Man and World
Seen in the Light of Evolution

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Ladies and Gentlemen,

Yesterday I described how fundamentally the modern way of thinking was centered on the human; how deeply people were convinced that everything has meaning only from a human point of view and is to be understood exclusively in human terms. We also saw that occasional discomfort with this anthropic idiosyncrasy did nowhere lead to an actual overcoming of this mindset. At the end, I indicated that a consequent evolutionist understanding of the human and his relation to the world might lead us beyond the errors and the narrowness of the modern thought-form and open up a different view that on principle understands the human not as a being opposed to the world but connected with it. This I try to explain in more detail today.

1. Man is a worldly being because he is shaped all through by evolution

Let me first explain that we humans are not unworldly but on principle worldly beings as we are shaped by evolution.

a. Imprints from cosmic evolution

Our first worldly stamp comes not from biological but already from cosmic evolution.

Our bodies are tuned to terrestrial conditions with high precision. The gravitational force of the earth, for example, is most distinctly inscribed into the structure of our bodies. Humans had to achieve and stabilize their upright walking against gravitation, and the human skeleton directly signifies that man took the venture to counter gravitation by erection. – Remember the spectacle offered by the first astronauts on the moon: When they wanted to make just a step, they immediately performed a full jump – because our bodies are tuned to the earthly conditions. The moon's gravitational pull is far lesser than that of the earth, but our locomotion patterns and our tendons and muscles are adapted to terrestrial conditions; therefore steps on earth amount to jumps on the moon.

In a comparable manner, the atmospheric pressure is inscribed into the design of our bodies. The inner pressure of our cells responds exactly to the atmospherical pressure. If one would all of a sudden remove the latter, we would vanish instantly (and not only after some time, due to the lack of oxygen), we would immediately burst asunder in all directions.

To be sure: We are usually not aware of such background circumstances. These physical matchings with the world are conditions of our existence so elementary that we just take them for granted – and this they are indeed. However, we should think about these conditions from time to time and make it clear to us how essentially our bodies are tuned to the physical properties of the world, how much these conditions are *internal* to us.

By the way: We are not only terrestrial but even cosmic beings. Ninety-two percent of the elements we consist of originated in stars – we possess an indeed stellar nature.

b. Imprints from biologic evolution

Secondly are we – as products of biological evolution – also integrated into the stream of life and are, for that reason, in no way misfits and loners on this planet but coupled with the living creatures around us in many ways.

With the genetic code, for example – an invention dating almost four billion years back – an extremely old and general achievement is still decisive for us. Something similar holds even for each of our features: they are all based on age-old inventions that were not made by us but by other living creatures long ago and then, through phylogeny, transferred to us.

With this in view, I sometimes advice to bring to mind an evolutionist map of the human. On this map, one would see, emanating from the parts of our body, long lines leading back to the original invention of those organs and capacities. One would see, for example, that the circulatory system was invented in evolution about 600 million years ago, the central nervous system 590 million years ago, pulmonary respiration around 380 million years ago and coordinated binocular vision – these are all extremely important achievements for our existence – more than 200 million years ago.[1]

The crucial point is that direct lines lead from these evolutionary prime inventions to their ongoing presence in us. One must take into account that evolution is extremely conservative. An invention made once will not be made again later – perhaps in a shorter or more sophisticated or more efficient manner – but is principally retained and expressed again in the same way in the individuals emerging million years later. It is at most modified afterwards in a manner typical for the species – but this again according to age-old ways of transformation. The eye, for example, has been invented during evolution only once. Admittedly different types of eyes developed later – for example, the vertebrate eye as distinct from the insect eye – but in all living beings with eyes, the formation of the eye still begins through the same regulatory gene that was originally responsible for the first eye ever.

[1] Other, for us equally essential inventions like immune defense and sexuality, are – with more than 2 billion years – still older than the ones mentioned.

