A. BOHMERS

EVOLUTION AND ARCHAEOLOGY

II. *Evolution, Revolution and Epitomization*

Apes and monkeys almost always live in groups. This is also true of all primitive human groups. If one attempts a broad comparison between groups of apes and monkeys and primitive human groups living more or less in the stage of hunting and fishing, for example as Australian aborigines, one finds many correspondences, but many differences as well[1].

1. The groups are composed of a few hundred individuals at the most.

2. Semi-arboreal monkeys, such as baboons who form the largest groups among the higher primates, circulate within a well defined area.

3. Apes and monkeys seldom defend their territory against foreign groups of the same species, but men usually or almost always do so.

4. Apes and monkeys occupy particular sleeping places and make their homes in trees; men form camps for shorter or longer periods with primitive huts or shelters or occupy caves or refuge places.

5. Apes and monkeys mostly live endogamously; men are sometimes endogamous, but mostly exogamous. Men generally seek mates from other groups, but male apes do not.

6. Apes and monkeys are polygamous, while men practise a more or less pronounced monogamy.

7. Among ape and monkey communities we find altruistic methods. Stronger animals defend weaker ones. They clean one another's pelt, and pick lice off one another. But sick or wounded individuals unable to keep up with the group are fairly quickly abandoned, while primitive men go on longer with this.

8. Apes and monkeys look after their young for a shorter period than humans. But even among apes and monkeys the young are loved and protected by the entire group.

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[1] S. L. Washburn and Irvin de Vore, *The social life of Baboons.* Scientific American, June 1961.
F. Bourlière, *Patterns of social grouping among wild primates.* Social life of early man. Edited by S. L. Washburn, London 1962.

9. Apes and monkeys generally provide food only for themselves, exept for the females who provide for their own young. Human groups often divide food among the entire community. Some species, for example chimpanzees are, like humans, omnivorous, though to a lesser degree[1].

10. Among apes and monkeys there is a definite ranking, based both on physical supremacy and on seniority and convention. The latter plays a greater role among humans.

11. Within the ape and monkey community there is clear differentiation. There is a group of older males that forms the leadership. Then there is another group comprising the younger males, the females and the young. Primitiv human groups are generally somewhat more strongly differentiated.

12. Primitive human groups join together more or less intensively into larger units, a clan or tribe; this does not occur among apes.

This is a comparison between the social structure of two types of creatures that are far apart in evolution. We must remember that even the most primitive of recent human races belongs essentially to *Homo sapiens*. Between them and the apes lies a period of development of several millions of years and many species that have disappeared. Some of these are known, such as the Australopithecine stage, which developed more than a million years ago from the highest of the apes. Then comes the Pithecanthropus stage, the Homo Neanderthalensis stage and the Pre-Sapiens stage.

Considering this very long development, and bearing in mind the many fundamental changes, one might almost say revolutions, that have occurred, one could say that the differences, cited above, between the social structure of apes and primitive human groups are not so very great. Some of these changes are:

1. The change from arboreal to terrestrial life and the attainment of an upright posture. The forelimbs can thereby be employed to hold and transport foreign objects and use them as implements.

2. The making of implements for particular purposes. These make it possible to catch other animals and to go over to a fully omnivorous diet. This permits the settlement of new territories.

3. The more continuous receptivity of the females permits the formation of more monogamous relationships. In the ape and monkey society, only a few females are receptive at any one time. The strongest of the males fight continuously for their possession. With more monogamous relationships, the males behave less aggressively and with less mutual hostility, and have more opportunity for cooperation[2].

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[1] J. Goodall, *My life among wild Chimpanzees.* National Geographic Magazine, August 1963.

[2] C. R. Carpenter, *Societies of monkeys and apes.* Biol. Symposia 8, p. 177–204.

4. Along with a more intensive cooperation, the beginnings of language develop. This event is perhaps to be regarded as the greatest revolution in prehistory before the agricultural revolution at the beginning of the Neolithic[1].

Besides the biologically determined heritage transmitted through the genes, which expresses itself as instincts, the possession of language makes it possible to pass on acquired knowledge concerning the most varied technical, social and cultural facts. The former represents bio-genetic evolution, the latter socio-genetic evolution[2]. Genetically transmitted instincts are very strong and difficult to alter; verbally transmitted knowledge is extraordinarily flexible. Bio-genetically transmitted instincts are passed on from father and mother to their own children; socio-genetic information can be transmitted to any chosen individuals in any chosen number within a particular culture. This has an entirely different and extremely far-reaching effect.

