2000) discusses the somewhat neglected topic of the shape of the fitness landscape. The term, coined by S. Wright in 1940s, belongs to the standard arsenal of neo-Darwinian theory and helps to depict the evolution of an allele or a species in the direction of greater fitness.

A paradigmatic landscape as might appear in any textbook of evolutionary biology is shown in Fig. 5.7a. The peaks represent the maximum fitness attainable, the population resides somewhere on the slope, and due to pressure exerted by natural selection it climbs to the top. More precisely: ongoing processes of mutation,
recombination, and selection will move the population infinitesimally up and down the hill; but whereas downhill movement will soon be stopped by selection pressure, climbing steps will be additive, i.e. the population will be pushed by selective pressure towards the local optimum. The neighbouring peaks – optima – are unattainable, because the very manner of movement – by infinitesimal steps – prevents jumping across the valley, and stepwise descending to the valley, to climb another peak, is also prohibited as said above by selection. The model is apparently meant as to illustrate the high mathematics lying in the background; and for this reason it takes the landscape to be constant, i.e. does not discuss possible erosion or orogenic processes. Kauffman takes such processes into consideration, and also contemplates not only smooth landscapes like that of Fig. 5.7a but also more

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12If you are a bird you can improve some particular way of flying, but you cannot fly across the valley and join bats who are struggling to improve on another neighbouring peak.
rugged forms. In such cases it turns out that the acknowledged drivers of the evolutionary process, i.e. mutation, recombination, and selection, do not thrive so well as in the smooth landscape. For example, in a “landscape” consisting of telegraph poles (Fig. 5.7b) such processes are of no help: to land on the top of a pole is like winning a jackpot, but in all likelihood you are going to loose everything in the next mutation or recombination step. Kauffman argues that the shape of the landscape is also the result of a long evolutionary process. To fit the evolutionary processes as we know it, you must have an appropriate playground: evolution involves both organisms and their evolutionary landscape.

Let us be inspired by this virtual model and transfer it to the real Earth landscape. Not much effort will be needed to recognize Gaia as a system containing living beings shaping their landscape to fit their game, at the same time channelling their own evolution in such a way as to fit the given landscape. The planet is cleared and shaped for life; life is adjusting to the shape of the planet. Of course, even Gaia has outer and inner limits that influence her well-being, the smoothness of evolution. Cosmic and telluric forces may introduce very drastic changes into the trajectories, either by destroying the playground or the player, or by causing excessive rates of mutation. As for the inner limits – Gaia as a self-organized criticality is not immune to catastrophes of different intensity, generated by the very process of internal complexification.

Life cares, Gaia cares... We can venture another step and derive inspiration from Heidegger again, in his *Conversation on a country path about thinking* (1966). Three partners walk through a countryside, and in their dialogue the situation of man in the world is expressed through the parable of a region (Gegend) in which man is clearing his way and the existing countryside, and where the landscape and ways cleared decide his further steps. The region regions (die Gegend gegnet) and shapes this symbiosis. The world, then, is the region, “that-which-regions” (die Gegnet); it goes towards man from the horizon and man approaches it. It is clear that Heidegger speaks about the human condition, but what of Gaia as that-which-regions and co-creates the world?
Chapter 6
What is the Source of Likeness?

It was believed – and in part is still believed today – that we can build up the organism through recourse to its elementary constituents without first having grasped its building plan, i.e. the essence of organism, in its fundamental structure and without keeping this structure in view as that which guides the construction. [. . .] And yet it is a fundamental deception to believe that the effective power behind the transformation of contemporary biology is a matter of newly discovered facts. Fundamentally and primarily it is our approach to the question and our way of seeing that has been transformed – and in accordance with this the facts. This transformation of seeing and questioning is always the decisive thing in science. The greatness and vitality of science is revealed in the power of its capacity for such transformation.

Heidegger 1995, 260–261

In the previous chapter we attempted to convince the reader that horizontal communication constitutes the background for a coherent whole called the planetary organism. Nonetheless, it does not make sense to talk about a planetary network of living beings without taking a closer look on their individuality. Here we shall deal with a selfhood of individualized organisms, species, and lineages. We encounter the problem especially through the concept of homology, which points towards qualities shared amongst groups of organism as well as to the features that characterizes groups. We enter the area of some 250 years of intensive research during which reputable schools have risen and fallen, and endless battles – often furious – have been fought (sometimes ridiculous ones – and not just from our Whig perspective). The central question behind such a long-lasting intellectual surge is ostensibly simple: why do organisms share corresponding body parts?

Three perspectives may be distinguished:

1) Body parts are shaped by forces (universal causes) which are either lawful (like the crystallization of a snowflake) or which reveal the pre-stated dynamics of some structures (in a structuralist sense).
(2) Similar morphologies result from differentiation into diverging lineages starting from a common ancestor with whom all descended lineages share the trait in question.

Note that living beings themselves have no say in either alternative above: they come out as passive “material”, as a medium that allows corporeal existence and in-corporation, of either eternal or unchangeable virtual principles in the first case, or as engravings, forms carved by capricious gimmicks of history. Internal communication within and among organisms is not considered in the second.

We shall try to amend this gap and suggest a third possibility to explain how shapes could appear in flesh:

(3) Frantic “horizontal” crosstalk within communities, which enables living beings to develop imitative powers. This alternative has only seldom been discussed – perhaps on account of the “mystical” flavour that surrounds it, and because of the impossibility of formalizing it into a coherent scientific theory. As being-together is one of the topics investigated in this book, we shall devote some space especially to the last possibility.

**Short Glossary**

Homology is usually considered as a relationship of correspondence among those parts or organs that are derived from their precursor present in the most common recent ancestor of those species. Analogy, in contrast, means the correspondence between parts of organisms that have the same function or are superficially similar. Some authors regard analogy as the logical counterpart of homology. Thus analogues are those organs or body parts that are non-homologous. It means those that cannot be traced back through a chain of intermediates to a common organ predecessor occurring in the most recent common ancestor. There are also authors who do not place the terms analogy and homology in strict logical opposition. According to them, some homologues can be at the same time considered as analogues; for instance the forelegs of birds and bats are regarded as being analogous as wings because of the congruence in function, and homologous as forelegs because they were inherited from their precursors in a common quadruped ancestor. Hence, the level of homology must always be specified.

If two entities are considered homologous it does not necessarily mean that they are also similar. Homologues can be totally dissimilar because they have become adapted to different functions in the course of evolution. Bones of the middle ear of mammals are homologous with the bones of lower jaws of reptiles but are not similar to them. Besides analogy, the term homoplasy is also used as a counterpart to homology. Homoplasy is usually understood as derived similarity that is not the result of common ancestry. The relationships between homoplasy and analogy may change from author to author; some take these terms as synonyms, others regard homoplasy as an attribute associated with the distribution of characters on a phylogenetic tree, whereas analogy is frequently associated with functional agreement and conceived as a result of convergent evolution.
How the Terms Homology and Analogy Got Their Recent Meaning: A Brief History

Ever since the time of Ancient Greece, the concept of analogy/homology has been used for capturing the correspondences of our world. Empedocles connected on the basis of appearance dissimilar parts of very different organic beings, e.g. the hair of man, leaves of plants, and feathers of birds (Kirk et al. 1984). Aristotle also suggested similar correspondences in his biological works, especially Historia animalium and De partibus animalium (Russell 1916; Cole 1944; Rieppel 1988, 1994; Bäumer 1989, 157; Panchen 1992, 1999). Some of Aristotle’s comparisons resemble the modern senses of analogy and homology, even though there is a rather vague connection between the ancient and modern understanding of these concepts. The first tentative evidence for the modern use of the concept came much later. The comparative illustration of a human and a bird skeleton by French renaissance naturalist Pierre Belon (1555, 40–41) is a well-known icon in the history of biology. It is usually interpreted as an early example of the establishment of homologies because it follows the topological criterion of exact comparative knowledge typical of the 19th century (Rieppel 1994, 64; 1988, 35; 2002, 64; Steiner 1954, 2). Frankly, nobody knows whether this interpretation should be considered as a case of subconscious projection of the contemporary intellectual attitude to Belon’s era (Foucault 1973, 22). Anyway, a notable improvement in comparative theory came later when French morphologist E. Geoffroy Saint-Hilaire formulated the principle of connection (principe des connexions), i.e. positional agreement of corresponding body parts that are always in mutual interconnection with other parts of the body (Geoffroy Saint-Hilaire 1818, xxv). In his theory of analogues (théorie des analogues), he attempted the first exact specification of an intuitive process for the establishment of correspondences among body parts.1 Geoffroy’s rival Georges Cuvier considered analogy rather loosely as resemblance and used the principle of analogy as an auxiliary tool for the comparison of fossil material, and hence for establishing correspondences among the parts of a skeleton (Bäumer 1989, 159). Nonetheless, Cuvier bet on the other powerful intellectual instrument, the principle of correlations among body parts, which enabled him to reconstruct the general form of a whole animal or infer the structure of its parts simply from the form and functional relationships of different parts of an animal (Russell 1916, 35).

It is a little uncertain when homology and analogy became separated as distinct terms. The first clear division may be found in the second decade of the 19th century. English naturalists William Sharp MacLeay and William Kirby distinguished between analogy and affinity: analogies representing superficial similarity in the design of organisms, while affinities reflecting the plan of creation and thus are convenient for use in taxonomy (MacLeay 1823; Kirby 1823). The tradition was later developed by Hugh Edwin Strickland, who distinguished between three kinds of similarities: (1) affinity is the reflection of the original plan of creation;

1Note that Geoffroy’s “analogue” is comparable to Owen’s “homologue” (see below).
(2) **analogy** represents coincidence of structures due to the identity of external physical conditions, with the analogous structures usually sharing the same function (in this respect he was in agreement with Owen, see below); and (3) **iconism** signifies the kind of resemblance that repeatedly occurs due to chance, which is a reflection of Nature’s unbounded richness (Strickland 1846).

In 1843 Richard Owen published his famous definitions of analogy and homology in his *Lectures on the comparative anatomy of invertebrates*, in which an analogue represents “a part or organ in one animal which has the same function as another part or organ in a different animal” while a homologue is defined as “the same organ in different animals under every variety of form and function” (Owen 1843, 374, 379). In these definitions analogy and homology were introduced as absolutely disparate terms. This distinction was reinforced by linking the term analogy with sameness of function! Once these definitions entered biology it was not possible to consider the concept of analogy as essential resemblance that could reveal correspondences in the plan of nature, as it was in the case of Geoffroy’s concept of *analogue*. Moreover, superficial resemblance that does not refer to functional correspondence should no longer be taken as analogy. Owen’s definition, i.e. linking the concept to the agreement of function, partially rid the concept of analogy of its traditional polysemous meaning. This does not, however, mean that later authors followed Owen’s definition without amendments. Thus Charles Darwin linked analogy with the results of adaptation that usually result in superficial similarity in structure (Darwin 1860). A decade after Darwin’s revolutionary entry in 1859, E. Ray Lankester suggested that the term homology is inappropriate for the phylogenetic programme of biology of his time on account of its idealistic meaning and hence it should be removed from the biological vocabulary (Lankester 1870). Accordingly, Lankester introduced the new term of homogeny instead of homology, and furthermore he installed the new term homoplasy alongside analogy, as the counterpart of homogeny.

Eventually, despite the changes in paradigmatic definition, the comparative terminology entered the twentieth century in the following configuration: (1) **homology** – relationships between structures inherited from a common ancestor (*homogeny*), but in some cases also the sameness within the ideal plan; (2) **analogy** – correspondence in function often followed by superficial similarity; (3) **homoplasy** – similarity in structure incongruent with common descent and having no reference to functional agreement. Throughout history, many classification systems for homology have come and gone again (for review, see Kleisner 2007, 2008), but leaving unsolved the basic difficulty aptly summarized by McKittrick (1994, 6): “Each vertebra is a historical individual, although the closest common ancestor of any two vertebrae is not another vertebra but rather the undifferentiated mesoderm.” Multicellular bodies start from a single undifferentiated cell; their structures are not descendants of parental structures! What is inherited are not structures as such, but traits, endowments, capacities to build the structure in question. Can, then, traits be homologized at all?
Troubles with Levels of Description

In the first half of the 20th century, understanding of the concept of homology was once again shaken when the leading personality in the field of embryology, H. Spemann, criticized the concept and its history (Spemann 1915). For him, homology represented the basic concept of morphology, because it dealt with the *formal nature* of organisms, regardless of the functional aspects of given structures, i.e., “homologous” means “morphologically equal”, or in other words “the same”. Spemann required that the causal explanation of development should be apprehended in a morphological context, increasing the heuristic status of the crucial concept of homology.

Take a vertebrate eye as an example: from the viewpoint of the old morphology, there is no doubt that all vertebrate eyes are homologous, being built according to a common principle, idea. From the standpoint of Darwinian evolutionists, the eye is also an obviously homologous structure: paleontology as well as embryonic development from identical anlagen reliably confirm the hypothesis of a common eye-bearing ancestor. But the study of the regeneration of eye lenses in amphibians (G. Wolff, H. Driesch or H. Spemann) brought the historical concept of homology into doubt: the regenerated part emerged from anlagen different to the original ones initiated in the embryo, as if the regenerated lens were in a homoplastic – i.e. non-homologous – relationship with the normal one! Is, then, a regenerated eye comparable, in terms of structure and function, to any other vertebrate eye, i.e. homologous to an eye developed from an embryo, or not?

Based on such inquiries, a return to the old times of morphological research was proposed by E. Jacobshagen. As no morphologist has seen the common descent, morphological research should abandon the notion of common ancestry. “Liberate morphological issues from any bounds of evolutionary theory – after all, we are morphologists! Let us therefore formulate laws of forms on a formal order which comes up from comparative observations.” (Jacobshagen 1924, 258) He decided on a return to pre-Darwinian typologists, namely Goethe and Cuvier, and proposed the following definition of homology: “We call homologous all organs encompassing (embodying) a common bauplan, or organs whose basic building parts will correspond, regardless to their possible differences in form and function.” (1924, 260)

But how, then, to get the bauplan? Is there a level of biological organization from which homologies could be explained and even inferred? Gene sequences, products of gene expression, cells, cellular lineages, germ layers, tissues, organs, body parts, morphologies etc., were many times declared to be just such reliable platforms, but things never developed to the point where one conception could prevail forever. All levels distinguished by this or that observer were found to be mutually dependent and no single one would rule them all. We saw above how complicated the establishment of homology may be even in such a seemingly clear-cut case as the vertebrate eye. If a developmental approach is taken, then often homologues arise from different germ layers, processes, or genes.
L. Roth (1984) therefore proposed an inclusive definition of homology, combining elements of previous definitions: homology should ideally be based on some universal concept that conflates all its forms, regardless of whether they are rooted in evolutionary phylogenetics, cladistics, or developmental genetics. The concept should be rooted in development instead in genes, and should be taken as a hierarchical rather than being based on all-or-none relationships. It is important to recognize various degrees of homology, “from nearly identical, strongly homologous structures, down to the very weakest degree of homology, manifested by structures which simply derive from the same germ layer.” (Roth 1984, 18–19) Finally, she provides a general definition: “homology is based on the sharing of pathways of development which are controlled by genealogically related genes”.