In addition, evolution generally does not produce neo-formations through design from scratch but by way of modification and functional change of the already existing. In mammals, for example, essential elements of the auditory system (hammer, anvil and stakes) developed through alteration from the jaw joint and the cranial bone of fish.[2] Or, from the gill apparatus of fish have been made, in the transition to the terrestrial and lung-breathing vertebrates, parts of the lingual bone and the larynx. So we humans are in very improtant aspects – hearing and speaking – a restructured variation of fish.

Each contemporary individual still draws on these evolutionary inventions and paths of modification. This can be seen very directly in ontogeny: the human embryo does not start out as a human embryo but at first looks like a fish (with branchial arch arteries and cardinal veins), after that like an amphibian, then like a newt or salamander, subsequently like a reptile somehow similar to a mammal, and only at the end of the eighth week it becomes obvious that a human being is in the making.[3] Thus, the human embryo in his development runs through the whole alley from fish via amphibian and reptile to mammal – exactly the route that in evolution led to us humans.[4] Phylogeny is not behind us, but in us, it still shapes each one of us.[5] – The human is to be comprehended by looking at the long current of evolution – and in no way by looking just at the human as such. And much less is (as the anthropic principle would have it) everything else to be comprehended by taking the human as point of departure and reference.

c. Our cognition, evolutionarily founded

Also in terms of cognition – which one might chiefly be tempted to consider an exclusive property of us humans – it is no different. Here, too, first of all, an enormous evolutionary continuity exists.

Our brain everywhere continues prehuman organizational principles. The transceiver polarization of nerve structures invented more than half a billion years ago is still present with us, our chemical transmitters are largely the same as in insects and snails, and the learning mechanisms of the evolutionarily very old snail brain still persist in our brain.[6] Or, the phylogenetically younger areas of our cortex still show the same basic structure as the older ones: the

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[2] Mammals develop a jaw joint different from that of fish (a "secondary jaw joint"); therefore, the elements of the "primary" jaw joint typical for fish are freed from their former task and can now be used for sound transmission.

[3] Cf. Werner A. Müller and Monika Hassel, *Entwicklungsbiologie der Tiere und des Menschen* (Berlin: Springer ^{2}1999), 177 f.

[4] Cf. also Haeckel's "biogenetic fundamental law" according to which ontogeny is "a brief and rapid recapitulation of phylogeny" (Ernst Haeckel, *Generelle Morphologie der Organismen*, vol. 2, Berlin: Reimer 1866, 300).

[5] The ancient evolutionary paths must still be repeated in the ontogeny of each individual because the phylogenetically younger genes, in order to become effective, depend on the anterior expression of the older genes: the latter ones have indispensable functions of preparation and stimulation for the newer genes. Therefore, the next stage cannot be achieved without an intermittent iteration of the earlier stage. For example, man, with his pulmonary respiration, must first form a gill apparatus; only from this apparatus can then arise – just like once in phylogeny – lingual bone and larynx. In evolution just no other way than the detour is open: the way that was taken in the distant past and has led to the new form. – Hegel wanted to see things differently. He was of the opinion that nature always takes the shortest path, whereas it is characteristic for the mind to take detours (cf. Georg Wilhelm Friedrich Hegel, *Vorlesungen über die Geschichte der Philosophie I*, Werke 18, Frankfurt/Main: Suhrkamp 1986, 55). Hegel was wrong. What he formulated as a principle of the mind, is long since that of nature.

[6] About 90% of the genes that are expressed in human neurons are to be found already in the nerve cells of snails.

same structure and mode of operation was only extended and iterated – not a new one invented.[7]

aa. Innate knowledge patterns – prior respectively core knowledge

Likewise, our basic cognitive patterns are continuations of cognitive achievements made long ago in mammals and primates.

