The conception of the mind-body relationship in A. N. Whitehead and N. Hartmann

Summary: Both Alfred North Whitehead and Nicolai Hartmann developed an organic philosophy of nature.

In his early writings, Whitehead took the view that nature is a system closed to mind. But this view results from the decision to ignore the role of sense-awareness and sense-perception in our experience of nature. In his mature books Whitehead comes to the conclusion that there may be a certain affinity of mind to nature. This may be seen from the fact that nature is impregnated with values. A crucial step taken by later Whitehead is to be seen in a richer account of the driving forces of nature, summed up in the notion of creativity. Moreover, there is a reciprocity of efficient and final causes that indicates a certain degree of integration of organism and environment and an internal relationship of the material and the mental factors which constitute its make-up.

In contrast to this, Hartmann maintains that nature in no way is dependent on mind. For him, nature is a system of layers or levels, the lower levels bearing the higher ones, the higher ones being dependent on the lower ones. Moreover, the higher levels are characterized by specific categorical forms not to be found in the lower ones. Hartmann's theory of modality, in itself a fine piece of philosophical thinking, leaves no room for propensities as driving forces of natural processes. In a sense, the framework of nature is alien to our human intentions, especially in that there is no objective teleology in nature. The categorical structure of the mind cannot be derived from the categorical structure of nature.

The conception of the mind-body relationship allows for a comparison of both thinkers. Whitehead proposes a field-theoretical account of mental processes. For him, man is an electro-dynamic event. From this assumption he construes what has been called the *"psychical atom"*. It is a functioning unit with a certain spatio-temporal extension, but the spatial extension is rudimentary only. It allows for a non-sensuous perception of the immediate past and of our bodily existence. Hartmann, in his turn, takes the view that the mind-body relationship may be *sui generis* and that we human beings have no possibility of forming an intuition or perception of it. In his mature work, the problem of its nature is dissolved in a specific way.

My contribution attempts at a discussion of the merits of both theoretical options.

I.

In his famous dialogue, the *Timaeus*, 34 bc, Plato makes in passing the following remark. *"There is in us too much of the casual and random, which shows itself in our speech; but the god made soul prior to body and more venerable in birth and excellence, to the body's mistress and governor."*[1] We may say, all of us depend on the accidentals of life, and our philosophical discourses are somewhat confused. Plato gives us a hint that it is the business of

philosophy to make the universe intelligible. Therefore, the first question to be asked is the following: What about the framework in which the problem of the mind-body relationship is to be discussed? Whitehead connected Plato's *Timaeus* with Newton's *Scholium* and conceived with their help what philosophers of the seventeenth century, the *"century of genius"*, called *"the order of nature"*. The order of nature is the framework in which the mind-body relationship finds its proper place. Hartmann, on the other hand, in an early essay derived his conclusions from the new paradigm of Darwinian and neo-Darwinian biology; he places the problem in the very center of his theory of the cosmological and especially the organismic categories.

In order to make possible a rather exact comparison of Whitehead and Hartmann, I want to remember you of the very contrasting views entertained by these thinkers about the relationship of mind and nature. It is not to be confused with the mind-body relationship, on the contrary; but it has a certain bearing on it. In *The Concept of Nature* (1920) Whitehead defends the position that nature is a system self-enclosed; however, he maintains this position as a methodological option only.[2] In his later works on the philosophy of nature, e.g. *Process and Reality* (1929), *Adventures of Ideas* (1933) and *Modes of Thought* (1938), nature is opened to mind. According to Whitehead, however, there is still no strict identity of mind and nature because our *"prehensions"* depend on processes of appropriation of the preceeding experiences of the organism. Hartmann, in his *Grundzüge einer Metaphysik der Erkenntnis* (1949), makes the claim, *"that the othering of the subject in the act of cognition is mysterious."*[3] The contents of our consciousness are only private but our knowledge is understood to be knowledge of an outer reality. This tension between two basic phenomena is called by Hartmann the *"aporia of knowledge"* (or of consciousness in general). For him, this problem is not only an epistemological one; rather, it belongs to metaphysics of knowledge.

II.