Homology of gene sequences especially has entered the stage with vehemence, sometimes to the point of obscuring bodily forms. Actually, those who construct homology trees of sequences have no need to recognize sequence bearers in any respects other than species names, which simply serves as an address, an ID, of the organism. Such a development deserves a closer look.

There are two important reasons why homology cannot be reduced to correspondence between genes, as is often believed. The first is pleiotropy, i.e. the situation where a single gene can affect distinct features of the phenotype; the expression of a single or several genes in a structure cannot be taken as proof of homology. The second problem illustrates what Roth (1988, 7) has named genetic piracy: “New genes previously unassociated with the development of a particular structure, can be ‘deputized’ in evolution; that is, brought in to control a previously unrelated developmental process, so that entirely different suites of genes may be responsible for the appearance of the structure in different contexts.” This is similar to what de Beer (1958) covered by the term mimic genes, or different genes with identical effects. The reason for both above-mentioned problems lies in the fact that most “gene products”, i.e. proteins, are not engaged in any metabolic or tectonic functions, but take part in the networks of “cross-talk” within cellular and organismal “information processing” systems. It is obvious that the content may be expressed with different types or genres of such “talk”.

**Continuity of Information, Genes, and Structures**

With knowledge of such facts, from Van Valen (1982) came another attempt to grasp the essence of biological homology: “In fact homology can be defined, in a quite general way, as a correspondence caused by a continuity of information.” By information he understands nothing other than what is encoded in the nucleic acids of a genotype. But only more or less, for he adds: information may also be carried by, for example, culture. One way or another, inserting the term information into the heart of the definition does not provide any remedy for the elusiveness of the homology concept: the very concept of information is quite equivocal, and its
mathematical specifications are not very suitable in biological contexts. Roth endorses Van Valen’s definition of homology for its general applicability: “Its beauty lies in its flexibility: the definition can be used by adherents to any school of thought by simply specifying the relevant kind of information.” (Roth 1988, 2)

Rooting the definition in genetic information is, however, also problematic from the perspective of the biological homology concept. Therefore Haszprunar (1992) proposed that the “continuity of information” should be guaranteed by some kind of notion of “biological information”, such as cytoplasmatic factors. He proposes the following definition: “Homologies are similarities of complex structures or patterns which are caused by a continuity of information (in the sense of instructions)”.

What, however, do we learn from such definitions, and what tools do they provide?

An approach to homology based on continuity of information characterizes ontogeny as an embodiment of information continued between successive generations. The adherents of this school thus suggest ontogeny as a manifestation of homology (Roth 1988). But does not the very term information gain the suspect contours of some elusive force typical of vitalism?

The biological concept of homology in a specific sense has been broadly elaborated by Wagner (e.g. 1989). His understanding is rooted in an assumption of conservation of phenotypically individualized parts due to functional constraints or burdens (Bürde), which become internalized into the epigenetic system. “The process of internalization is thought to be caused by selection for adaptation rate and is assumed to lead to an ‘imitation’ of the pattern of functional constraint by a system of developmental constraints. Developmental constraints are required to explain the maintenance of the morphological pattern in spite of changes in function.” (Wagner 1989, 61) According to the different grades of burden we may recognize structures having different potential to be changed during evolution.

What are the reasons for accepting a biological concept of homology instead of an historical or phylogenetic one? The phylogenetic approach exposes the distribution of homologues along a phylogenetic tree but lacks the means to reveal the mechanistic causes of homology. It recognizes that there is a lack of continuity caused by the fact that morphological structures must be newly formed in each generation; only directly inherited entities, such as genes (or cells), are replicators. The second problem may be the lack of individuality, related to the question of whether the usual method of homologizing in phylogeny through one-to-one comparison of corresponding parts in different individuals is possible in all cases. Only developmentally individualized parts can be effectively compared (Wagner 1989, 1996, 1999).

One example: according to Goodwin (1993) the digits III of all tetrapods can be homologized only if there is evidence that transformation of these digits doesn’t affect the formation of other digits on the same limb. Thus, if salamanders have only four digits on their forelimb, it is impossible to tell what digits of the original pentadactylous limb they represent (1–4, 2–5, or any other combination). In general, the lack of individuality means that none of the elements within the structure can be changed or even lost without affecting the whole structure. Similarly, it is impossible to draw any simple topographical statement about digit homology between the
modern pentadactylous limb and the polydactylous limb of Devonian *Acanthostega* and *Ichthyostega*.

A third complication arises from the variability of development. As we have seen, potentially homologous organs may develop from a different material base (germ layer, source of cells), they may have different modes of development, and their development may be induced by different stimuli.

Fourth, different types of anatomical structure can be distinguished according to their way of becoming. Whereas replicators (genes) can be directly copied from their parental structures, organs have no direct connection neither to organs of their parents, nor to DNA: they must be built anew in each generation. Are there any microscopic structural memories that help to reconstruct the body, as Barbieri (see Introduction to Part II of this book) suggests?

A preliminary definition of homology by Wagner states: “Structures from two individuals or from the same individual are homologous if they share a set of developmental constraints, caused by locally acting self-regulatory mechanisms of organ differentiation.” (Wagner 1989, 62) The organizational concept of homology proposed by Müller works in almost the same manner (2003): “Homologues are autonomized elements of the morphological phenotype that are maintained in evolution due to their organizational roles in heritable, genetic, developmental, and structural assemblies.”

An interest in biological form rather than in the distribution of characters in phylogeny is the common denominator of proponents of biological homology as well as of so-called biological structuralism. According to their view, descent from a common ancestor cannot be simply observed, and consequently homologues can be revealed only through the analysis of correspondences between structures: “History is not explanatory of form because it does not describe the generative processes that make different forms possible.” (Goodwin 1994, 239) Biological structuralists have attempted to connect the crucial role of organismic entirety, morphogenesis and hierarchical taxonomy of biological form in modern biology, in order to give an alternative to the replicator-based view of some neo-Darwinians. Goodwin takes homology as a generative process, pointing towards the mathematical “concept of equivalence under transformation”. In general, structuralist understanding of homology conflates the process (transformation) and the constant final pattern (structure) where equivalent patterns arise from biological invariants (the generative unit in morphogenesis).

**Structures and Traits; Ideas and IDs**

We saw in the previous sections that hypotheses about homology should be firmly based either on the bauplan or on a common ancestor; otherwise we are left with the freedom to create narratives that allow us to construct interesting and inspiring analogies biased by subjective preferences, and which are thus somewhat unscientific. Our notion of likeness as presented in previous chapters may look similar – but
note that likeness is a manifestation of the intrinsic powers of organisms themselves, not a figment of a biologist who is required to recognize and describe it. Note also that throughout this chapter we have treated living beings as objects of science, not different in principle from atoms, molecules, pendulums etc., which appear as passive entities moved and moulded by external forces and “laws”. Likeness is a manifestation of the intrinsic autonomy of living beings, and as such is beyond scientific grasp, and cannot be treated in this kind of homology discourse. This is mainly because the self-representation of every organism is not a passive event but an activity which has a signalling role and thus cannot be justly objectified without knowing the perspective of both a sender and receiver. We shall return to the problem below.

To remain in objective science we should stick to some of its shared paradigms. The first approach, the belief in formative principles (the “Platonic” approach, as we called it) looks natural and well-supported by enormous amounts of collected samples and comparative work. The principal drawback of the approach is its lack of explanatory and prediction power: no generalization – rules or laws – can be drawn from the material collected. Whereas there exist solid explanations about why, say, snowflakes of predictable shapes and properties are formed again and again from unorganized water molecules, no such theory will explain why a rabbit and not, say, a shark or an oak tree, can grow from a rabbit zygote. Platonic ideas as attractors towards which shapes develop are definitely not welcome in contemporary science.

The alternative, phylogenetic explanation, assumes a common ancestor from which independent lineages of descendants come into existence: the lineage of oaks will definitely not bear rabbits. Two characters in parallel lineages are homologous if they can be traced back as attributes shared with the common ancestor of both lineages. Otherwise they should be taken for homoplasy (convergent characters) or homonymy (based on opinion only). Said the other way round, well-documented homologies provide tools to help reconstruct evolutionary lineages, and it is on this area that most attention is focused. Hence we have an explanatory circle, where lineages and trees are being (re)constructed on the base of homologies, and homologies are confirmed from the shape of the tree.

To proceed successfully and consistently, in addition to homoplasies the horizontal transfer of traits between lineages should also be forbidden. Bearing in mind the informational promiscuity of the prokaryotic biosphere (see previous chapter), such a precondition looks very precarious, even if it is known that horizontal transfers in multicellular eukaryotic lineages are many order of magnitudes rarer than in prokaryotes (they may be taken for singularities rather than rules). Yet they do occur, especially over long evolutionary time-scales. Similarly, hybridization events between lineages, however rare, can never be excluded. Third, subjective evaluation of characters may and must influence the process; this is especially true for structures that cannot be transformed into reliably comparable data. As a result, many competing similarity trees can be constructed, depending on which characters are taken into account.

The advent of molecular sequencing and the availability of robust data – even of whole genomes – has given the whole area a new impetus. The number of characters
that can be taken into account for classification is enormous, and they are seemingly objective – provided that such homologous sequences can be determined in many lineages (which is usually not a simple task). The correct annealing of the great number of characters is the main task here, and robust statistical methods, combined with the experience of the researcher (a subjective factor again), are required both to feed the tree-constructing software with data and to choose the most plausible tree out of many.

But notice another shift in view. Before the genomic era, traits represented something imaginary that could be treated as a black-box (as in Mendelian genetics); traits were simply “causes” of structural or functional characters detectable in bodies. When traits turned into sequences of “letters”, they themselves became the subject of homologization and the basis for tree reconstruction. And because of the enormous amounts of sequence data that can be obtained, we tend to forget morphological characters altogether, and the whole realm becomes a whirl of mathematical techniques available to anybody able to master them. One does not need to be a biologist any more, and one may never see or observe any living beings except humans and their pets (and perhaps also pigeons in the street). Evolutionary trees became a matter of comparing many-digit code numbers written as if on an ID card, revealing the ancestry of the bearer. The task is to determine which numbers on the “card” changed in each lineage and how. There is no need to be acquainted with the bearers of the IDs in the flesh – the whole task of reconstructing the tree of descendants and resemblance of kinsfolk can be done cozily in the parish register! (This resembles the practice of many cultures and regimes in history where what is important has not been the qualities of a given person but rather her/his family tree.)

Such a development would perhaps be justifiable if gene sequences really were causes of traits. This is however, not the case, because causation in living beings goes through many domains and almost no clear-cut linear relationships can be distinguished between genes and morphological traits, even if we maintain a hierarchical vision of biological organization.

This approach leads to the abandonment of a strictly hierarchical view of development. There is no simple linear hierarchical relationship between gene actions, developmental processes, or final morphological structures. Minelli (1998) therefore proposed to discard the concept of homology as an all-or-nothing relation, and recommended instead a “combinatorial approach to homology” that focuses on individual cases at the level of particular modules in specific contexts. Homology assessment should thus be partial, for only partial homologies are operational in this respect, with absolute homologies (almost 100 percent similarity) representing asymptotic cases.

The concept of field homology represents another alternative approach to reconciling various levels of organization. Here, homologies correspond to field attractors visualized as recurring valleys in an epigenetic landscape: “Characters that represent corresponding valley bottoms (attractors) in the epigenetic landscapes of two or more organisms are homologous if they have continuously reappeared in the ontogeny of individual organisms since their origin in a single population of ancestral organism.” (Striedter 1998, 224)
Homology would then be defined as a groove in a landscape created by inner tensions (Platonic component) reinforced by habitual usage (evolutionary component). Remember Heidegger’s notion of the Region (Chapter 2) – the scenery is almost isomorphic! But only almost: the active nature of the very bearers of trait is not supposed in biological parables inspired by Waddington’s explanation of the epigenetic landscape, whereas, as we have seen, authors like Heidegger, Kauffman, Bachelard and others do not hesitate to add this active element (at the price that they would be only grudgingly, or not at all, accepted by science).  

**Unity of Semantic Field**

As already mentioned, none of the theories discussed in this chapter take into account the fact that what is treated is living beings. Most profoundly this is shown by theories which take for granted that characters as a whole are somehow inscribed in genetic strings of molecular “letter-signs”. We suggest another approach which takes into account the unity of organismal experience, its form in space-time as epitomized by the slogan “We never have been dead”.

We are again approaching the idea of being-together, which has been discussed at many places in this book. In the previous chapter we tried to apply it to the Gaian world of the prokaryotic biosphere, and here we shall proceed by developing it in relation to the concept of likeness. In the case of the planetary web we focused our attention on genetic promiscuity and on a common symbolic language enabling the coordinate action of whole ecosystems. In multicellular eukaryotes (animals, plants, and fungi), horizontal gene transfer is apparently of minor importance in everyday “milling about”, but it may have often played the role of a *deus ex machina*, a historical singularity, in evolution. The second point discussed in connection with Gaia – the crosstalk, is, however, of great importance here as well. A third factor, imitation, only enters the game of interspecific information flow (for further details, see Kleisner and Markoš 2005).

A constant game of information processing and exchange of intelligence takes place between cells in a body just as it does between individuals in the biosphere. Cells in a body are permanently interconnected by signalling networks such as the nervous system, as well as many levels of humoural regulation, morphogens, the immune system, etc. Such signalling modules enabling information transmission are, as in the case of the genetic code (see Chapter 5) of a universal nature throughout the biosphere (with something of a gulf, albeit not an insurmountable one, existing between prokaryotes and eukaryotes). Such universality suggests the presence of intricate interconnectedness between “nodes” like cells, individuals, species, or ecosystems. Moreover, they point towards very strong pressure to maintain this interconnectedness, i.e. to maintain universal communication tools operating by way of a kind of common language. For example, the symbioses (from

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2Epigenetic ways in which structures can emerge will be discussed in the next chapter.
What is the Source of Likeness?