When human babies already master the identity and permanence of objects,[8] or when infants comprehend bodies as individuated objects characterized by cohesion and solid borders, or when they are familiar with perspective and aspect variance (i.e. know that a body when looked at from different angles appears differently and yet is the same body), in short: when they master basic regularities of body physics and solid geometry, then all this stems from our tribal and generic history. It is just knowledge common to mammals. Michael Tomasello expressed this the following way: "The childlike understanding of the physical world is based on the reliable foundation of primate cognition."[9]

bb. Innate rules for the epigenetic formation of our world picture

In addition, rules are innate that control the epigenetic development of knowledge. To bring in only one of many examples: Newborns can see but have yet to learn how to coordinate both eyes. Here, a mechanism is at work which ensures that only those visual experiences in which the baby uses both eyes in a well coordinated manner and focused on the same object can affect the new wiring of a more complex network. Only in this case the signals are used to optimize the wiring – not, however, if the baby just lets his eyes roam in an uncoordinated manner.[10]

This selection principle is easy to understand: If even the roaming mode would be awarded repercussions, then interconnections would arise that would be dysfunctional, for example for determining the distance of objects (a main achievement of binocular vision). Precisely this is prevented by the internal control mechanism. It assists our ability to estimate distance.

This ability obviously takes account of the actual spatiality of our world and constitutes a major advantage in orientation. A wiring mode programmed by rambling vision would not stand the test. The world is not as it appears when one looks at it in a rambling and uncoordinated manner. Beings able to see at a distance would, if programmed to this mode, soon get into trouble. So this control mechanism – in which age-old experience of the spatiality of this world and its objects is stored – guarantees that the baby's formation of its world picture does not run counter but conforms to the actual structure of the world.

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[7] "The human brain is very conservative not only in its basic structure but also in its fine structure" (Gerhard Roth, *Aus Sicht des Gehirns*, Frankfurt/Main: Suhrkamp, 2003, 12). The specificity of different areas results only from the difference of afferent and efferent connections and from variations in the quantitative proportion of the types of nerve cells. – Therefore, it is almost impossible to discern a piece of a human cerebral cortex under the microscope from that of a mouse (cf. Wolf Singer, *Der Beobachter im Gehirn. Essays zur Hirnforschung*, Frankfurt/Main: Suhrkamp 2002, 64).

[8] Cf. Rainer Mausfeld, "Vom Sinn in den Sinnen – Wie kann ein biologisches System Bedeutung generieren?", in: *"… sind eben alles Menschen". Verhalten zwischen Zwang, Freiheit und Verantwortung*, edited by Norbert Elsner and Gerd Lüer (Göttingen: Wallstein 2005), 47–79, here 58 f.

[9] Michael Tomasello, *Die kulturelle Entwicklung des menschlichen Denkens. Zur Evolution der Kognition* [1999] (Frankfurt/Main: Suhrkamp 2002), 220.

[10] Cf. Wolf Singer, *Der Beobachter im Gehirn*, a. a. O., 49 f.

In summary: Basic contents of knowledge concerning typical regularities of objects have been handed down to us by phylogeny. The same holds true for rules that concern the epigenetic rearrangement of our neural connections. Even up to singular acts of perception and knowledge (for example in shape recognition) phylogenetic patterns are at work. All our subsequent acquisitions of knowledge are based on this elementary knowledge. So we live also in the sphere of cognition on prehuman achievements; we draw on elementary knowledge achieved in evolution long before the advent of us humans.

2. Epistemic congruence with the world

We have seen so far: bodily, biologically and cognitively, we humans are shaped by evolution to a very high degree. What results from this for our relationship to the world? Generally speaking: that we are tuned to the world and well integrated into it.

Physically, it is obvious that we are adapted to world conditions such as gravity, atmospheric pressure or oxygen content. Biologically, it is clear that we carry a wealth of sophisticated world-adjustments within us – from the nervous system via pulmonary respiration through to color vision. And even cognitively are we – this I want to set out in more detail in the following – calibrated towards the world and best connected with it.

a. Our elementary knowledge fits the world

First of all, our elementary knowledge – the aforementioned mastery of object identity and permanence as well as of perspective and aspect variance – obviously depicts fundamental features of the world correctly. Our cognitive patterns capture essential traits of the object world. For this claim, four arguments can be presented:

First: The contents of this knowledge obviously correspond to the *actual behavior of objects*. The body-like objects in the world are in fact characterized by identity, permanence and aspect variance: they do not change their size suddenly; they remain the same when moving; and they do possess different views. In these points, our elementary knowledge meets basic structures of the world.