Whitehead's philosophy of the organism developed from a close examination of classical and neo-classical physics. Descartes and Hobbes had extrapolated from its basic concepts to a mechanistic world-view, and Leibniz and Berkeley had analyzed and criticized its mathematical foundations. Whitehead rejected the dualism of Descartes and Locke, and especially the distinction of primary and secondary qualities; for him the internal relation of the (material) object and the object-as-perceived was the paradigm of an organism.[4] Further examples are the *"prehensive unity"* of space and time, as in classical physics, or of space-time, as in Einstein's (and Whitehead's) special theory of relativity.[5] The rhythmically patterned emission of energy, studied in modern nuclear physics, is a last case in point to be mentioned here. In a first approximation, an organism may be viewed as a nucleus of internal relations that is to be enfolded in spatio-temporal relations. Space and time, or the space-time of Einstein and his followers, are no primordial realities of nature; rather, they are constituted by the formation of its most elementary organisms. In connection with his discussion of relativity physics and quantum physics, Whitehead observes that there may be primary organisms, so-called *"primates"*, whose composite structure permits no further analysis into their constitutive elements.[6]

In two famous chapters of *Science and the Modern World* Whitehead recapitulates the history of post-medieval philosophy in the reverse order of its historical development.[7] The philosophy of the organism is in need of a conception of what now is called a *"synthesis"*. Whitehead does not follow Kant, that is to say, he denies the latter's proposal that the human intellect prescribes its laws to nature. Nor does he follow Hegel's construction of a dialectical movement of thought and of being itself. Whitehead starts with Berkeley's divine Mind: In a sense, it is a comprehensive unity from which our human ideas are derived. Moreover, the philosophy of the organism has a marked affinity to Leibniz' universal perspectivism and to Spinoza's inspired use of (the notions of) substance, attribute, and mode: The infinity of the attributes of the divine Mind, the absolute substance, has a modal, i. e. finite presence in the human mind(s). Descartes, at the very beginning of this process of conceptual differentiation, in connecting the *"realitas objectiva"* with the *"realitas formalis"* of an idea, refuses to separate the intra-mental sphere completely from the extra-mental sphere. - Now, this is Whitehead's standpoint: There are layers or levels of being; prehensions are the very stuff of nature; the composition of an organism or synthesis is a cosmic event; all organisms have latent proto-psychic or even proto-mental properties.

The afore-mentioned idea of an order of nature, originating with the philosophy of the seventeenth century, must be commented on in a few words. According to Whitehead, it will forever remain mysterious to us that there are laws of nature at all, and in this Plato's *Timaeus* gains the overhand over Newton's *Scholium*.[8] There exists a basic *"creative advance"* of nature that may be identified with the tendency of a system of internal relations to manifest itself in the world of space-time. In *Science and the Modern World*, having received Spinoza and Leibniz, he prefers the term *"substantial activity"*, and in *Process and Reality* this amounts to the *"category of the ultimate"*.[9] The latter, however, is not restricted to nature; it is concerned with how the unity of being is reconciled with the plurality of beings. Moreover, there exists a series of *"cosmic epochs"*; and today we live in the epoch of Maxwellian electro-magnetism. An aphorism like this does not mean that Whitehead maintains that Maxwellian electro-magnetism is the only leading physical theory of our time. Rather, it points to the fact that Maxwell's theory gives an elaborated account of the composition of the more complex organisms of physics and biology. Since ancient times, physics has oscillated between an atomistic conception of the most elementary components of nature and a rival conception that may be called *"continuitism"*. Maxwellian electro-magnetism allows for a compromise in that it lays an approximately equal stress on atomism and continuitism, and we shall see that this feature for Whitehead is a clue to the structure of our inner life.

The order of nature as conceived by Whitehead is marked by a certain reciprocity of effective and final causes. Final causes had been condemned by Fr. Bacon but no less a philosopher than Leibniz rehabilitated them.[10] From the standpoint of modern natural science, the efficacy of final causes depends on the existence of cosmic areas that resist to the entropic tendency of the universe for a while. There is a significant parallel to the constitution of higher organisms in that the latter must absorb energy from their surroundings; we may say that higher organisms are patterns of energy distribution. This is even more evident in vital organisms: The phenomenon of *"canalization"* testifies to the fact that energy distribution is a central feature of the internal structure of the organism, too.[11] From this results the existence of the

so-called *"hybrid prehensions"* and the possibility of a *"mental pole"* of the organism: Life militates against the routines of nature impressed on it by the averages of statistical laws. According to Whitehead, the stability of the organism is accounted for by two types of continuity: Its physical existence is guaranteed by the inheritance of the character of the first member of a structured society of actual occasions by the other members of the society, a modern version of the substantial forms of Leibniz. The inner life of the organism, on the other hand, is established by the interweaving of its prehensions, conformal or otherwise. The existence of the prehensions themselves is a measure of the partial openness of the universe or rather its permeability by natural causes.[12]