Pathogenicity up to very intimate connections) that exist between organisms have seemingly developed independently over hundreds of millions of years. Such a state of affairs suggests the existence of a network of interconnections within a multicellular body, which is at least partially inter-penetrable for other participants of the game. The same holds for the networks of signals like pheromones, odours, and behavioural cues, which represent communication between individuals not just of the same kin, but also across phylogenetically distant lineages. A third example comes from molecular biology: very old assemblies of genetic modules (e.g. homeotic genes) are universally operative across wide areas of the organic realm. Thanks to such universal devices, different networks can be interconnected and enter into the endless games of informing, misconception, broken communication, tapping somebody else’s communication lines, cheating, etc. Out of all this arise relationships like commensalism, symbiosis, parasitism, etc.

Informational modules represent an expansion of R. Dawkins (1982) concept of the extended phenotype: there cannot be anything like a total and final set of gene manifestations. Phenotypic traits are manifold even within a single organism, but they extend even beyond the individual and, practically, can influence anything in the biosphere. The argument holds even if turned upside down: crosstalk across the biosphere is possible thanks to the existence of a planetary information network(s) which is, to some extent, accessible to all participants of the game. To communicate requires knowing one’s partner, and being able to become linked into the network of this or that “operator”. Biology is good at reifying means, channels through which this “empathic” current flows, but how to explain the very phenomenon of understanding is the task of semiotics. This “extended phenotype”, then, will decide the fitness value of particular versions of gene alleles.

External Appearances

Now we can return to our question of body plans. As we have seen, in contemporary biology the external appearance of living beings is being predominantly explained as the result of the advantages emerging from morphological and/or functional adaptations to external conditions present or past. Such views contrast with the older school of idealistic morphology that believed in rules of form that made reference to the unity of plan, as embodied in a particular species and individual. Taking into account the universality of molecular and supramolecular languages (coding systems), one may ask whether both idealistic morphology and phylogenetics did not miss another crucial point, which we will name feeling for shape or, more generally, feeling for being-in-shape, i.e. for being fit (hence fitness – of self and of the others). Seen in this way, body expressions remain as something that is to be recognized by the community – of kin and of other players of the game, as signs for the significance they convey (see also the discussion of Portmannian biology later in this chapter). The ability to communicate, or the inborn proneness to establish and enact means for communication (endow signs with meaning) arises quite spontaneously from the
common living-together in, and building-together of, a world, a biosphere. Living together develops eventually into a living community which, when grown mature and stable, becomes a culture – and hence we feel justified in studying true cultural phenomena. Such naturally formed societies provide models for natural social studies. What we want to point to here is imitation.

Bodily shapes seen as social phenomena are not only signs of a living community and a semantic means for communication, but are also signs of the common past and a means for “historical communication” with ancestors – bearers of an evolutionary experience – that is, signs of a past that is in principle still accessible to understanding and ready for use. Thus it may not be as far-fetched as it sounds to say that when the predecessors of whales entered the ocean, they did not develop all the necessary adaptations anew: they were able to dig from their phylogenetic memory, from the ancient experience accumulated by the fish-like ancestors of tetrapods. We will not go to quite these extremes, but will draw attention to ordinary yet hardly explicable phenomena from our biosphere, such as homoplasy and mimicry, i.e. to the emergence of formal resemblances within unallied lineages. Two “biosemiotic” explanations come forward: remembering experience of the past (as in case of whales above), or genuine novelty (comparable to fashion trends in human society).

(1) Latent morphogenetic modules (or latent homologies) may remain incorporated in the experience of lineages, to emerge unexpectedly in unrelated lineages. Homoplasy, then, may not be newly derived at all: rather it is a result of the persistence of a morphogenetic system, which becomes re-awakened or even invented (based on previous experience) in an unusual context. Hence, whenever organisms are about to evolve a new adaptive structure they may activate remote morphogenetic systems, and under the actual circumstances an unexpected shape will appear. From the biosemiotic point of view, such “realization” refers both to understanding (becoming aware of “knowledge” – of the existence of an engram), recognition of its significance (acknowledgement of a mute sign) and its bodily interpretation (the know-how of the developmental process).

(2) A classic example of hesitation when confronted with semblances in unrelated lineages is mimicry. Prevailing interpretations are often counterintuitive and implausible (except, perhaps, for aposematism or crypsis). But there exist many other examples of mimicry that cannot be explained so easily (for details and references, see Komárek 2003). For example, Batesian mimicry denotes the imitation of shapes belonging to the individuals of some well-protected species by individuals of a less-protected species (e.g. when a butterfly looks like a wasp). The unprotected species (the mimic) performs a kind of “semetic parasitism” by taking on a semblance of the protected species (the model). In Müllerian mimicry two or more protected species mutually imitate each other so as to form a concatenated ring of semetic relationships. Finally, in Wasmannian mimicry, we are confronted with the semblance of termitophilic or myrmecophylic inquilines\(^3\) to their termite or ant hosts. In all such cases the mimic must have the feeling of selected important

\(^3\)Inquilines are inhabitants, symbionts of ant or termite hills.
markers of the protected species (the “host”): only some, often superficial, characters are mimicked. We repeat again: an imitation is always an imitation of some, often very superficial, character of the model. Upon closer examination, the external observer will usually easily recognize the mime.

Many counterparts of animal semetic relationships can, of course, be found in human societies. For example, the termite – inquiline relationship is similar to that between humans and their domestic animals or even plants. The mimicking activity may even originate from the domesticant.

We consider imitation a result of interspecific “informing” based on a very similar feeling for shape amongst creatures that have shared the world since time immemorial. It could be compared to fashion, a phenomenon of collective imitation (or refusal) of practically anything (for more details, see Kleisner and Markoš 2005). Fashion, as we know from our own culture, is a luxury phenomenon applied mostly to external appearance (clothes, jewellery, cars, and housing). It has no rules (except that of rejecting the fashion of the immediate past) and it cannot be imposed by authority. Fashion is rooted in imitation, and its prerequisites are the ability to understand others, to have an internal feeling of how one is seen by others, and having the freedom to decide to look – only to a certain extent of course – like them. In non-human beings, psychobiology, ethology, or memetics have brought evidence of how imitation works in young (primates, carnivores) or in domestic animals – hence mainly birds and mammals. We would like to be more general here, by taking interconnectedness of life in the biosphere for granted.

Our thesis is that imitation is a common phenomenon that interconnects living beings “horizontally”. As in the case of fashion, imitation is a matter of free, voluntary decision – it is imposed from inside, and is a matter of selected superficial traits that is uniquely casuistic. For example, in the environment of the ant-hill some of the symbionts will understand the message and will take on various superficial traits typical for ants. Such mimicry supposes – like in the case of fashion – a reflected dictate.

We suggested the notion of the semetic ring (see also Kleisner and Markoš 2005) to name a shared but non-kinship semblance (e.g. mimicry), and we shall take this as a case of horizontal communication between organisms. With Portmann (1967) we suppose that self-expression (Selbstdarstellung) of living beings belongs to their shared experience of being alive, and that it implies the existence of a recipient of the message who will perceive it in a competent manner. Hence, a living being’s external appearance or even distinctive characteristics (eigentliche Erscheinungen in Portmann) represents a value, a raison d’être in itself. Organisms may even strive to dissipate their own likeness, (semblance, image) throughout the world (as, literally, media stars do in our culture). In addition to reproduction and amplification of genes and memes, semes (hypothetical “units” of semblance) too influence the evolutionary process. Instead of self-reproduction for gene transmission, semetic self-realization through self-dissipation (self-transcendence) may be regarded as the true propeller of evolution. Accepting such a proposition would explain the broad range of similarities in living nature, because likeness is not genetically bound to the bodies which invented the original shape. Again, we move in a biosphere-type
network of mutual understanding, as in the case of gene and signal promiscuity discussed above.

Darwinian evolution by selection of the fittest can be understood as a semetic process that depends on mutual understanding within the biosphere, by setting future layouts, by interpreting the actual situation and by the scrutiny of historical experience of all beings present at a given time. Such a semetic process presumes mutual understanding by the participants, and a continuity of communication across many levels of organization. Only part of such a crosstalk is not semetic, i.e. has been assigned to automatisms like metabolic pathways, feedback circuits, or coded symbolic interactions. Semetic processes, however, rule over the whole biosphere. They may represent a real analogy of natural language, and it is this level of communication that is decisive for the proceedings of natural history.

In conclusion a reminder to the concept of likeness introduced in Chapter 4: Likeness is the manifestation of the dynamic nature of living forms. It refers to their semiotic aspect. It points to various ways how to look alike, being itself the expression of its variability. It is included in the very polysemy, apparent from the way it looks – from any actual way it looks, since each of them displays or means (implies or at least hints to) the other ways of looking-alike. . . . Likeness expresses its ability, potentiality, inclination or readiness to change by suggesting (reminding, pointing towards or referring to) such changes just by the way it is.

Back to Letter-Signs (ID) and Shapes (IDea)

How the body is built and what it is made of are of the utmost importance for how it looks. The fabric of the corporeal reality of a living being brings evidence of becoming – its becoming to what it is. And the way it is, includes, represents and reveals the whole way or process of its development. Thus the actual form of a body is at the same time the sign of its formation, its nature – that which makes up the very being of the living being. Clearly, for body-sign, in contrast to letter-sign (as in gene sequence), form is absolutely essential. The body – the way it is – incorporates the individual way of life, the unique way the life story. It has run its particular course by finding its way through all kinds of cross-roads, forks and turnings to and fro, in and out of the many blind alleys of collision and dark valleys of decisions, reformations and transformations.

That inner form, the subjective, narrative format of the life story, is stored, its winding ways of being and becoming woven to the form of the body to find its manifestation in the way that body looks. The bodily appearance is the expression of a being’s nature. It is what makes the body into a sign; its form is not limited to the overall shape, but includes its countenance, behaviour, comportment etc., with every aspect of the bodily appearance contributing to its nature’s expression or “physiognomy”. Note this difference, however: the general look pertains more to the generic

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4See Ho (1993) regarding such coherent communication “across many octaves”.
nature (that of the genus and species) than to the individual one. That is why taxonomy is based on global morphology and anatomy (stressing the characteristics the members of the same taxon have in common) in contrast to what we might call physiognomy – the recognition of the individual’s *physis*. Every aspect of body *form* conveys a meaning – is important and meaningful – relevant to the semiotic nature of the living body; its whole form makes it into a visible (perceivable) sign of its formation – that is, of itself.

What about the material aspect of the body-sign? At first glance, its materiality might seem the most evident and essential aspect of living existence. A body is solidly physical – tangible and visible. However, in a living body it is hard to tell apart matter and form, or to draw, if only in principle, a theoretical distinction between its formal and material aspects. So-called “living matter” is all flesh (*sarx, caro*), any bit of which either actively takes on the form of the body and/or participates in its formation. Indeed, all the components of the living body (its parts, elements, aspects, abilities) work in concert to make up the body. Virtually every cell and every molecule acts either as an essential element of the body’s morphology or plays an active role in morphogenesis – and usually both.

What might be called the “chemical composition” of so-called “living matter” or an “organic system” has no bearing on the topic. It merely refers to the presence or absence of atoms and molecules, their amounts (sometimes even concentrations), relative frequencies and distributions. This can hardly be regarded as the matter (the material aspect) of bodies or their parts, the stuff from which organs, tissues or cells are made. Chemical entities, as defined and conceived by contemporary biochemistry, cannot stand for the material aspect (or substance) as opposed to the formal one. They make sense only within the frame of a pre-existent theory in which the Aristotelian categories bearing on natural experience do not hold. Another of the many reasons (if reasons be required at all) for the inadequacy of thinking that atoms, compounds or molecules stand for “matter” is that they are defined by their formal characteristics and not material ones! These so-called “formal” characteristics hardly refer to true “form”, that is, to forms or shapes in the morphological sense; rather they consist of numerical data concerning proportions, positions or quantities such as weights or volumes, and the same holds for chemical composition. The last vestiges of form still admitted in the biochemistry of organic macromolecules go under the name of “(spatial) conformation”. But they are but shadows of real forms, and chemists are doing their best to force them into the straightjacket of geometrical figures or solids. In science, matter does not matter and forms are substituted by their ghostly projections into Euclidean space.

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5 All of us have learnt that the synthesis of urea in 1828 was a break-point – a true scientific victory showing that both organic and inorganic realms are essentially the same. That rational morphology was also flourishing at the time and demonstrating that they are different is mentioned only scarcely, and not many biologists are aware of its existence. Why the first event deserves mentioning in textbooks even today is a puzzle – except that authors tend to copy such phrases from older books.

6 A very curious conclusion, for we all learn in school that the idea that “matter does not matter” is the creed of certain mystical or “idealistic” figures known as notorious opponents of true
Truly natural forms – those neither constructed nor synthesized or otherwise produced from without but grown from within – manifest their essentially morphological nature too obstinately to stand for geometrical abstraction. Thus they are simply ignored by science as much as possible; appearance, shape, semblance or likeness do not belong to objective categories, and have no counterparts in objective reality. Hence, the striking lack of concern apparent in present-day biology for morphological aspects of the living, and the biologist’s general lack of interest in how organisms actually look. Such methodological blindness, which seems so odd to lay people, might account for the widespread “materialism” professed by most biologists. Again, we are confronted with the puzzling phenomenon that in science what is material becomes immaterial: scientific explanation explains matter away. What does not matter is insignificant and what’s immaterial is meaningless. The science of semiosis cannot come to terms with objective science. A “great (epistemological) divorce” is its only option to get established.

Both morphological and morphogenic performances depend precisely on the form of these various factors and actors of body form and formation at all levels of structure and construction. Contrary to the usual explication, we suspect that the nature of the formative activities exerted by these molecules and cellular structures in creating the body is not mechanical but rather is semantic. Their forms are not just appropriate shapes appropriately “wrought” to suit function as building blocks are apt to fit together as the parts of some structure or machine (preferentially through spontaneous self-assembly), or to perform special tasks (attaching, cleaving, replacing etc.) on other specific elements thanks to their steric reciprocity or complementarity of the lock-to-key kind.7 Rather, the character of the elements involved suggests that their action does not depend on the physical properties of their geometric forms but rather on the semantic content of their morphological behaviour. Indeed, rather than being physical bodies, somatic features of living matter resemble semantic expressions like words, symbols, emblems, signals. They are not like structures and compositions but rather like instructions and disposition. They do not act by impacts under defined conditions but rather through pacts concluded in a situation. J. von Uexküll and many others drew attention to the non-mechanical status of the living, but such authors remained as mere curiosities at the periphery of biological science.