Secondly, there is an argument with respect to the formation and provenance of this knowledge. The fact that it has developed in evolution implies that the world has had its part in its formation. When germs of this knowledge randomly fitted the structure of the world, they were ‘rewarded’ or selected. Thus, these germs have been reinforced and could spread out so that this knowledge became available across-the-board. It bears in itself *a positive sanction by the world*.

Third: If creatures live their lives in the duct of cognitive acts, then their cognitive patterns must at least reasonably fit the world – otherwise the species would long since be extinct. As Daniel Dennett has put it, "Natural selection guarantees that *most* of an organism's beliefs will be true, *most* of its strategies rational."[11] Functionality testifies to accuracy.

Fourth: The elementary knowledge described is not species-specific, but is *common to many species*. It even transcends the boundaries between genera, is remarkably general. Not only primates but all mammals possess it. And probably other species as well. Or have you ever

[11] Daniel C. Dennett, "Making Sense of Ourselves", in: *Philosophical Topics*, 12 (1981), 63–81, here 75.

seen a bee trying to fly *through* a tree – instead of flying *around* it? Apparently, also bees (and countless other animals) regard solid bodies as solid and therefore impenetrable bodies, and they behave accordingly. So the knowledge described is not species-specific, not species-idiosyncratic.

Remember however: According to the proponents of the modern manner of thought, all knowledge (human as well as animal knowledge) ought to be species-idiosyncratic. Jacob von Uexküll formulated it this way: "In the world of the earthworm, there are only earthworm-things; in the world of dragonflies there exist only dragonfly-things etc."[12] This is obviously wrong. The special animal worlds, despite many differences between them, also have some things in common, for example the aforementioned basic patterns of the object world. And that is anything but surprising, because the behavior of objects in fact is the same towards all species. The identity and permanence of bodies does not care what kind of creatures are currently affected by it or interested or disinterested in it. That solid bodies are impenetrable for other solid bodies, is therefore not human idiosyncrasy or mammalian fantasy or the fiction of ants, but simply a physical fact in the world of bodies. The knowledge concerned *is* objective knowledge.

Therefore, we can say, in summary, that our elementary knowledge does fit the world. It correctly renders basic features of the physical world.

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But then: Even if on this elementary level world correctness is granted to us, what about the further developments of our knowledge? Do they, on the basis of this primary correctness, lead to further forms of true knowledge of the world? Or do we gamble away our basic epistemic fit later on by producing higher forms of knowledge that in fact provide only humanly valid world constructions and can no longer claim to be congruent with the real world?

b. Potentials for correction

Oftentimes perceptual illusions are invoked as evidence that we humans go wrong even in relatively straightforward cases. That is right but at the same time shortsighted. For obviously we also have an ability to identify and resolve those perceptual illusions. We possess a correction potential that, after having gone astray, can lead us back on the path of truth.

How perceptual illusions come about is easy to explain: In perception, we use models of interpretation which have proven themselves a billion times under normal conditions, but under unusual conditions lead us astray – then the illusions occur.

Basically, the use of standard patterns is reasonable. They make possible an extraordinary rapidity of perception – which, of course, was evolutionarily advantageous: for example, in situations of attack or defense it allowed the required speed of actions and reactions. However, since these standard patterns are calibrated to *normal* conditions, they must be misleading under *anomalous* conditions. To be sure: They do correspond to the world, but, so to speak, only to the standard world. However, there also exist non-standard phenomena, and as we possess no special patterns for those, we use the standard patterns even for them – which naturally produces illusions.

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[12] Jacob von Uexküll, *Umwelt und Innenwelt der Tiere* [1909] (Berlin: Springer [2]1921), 45.