I now want to give a close reading of some of Whitehead's remarks on the problem of the mind-body relationship. There are many lines of argumentation in Whitehead but I can take up only one of them. In *The Concept of Nature* the author comments on the notion of the *"percipient event"* (an early version of the notion of an organism): *"This percipient event is roughly speaking the bodily life of the incarnate mind. But this identification is only a rough one. For the functions of the body shade off into those of other events in nature; so that for some purposes the percipient event is to be reckoned as merely part of the bodily life and for other purposes it may even be reckoned as more than the bodily life. In many respects the demarcation is purely arbitrary, depending upon where in a sliding scale you choose to draw the line."*[13] Again, in *Science and the Modern World*: *"[I] have started from our own psychological field, as it stands for our cognition. I take it for what it claims to be: the self-knowledge of our bodily event."*[14] And, in another connection: *"I have […] sketched an alternative philosophy of science in which organism takes the place of matter. For this purpose, the mind involved in the materialist theory dissolves into a function of organism. The psychological field then exhibits what an event is in itself. Our bodily event is an unusually complex type of organism and consequently includes cognition."*[15]

We are compelled to ask: Is it possible to link up the mind-body relationship with the theory of electro-magnetism or modern nuclear physics as conceived by Whitehead? For him, the electro-magnetic particle and the electron, respectively, are only a condensation of the field or, in other words, they modify the field.[16] Atomism and continuitism can be reconciled with one another, and even if there is a certain dualism of particle and field, there is no dualism of substances. In a similar vein, the *"ego-object"* is only a phenomenal self, not to be sharply distinguished from its phenomenal contents. W. James and F. H. Bradley and especially H. Bergson have given elaborate accounts of how the discrete elements of consciousness are embedded in a field-like background that exhibits the nature of the continuum. Therefore, the general characteristics of consciousness can be explained with the help of these physical theories if we are allowed to conjecture that there is something like a *"psychical atom"*: a functioning unit with a certain spatio-temporal extension, and with proto-psychical or even proto-mental properties. The age-old controversy about the spatiality of the soul is settled in this way: The soul, or rather the psychical processes of the organism, are spatially extended indeed, although only to a minimal extent.

Causality for Whitehead is an organic process in nature, a process that conforms to Lockean not to Humean standards. There is another famous passage or rather, another series of famous passages in Whitehead's later works: In *Adventures of Ideas* he explains his view by a

confrontation of ancient and modern philosophy: The pronouncement of a sentence requires an enfolding of the logico-grammatical structures in the dimension of time but even before the speaker opens his mouth these structures must be *"together"* in his mind.[17] Therefore, Hume's associationistic theory of human experience is a complete reversal of an original truth. Locke knew better, and Plato in his *Timaeus* gave the complete story. The *Timaeus* is a cosmological myth and a masterpiece of ancient philosophical theology: It gives an account of the divine origin of the soul and it places it in the midth of the cosmic body. In Whitehead's reading of Plato's *Timaeus* the *"chora"* or *"receptaculum"* is nothing but a circumscription of the essential features of the human personality. Sentience, perceptivity, emotion and even abstract thought can be traced back to nature. Mind and nature are not altogether alien to one another; mind is not a principle superimposed to nature; far from being that, it originates - in Whitehead's own words - with the *"lure for feeling."*[18]

The crucial notion of a *"non-sensuous perception"* is illustrated by Whitehead as follows: *"In human experience, the most compelling example of non-sensuous perception is our knowledge of our own immediate past. […] Roughly speaking, it is that portion of our past lying between a tenth of a second and half a second. It is gone, and yet it is here. It is our indubitable self, the foundation of our present existence."*[19] In his last collection of essays, the *Modes of Thought*, Whitehead is even more explicit. The awareness of our immediate past is of the same type as the awareness of our bodily existence: *"[O]ur experience in the present discloses its own nature as with two sources of derivation, namely the body and the antecedent experiential functionings.*"*[…] [T]here is only one ego, to claim the body and to claim the stream of experience."*[20] I may summarize these considerations of Whitehead's in a few words: The Cartesian heritage of modern philosophy is responsible for our inability to give an adequate account of the mind-body relationship. But the community of mind and body must be commented on in most modest terms: There is a certain *"withness of the body"*, as disclosed in the etheric nature of non-sensuous perception.[21]

I want to close this part of my essay with three short remarks: The thesis that the animal (human) body and especially the animal (human) brain is an electro-magnetic apparatus has been propagated by some Gestaltists also, e. g. W. Köhler[22] and K. Koffka[23]. So does the famous neurophysiologist C. Sherrington[24]. An electro-dynamic theory of life has been developed by a former disciple of Whitehead, namely F. S. C. Northrop (in collaboration with H. S. Burr).[25]

III.