The semiotic approach corroborates the suspicion that the nature of living bodies, although being somatic by definition (soma = “body”) and by existence, is not at all “physical” or “material” in an ordinary (or better, a scientific) sense. Both semiotic and living existence transcend the difference between form and matter: here, matter is always a matter of form.

To be sure, the form (morfe) of every concrete existence does not refer solely to its shape but also to its material properties. Colour, density, weight, and consistency

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7 All kinds of physiological processes – from metabolism and regulation to information processing – are understood in terms of levels and cogwheels, regardless of the obvious fact that no structures with physical properties adequate to such types of interaction seem to exist.
belong to the formal aspects of a thing. With “ordinary objects” (like clouds and smoke, shells and combs, stones or bones, to say nothing of artefacts) we can easily distinguish their outward forms from the inner (intrinsic) formal characters of the “matter” – the inner stuff of their shape, the inner form of the “shaped stuff”, and we can ponder over their mutual relation and relative independence.

With living objects like bodies and their parts, however, the relation between shape-form and quality-form is a different matter. At all levels – including both external parts (head, trunk, limbs . . . ) and internal organs (brain, heart, liver . . . ) – everything is both shape and matter.\(^8\) Outside and inside, morphology and anatomy, histology and cytology, molecular conformation and composition: all are but two sides of the same coin. Therefore, we cannot readily identify “matter” with inner content (e.g. a tissue or cytoplasm) and “form” with outer shape or with exterior features. Any surface is a sur-face, i.e. a face – a significant expression of a semantic content; it is part and participation, tribute and contribution to meaning for the body’s appearance. This is because the living body is not simply an object – a mere unity of matter and form, a shape resulting from or imposed on a material quality – but rather is an objective phenomenon, a process involving life’s embodiment, i.e. becoming flesh. Let us therefore call the particular nature of the living body as flesh. This respectful traditional term proves to be useful in the context of the particular kind of existence in which form and matter, as well as shape and “quality” have a different status and meaning.

The form of an expression acts as a material of understanding, the subject of an interpretation which, again, finds its expression in another form – a new one. Just as a mythical motive becomes the content of a heroic drama (its “narrative substance”) and this epic expression (its literal form) is used subsequently as stuff for a theatre play, i.e. is expressed in dramatic form, so a flesh-body is not an object but a discrete objective of becoming, the objective (or the sense) of a dynamic process of the transformation-transmutation.

We try to avoid the obvious word, “structure”, which also seems precisely to refer both to the shape and the material property of an object in the way we are seeking to capture. Significantly, however, this fashionable, comparatively modern term (struc-tura, derived from the Latin verb struo – to build, establish or put together, join) is applied to artificial products that are built (con-structed) out of parts (components). Hence, the wildly acclaimed “structural approach” allows one to ignore, overlook or omit qualitative or material properties and, eventually, suppress matter (hyle – the material aspect of concrete existence) itself – presumably because of its resistance to formalization. Like natural forms, material qualities have no objective counterparts; their reduction to “structural aspects” provides an expedient method for explaining them away. However, the material or qualitative (hyletic, plasmatic) nature of living bodies and their variability are precisely and manifestly the most prominent aspects of Life.

\(^8\)Only recently do we experience this shape-and-matter relation in artifacts such as microprocessors, nanotechnologies, special surfaces, etc.
As a “substrate” this substance makes up the likeness of the body – the essential form (eidos or species) of the organism, the subject (as the origin and responsible agent) of its becoming, a subject who cares how it looks. The visual (or better, perceivable) aspect of its bodily existence is of the utmost importance to it; it is the expression of itself, and an objective sign of its subjectivity. Hence, the individual living body is both a semiotic object and, at the same time, the subject of its objectivity, an object to itself. It is the expression of a semantic matter which matters.

In living bodies, matter and form cannot be disentangled through laboratory means. Only from the semiotic perspective can the material and the formal aspects be distinguished as semantic content and its semiotic expression. Although they can be told apart, they cannot be put apart or separated. They are but two united perspectives, formed from each of the countless semiotic relations making up the semiosis of each life. However, each tension between meaning and its expression, locally complementary and relative, adds up to global anisotropy or asymmetry based on the diversity of opposed intentions. Through it, the individual life-space of biosemiosis – the embodied space of signification – gets polarized.

As already pointed out, the appearance of body-signs (eidos) is significant, unlike the shapes of letter-signs which are irrelevant for their signification. We went so far as to conclude that letter-like signs have neither form nor matter, in sharp contrast to body-signs (although we find their role in semiosis to be by no means trivial).
ogy, or better still to “ontophany” – a revelation of being rather than seeming. For us, Portmann’s unaddressed signs-proper are signs of being as manifestations of the meaning of body-signs. The ontological meaning of body-signs refers to the being of their “herold” – the heraldic bearer of these signs seen as evidence of authenticity, sovereignty, strength and power (or of the lack of them).

The “ontosemiotic” approach to the aesthetics of the living proposed here seems in better agreement with Portmann’s interpretation of such phenomena as self-presentations (expositions or expressions) of the organism’s proper inwardness than do “luxury”, “superstructure”, “cultural and aesthetic need” and similar Portmann concepts. In our opinion, this semiotic interpretation of life’s aesthetic expression is in full harmony with Portmann’s doctrine as exposed in his chef-d’oeuvre on animal appearance (1967). Moreover, it opens up the exciting possibility of the reconciliation of his biological thinking with (seemingly quite incompatible) Darwinian evolutionism. Provided, of course, that “natural selection” occurs at the level of semiotic competence, based on the competition for prevailing, imposing or pushing-through one’s own likeness (the struggle for meaning), rather than functioning at the level of social-physical concurrence based on contention for (progeny’s) survival (the struggle for life).

Semiotic selection rates ontological fitness in being (of which becoming-an-ancestor is but a special case) and reflects the qualities of truth and value, whereas classical selection operating through differential physical survival appreciates short-term economic success in cheating by rewarding lying and ruthless ruses. Nowadays it seems that both the shift to the genocentric view and the inspiration provided by the now-fashionable memetics have contributed, rather paradoxically, to build up a climate of ideas that is much more open to semiotic thinking than either the original Darwinism or the traditional neo-Darwinian synthesis would have been.

The ontological interpretation of the aesthetic aspects of living forms in terms of the meaning of body-signs suggests a solution to yet another paradox of Portmann’s biology. Even when rejecting the role of phenomena proper in evolution (i.e. denying their contribution to “intrinsic fitness” in a deeper ontological sense), and staying with the belief that “every thing that hath breath praise the Lord” (Psalm – 150, 6), an awkward problem arises (discretely overlooked by Portmann and his followers). This is the question of why, on earth, the aesthetics of most so-called un-addressed phenomena seem nevertheless to be addressed to man? In other words, how is it that the form of so many body-signs (even if the obvious methodological selection effect” is taken into consideration!) conforms to human receptivity, i.e. to our sensory perception, neurophysiology of perceptiveness; why does it meet our aesthetic values and answer our tastes? Suppose however that man is, by nature, responsive or open to the being rather than to the appearing. Then we may account for his sensory abilities and receptive faculties as being primarily adapted (selected-for) to perceive signs of the truth and genuineness of phenomena, rather than just to be responsive to the orientation among phenomena of a specific umwelt. Further, let us suppose that the perception of reality (the quality and fullness of being – of being true and reliable, one and unique, autonomous and authentic, strong and mighty, valid and solid, whole and healthy, etc.) is accompanied by the feeling of beauty. By
admitting (in agreement with many aesthetic theories and philosophical concepts) that humans perceive the real as beautiful then we solve the paradox of human-oriented criteria, and the usual objection to Portmann’s unwarranted anthropocentrism falls away. The phenomena proper do not cause the living being to be beautiful; rather, they are signs of its proper being – being meaningful and significant. That is what the body-sign signifies. We are not the addressees of these signs but their witnesses. Maybe we are not the only ones. However, such an orientation towards being itself (being its self) is doubtless a particular characteristic of our species and an essential and mandatory feature of the human condition.
Chapter 7
Creation and Its Vestiges

In short the egg cytoplasm determines the early development and the sperm and egg nuclei control only later differentiations. We are vertebrates because our mothers were vertebrates and produced eggs of the vertebrate pattern; but the color of our skin and hair and eyes, our sex, stature and mental peculiarities were determined by the sperm as well as by the egg from which we came.

E.G. Conklin, 1918

Living shapes never arise de novo like snowflakes or tornadoes; they always come into being as the successors of their forebears. Moreover, they do not come into existence as replicas of such predecessors, but are built from germs endowed with information about how to create an individual which belongs to a given lineage. When entering the enormously interesting and extensively-studied field of embryonic development – especially when taking into account its historical dimension (the so called evo-devo problematic) – we are at risk of repeating banal truths available in any textbook, and providing but another dull depiction of what any biology student knows by heart. Or we may feed the reader good-looking, but alas unfounded, speculations. Special caution should be exercised, then, when approaching the topic by way of the central idea of this book – life as being-together.

Species as a Cultural Phenomenon

In Chapter 5 we described how the planetary prokaryotic network promiscuously exchanges genes and signals, so that from some aspects it can be treated as a single body – a single (super)organism. Starting from this background, we easily recognize that eukaryotic organisms are different. Obviously they have, to a great extent, found their way out of bonds of Gaian continuum; they represent clearly defined lineages that tend to be isolated from all other similar lineages.1 Hares obviously maintain the “hareness” of their lineage, undisturbed by the existence of other

1What will be said further holds more or less for all eukaryotes. To reduce somehow the number of “more-or-lesses”, we ask the reader to keep in mind only sexually reproducing multicellular eukaryotes such as hares, flies, daisies, moulds, and toadstools.
lineages-species, such as the parallel lineage of rabbits, or more distant wolves or, say, oak trees. Such a mutual insulation of lineages is the basic presumption of the homology studies that were discussed in Chapter 6, and for idealistic morphology it may be even the single and sufficient presumption.

With the advent of evolutionary biology the neat image became more complicated, because it allows for the transformation of lineages in time. First, we recognize lineages of hares and rabbits, but their shared characters suggest that some time ago there were no hares or rabbits around; both arose from an ancestral lineage of some lagomorph mammal. By delving deeper into history we can dig up (even literally) a common lineage leading to both hares and wolves, and deeper still we may be able to conjecture (probably not dig) a common ancestor lineage leading to both hares and oak trees. It follows that all lineages are interconnected by characters inherited from their mythical common forebears.

Second, once isolated, lineages do not remain in splendid isolation. External factors embraced by a common notion of natural selection constantly mould the characteristics of a lineage. This moulding force-field comprises, amongst other factors, wolves, eagles, oaks, and hares themselves. Long-lasting co-existence with the lineages of “others” (their “selection pressure”) will undoubtedly influence some characters of the hare lineage. Predators will push it towards better abilities to hide or escape; the presence of other hares leads to intricate ethological and sexual interplays, as well as towards the development of immunity against shared pathogens; an unbroken canopy of an oak forest brings the need to discover alternative ways of grazing . . . Unravelling the ecological and evolutionary games played by all creatures sharing a given space and time occupies a significant fraction of contemporary biologists. Actually, the previous sentence is not quite true: for contemporary biology, it’s usually not living beings themselves that are of interest; it is their genes, i.e. the molecules participating in the “game”! And if the previous sentence is true, then we should first ask, how molecules can “play” at all.

As already mentioned in many places, we consider such an image of the evolutionary game quite unsatisfactory, because it encompasses no real players, only chess pieces moving around the board! The final pattern of the game does not depend on the activity of pieces. The whole image reminds one rather of a chemical tank full of different organic compounds. The quality and yield of final products will depend on overall initial conditions encompassing the temperature, size and shape of the reactor, the species of molecules present, the evenness of their distribution in space, etc. We are reluctant to say that molecules in the broth play a game, even when it is conceivable that the whole process could be modelled by procedures of mathematical game theory. Molecules do not play, they simply obey – and so too do the genetic molecules assumed to be crucial in evolution.

Instead of a mathematical game model, elsewhere we have suggested the parable of a lineage, a species, as a culture (see Chapter 1)

We suggest maintaining this parable of active players who inherit not only their form, genes, metabolism etc., but also ways, experience of how to handle affairs, on the grounds that it is more appropriate to life than are passive molecules or chess pieces. To be more precise: we do not deny the role of very complicated reaction
networks in highly structured “reactors”; we only point out that these processes run in the background of what is really going on, which is a semiotic, hermeneutic, cultural process (see previous Chapters).

But what, then, will we understand as culture? We shall borrow appropriate formulations from an article by Quinn and Holland (1987). In the first paragraph we read: “Undeniably, a great deal of order exists in the natural world we experience. However, much of the order we perceive in the world is there only because we put it there. That we impose such order is even more apparent when we consider the social world, in which institutions such as marriage, deeds such as lying, and customs such as dating happen at all because the members of a society presume them to be. [...] Such a culturally constituted understanding of a social world point up not only to the degree to which [people] impose order on their world but also the degree to which such an orderings are shared by the joint participants in this world.” The authors then continue to discuss the enormous thesaurus of cultural knowledge and cultural models that is taken for granted by most members of the community, about experience helping to canalize different cognitive tasks, and helping to construct post hoc accounts of what was lived through. We shall end this excurse into culturology with two more quotations: “Our cultural understanding of the world is founded on many tacit assumptions. This underlying cultural knowledge is... ‘often transparent to those who use it. Once learned, it becomes what one sees with, but seldom what one sees. This ‘referential transparency’... causes cultural knowledge to go unquestioned by its bearer,” (p. 14) Sets of tacit assumptions will be woven into the stories [see also tyche in the Chapter 1]: “These ‘stories’ include prototypical events, prototypical roles for actors, prototypical entities, and more. They invoke, in effect, whole works in which things work, actors perform, and events unfold in a simplified and wholly expectable manner. These events are chained together by shared assumptions about causality.” (p. 20).

Below we discuss a number of problems seen through such a “cultural” prism. First, however, mention must be made of some necessary facts about how shapes come into existence. We shall confine our examples to animals, not because we are zoo chauvinists, but because in the limited space we have here we prefer to discuss the most prominent examples. Caveat lector: every “typical” situation has many departures from the rule, but our role is not to provide an exhaustive textbook knowledge here; what we offer below is a simplified depiction, indeed almost a caricature or a cartoon.