However: We are not victims to those illusions once and for all, but are apparently also able to detect and correct the mistakes. Our cognition is not only primarily reliable, but can also work its way out from faultiness.[13]

Such capacities for correction are to be found not only in humans, but already very early in the animal kingdom. Once the cognitive activities of animals became complex, they have also developed the ability to make corrections in cases of conflict – to perform recalibrating.[14]

So the picture is the following: Animals (and consequently humans) possess, firstly, perceptual patterns which match the environment very well. Secondly, they also have tools for correction and readjustment. So the answer to the question raised earlier, whether the correctness of our basic knowledge about the world of objects is preserved and expanded in our subsequent steps of knowledge building or whether it is squandered by subjectivist constructions, is (at least up to this point) this: The subsequent steps do not take us away from the world, but, on the contrary, lead us more precisely and completely to it. The evolutionary increase of subjective components (such as correction potentials) does not lead into subjective private-worlds but provides exactly more objectivity.

c. Expansions through science – beyond our primary meso-cosmic fit

Finally, an extension beyond our primary range of adaptation is to be considered. Roughly speaking, our cognitive equipment is tailored to meso-cosmic conditions. We can well orientate ourselves with respect to near and middle distances, to weight and size ratios corresponding approximately to our body conditions, and in the range of low and medium speeds. However, macrocosmic conditions (think, for example, of the space-time continuum) and microcosmic laws (think of the uncertainty relation) are initially unfamiliar, even sealed to us.

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[13] By the way: Not only on the level of science, but already on that of sensation, illusions can wear away, can be dissolved. Anyone who has repeatedly practiced Aristotle's illusion (double sensation of a single object placed between the crossed index and middle fingers) and has made clear to himself how it comes about, can bit by bit free himself from this double sensation.

[14] Joëlle Proust, "Mind, Space and Objectivity in non-human Animals", in: *Erkenntnis*, 51 (1999), 41–58. In general, it is the case that correction procedures are very elementarily implemented in perception. For example, in our color perception we are by no means simply at the mercy of the stream of information particles, but always correct the information towards truthfulness to the object. Otherwise, we would not perceive a red rose under changing lighting conditions as the same rose, but were surprised that in the same place time and again different colored roses appear (with only their form curiously remaining the same). Our perceptual system thus operates – entirely appropriate to the objective conditions – in the direction of color constancy. That things retain their color under varying light conditions belongs to the basic regularities of the objective world and to our basic knowledge about it. (This is why, in contrast, the chameleon for being able to self-actingly change its color appearance is so irritating.) So we correct what is just appearance (varying color shades due to changing light conditions) quite automatically in favor of the real constitution of the object – we do not charge the latter with what in fact is caused only by the conditions of its appearance. This is one example of how corrective mechanisms are implemented already in simplest perception and how our perception, which is on principle calibrated to correct apprehension, is able to maintain or regain its world-correctness even under potentially irritating conditions. – Wolf Singer distorts the situation when he concludes from our orientation towards color constancy that our perceptions are "pure interpretations". He writes, "Whether in the morning or evening light, the same rose appears to us in the same red, regardless of the fact that, due to the different lighting conditions, it radiates in quite different ranges of the spectrum. The reason is that we base our color estimation on comparisons with surrounding color fields, in this case perhaps on comparisons with the green leaves, and not on the measurement of absolute wavelengths of light. Our perceptions are pure interpretations" (Wolf Singer, *Ein neues Menschenbild? Gespräche über Hirnforschung*, Frankfurt/Main: Suhrkamp 2003, 43). That is too physicalist thinking – as if momentary states of wavelengths would constitute the truth of the object world. By contrast, our procedures of interpretation and correction aim at object-appropriateness. We do not let us be led astray by varying light conditions and thereof resulting differences of appearance about the objective constancy of the object's color.

However, we can declare this only because apparently we have managed to transcend the meso-cosmic limitation and in the meantime know about the different structure of macro- and micro-cosmos. How was it possible to extend our knowledge beyond its initially only meso-cosmic fit?