I now want to discuss some related aspects of the philosophy of N. Hartmann, Whitehead's younger contemporary. Hartmann, in opposition to neo-Kantianism and to Husserl's phenomenology, became the prominent representative of a movement that is known as the *"new ontologies"*. In a sense, he attempted to go back to Aristotle for he conceived the categories primarily not as forms of consciousness but rather as forms of being.[26] Hartmann rejected the turn to subjectivity that manifested itself in the works of Descartes, Locke and Kant, and especially Kant's Copernican revolution in epistemology but he accepted his standpoint that the conditions of experience are the conditions of the objects of experience, too. He departed from Kant in that he entertained a radical revision of the transcendental

arguments of the latter's critical philosophy: If there is an a priori foundation of knowledge, this foundation must be detected empirically, i. e. by a careful analysis of our common sense notions and our scientific theories.[27] This empirical shift-back is implicit in Kant and explicit in the thoroughgoing realism of Hegel. There is a further affinity to Hegel: Hartmann conceived of the totality of being as a hierarchical structure; on the other hand, he denied the dialectical movement of thought and of being itself.[28] For Hartmann, all forms of idealism are guilty of our human hubris; therefore, he favoured a modest realism which revokes the central role which the human race has to play in traditional philosophy. Consequently, he sharply criticized teleological thinking because of its anthropocentric and anthropomorphistic bias.[29]

It may be mentioned in passing that there are some striking parallels in Whitehead and Hartmann. Whitehead once insisted *"[that] knowledge is ultimate"*, and he explained this astonishing thesis by his conviction *"[that] there can be no explanation of the 'why' of knowledge; we can only describe the 'what' of knowledge."*[30] Strictly speaking, he subordinated epistemology to a system of natural theology. Hartmann, in his turn, declared *"[that] epistemology presupposes metaphysics, and metaphysics presupposes epistemology."*[31] Philosophical thinking is involved in an unavoidable circularity, and Hartmann wanted to do justice to this situation with the help of a phenomenology that precedes the metaphysics of knowledge. Moreover, acts of cognition for both thinkers are real acts, named by Whitehead *"prehensions"* and by Hartmann *"Erfassen"* or *"Erfassungen"*. (It is no accident that Whitehead's notion is usually translated by this latter term.) Whitehead's prehensions are conceived as an integral part of the world, and so are Hartmann's Erfassungen. You will also notice that Whitehead and Hartmann agree on a point that may be crucial for our further discussion: Whitehead maintains that organisms will be found mainly in the realms of physics and biology, and Hartmann takes notice of the structural peculiarity of the human world.

Undoubtedly, there is a possible advantage in Hartmann's theory of categories over Whitehead's conception: The latter once remarked, *"[O]ur problem is, in fact, to fit the world to our perceptions, and not our perceptions to the world."*[32], and in *Process and Reality* he turned this Berkeleyan conviction into the *"ontological principle"*[33], a principle that is destined to guarantee the intelligibility of the world as a whole. Hartmann, on the other hand, realized that there may be a gap between the forms of our thinking and the constitution of reality itself. The categories may be conceived either as forms of being or as forms of our intellect but there is no parallelism of reality and knowledge of reality anyway: *"Knowledge of [the conditions and principles] of the intelligibility of the world is secondary to knowledge of real objects."*[34] This remarkable insight has further consequences for it enables Hartmann to criticize certain mistakes that characterize most of traditional ontology, e. g. the *"failure of homogeneity"* or the *"failure of heterogeneity"* (to mention only two).[35] That is to say: Neither can the world be (fully) adapted to our consciousness, nor can our consciousness be (fully) adapted to the world. The relation of epistemology and ontology is more sophisticated but also more problematical in Hartmann than in Whitehead.