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2The article is about human culture. Whenever there are references to “people”, “we”, etc. in the quotation, we underline it; we invite the reader to replace such words with expressions like “living beings”, etc.; similarly, the word society should be read as “lineage”.

3Compare with things likes stones or trees which exist “whether or not we invent labels for them”.

4One of the most fitting descriptions of such behaviour is the analysis of cartoons by Eco (1994).

5Recall “things thinging” in Heidegger (Chapter 2).
What is Passed Down?

As we have already seen, animal forms have no “common ancestors” – they do not come into existence by a replication process but are built up by the coordinated activity of cells. If forms do not arise from forms, what, then, is passed down the lineage and what is the nature of the formative forces? This brings us to the notion of *replicator*, so often used and misused in the contemporary literature. As the name suggests, such an entity should be able to produce a copy, a *replica*, of itself. Loosely speaking, only one kind of such replicators is present in the contemporary biosphere: cells. Speaking technically, even cells are not replicators, as there cannot exist two *identical* bodily structures: daughter cells can be only *similar* to their mothers, to this or that extent, and what is passed down is likeness not replicas. Likeness, for its part, demands semiotic abilities. Moreover, every sexual process will produce a new cell lineage with a new genotype. How to name the process of such a merger of two cell lineages into a new one? It follows that no “material” entity can be pinpointed that could serve as an invariant which is passed “down” the generations. It is not a material thing but a *way* of handling affairs that is inherited.

The reader may argue immediately that the term *replicator* has been well established by contemporary molecular biology and the neo-Darwinian theory of the selfish gene. It designates information molecules like DNA or RNA whose *sequence* of distinct monomers can be faithfully copied. The term is catchy but quite unlucky. First, it is the body, not information molecules themselves, that performs the replication. Second, cells, molecules, i.e. bodies replicated come out in different shapes and conformations – they are similar not identical. What really *is* identical (save for copy errors) is the sequence of letter-signs, the pure information embodied in the molecules. Letter-signs have no body, therefore they really can be *replicated*; the strings are not just similar, they are identical (for discussion, see Markoš and Švorcová 2009). To avoid confusion we shall avoid the word “replicator” from now on. But still the question remains: what is actually passed down along the lineages?

Two germ cells, sperm and egg, meet and merge in the fertilization process. As for the total mass, the sperm cell is negligible compared with the egg, and its specialized cell structures often do not even enter the egg cell. What undoubtedly enters the egg is the sperm nucleus, with a neatly packed (zipped) chromatin structure containing one genomic equivalent of DNA. It contains a unique version of the genotype and a unique way of packing it, as does its counterpart waiting in the egg. The two nuclei merge to form the single diploid nucleus of the fertilized egg – the zygote.

What follows can be sketched by the metaphor of a chemical reactor as discussed above. The “reactor” is embodied by the zygote, which contains a huge reserve of “chemicals”, catalysts, spatial heterogeneities and both matter and energy flow. Fertilization represents a switch, a spark that launches a complicated series of almost automatic events, with cleavage being followed by gastrulation and the establishment of so-called phylotype.

During cleavage, the nucleus starts to divide, the daughter nuclei move apart, and then divide again and again. They claim some specific region in the egg cell, with all the peculiarities of that region. Nuclear division is accompanied – or followed after
What is Passed Down? 183

some delay – by cell cleavage. Everything is supplied from the reserves accumulated and by structures at hand, the nuclei remaining genetically silent as they are fully absorbed in replicating their DNA and nuclear division (mitosis). Nevertheless, they are sensitive to the characteristics of area they happened to enter and become determined by those surroundings. Thus they make the layout for their further fate, further differentiation, according to their understanding of their space-time position within the egg.

Once several hundreds to thousands of cells are formed the stage of the blastula is attained. This resembles a hollow ball paved with cells on its surface (or some modified equivalents of such a ball). In the meantime, groups of nuclei (cells) are engaged in transcription (and proteosynthesis), supplying new gene products to add to the “broth” inherited from the mother. Now a very intricate process of gastrulation will follow, consisting of coordinated movements of cells or whole cohorts of cells (groups, sheets) into the cavity of the “ball”. This movement is accompanied by processes of induction, when neighbouring cells or groups of cells mutually influence their further fates. The gastrula reveals already the future body axes and the layout of anlagen for future organs. Its further transformation leads to a peculiar structure that is typical for a given lineage – phylum – hence its name phylotype. The whole structure is of about the same size as was the original zygote. The phylotype is the starting point for organogenesis and growth.

Recall now Barbieri’s platform discussed in the entry of the second part of this book. We described his idea of the triad of genotype – phenotype – ribotype. Whereas genotype and its processes can be described by standard chemical language and genetic programming, the phenotype (i.e. proteins in this case) cannot be deduced directly without the knowledge of the code residing in the ribotype. The code is an evolutionary artefact, the result of historical “negotiations”. In case of embryology, Barbieri suggests a similar triad genotype – phenotype – phylotype. “Genotype” in this case encompasses all deterministic processes that lead to the phylotype, the phenotype is the adult structure, and the phylotype is the seat of historically constituted epigenetic rules that specify how to build the phenotype. Thus, if you take human and horse phylotypes, they will look alike because they follow universal vertebrate ways of specifying what the phylotype should look like. The human phenotype, however, knows, how to build a hand, whereas a horse phylotype will, from homologous anlagen, build a hoof: the same information will be differently interpreted in each species, according to the rules for the particular species.

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6 In some embryos, the whole process of cleavage and establishment of early embryonic stages goes on even in enucleated zygotes.
7 We use “phylum” in a very loose sense here, to refer to a group of organisms corresponding to some “higher” taxon like phylum, kingdom, class, etc.
8 In fact, the language is not chemical but biochemical, taking into account enzymes which cannot be understood in terms of chemistry alone; but we will not go into the problem here.
9 In the 1940s, C. H. Waddington (1975) introduced the concept of epigenetics to give a name to causal interactions between genes and their products that lead to the accomplishment of the phenotype. Today, epigenetics serves practically as a synonym for ontogeny.
Barbieri interprets the events as follows: all events up to the phylotype are automatic – they represent the execution of a “program” of reactions leading to the phenotype. The amount of information necessary to build a body is, however, many orders of magnitude greater than the amount stored in the “genotype” (including the structure of the egg cell as the “wetware” of the operation) – it will suffice to build the phenotype but not much more. Information contained in the zygote or spore is somehow insufficient, unsatisfactory, and new information must be generated to build an adult organism. “The reconstruction of structures from incomplete information is therefore a model that could make us understand how it is possible for a system to obtain a convergent increase of complexity” (Barbieri 2003, 70). The phylotype, then, represents a scaffold, an empty memory matrix, which, through many rounds of iterative processes, will “reconstruct” the species-specific phenotype from the incomplete inherited information. Note: information must be created, a great leap forward from the traditional views held by informatics. The code for how to perform the reconstruction is implemented into the phenotype, and it is similarly implemented in the ribotype in the case of proteosynthesis; in both cases information resides in structures not in genes. Barbieri argues that “The real key to embryonic development is the logic of systems which are capable of increasing their complexity in a convergent way, and in order to understand this we need if not a machine, at least a model that is functioning according to that logic” (p. 68). We, however, maintain that any reconstruction from an incomplete projection requires a comprehensive reader who understands what is to be reconstructed. Otherwise the blank could be filled only by pre-defined rigid structures, but these are surely not the concern of semantic biology. As stated elsewhere, we therefore prefer the top-down approach to Barbieri’s platform – instead of machines and memory matrices operating automatically, we are looking for interpretative, semiotic and hermeneutic explanations.

One more comment on increasing complexity. As stated in R. Dawkins’ famous definition: “a complex thing is something whose constituent parts are arranged in a way that is unlikely to have arisen by chance alone” (Dawkins 1976). If we jumble the parts of an airliner at random, the likelihood that a working Boeing 747 will come into being spontaneously is vanishing. Only one or very few contraptions out of zillions would actually fly. Such an arrangement of the parts that will fly is meaningful and all the other arrangements are meaningless.

Certainly, the documentation on how to build an aircraft does not contain the “complete” information for the construction of an aircraft. No project will bother with providing information concerning, e.g., how to screw the bolts or how to use a hammer, to say nothing of iron-ore mining instructions, the theory of the wheel, or Newtonian mechanics... No project is accomplished in three dimensions and in a 1:1 ratio, to really contain the complete information. It has to be detailed enough to be understandable to the knowledgeable reader or even for a robot equipped with the necessary instructions. This is because information in a developing structure can increase only if (1) a wired comprehensive model exists for the reconstruction of structure (i.e. additional information is represented in the wiring of the robot), or if (2) an understanding, informed reader can build a whole structure from an incomplete source.
Let us now imagine the “747” documentation with some pages and drawings missing. It may even appear that only as little as 10% of the files are really crucial for the construction of a functional plane. The robot performing the task would be lost, but not so the constructor who knows what the outcome should look alike. Plans for the board kitchens, seats, bathrooms, seatbelts etc. are not that crucial for somebody who knows what kitchens, seats, bathrooms, seatbelts etc. mean, what they are good for. An engineer who understands aviation may even be able to assemble the parts in a better way than what was intended in the (now lost) documentation. Any (re)construction requires a great deal of experience and/or constructive imagination.

But now: we do not suppose any external intelligence or force. In contrast to a 747, a living being builds itself, yet the process is not encoded as a static sequence of signs in some medium (like DNA), it is a bodily process negotiated within the lineage – and this is a cultural process.

The Sheaf

Actually, Barbieri’s platform is far from being smooth: it is deeply rugged, and events are not that clearly differentiated as described above. Gene expression from newly-established genotypes may take place quite early. The structures are plastic under external influence. The automatism is not absolute in most cases – e.g. in mammals, dividing early embryos into two results in two normal fetuses, and a merger of two unrelated early embryos will produce a chimerical, but otherwise normal, fetus. The phenotype can be thus diffuse in space and time – to the extent that it cannot be recognized at all (as in some parasitic wasps – yet their adult stages reveal no reference to the fact).

But this is not the whole problem. Similarities between the early stages of embryos were already recognized by von Baer in 1827. He opposed earlier Meckel’s (1812–1818) conjecture that “higher” animals pass during their ontogeny through the adult stages of “lower” forms. With the advent of Darwinism, however, both views quickly united into one and received a time-axis: early embryos embody earlier phylogenetic stages of the lineage, and study of embryonic stages should reveal the history of the lineage much better than palaeontology with its notorious missing links. The most prominent formulation came from E. Haeckel as the basic biogenetic law. A human being starts as a single cell, because her/his earliest predecessors were single-celled, and then proceeds through the stages of coelenterate, planarian, fish, saurian, primitive mammal, and ape, with higher, i.e. phylogenetically later stages, becoming more and more prominent. Of course, it is not easy to reveal all stages because some may be suppressed, others exaggerated, but a systematic study of many cases should reveal the true phylogeny of the lineage. According to such a view, ontogeny of all members of a phylum should proceed more or less uniformly up to the stage which we now call phylotype (strictly speaking, the whole trajectory from egg to that stage would represent the phylotype). Only from this point on would differentiation into species-specific characters proceed (Fig. 7.1a).
It quickly turned out that such a “broom” model was untenable, as the earliest stages of ontogeny within a phylum proceed along very different trajectories, only to end in more or less uniform phylotypic stages. As Raff (1996, 197) notes: “We are faced with a paradox. Body plans are clearly stable over long evolutionary spans. If they were not, we would not recognize persistent higher taxonomic categories such as phyla and classes. Yet basic elements of body plans are attained by different developmental pathways. They have been extensively modified by additions, and in the evolution of direct-developing species, losses and remodeling of larval body plans. Adult body plans have also been remodeled. Since shared body plans can be attained by different pathways, why should they be so stable and channel development through evolutionarily conserved phylotypic stages?” He therefore introduces the “hourglass model” (Fig. 7.1b), in which the early ontogenies of different lineages – members of the same phylum – are different, but are at one point all canalized into the single bottleneck of the phylotype, only to diverge again into various realms of the species morphospace. In such a model, the phylotype really is a prominent structure, a scaffold, a platform determining the layout of the possible morphologies that are allowed in the frames of the platform, of one phylum. The question remains, however, why such a structure is necessary at all, taking into consideration the plurality of pathways of early morphogenesis that precede, and are canalized into, the phylotypic stage.

Does the phylotype, then, represent an attractor in a morphospace? Or is it an unwitting demonstration of “belonging together”, like straws in a sheaf? After all, in some species that undoubtedly belong to a given phylum, the phylotype stage may be suppressed or even lacking. Our “straw model” (Fig. 7.1c) shows the ontogeny
of phylum members as loose bundles of species-individuals with different life curricula, but still feeling their belonging-together – and one of the most prominent declarations of such a feeling is the phenotype. This brings us back to our cultural model.

**Cultural Parables**

Some 25 kilometres northwest from Prague is the locality of Budeč, one of the most revered places in Czech history. At the end of the 9th century there was a school there, founded by the Frank missionaries; here the emerging Czech nobility received their Christian teaching. The young prince Václav (Venceslaus), who became founder of the Czech princeedom, and who as the martyr St. Venceslaus has been the patron of the country throughout the centuries, received his education there. Today the hill is dominated by the little church of St. Peter and Paul; its main part is a rotunda built in the 9th century – the oldest stone edifice in Czechia.

Such rotundas were frequent in the middle of the period of the Frank Empery (Aachen, Cologne), so it is no wonder that the missionaries imported the symbol (phylotype?) of their culture to the very outpost of Christianity of that time. Yet there is a striking difference between the buildings in a metropolis and a rotunda on the borderland. The former were built from bricks, whereas that in Budeč is cast from concrete! Even today we can recognize the impressions of wooden formworks on the walls, and reconstruct how the monolith of the rotunda was built! The lesson is that the Czechs sought to become members of the great Christian phylum, and wanted to show their determination not only in a spiritual but also in a symbolic way. They built the rotunda according to the descriptions of the missionaries, but as for materials, techniques, and craftsmen, they tinkered with what was immediately at hand. They succeeded in building a Christian phylotype – or better, its external symbol!

Let us take the parable at a deeper level. Peoples of all sorts, origins, tongues and cultural levels became attracted to the Christian message – the “phylotype” according to which their further life histories were to unwind. They received not only the archetypal Scriptures – which of course were and are available all the time – but before all the teaching and interpretation of the Scriptures that was valid at their time. They of course received the ancestral set of instructions as written in the genetic memory of Christianity – but it gives rise to endless formal expressions in body and flesh – in terms of denominations, peoples, small communities, and individuals. By joining the phylum they also, to a greater or lesser extent, modified that very phylotypic teaching (as opposed to the unchanged Scripture).