Some of our meso-cosmic matchings are strikingly accurate. For example, the optical window of our perception (ranging from 380 to 760 nanometers) is quite precisely adjusted to the atmosphere's penetrability window for sunlight (which ranges between 400 and 800 nanometers). This is a phenomenal fine-tuning of our sight to the sunlight. On the other hand, other frequencies of the electromagnetic spectrum are sealed to us – while being open to other animals. With our eyes, beyond the specified window nothing is to see, but with bat echolocation, much can be detected between 9 and 200 kilohertz.

Nevertheless, we have cognitively accessed much of what was naturally (by the basic equipment of our cognitive apparatus) sealed to us. We now know not only about the specific perceptual abilities of bats (about their frequencies and their technology), but know the full spectrum of electromagnetic waves and are well aware that the light accessible to us represents only a very small part of it. We know this and similar things through the insights of science. Science is an enormous undertaking to expand our knowledge beyond its primary meso-cosmic adaptation.

The basic form how such expansions are possible is easy to indicate. What is required, is, first of all, a reliable starting ground with high epistemic security. This is, in our case, provided by our elementary object knowledge that reflects basic regularities of the behavior of bodies, and by our additional tools for correction. From this reliable starting ground, extensions are possible if – secondly – a specific skill factor comes in addition that allows to perform extensions in a controlled manner. This is the case with us due to the eminent reflective capacity of our brain.

One should be aware that in the human brain the tracks of internal communication outweigh those of external communication in the exorbitant ratio of 10^7:1 (10 million : 1).[15] Thus, the human brain is a gigantic apparatus for self-reference. This our reflective capacity we use not only in everyday contexts, but especially in scientific ventures. Science keeps asking whether something that one thinks one knows could be understood or interpreted in a different manner and whether this differing perspective could possibly be more comprehensive than the one pursued up to now, i.e. whether it could perhaps explain other things too, which had not found an explanation so far, so that this new perspective would extend our knowledge. This process requires an immense amount of reflexive steps and always-new tests of shifts in perspective that only a reflective being par excellence is able to perform.[16] This way, such a being can achieve a modified, extended and more appropriate view of the world. It detaches itself from supposedly secure commonplace views and proceeds to relatively unfamiliar ideas that prove appropriate by both explaining new phenomena and making understandable the former conception as a good approach under limited (for example, meso-cosmic) conditions.

Again and again, science progresses by unmasking pseudo-evidences as illusions. Famous examples are in modern times the Copernican Revolution and Galileo's laws of falling bodies,

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[15] Cf. for an explanation of the emergence of this configuration which constitutes the peculiarity of the human brain: Wolfgang Welsch, *Homo mundanus*, loc. cit., 718–722.

[16] Science relies, in addition, not just on individual reflection but has created institutions and networks of collective reflection.

and in the last century quantum and relativity theory. In such extensions, we progress beyond our primary meso-cosmic fit; we gradually transcend the anthropic narrowness. In this sense, Max Planck said, "every great physical idea is a further step in the emancipation from anthropomorphism."[17] Only it should be noted: We are thus not removing from the human condition but acting out its potential. Not confinement in the meso-cosmic and anthropic narrowness but their transgression is the very possibility of our being.

d. The world-connectedness of this knowledge

Having thus outlined how we can effect extensions of our knowledge beyond our primary meso-cosmic fit, the question whether this knowledge is indeed objectively true or perhaps only indulges in human constructions might yet recur. Humans have long since moved from natural via protocultural to cultural evolution,[18] and along this way to more sophisticated forms of cognition, and for those it appears more questionable than for the initial ones whether they are objective.

Yet it is undeniable that our trans-meso-cosmic knowledge is at least pragmatically reliable. Each of its technical applications confirms this. Lightning rods work because lightning events actually are how science (in contrast to daily faith) understands them, and the Hubble telescope delivers excellent images because our calculations are correct and our repairs effective.