It is not possible in this context to give a detailed account of Hartmann's theory of categories. May it suffice to call to mind that it links up ontology and epistemology; every detailed ontological analysis becomes an analysis of *"modal"* categories such as *"possibility"* and

"reality", *"necessity"* and *"contingency"*.[36] Reality for Hartmann consists of a system of layers or levels; the lower ones bearing the higher ones. Certain categorical features of the lower levels recur in the higher ones, but in a modified form. On the other hand, there are novel features in the higher levels that can be compared with the emergent properties of Lloyd Morgan or Sellars.[37] There are general or universal categories and special categories, and a philosophy of the organism (if I may be allowed to transfer this term from Whitehead to Hartmann) deals with the special categories, namely the cosmological and the organismic categories.[38] Due to our *"spatial eidetics"* (P. A. Weiss[39]), this picture may suggest a rather static ontology to us, but it is not impossible to give a processualistic interpretation of it. Such an interpretation has been given by Hartmann himself in an early work under the title: *Philosophische Grundfragen der Biologie* (1909).

The reader of this article will be surprised that Hartmann has a rather good knowledge of the biology of Darwin whose fundamental tenets are accepted by him without reservations: *"The theory of descent is by now no mere conjecture."*[40] The formula of descent, however, does not exhaust the theoretical resources of Darwinism. Genetic variability and natural selection are the scientific means by which all phenomena of the natural history of living beings are to be explained. A central problem of Hartmann's *Grundfragen* and the later systematic work under the title *Philosophie der Natur* (1950) is the relation of phylogeny and ontogeny. In a sense, phylogeny is more important than ontogeny for the very possibility of the *"morphogenetic processes"* of ontogeny is causally dependent from phylogeny. On the other hand, ontogeny may pose a problem that cannot be fully explained by genetic variability and natural selection, namely the problem of the stability of the living form during its life-cycle. Obviously, Hartmann knew some of the results of W. Roux and H. Driesch, his later opponent. The above-mentioned causal dependence is not one-sided; rather, there is a certain circularity![41] In order to give a satisfying account of this situation, Hartmann entertains a conjecture which is scientifically doubtful but has some philosophical depth: Whereas for him phylogeny possesses an open causal texture, the *"dispositional system"* of ontogeny – a nucleus of internal relations that tend to manifest themselves in spatio-temporal relations – is closed to external influences, at least to a certain extent.[42] The apparently teleological character of the living organism may be explained away by a consideration like this.

The evolutionary biology of Darwin and his followers accentuates the continuity of life on earth from its very origin to its present stage. Therefore, we will be inclined to assume that the questions posed by the existence of consciousness, especially the question of its evolutionary origin, are included in the methodological canons of biology. But Hartmann dismisses this seemingly natural solution of the problem: For him, the afore-mentioned evolutionary continuity of life-forms does not guarantee the existence of a single coherent categorical framework in which the fundamental tenets of biology and psychology can be dealt with in an uniform manner. Although Hartmann is convinced that animal and human consciousness has biological roots and that it is adaptive, he denies the possibility that its contents may be explored by objective means. Biology does not give us the characteristics of consciousness, the very privacy of its contents, and psychology does not give us the objective characteristics of the life processes of the organisms themselves. Whitehead knew the conception of a *"Psychological Physiology"*[43], but Hartmann states: *"There is no transfer from psychology to*

physiology, or vice versa."[44] The author draws the consequence: *"Biology does not make a specific contribution to psychology."*[45] Therefore, the mind-body relationship cannot be made intelligible to our human intellect although there is no doubt that the processes of evolutionary biology are pertinent to it. In a scientific world-view the mind-body relationship will forever remain unintelligible but it may be possible to gain some hints by an inspection of the proximate layers of being.

In other words, in Hartmann's mature works the mind-body relationship is not prominent, that is to say, its existence and problematic nature are diminished in a specific way. A first part of the problem is related by Hartmann to the *"aporia of knowledge"* (or of consciousness in general)[46], a second part is related to the alleged fact that the central determination of the organism must be unknown to consciousness[47], and a third part is related to the well-known thesis that the nature of man comprises all levels of being and finds its adequate expression in the works of culture.[48] He gives his definitive conclusion in the following statement: *"The psychical functions of the living organism obey a law of being of higher order, and this law is sufficiently heterogeneous to the organic sphere to possess relative autonomy."*[49] And, in the negative: *"We have no organ of perception to represent the organismic processes in our consciousness."*[50] In contradistinction to nearly all traditional approaches Hartmann's theory of the categories and his ontology are impregnated with real experience; therefore, they do not prejudge their questions. Hartmann was prepared that his explorations might lead to a prolonged modification of his fundamental categories and ontological tenets in the light of experience.