We all know that almost immediately after christening of some peoples centrifugal tendencies have appeared. Local traditions, use of language, translations of the Scriptures, etc., all these have contributed to the diversification of the Christian “morphospace”. Great effort (selective pressure) was necessary to keep the provinces within the framework of accepted norms, but even then, Christianity is (and always had been) a mosaic of various denominations bound by a common
phenotypic core – and that very core evolves with time. Once again: the core is not the Scriptures, which are unchanging – the core is what Christians here and now take for such in their lives! They negotiate it incessantly.

Let us give a secular example as well: the US Constitution has always been praised as well-balanced basic law, a shining example for any democratic country – and needing only minor amendment over more than two centuries. Yet there were American communities in history that could easily accommodate slavery, racial segregation, the extermination of Indians, or McCarthism, without having any doubts about their being good and constitution-obeying citizens. In other words, written documents have many interpretative frames – and these can be thought of as being akin to phenotypes.

The Ghosts of Common Ancestors

As shown in many places throughout this text, modern science – based on time-independent, eternal “laws” – has difficulties when it comes to explaining, or even accepting, life. Spontaneity, bodiness, likeness, care of oneself: these are concepts that have no place in contemporary biology. Rightly, of course, for they would erode the very edifice of biology as a science, whose tasks are (1) to study the chemistry and physics of living beings, and (2) to create lists of whatever can be listed, and to sort such lists according to certain systematic criteria.

To explain the forms of living beings without admitting their active participation in the process of formation, science must retire to some invariables from which the bounty of life derives. Essentially, three such approaches can be distinguished (see also previous chapter):

(1) Idealistic morphology (and its successors like biological structuralism) supposes archetypal forms (sensu ideal Platonic bodies), which represent a kind of field of force that attracts living beings within its reach.

(2) Evolutionists suppose the existence of a common ancestor of a group, equipped with the genetic script that pushes ontogeny towards a particular form: “Although metazoan body plans vary, they are based on an ancestral sets of instructions that have been maintained beneath the disparate phylotypic stages of various phyla.” (Raff 1996, 200) Evolution, then, is based on mutation of that script, followed by necessary reorganization of the body: “Some variations are more likely to occur than others in any particular genome. However, nothing would be really forbidden, and given enough time, sufficient variation could arise for selection to transform a horsefly into horse” (Raff 1996, 296) In the absence of an archetype, pigs can get wings, if natural selection favours such an outcome.

(3) The third approach is essentially a variant of the second one. It takes into account the modular character of living beings, when whole pathways or
structures can easily be left out with little effect on the outcome. Quoting Raff again: “Highly regulated patterns in one species may be quite different in a related species. It’s not that the regulated patterns of cell commitment or gene expression are unimportant for development within a species: rather, it is that other patterns can be substituted without loss of coherent and even conserved modes of early development.” (1996, 318–319) “Those elements that cannot be dissociated may be the features that define the phylotypic stage, and thus the conserved elements of the body plan.” (336) What evolves here is not only a genetic script determining particular features, but also a regulatory network. As the network is modular (see Chapter 5), its outputs may be very resilient to any seemingly drastic mutations it may experience.

The science of “evo-devo”, bringing together ontogeny with the reconstruction of evolution from changes in the usage of genetic scripts (toolkits), brings fantastic insights and explanations to all realms of biology. If we take zoology, the concept of zootype, the stage where the antero-posterior axes are determined by homeotic genes, is a typical output of this systemic research. Similarly, the deepest branches of the zoological system have been totally rearranged on the evolutionary “tree”. All this can be done scientifically, without reference to concepts like meaning. As this branch of biology is developing explosively, it is duly optimistic and self-confident in its hypotheses.

We have no intentions to question the efforts of modern biology, yet we stress another axiom: life means understanding the evolutionary narrative, and approaches actively the challenges of the present. It takes into consideration the experience, both that of the lineage and its own, and doings of other co-inhabitants of the biosphere. The community of living beings performs constant semiosis, but often comes to a quasi-stationary state – habit in a Peircean sense, or framing in the Heideggerian sense. This can be easily confused with laws imposed from outside – until a catastrophe, external or internal, does not set the pieces of the game anew.

To conclude, we can rewrite a paragraph written some pages above. The added parts are in italics: “Thus, if you take human and horse phylotypes, they will look alike because they follow today’s universal vertebrate ways how phylotype should look like. The human phenotype, however, knows, how to build a hand of a contemporary human being, whereas a horse phylotype will, from homologous anlagen, build a hoof not of some ancestral forms, but of a contemporary individual of Equus caballus species-culture: the same information will be differently interpreted in each species, according to rules which reign in the particular species.”

Such as, for example, leaving out the larval stages in one of two closely related sea urchin species. Adult stages are very similar and can even interbreed, yet their ontogeny takes different trajectories.
Quaerendo Invenietis

Our thinking is still influenced by that old Xenophantian anthropocentric fallacy that requires the world to behave rationally. Modern science has reached this point by automatically assuming that what counts is the non-living world with its eternal laws, dictating mathematical behaviour to all beings. In such a framework, life (and the mind even more) looks like an abomination, a mystical derivation challenging the invariable and automatic order of world affairs. If neither divine intervention (intelligent design) nor creative ordering forces (like Bergsonian élan vital) are allowed then we are left with an indifferent world which, under some circumstances, expresses emergent behaviour. Under such-and-such conditions, with such-and-such probability, some phenomenon will appear that is in good agreement with all laws, yet could not be calculated in advance. If the probability is too low, then only ex post can we state that the phenomenon in question belongs to such-and-such class of phenomena.

But what if the world loaded with energy is *inventing* things? Phenomena like galaxies, tornadoes, or flames suggest a lot, yet we hesitate to call them “inventions” as they can be satisfactorily modeled as dissipative structures, or in terms of self-organized criticality, autonomous agents, etc. After all, repeated cases of “invention” become habits; their coming into existence is no longer an invention and their appearance can indeed be foreseen by statistical methods.

The common feature of all such non-random, organized, dissipative structures like galaxies or flames is their development in time, and the considerable freedom that exists regarding what happens next. They can emerge indeed de novo and repeatedly “from scratch”, and will die out when circumstances favourable for their existence end or disappear. Undoubtedly the flow of energy through such systems has an organizing impact, in that it organizes huge numbers of molecules into coherent behaviour and informs them about how to behave. But we hesitate to identify such “in-formation”, such “telling-in”, with intelligence, and rightly so.

A true avalanche of inventions could be witnessed only when life defined itself as structures endowed with symbolic memory and symbolic communication processes. This is because symbols can be downloaded and kept in memory, and can even be written down as letter-signs, can be re-interpreted, and above all, can be shared with others! They allow experience, orientation in the world, and culture. They allow not only the creation of phenomena from random singularities, but also their re-creation out of experience. With the advent of life, sign systems, semantics, semiotics, and interpretative systems became emancipated from the “physical” world.\textsuperscript{11}

Symbolic communication led to the establishment of biospheres, involving players sharing several levels of symbolic communication – and all participating in the maintenance of communication channels. Self-insulation, cutting off the net, would immediately mean lower fitness. How such a Gaian communication network might

\textsuperscript{11}If we still maintain that there exists anything like it. If we start from *physis* instead, the emancipation will not be *that* apparent!
work we outlined in Chapter 5. A biosphere cannot appear from scratch, because it bears with it the experience of generations unknown, and a historically – and actively – built network of interactions. It is not a physical force organizing elements into a coherent whole, as in dissipative structures; rather it is a story woven by *physis*. (It was the principal fault of vitalists of all denominations that they – having recognized the “otherness” of life – still longed for a quasi-physical force which would *explain* the ways in which life *is*.) Note, however, that establishing such a communication network also involves a “centrifugal” force: the players – cells – keep their individuality. At no point was the biosphere represented by something like a “living ocean”,\(^{12}\) because such a formation would soon suffer a “complexity catastrophe” (Kauffman 2000) which can be very easily avoided by great amount of players with information distributed across many nodes.

Eventually (after about 3 Gy) the Gaian biosphere gave birth to another mode of expression of life – as partially emancipated cultures – quasi-isolated lineages of multicellular organisms who brought the symbolic language to a different vista. While still interconnected with the body of Gaian network, they develop species cultures which remain to a great extent preoccupied with themselves: their ontogeny, intraspecies games, ways of interpreting universal messages from outside. All this led to different way of being-with, perhaps well-epitomized in ecosystems.

\(^{12}\)Like Solaris in the famous work of science fiction by S. Lem.
We have heard things about the relationship between science and philosophy – or, more specifically, between biology and epistemology. I am supposed to tell you something about their necessary unity, complementarity or at least mutuality and collaboration. But philosophy and science (by “science” I mean natural science) are so different! They differ in language, terminology, in their ways of thinking, and in terms of the tacit knowledge they involve. There even seems to be no common experiential background that science shares with our common sense, literacy and general knowledge. It would take a long time and hard work to present before you a single body of scientific knowledge or a self-explaining philosophical reflection in a responsibly comprehensible way and still longer to say something about their relationship. In what type of speech would they be told – scientific or philosophical? Still, both science and philosophy are part of our culture. Or were – and should still be. This perplexity reminds me of a story told by my favourite author, Gregory Bateson. A man wanted to know about thinking. And having stored into his computer all the relevant data, he asked: “Do you compute that you will ever be able to think as we men do?” The computer, after performing a good deal of information processing, finally gave the output: “This reminds me of a story…”

Thus, Bateson introduces his central thesis: “We think in terms of stories”. The elementary forms of stories are fairy tales. They are stories told about fairies – elemental beings, spirits, elves, inhabitants of elements, shadows and light, forests, rocks and mountains, trees, leaves, flowers, and mushrooms, rain drops and rainbows... Immortal and timeless, their stories come from without, from elementary forms of common sense, involving the universal schemes of meaning that any narration must unwittingly respect in order to make sense. And stories, in their turn, are the proper and only form of any kind of wisdom or knowledge that can be shared by all people. Fairy-tales are archetypes of understanding – the very opposite of newspaper articles.

The fairy tale I am about to tell you has a common, even banal theme: it concerns good and evil, and how the former, with seemingly no chance at all, wins out at last over the latter. This particular story is about how single, inconspicuous good deeds,
acts of goodwill, expressions of selflessness, kindness, solidarity, service and self-sacrifice can lift a curse or dispel an evil spell: the spell of selfishness, egoism, and reckless behaviour. In our world – like that of science – pragmatism, assertiveness, opportunism, are the prerequisites for survival, the necessary condition for existence. Fairy tales like this one teach us otherwise. Its moral: not a struggle for life, but rather kindness and understanding, are diffusivum sui, a self-propagating power of love and kindness.

Once upon a time, at the threshold of our modern age, the world was again young and fresh and enchanted, deep, unfathomable, and full of hope. Historians call it the Renaissance – rebirth. But fairies tell us it was the very beginning of our world. A fairy world had been born, in which Heaven and Earth were again celebrating their new sacred wedding (hieros gamos) and found out that they were one: “the Heaven above, the Heaven beneath” (Ouranos ano, Ouranos kato), “in earth, as in heaven”… So did mankind. It met Nature again, young, beautiful, radiant, everlasting, innocent, stainless – snow-white. (That’s why the fairies left us their enigmatic tidings of hers under this name: Snow White) They too realized the identity of human nature with Nature: “This is now bone of my bones, and flesh of my flesh”, whispered the Renaissance man after the first man of once. Not only poets and artists, but even scholars and scientists wooed her. Philosophers realized that she is the Wisdom (Sophia) they have always loved and searched for. Nobody could resist her spell and charm and magic. And spells and charms and magic were the appropriate means through which they thrived to make her acquaintance. For it was known that Nature “likes to hide” (Physis kryptesthai filei). She speaks through symbols, signs and portents, and makes herself approachable by being imitated.

Science became the hermetic art of interpretation, dealing in hermeneutics and exegesis of Nature’s arcane signs and symbols. Once again, art and knowledge merged. It came to pass that apart from the white magicians – hermetic scholars – there were also black ones: necromancers, conjurers, and scryers. They called themselves mathematicians, mechanists and architects. They were envious of Snow White’s magical spell, which their white colleagues and common people preferred to the ingenious mechanical effigies devised by the black magic of mathematical tricks. By means of special witchcraft – then called dioptics and catoptics (imported from the Thousand-and-One-Nights land of the moon-crescent cult and shadow culture), they conjured up Nature’s image in their wonderful looking glass. And from that hour, whenever they looked at Snow White, their heart heaved in their breast, and they quickly covered her image with the cobwebs of their magical formulas and schemes… They maliciously substituted her unreal mirror reflection for the real nature of body and flesh. (They did it by another artful divination called “divine perspective” nowadays known as “geometrical projection”.)

Of course, the Wise Men of the Ivory Tower on the King’s Mountains saw through the fake and soon recognised its mirrored nature. But having no personal acquaintance with the real thing on whose reflection they reflected – Nature herself – they presumed it was her own reflection, and they were flattered. They confounded Nature with the nature of their own minds. This wisdom was later called the Great Philosophy – contrasted to the Small One, a mere philosophy of nature
(Naturphilosophie), still pursued by some dwarfish lovers of true Wisdom. They dwelt in the remotest parts of the world, in forests and caves, where Snow White once more took her refuge. Meanwhile, the black magicians boasted of their artifices – moving statues, speaking heads, artificial pianists, etc. . . exposed in the artificial parks distinguished by their geometrical design and sophisticated symmetries. But their envy and pride grew higher and higher in their heart like a weed, so that they had peace neither in the day nor at night. The necromancers decided to dispose of snow-white Nature once for all. They infused a venomous spell into a novel fruit from the Tree of Knowledge (safely secluded from the Tree of Life). It was called Newton’s apple and it was brought once again into the remains of Earthly Paradise and brought to Snow White as an offering of mathematical primaries to her Wisdom (Philosophiae naturalis principia mathematica).