However, the pragmatic success of knowledge does not seem sufficient to attest truthfulness to it. Or is it? At least to some extent? Our cognitive schemes have emerged in interaction with the world and proven successful in this world. They have guaranteed survival and made possible the extraordinary success of the species *Homo sapiens* – the only human species that remained and was able to spread all over the earth. If a species performs not just some cognitive activities but if these cognitive performances are the proper fitness sphere and success domain of this species (as is the case with *Homo sapiens*), then these cognitive performances must have a remarkable fit with the world; otherwise they could not have guaranteed the survival or enabled the extraordinary success of this species. These cognitive capacities must be adapted to the world approximately as well as the fish fin to the water.

Therefore, while the pragmatic success in general proves viability (that the knowledge concerned reasonably fits the world), the success of a species that *mostly* relies on its cognitive performance suggests that their abilities match the world to a large extent.[19] Our knowledge does fit the world.

Humans are thus not only anatomically and biologically, but also cognitively tuned to the world. We initially draw on potentials that have come down to us through prehuman evolution; and in our subsequent steps of cognition we do not move away from the world, but are increasingly getting closer to it, and through science we begin to apprehend (beyond our primarily just meso-cosmic understanding) the fine and deep structure of the world.

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[17] Max Planck, *Acht Vorlesungen über Theoretische Physik* (Leipzig: Hirzel 1910), 7. In a similar manner, Musil expected from science a "resolution of the anthropocentric behavior that considered man for so long to be the center of the universe" (Robert Musil, *Der Mann ohne Eigenschaften* [1930–1952], Hamburg: Rowohlt 1952, 150).

[18] Cf. on this distinction: Wolfgang Welsch, *Homo mundanus*, loc.cit.,715–762.

[19] Of course, errors and failures occur repeatedly. However, they can be corrected, and this possibility of correction shows that the limits of the world congruence are not of *principle* nature.

3. Man and his cognition as a phenomenon in the process of the world

Finally, I want to go one step further. In the rest of this lecture, I will try to consider the phenomenon of cognition not from the viewpoint of the knower, but of the known, i.e. from the viewpoint not of man but of the world. What does human cognition mean in the context of the world?

a. Rudimentary cognition – since the beginning of life

To answer this, one must reach far back in cognitive matters to a time far before the appearance of the human. Because in the course of evolution cognition started a very long time before us. The first cognitive performances occurred almost simultaneously with the beginning of life – in protozoa nearly 4 billion years ago. Why was that?

Living beings are constitutively open, i.e. environment-related, not closed, self-contained systems. They depend, for example, on gaining food from the environment. For this, already in simple cases, four things are necessary. First, the organism needs a system that signals to him his homeostatic state; he needs this minimal form of self-awareness in order to be able to notice hypoglycemia and thus to feel compelled to countermeasures. (All this occurs of course purely biochemically, not yet 'mentally'.) Second, the organism needs a biochemical pattern of potential food and energy supplies. Third, sensory skills are needed to find out where in the environment an appropriate candidate is present or to be expected. Fourth, motor skills are required in order to be able to follow the sensory evidence and to move towards the food source. As one sees, even in this simple case considerable skills of inner as well as outer cognition (self-cognition as well as foreign-cognition) are required. Without them, organisms would not be able to exist.

Certainly, this initial cognition is, in terms of its predicates and its range, very limited. Thus, it is, however, also most accurate. While the sugar is altogether much more than just a carbohydrate donor, the organism has no idea of such other properties. But it is objectively true that sugar is an excellent carbohydrate donor for this organism, and this single aspect the organism detects in a perfectly appropriate manner.

It is certainly a very long way from this rudimentary form of cognition to highly sophisticated human knowledge. On this way, the degrees of freedom are increased, the range of predicates is expanded, and the self-reference is potentiated.[20] It is, however, a continuous strand that (on Karl Popper's wording) leads "from the amoeba to Einstein":[21] The human cognition is an extremely enhanced and further developed form of the new phenomenon of cognition that came into the world with the beginning of life.

b. Cognition as a new strategy of being

Now let us return to the question what cognition means, viewed not from the perspective of its agents (the organisms) but of its initiator, the world?