May I say in passing that a great philosopher-scientist, H. Weyl, has given exactly the same description of the problem-situation as Hartmann.[51] Also, some biologists of the elder generation, e. g. M. Hartmann, K. Z. Lorenz, P. A. Weiss and, last but not least the spokesmen of an evolutionary epistemology, have partially confirmed the results of his philosophizing (often in a rather crude manner).

IV.

I want to summarize my essay by a short confrontation of some central theses of A. N. Whitehead and N. Hartmann. Some years ago, A. Shimony took up the phrase *"to close the circle"* and gave it a sharp contour.[52] Closing the circle means to bridge the gap between ontology and epistemology, and Shimony demonstrated this by means of an investigation of the *"causal theory of perception"*.[53] Whitehead had advocated this theory; individual perceptivity for him was the capacity to be causally influenced. The sensationalist theory of perception, on the other hand, maintains that all information about the world comes to us through certain channels, i. e. our outer senses, so it equates *"perception"* with *"sense-perception"*. Whitehead fighted against this theory for a life's time; his system of philosophy depends on the impossibility of the identification of perception with sense-perception, that is to say, on the validity of the central thesis of the causal theory of perception. But even this thesis does not tell us the whole truth: Firstly, in all perception there is a projective component or *"vector-character"*; secondly, there is the *"non-sensuous perception"*, the awareness of our immediate past and our bodily existence. These features of our experience cannot be explained by a causal theory of perception.

Hartmann, in his turn, never took a solution like this into consideration. He knew some forms of passive experience that are reminiscent of Whitehead's thesis that our perceptions always have an affective tone, due to their bodily origin or sense of derivation. He called them *"acts of emotional receptivity"*. But an elaborate construction such as Whitehead's is not to be found in Hartmann. When he says that we do not possess an *"organ of perception"* to represent the organismic processes in our consciousness (see above), he seems to speak the language of Aristotle or rather the language of a German morphological tradition but he does not comment on this notion. In a sense, he is more revolutionary than Whitehead for he prefers an aporetic style of philosophy unknown to his elder British contemporary and he realizes that it might be impossible to close the circle. But his philosophic position leads to considerable trouble in connection with the intelligibility of being. The decision whether Whitehead or Hartmann set the right course in the treatment of the mind-body relationship will depend on the question of how to manage these deeper philosophical questions.

Notes

1 Plato, *Timaeus*, translated by F. M. Cornford, London / New York 1959, p. 24.
2 A. N. Whitehead, *The Concept of Nature*, Cambridge 1920, chap. I.
3 N. Hartmann, *Grundzüge einer Metaphysik der Erkenntnis*, 4th ed. Berlin 1949, p. 61. The notion of *"othering"* is unfamiliar in this context; I have borrowed it from the later works of P. Weiss who uses it in reconstructing problems of a Hegelian, Husserlian or Hartmannian phenomenology.
4 A. N. Whitehead, *An Enquiry Concerning the Principles of Natural Knowledge*, 2nd ed. Cambridge 1925, pp. 8 – 11.
5 A. N. Whitehead, *Science and the Modern World*, New York 1925, p. 90.
6 A. N. Whitehead, *op. cit*., pp. 185-192.
7 A. N. Whitehead, *op. cit*., Chap. III and chap. IV.
8 A. N. Whitehead, *Process and Reality*. An Essay in Cosmology, corr. ed. by D. W. Griffin and D. W. Sherburne, New York 1978, pp. 92-96.
9 A. N. Whitehead, *Science and the Modern World*, p. 152 ; *Process and Reality*, pp. 21-22.
10 L. J. Henderson, *The Order of Nature*, Freeport New York 1971, pp. 25-26. Henderson is a physiologist and biologist of the first half of the 20th century; he stood close to Whitehead. So did J. S. Haldane and J. Needham.
11 A. N. Whitehead, op. cit., pp. 107-108.
12 The so-called *"prehensions"* are relations with mixed properties. They correspond in part to the concept of external relations, in part to the concept of internal relations. The paradigm case is memory because it appropriates past experiences; so it entertains an internal relation to them whereas the past occasions themselves remain external to it. Therefore, the Lockean paradox of memory is dissolved. Also, the modern anti-materialistic concept of memory traces, as developed in Gestalt psychology, can be illuminated by Whitehead's prehensions.
13 A. N. Whitehead, *The Concept of Nature*, p. 107.
14 A. N. Whitehead, *Science and the Modern World*, p. 103.
15 A. N. Whitehead, *op. cit.*, p. 271.
16 A. N. Whitehead, *The Concept of Nature*, pp. 158-9.
17 A. N. Whitehead, *Adventures of Ideas*, New York 1933, pp. 233-5.
18 A. N. Whitehead, *Process and Reality*. An Essay in Cosmology, p. 185 and elsewhere in the text of the book.
19 A. N. Whitehead, *Adventures of Ideas*, pp. 233-4.
20 A. N. Whitehead, *Modes of Thought*, New York 1938, p. 220.
21 A. N. Whitehead, *Process and Reality*. An Essay in Cosmology, p. 81. Cf. pp. 311-2: *"[W]e feel* with the body. *There may be some further specialization into a particular organ of sensation; but in any case the* 'withness' *of the body is an ever-present, though elusive, element in our perceptions […]."* Whitehead in this passage comments primarily on the notion of *"presentational immediacy"* but his remark pertains to all other forms of perception *a fortiori*.
22 W. Köhler, *Gestalt Psychology*, New York 1929, p. 7.