Snow White longed for the fine apple, and when “she saw that it was good for food, pleasant to the eyes, and to be desired to make one wise”, and seeing that other people eagerly ate from it, she could resist no longer: she stretched out her hand and bit the poisonous half. Again the well-tried promise of god-like position and immortality worked. It turned paradise into a tenseless, ghost-like reality. This time, man was not driven out of Paradise, but the whole Garden of Delight assumed a lifeless mineral existence. (“Newton” means New Town that is, the New City of Jerusalem – the modern counterpart of earthly, natural Paradise, built of walls of precious stones and metals and Pearly Gates on the principles of celestial mechanics.) Nature’s subtle snow-white living body turned into a geometrical body: a dead thing of objective reality. Laid in a transparent coffin of Euclidean space so that she could be seen “objectively”, from all sides, unable to hide anything from the curious looks of science, she was laced quickly and tightly by the causal chains. The black humour of the magicians called these fetters Laws of Nature. And now Snow White lay a long, long time in the coffin, declared dead and like any other mechanical device of the black magicians. Yet the seven dwarfs stubbornly believed her to be alive. They did not accept the death warrant of scientific rationality, trusting more their five senses, natural intelligence and common sense. (That’s perhaps what is hinted through their number in the fairy tidings of old). She did not change, but looked as if she were asleep – a sleeping beauty, not subjected to corruption or decay. . . But – so were they told – this was the very proof that she is not only not alive but in fact never was, being but a mechanical toy devised by a Godhead arch-master artist-engineer, the Arch-architect of the universe worshiped by the magicians. It was Him, who created both Heaven and Earth, as one-and-the-same thing: lumps of matter made out of nothing – a kind of universal filling scattered here and there throughout the emptiness. Its boundless void, however, rested on geometrical bounds.

This novel, unnatural nature of the world was declared the true, mathematical stuff of reality – such as the natural laws are made of. Through mutual push-and-pull interactions from without, devoid of true mutuality and relationship, those chunks of fullness aggregated into forms and shapes: material objects. Some of them were composed of moving parts: the bodies. Geometrical bodies, mind you, not living-flesh! The dwarfs persistent in their conviction were dwarfed even spiritually: they were declared illiterate, uneducated people, their obscurantism in bad
need of enlightenment. So they stared at the glass coffin, the helpless mourning spectators, slowly learning not to believe their wits and senses and memories. But it came to pass that, suddenly, rumours spread that it might not have been always the case: living forms did change in time. The Gospel of Evolution spread, awakening great hopes and great stirrings. The curse seemed to be broken at last; the world appeared once again true and familiar. Tidings spread that not only living beings are truly alive: Nature itself, the very nature of reality, was active, striving, creative, and meaningful.

The necromancers (which means death-scryers) were taken aback. Their whole science was at stake! Evolution meant a death warrant not for Nature but, instead, for her “eternal laws”, which being mathematical (basically reflecting geometrical rules) just had to remain always the same. Then another magician came to their rescue (maybe unwittingly) with a mighty spell: “the Principle of Natural Selection”. The black magicians used the new formula as a powerful seal on Nature’s coffin. It was acclaimed by them as the mechanism of evolution and was added to their “Natural Laws”. It amounted to something quite preposterous – and so it was, indeed, a kind of “square circle” or “black snow”. But few noticed at the time, and with time even the dwarfs got used to its absurdity.

What the new Principle means amounts essentially to this. Yes indeed, forms do change, being immaterial, that is irrelevant – not real. Thus, many haphazard and most fanciful combinations of the chunks of stuff filling space may emerge. They were not created to gather into some pre-established bodily forms. Their aggregations are but various “Lego-like” combinations of various pieces bound together by the very same universal principles. However, the shaping itself is not governed by any such principles. There is no natural law of formation or aggregation. That’s why probably no two absolutely identical snowflakes did ever fall on the surface of earth. And still, they are the prototypes of mathematical principles of reality. Slightly different forms and shapes and patterns may arise according the very same immutable Natural Laws. Admittedly, water crystals, despite their variability, are rather uniform.

Where, then, do the enormous diversity and variation of living forms come from? Why and how did they evolve? The so-called living forms of matter evolve because they multiply. They function like self-reproducing machines impressing their replicas onto matter. The copies are similar, but not quite identical; again, every individual is slightly different. But since both matter (the universal stuff of bodily existence) and space (its universal place) are limited, the multiplication, replication and propagation of bodies cannot go on forever. Thus ruthless, reckless competition must ensue among them. It has been labelled the “struggle for life”, although it is but a poetic way to describe what in principle is nothing but mechanical sifting. The bodily forms themselves are passive and indifferent, being in reality “dead”, i.e. non-living, like everything else; they are as passive and inert as the stuff whose forms they are. Few variants would pass through the thick sieve or the narrow bottleneck to the next generation under conditions of great demands on, and scarce supply of, existence – the opportunity to exist. The overwhelming majority are not reproduced at all and only a tiny part of those most fitting will induce matter to assume similar
forms. This is the survival of the fittest or the Principle of Natural Selection in a nutshell.

Hence, evolution only looks like the strivings of organisms to change and adapt, to invent new tricks and stratagems. All this is but an illusion. In reality, it is nothing but mechanical sorting out. Darwin did not discover evolution. He didn’t even explain it. Rather, he explained it away! And yet, his achievement won such fame that it is being venerated as “Darwin’s most dangerous idea”. It has been compared to the royal acid of alchemy: the aqua regia held and hailed by the necromancers as the all-dissolving corrosive once and for all disposing of any illusion of meaning, purpose and the hopes for the rebirth and the re-enchantment of the world. Those are but products of human nature bent to see sense everywhere, products of our inborn incessant craving for meaning projecting itself into everything in the otherwise meaningless reality – lifeless beyond hope. This propensity seems to have arisen as a survival trick peculiar to our species. This kind of self-illusory thinking (information processing) is due to particular patterns of interconnection between our little grey cells. Their interactions are subject to the same and universal kind of chemical and electrical interactions as any other neural “wiring” even for the most primitive inborn stereotypes. It might have proven useful, it might have had selective advantage – and yet it is no less fictitious and wrong. Nowadays, the matter seems settled once for all. Indeed, adherence to this Creed is considered a touchstone of scientific literacy, a generally accepted criterion of intelligence and rationality. A mighty spell, indeed.

And yet, like every curse, even this one has a “catch”, an inconspicuous clause, a stipulation – a condition most unlikely to be the case. Never, but never and nowhere in nature shall love be found; no such thing as kindness, mutuality, unselfish care, a selfless service, some willing help can exist; any trace of love true friendship, albeit small can never occur! All this is impossible, excluded beforehand, since all life phenomena result from evolution driven by natural selection. Its almighty Principle, by its very rationale, drives the transformation of life forms towards all kinds of – ever improving – “selfish” behaviour. That is, propensity towards forms whose properties must seem inconsiderate, egoistic and reckless, since it objectively favours their own profit, which consists in successful reproduction of such forms. (Otherwise they would not have been there any longer!) But all these are, we necromancers keep on stressing and repeating, but manifestations of survival inertia. Indeed, forms and shapes too display a kind of “conservation tendency”, though not one dictated by any deterministic principles, being but the by-products of blind chance and optical illusion. This is due to the fact that anything we know must exist long and often enough to deserve a name if it is to be considered even to exist. And since forms are haphazard (only mathematical laws truly do exist!) in exceptional cases, even such unexpected and aberrant individual behaviour as that which results in a benefit to other individuals, to its own reproductive disadvantage, might sometimes be observed. Such rare misfits and mishaps are doomed to quick elimination. And should, moreover, such a tendency to self-denial prove to be hereditary, and against all the odds actually be passed on to the progeny, in the long term such a line will lose the race: the skilled cheaters will soon prevail over their “benefactors”.
But improbable as it seems, such phenomena do occur. And they are far from being limited to us humans! (We seem to be the most selfish of all creatures!). Rather, they are common in nature itself, naturally proper to natural living beings, widespread within that nature purportedly “red in tooth and claw” and full of deceit and fraud! Still, it is an established, undeniable fact recognised as such by the reluctant scientific community: animals do help each other! They do so in respects of hygiene, joint defence, collaboration, warning and even in the help and mutual support given when raising their young! They do all this mostly at their own cost: a bird signalling alarm to the flock is likely to draw the attention of the predator to himself and thus to put his own survival chance at stake for the sake of others. Let’s stress it again: these are by no means merely marginal cases of individual caprice! They are elaborate patterns of behaviour, inborn, hereditarily fixed and thus manifestly resulting from long evolutionary processes! This would have doomed the whole “mechanism of evolution” long ago were it not for the last evil snare, the deadly germ hidden in the very heart of Darwinian mechanics of “cockle sowing”.

The axiom of universal selfishness – it maintains – does not apply to individuals but to the inborn dispositions, endowments, or capacities known as “genes” (from gennao, to become).

Genes are programs, instructions, prescriptions; they are kinds of “recipes” received by the progeny from the parents, passed on from generation to generation. It is this “software equipment” that really counts in evolution, as the hereditary material. Genes are the only lasting – “surviving” – entities; all the rest is mortal, transitory, with no evolutionary significance whatsoever. Genes, not individuals, are selfish. It is to them that the selection principle applies. Now, the existence of “altruism” (such is the scientific term given to all kinds of generous deeds of self-denial resulting in the profit of other individuals) can be readily explained. Clearly, it is not the individual who profits from altruistic behaviour, but rather the genes driving it to such behaviour! The bird uttering its alarm call decreases its survival odds, but the gene for such an instinctive act immensely enhances the chance of survival of its copies in the other members of the warned flock. It threatens its “host”, but who cares? Certainly not the gene: in “the gene’s eye view” it is highly successful. Thus, the universal selfishness holds true – but at the genetic level!

This is not even very surprising. Have not self-sacrificing parental care and mutual affectionate partnership between mates been the classical examples of extreme, Darwinian egoism? (At the same time – or better, from time immemorial – they were also typical cases of love! Did nobody notice this patent paradox? Apparently not. Scorn, disdain and deprecation belong to the wicked speech of witches and, with time, we’ve got used to it.) Does not every cell of our body function as if working for the sake of the few, privileged ones belonging to the germinal line? And so it is with bees and ants... Thus, the idea of the so-called selfish gene has been born not as an apparition or wonderful intellectual device, but as something banal and self-evident. It only sharpens thecrudeness of the Darwinian world-view by pointing it out explicitly. It states that behind any behaviour – magnanimous, selfless and generous as it might seem – the selfish interest of a gene is lurking. Even human love, kindness, consideration, charity, mutuality, sacrifice are but self-deceptions.
They are travesties of one and the same universal, reckless and cruel struggle for life, examples of the cunning and sophisticated “survival tricks” employed by our hereditary endowments, inclinations, and dispositions – at our cost! Such misleading impressions are by no means limited to altruistic behaviour: all moral, social, religious values and principles, all virtues, goals, aims and ideals – noble and lofty as they might be – have the same biological explanation based on natural selection as the most vile and mean behaviour. All creativity and intellectual feats we are so proud of, although they patently hinder our procreative activities, must result from the selective advantage (at least in the remote past) of a gene responsible for it. The rest is but illusion. Or is it? Is it not the boastful satisfaction of the envious and life-refuting conjurors that is self-deluded? Does it not but dissimulate the fact, that, indeed, the seal was broken, the evil spell actually lifted, and the curse of universal selfishness ceased to hold, since the redeeming deed has been accomplished, the “clause” fulfilled? Are not the boastful claims of this devilish “gospel” of sociobiology that it has found the ultimate solution to all the riddles of the world, life, existence, but a cunning stratagem?

Their resounding is to drown and suppress the truly Good News that the snow-white Nature is alive, since never was she dead – as the dwarves rightly suspected, because “altruism” existed and never ceased to exist from the very beginning of Life? That suspicion might prove groundless: the black magicians ignored the rescuing condition of their curse. Thus “altruism” was treated as a theoretical problem; it just had to be explained on the basis of selfishness! But the selfish-gene explanation proves fatal for the axiom of universal selfishness itself.

This is the turning point of the epistemological fairy tale, the gist of the story, its “moral”. The much glorified “genocentric revolution” rests finally on a painful “category mistake”: it mistook genes and molecules (strings of DNA). Genes are information; hence, their existence is not objective. DNA is but “paper” on which genetic information is written – it is its “supporting media”, in which their textual form is stored. Genes are instructions, prescripts, capacities, and options. They do not compete for space or matter, nor do they struggle for energy. It is rather for competence they compete. In order to “catch on”, to stand the test of time under selection pressure, to gain acceptance, in short: to “survive”, they need to be accepted. That is: obeyed and performed in a profitable way. For this, first of all, they need to be understood in positive terms. They have to comply with the interpretative context. Thus their success depends on mutuality. In general, a disposition for a kind of behaviour (both developmental and social strategy) would gain nothing from “knocking out” its alternative. Endowments, inborn capacities and hereditary abilities enhance their own survival chance by providing the living being with an array of different or even contrasting options. In this, informational existence differs radically from existence of the objective (spatial) or even the logical kind. Information exists potentially: its reality is virtual, not actual. For this reason, its different versions need neither displace nor exclude each other. In order to be successful, they cannot “afford” to support only identical copies of themselves. It is in their very best “selfish interest” to conserve the informational environment favourable to them and even to favour its evolution towards their better and more effective interpretation of what they state,
advise, imply. In other words, natural selection favouring the prevalence, propagation, preference of prescripts, instructions, recipes, or dispositions acts at the level of semantics, not that of syntax – to say nothing about volume (place occupied), number of copies (redundancy) and the like. Those traditional criteria of success are but minor, “technical” aspects of information storage, access, and availability. In this respect, the nature of genes is much more similar to “memes” than one would be willing to accept. Memes (alliterative shortening for “mimemes”) are elements of imitation by means of behaviour, thought and speech.

They were originally postulated as cultural analogues of genes. Both genes and memes are examples of a more general class of entities – so-called “replicators”. Replicators, allegedly, should be “selfish” – by definition. Not only parts of genetic information, but also spiritual, cultural elements result from the unceasing struggle for prevalence, acceptance, and authority. The obvious fact that such entities do not compete, either for space or for number of copies, is still generally overlooked or ignored, although it is patently evident that their evolutionary profit does not consist in successful suppression or elimination of each other. The “selective pressures” in vigour are quite different. Such cultural “replicators” do not even replicate: imitation is not mechanical moulding. It requires interpretation in order to know what to imitate. A story, a joke, a skill, rumour or belief does not spread in the form of exact wording or mechanical reproduction. Rather it is its “gist” or “point” that matters. And certainly it does not succeed by necessity at the spite and cost of others. On closer inspection, memes too depend on a favourable environment: to be understood, accepted, propagated, they must look probable, convincing, “fitting”. They gather into so-called “memeplexes” like religions, movements, systems, and styles – both to fight and to support each other. What counts is the understanding, not just the feigning.