By having, with the production of living beings, proceeded to cognition, being (respectively

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[20] Cf. on this in detail: Wolfgang Welsch, *Homo mundanus*, loc. cit., 876–886.

[21] "From the amoeba to Einstein, it i
s only one step" (Karl Popper, *Objektive Erkenntnis. Ein evolutionärer Entwurf* [1972], Hamburg: Hoffmann und Campe 1984, 257).

evolution) has in a way begun to practice self-knowledge. The agents of cognition do capture properties of the world, so that these properties now gain, in addition to their physical existence, a cognitive presence. What initially was only physically there becomes now cognitively present as well.

Thus, the process of being has adopted a new strategy. Being now operates its further development by means of cognition. Cognition becomes – this is an absolute novelty – the engine of the further development of being.

One should be aware that cognition has ontological effects. By acting in the light of their cognition, organisms alter the world. This ranges from minor influences (such as the decrease of food stocks) to maximum effects. One example for the latter is the charging of the initially oxygen-free atmosphere with oxygen since the Paleoproterozoic – whereby, on the one hand, many species were extinct (because of the corrosive effects of oxygen) while, on the other hand, the career of other species (including all subsequent more complex organisms) was enabled. Another example is the biogenic origin of all limestones and fossil fuels. Therefore, not only the biological inventory of species, but even the physical inventory of our earth is in many ways a result of the activities of organisms. And as cognitive processes were instrumental in these activities, these changes are also effects of cognition. So cognition is an eminently productive matter. It does not only serve to recognize reality but also (and most notably) to transform reality. In the wake of cognitive processes, reality is altered. Basically, cognition is a strategy of being for its own transformation and advancement. Since the beginning of life, the latter is mainly due to cognitive effects.

c. In our recognition, the world apprehends itself

Let me come back to the guiding question about the relationship between man and world. If cognition, as I just tried to indicate, is a strategy of being itself, then we humans are obviously not only in our anatomical and biological dimensions, but even in our highest, in our cognitive activities entities coined by being and thus connected to the world. In his cognition, man is a service provider to the cognitive strategy of being. When we cognitively relate to the world, it is actually the world itself that – via our actions – refers back on itself, operates its self-recognition. In our cognition, the world apprehends itself.

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Let us remember: According to early and late modern thinking, our spiritual nature should make us strangers in this world, lacking any congruence with the world. In the meantime, we have seen that this is utterly wrong. Our cognitive nature has not only originated from the world and is shaped by it, but our cognitive acts themselves are at the same time acts of the world. When we say that *we* cognitively turn to the world, then this describes only one-half of the arch of knowledge. The full arc of knowledge leads from the *world* via *us* back to the *world*. – So we see: our worldliness extends even to our highest activities, to our acts of knowledge. Hence the human is, from bottom to top, a world-connected being. The adequate concept of the human is *Homo mundanus*.

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Let me, at the end of these two lectures, address one last and very important point. It seems obvious to me that the concept of *Homo Mundanus* with its emphasis on the deep world connectedness of the human is similar to central insights of Asian thinking. I want to express my

gratitude that during the last decades I had many opportunities to stay in Asia and to get acquinted with the Asian way of thinking. It was in particular my encounter with Daoism and Zen Buddhism that made it possible for me to conceive at all a step that would finally lead beyond modernity (including my "post-modern modernity") to a more veracious form of thinking focussing on the humans' deep world-connectedness. Certainly my manner of getting there differs from the one pursued in Asian. I try to arrive at this insight through a consequently evolutionary thinking. Insofar I pursue a "western" way. I do so also because I am convinced that the western rational thought can be driven beyond itself only by scientific insights and corresponding reflections – suggestions of another kind would simply find no resonance. But though the method is thus different, it leads to results congruent with Asian thought. This gives me the hope that in our globalized world the Eastern and Western traditions of thinking might join again and start a fruitful dialogue.