[23] K. Koffka, *Principles of Gestalt Psychology*, New York 1935.

[24] C. Sherrington, "Foreword to 1947 edition", in: C. Sherrington, *The Integrative Action of the Nervous System*, 2nd ed. Cambridge 1947, p. xiv.

[25] F. S. C. Northrop, "Causality in Field Physics and Its Bearing upon Biological Causation", in: F. S. C. Northrop, *The Logic of the Sciences and the Humanities*, New York 1947, pp. 219-34.

[26] Cf. his „Abhandlungen und Schriften aus den Jahren 1910 – 1923", in: N. Hartmann, *„Kleinere Schriften III*, Berlin 1958, pp. 1-313.

[27] N. Hartmann, „Wie ist kritische Ontologie überhaupt möglich?" (1923), in: N. Hartmann, *Kleinere Schriften III.*, pp. 268-313.

[28] N. Hartmann, Die Philosophie des deutschen Idealismus, 2nd ed. Berlin 1960, pp. 375-417.

[29] N. Hartmann, *Teleologisches Denken*, Berlin 1951.

[30] A. N. Whitehead, *The Concept of Nature*, p. 32.

[31] N. Hartmann, *Grundzüge einer Metaphysik der Erkenntnis*, p. 6.

[32] A. N. Whitehead, "Space, Time, and Relativity", in: A. N. Whitehead, *The Aims of Education and Other Essays*, New York 1929, p. 247.

[33] A. N. Whitehead, *Process and Reality*. An Essay in Cosmology, p. 19.

[34] N. Hartmann, „Über die Erkennbarkeit des Apriorischen" (1914), in: N. Hartmann, *Kleinere Schriften III*, p. 191.

[35] N. Hartmann, „Wie ist kritische Ontologie überhaupt möglich?", in: N. Hartmann, *Kleinere Schriften III*, pp. 280-5.

[36] Hartmann's *Ontology* consists of four volumes; for his modal analysis cf. *Möglichkeit und Wirklichkeit*, Berlin 1938 and *Der Aufbau der realen Welt*. Abriß der allgemeinen Kategorienlehre, 2nd ed. Meisenheim am Glan 1949.

[37] Whitehead, although impressed by S. Alexander and C. Lloyd Morgan, was not an *"emergentist"* at all. (The influence of C. D. Broad and the *"New Realists"* pertains to the theory of perception only.) For him, emergentism was a Lockean dualism projected from nature to natural history.

[38] N. Hartmann, *Philosophie der Natur*. Abriß der speziellen Kategorienlehre, Berlin 1950, pp. 251 -709.

[39] P. A. Weiss, biologist, must not be confused with P. Weiss, philosopher (cf. Note 3).

[40] N. Hartmann, „Philosophische Grundfragen der Biologie", in: N. Hartmann, *Kleinere Schriften III*, p. 84.

[41] L. J. Henderson, *The Order of Nature*. An Essay, Freeport, NY 1971, chap. VI.

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