Thus, both memes and genes are like elementary stories – the tidings from spiritual beings – fairy tales. Both evolution and culture are definitely not about a reckless rout over a morsel of stuff or space but rather concern understanding, exegesis, and the hermeneutics of meaning. Both genes and memes are mind-like. And so is nature. Mind and Nature – the “necessary unity” as the title of the last book of Gregory Bateson puts it. This is the end of the story: the resurrection of Snow White, the redemption of both man and world from the curse of selfishness. Do you still remember how the evil spell was lifted? It was through good deeds, mutual help and the willing sacrifice made by living beings. The fairy tale tells us that the prince put at stake his kingdom (rightful succession) and that he searched for his beloved at the risk of his life. But the decisive step was done by the dwarves: they refused to sell the coffin to the Prince for all the gold in the world. But, out of kindness, they proved willing to grant it to him gratis – as a free gift! (This too, by the way, goes generally unnoticéd!)

Now, what does this have to do with science and philosophy? Philosophy is concerned with such strange and remote themes as being, existence, reality and the like. You see that at times it may prove useful. It is sensitive to different kinds, modes, and ways of being. It is qualified to tell apart objective from informational existence. Unlike science, philosophy is not a method of explanation, but an art of
interpretation: ars interpretandi, that is, hermeneutics. Hermeneutics, exegesis, understanding refer to stories. By the necessity of the memetic selective pressure, even science tells stories in order to make itself understood and accepted by the general public. But it does not take the narrative form of its wisdom seriously. It sticks to the basic core: an explication of something, which is not story-like. To understand a story means to make it into proper experience. To understand it, it must turn to proper, personal experience, able to be related to other stories. The errand of philosophy is to relate the meaning of scientific knowledge to the whole of culture. Philosophy – love of Wisdom – might help to awake the Snow White hidden in the core of any piece of scientific knowledge. And to make us live together happily ever after. . .
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# Name Index

Note: The locators with ‘n’ denotes note.

<table>
<thead>
<tr>
<th>A</th>
<th>Dawkins, R., 49, 58, 66, 141, 142, 168, 184</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allia, P., 151</td>
<td>de Beer, G.R., 162</td>
</tr>
<tr>
<td>Amábile-Cuevas, C.F., 146</td>
<td>Descartes, 2, 24, 78, 108</td>
</tr>
<tr>
<td>Amaral, L.A.N., 150</td>
<td>de Sola, P.I., 151</td>
</tr>
<tr>
<td>Anaximandros, 11, 25, 116</td>
<td>Dong Li, 154</td>
</tr>
<tr>
<td>Aquinas, T., 12</td>
<td>Doolittle, W.F., 147</td>
</tr>
<tr>
<td>Aristotle, 55, 59, 62, 72, 74, 81, 120, 159</td>
<td>du Bois Reymond, E.H., 132</td>
</tr>
<tr>
<td>Augustine, A., St., 12</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelard, G., 43, 44, 77, 167</td>
<td>Eco, U., 181 n4</td>
</tr>
<tr>
<td>Baer, K.E. von, 185</td>
<td>Eimer, 60</td>
</tr>
<tr>
<td>Barabási, A.L., 153</td>
<td>Eldredge, N., 114 n16</td>
</tr>
<tr>
<td>Barbieri, M., 33, 60, 130, 131, 133, 134, 164, 183, 184, 185</td>
<td>Engels, F., 19, 132</td>
</tr>
<tr>
<td>Bäumer, A., 159</td>
<td>Erdős, P., 152</td>
</tr>
<tr>
<td>Belon, P., 159</td>
<td>Euler, L., 151</td>
</tr>
<tr>
<td>Berg, L.S., 60</td>
<td></td>
</tr>
<tr>
<td>Breidbach, O., 112</td>
<td></td>
</tr>
<tr>
<td>Buchanan, M., 154</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chebanov, S.V., 7, 15 n10</td>
<td>Flegr, J., 71, 114 n16</td>
</tr>
<tr>
<td>Clayton, P., 132</td>
<td>Foucault, M., 159</td>
</tr>
<tr>
<td>Clemens, 12</td>
<td></td>
</tr>
<tr>
<td>Cole, F.J., 159</td>
<td></td>
</tr>
<tr>
<td>Conklin, E.G., 179</td>
<td></td>
</tr>
<tr>
<td>Conway Morris, S., 60, 122</td>
<td></td>
</tr>
<tr>
<td>Costerton, J.W., 148, 150</td>
<td></td>
</tr>
<tr>
<td>Cusanus, N., 108, 125</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Davidson, E.H., 2</td>
<td>Haszpunar, G., 163</td>
</tr>
<tr>
<td>Davies, D.G., 149</td>
<td>Havel, I.M., 49 n10, 132</td>
</tr>
<tr>
<td></td>
<td>Heelan, P.A., 45, 46, 47, 49</td>
</tr>
</tbody>
</table>
Name Index

Heidegger, M., 7, 13 n7, 16, 22 n16, 31, 36, 37, 38, 39 n5, 40, 41, 42, 42 n7, 43, 44, 46, 47, 49, 61 n4, 63 n6, 76, 79 n14, 91, 97, 102, 134, 137, 156, 157, 167, 181 n5, 189

Heraclitus, 7 n1, 9 n3, 11, 17, 18, 87

Ho, M.-W., 171 n4

Hofstadter, D.R., 47 n9, 78

Holland, D., 181

J

Jacobshagen, E., 161

Kauffman, S.A., 32, 35, 37, 38, 45, 48, 50, 51, 52, 53, 55, 71, 129, 133, 134, 154, 155, 156, 167, 191

Kaufman, C., 153

Kim, W., 159

Kirk, G.S., 159

Kleisner, K., 160, 167, 170

Kochen, M., 151, 153

Kolter, R., 150

Komek, S., 169

Kretzschmar, M., 153

Kuchma, S.L., 150

L

Lamarck, J.-B., 32, 33, 60

Lankester, E.R., 160

Legendre, L., 144

Legendre, P., 144

Lewin, K., 71

Lotman, Y.M., 38, 46, 47, 48, 49, 50, 130

Lovelock, J.E., 137, 138, 139, 140, 142, 143

M

McKitrick, M.C., 160

MacLeay, W.S., 159

Markoš, A., 23, 31, 32, 36, 56, 129, 129 n1, 130, 131 n3, 143, 167, 170, 182

Mathieu, L.G., 147

Matrana, H.R., 129

Maynard Smith, J., 144, 145

Midgley, M., 108 n12

Milgram, S., 150, 152, 153

Minelli, A., 166

Monod, J., 19, 21 n15, 119

Morris, M., 153

Müller, G.B., 164, 169

N

Neubauer, Z., 92, 193

Nietzsche, F., 13, 34 n2, 98 n4

O

Origenes, 12 n6

O’Toole, G.A., 150

Ottino, J.M., 150

Owen, R., 159 n1, 160

P

Panchen, A.L., 159

Panniset, M., 147, 150

Parmenides, 10, 11, 12

Peirce, C.S., 47, 94 n2

Plato, 27–29, 73

Pool, I. de Sola, 153

Portmann, A., 168, 170, 175–177

Prigogine, I., 49 n10, 51, 61, 132

Protagoras, 9–10

Pythagoras, 11, 21

Q

Quinn, N., 181

R

Rádl, E., 31, 101, 103, 105, 107, 109

Raff, R.A., 186, 188, 189

Rapoport, A., 152

Rényi, A., 152

Rieppel, O., 159

Rigoutsos, I., 144

Roth, V.L., 162, 163, 180, 183

Russell, E.S., 159

Ruyer, R., 118

S

Solomonoff, R., 152

Sonea, S., 147, 150

Speck, H., 161

Steiner, H., 159

Steengr, I., 49 n10, 61, 132

Strickland, H.E., 159, 160

Svedolter, G.F., 166

Slogat, S.H., 152

Švorcová, J., 36, 182

T

Teilhard de Chardin, P., 60

Thales, 11

Thomas, C.M., 146

Thomas, T., 146

Thompson, d’Arcy W., 3

Treviranus, G.R., 129

Tsirigos, A., 144

U

Uexküll, J. v., 8 n2, 31, 60, 73 n12, 173
V
Van Valen, L.M., 162, 163

W
Waddington, C.H., 167, 183 n9
Wagner, G.P., 163, 164
Watnick, P., 150
Watts, D.J., 152
Wayne, L.G., 144

Webster, G., 3
Wilson, E.O., 14, 14 n8, 32, 50, 105, 141
Wolpert, L., 50

X
Xenophanes, 11, 12, 13, 21

Z
Zrzavý, J., 105, 112
Subject Index

Note: (f = “and following“)

A
Adjacent possible, 20, 37, 50f, 88
Analogy (biological), 158f
Anlagen, 161, 183
Appropriation (Heidegger), 38f

B
Bauplan, 161, 164
Being-in-the-world (Heidegger), 31, 41, 98
Biogenetic law, 185f
Biosemiotics, 64, 87, 131
Biosphere, 36, 41–45, 48–49, 52f, 130, 137–155, 167f, 189f
Bodiness, 111f, 115
Body-sign, 65f, 73f, 80, 88, 171f, 176
  See also Eidos; Likeness
Book of Nature, 103, 111

C
Christianity, 20, 103, 120, 125f, 187
Code/Codes, 2, 4, 24, 44, 46f, 48, 57, 66, 80, 129f, 131, 133, 134, 147, 162, 166, 167, 171, 183f
Concern (Heidegger), 40
Creation(ism), 11f, 34, 60f, 82, 88f, 91–127, 159, 179–191
Creationism, scientific, 120
Crosstalk, 36, 158, 167f, 171

D
Darwinism, 95, 101–107, 120, 176, 185
Dasein (Heidegger), 31, 36, 40f, 99
Determinism, 19, 95, 132
Dialectics, 132
Dissipative structure, 48f, 61, 190
DNA, 3, 23, 58, 72, 89, 132, 133, 142–146, 164, 182f, 185, 199

E
Editing the world, 2
Eidos, 26, 64, 72f, 99, 175
  See also Likeness; Body-sign
Emergentism, 49, 132f
Entelechy, 71f
Evo-devo, 179, 189
Evolution, 3, 13f, 20f, 32, 37, 51f, 56, 60–63, 91–127, 144, 147, 153, 171, 188
Extended phenotype, 168

F
Fate, 18f, 32, 40,
Feedback regulation, 50, 116, 121, 138f, 143, 171
Fitness, 19, 34, 43, 45, 71, 96, 154f, 168, 176
Flesh, 1f, 23–25, 64, 74, 81f, 88, 115, 158, 166, 172f
Framing (Heidegger), 38f, 189

G
Gaia, 137–140, 141–142, 143, 147, 148, 150, 156, 167, 179, 190
Genidentity, 71f
Geophysiology, 139–141
God, 1, 10f, 50, 100f, 104, 107f, 115, 123, 125
Going-along with (Heidegger), 36
Graph theory, 151f

H
Habit, 47, 71, 132, 189
Hermeneutics, 1–29, 32, 41, 45, 52, 73f, 76, 82, 85, 130, 134, 181, 194
Hermetism, 109

213
Historicity, 88, 111, 113f, 115f, 118
History, 110f, 115
Homology, 157–167, 180
Homoplasy, 158, 160, 161, 165, 169
Horizontal communication, 36, 129f, 143, 158, 165, 170
Horizontal gene transfer, 145f, 167

I

Idea, see Eidos
Imitation, 169f
Integron, 146

L

Language, 15, 37–40, 45–50, 61f, 134, 147, 167f, 171, 187
Laws of form, 3f, 161
Likeness, 21, 27, 38f, 67–89, 97–100, 108, 157–177
See also Eidos, Body-sign
Logic, 26f, 45, 63f, 69, 88, 104, 184
Logos, 63, 81f, 88, 96, 105–109, 116, 124, 127

M

Mathematics, 20f, 28f
Meaning, 4, 38, 46f, 59–89, 97, 103, 117, 130–136, 172–177
Memory, 21f, 31, 37, 44, 48f, 65, 68, 79, 86, 88, 133, 143, 169, 187, 190
Mimicry, 169f
Modernity, 10, 21, 31f, 95f, 109, 111f, 119f
Moral laws, 21
Myth, 13, 15, 26f, 35, 63, 101, 105f, 120, 127
See also Narrative

N

Narrative, 19, 22f, 32, 63, 68, 71, 87f, 94, 97, 103f, 111, 114f, 118, 127, 164, 171, 189
See also Myth
Natural law, 1, 9, 13, 21, 32, 34, 46, 116f
Nature, see Physis
Neo-Darwinism, 51, 56, 94f, 101f, 118f, 137, 141f, 154, 164, 176, 182
Networks, 130, 143–156, 162, 167f, 189, 190f
Novelty, 33, 36, 47f, 52, 55–89, 96, 113, 132, 154, 169

O

Objective reality, 2, 58f, 78, 96f, 107, 121–125
Objectivity, 57, 65, 76, 94, 103, 108f, 110, 113, 126f, 175

P

Pathogenicity island, 146
Phylotype, 133, 182–189
Physics, 32–37, 45, 51, 58, 61, 71, 95, 103, 120, 131, 151, 188
Physis, 7–29, 39f, 50, 55, 62f, 71, 75, 87, 96, 109, 118, 120, 127, 132, 172, 191
Plato’s line, 27f
Presocratics, 7
Pre-understanding, 7, 41, 45
Principle of connection, 159
Product, 12–17, 24, 41, 127
Prokaryotes, 143, 147, 149, 150, 165, 167

Q

Quorum sensing, 148

R

Rationality, 7–29, 59, 63, 94f, 105–111, 123, 125
Reality, 9f, 13, 20, 25f, 28f, 46, 55, 58f, 65, 71, 76–78, 81, 91–127
Region (Heidegger), 44, 70f, 137, 156, 167
Religion, 10–14, 21, 25–29, 34f, 91, 95, 104–127
Renaissance, 94, 107–109, 112–116
Replicator, 164, 182

S

Science, 2, 7, 10–29, 32, 35, 48f, 55f, 58, 60–65, 94–97, 101f, 106
Script, 23, 66, 188
Self-presentation, 68, 108, 168f
Self-reference, 66f, 70, 83
Seme, 170
Semetic ring, 170
Sign, 57, 59, 64–89, 171–177
Signal, 60, 148f, 171
Small worlds, 150
Struggle for life, 98–99, 176
Superorganism, 130, 141, 147
Superposition, 36–53

T

Thermodynamics, 61f, 132, 138f
Thingness (Heidegger), 97