Any population of animals or plants possesses a particular gene pool, and the differentiation of this gene quantity determines the existence of a given species. If enough individuals within a species possess a constellation of genes permitting them to survive in the case of an unfavourable change in their environment, then the species itself can survive as a population, even if the greater number of individuals within it perish. The same can happen with a human culture. If it possesses a greatly differentiated 'idea pool', there will always be groups of individuals capable of finding a solution even in the most unfavourable circumstances. The quantity and differentiation of genes, and of ideas, inventions, or thoughts of science and the technical level of the culture as a whole is therefore of very great importance.

The first beginnings of signs with symbolic significance occur in the social groups or 'states' of the highest representatives of the second great animal family, the bees. Thus, the direction and distance of a source of honey is indicated among bees not with sounds but with dance figures. The direction and distance of the honey source and the dance figures have nothing to do with each other, just as speech sounds have nothing to do with a particular artifact named by them. Human language is likewise based upon phonetic signs with a purely symbolic significance. Apes use a whole series of calls; but these have merely emotional significance. Only the possession of a means of communication embracing many symbolic signs permits the rise of larger social structures. The intensity of interdependence between the units is very important for social structures.

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[1] This 'revolution' took a long time, several tens of thousands of years; the agricultural revolution took some thousands of years and the industrial revolution needed only a few hundreds of years.

[2] C. H. Waddington, *The ethical animal*. London, 1960.

All these basic changes must have occurred between the social groups of apes that existed several millions of years ago in the second half of the Tertiary and those of the lowest humans of the first half of the Pleistocene. How these ape and human social groups were formed, can be reconstructed if, as argued above, we compare the recent groups of apes and the most primitive human groups in the hunting and gathering stage (Australians, Bushmen, Eskimos). It appears that the differences are not so very great, and that transitions between them can be imagined. Dobzhansky has expressed it as follows: 'It is reasonable to suppose that our prehominid ancestors had a social organisation not unlike that in modern apes'[1].

The social structure of primitive human hunters and gatherers was probably preserved for a very long time even in the original area of human evolution, Africa, Europe and Southwestern Asia. It existed in that area until the beginning of the Neolithic, the agricultural revolution. Only then did the same groups settle down in villages and, later, towns, with entirely changed circumstances. Agriculture and cattleraising multiplied the means of subsistence, thereby freeing many men to devote themselves to specialized employments. Craftsmen, scribes, teachers, and rulers appear; and the whole society begins to acquire structural differentiation and to specialize functionally. Towns grow into units with thousands of inhabitants, and these again unite into kingdoms and states counting millions of inhabitants. Civilizations appear, like the Egyptian, the Sumerian-Babylonian, the Chinese, the Indian, the Graeco-Roman, and subsequently, following a new revolution, the industrial civilization of the modern world powers.

The development just described has its beginning stages in the sphere of prehistory.

A development of this kind cannot be described entirely by the concept of evolution which implies the development and progressive differentiation of unicellular and multicellular animals and plants. Individuals, species and families show increasing divergence. The branches of the symbol of this development, the evolutionary tree, become continuously more numerous and spread farther apart.

But the events described above have, on the contrary, a convergent tendency. Individual groups unite and develop toward one another. A greater uniformity results. There is no longer struggle and 'survival of the fittest' between them. On the contrary, they support one another, and the number of inter-relationships increases. Altruistic impulses appear. As a symbol of this development, a net may be employed. Individuals work together to strengthen the group and enable it to maintain itself in the progressively more intense struggle for existence between groups. It is the groups that now behave 'Darwinistically' in relation to one another.

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[1] Th. Dobzhansky, *Mankind evolving*. New Haven, 1963, p. 198.

This human development, greatly intensified since the Neolithic, finds its parallel in events thousands of millions of years earlier, in the first geological period, the Pre-Cambrian. Unicellular organisms freely moving in the sea joined together to form a colony. Within the colony, they differentiated in various directions. Cells appeared that specialized in reproduction, while others specialized in digestion, others concerned themselves with the provision of food, and others still with defense. This internal differentiation of the colony increases progressively, resulting in the emergence of multicellular plants and animals. Exactly how this proceeded we do not know. There are many possible variations, and some of these are still occurring[1]. Something similar is arrived at when cells divide but do not separate, and then specialize. Sometimes no actual division occurs, but single cells with multiple nuclei appear; these cells then later develop into cell groups with differentiated functions.

Although we may never know exactly what happened in the Pre-Cambrian, it is certain that something occurred by which unicellular organisms developed into multicellular ones. Multicellular Metazoa are quite other forms of life than the unicellular Protozoa, their organisation being based on entirely different principles.

With the alga Volvox, as with human communities in a hunting and collecting stage, the interrelationships between the individuals are neither numerous nor intensive. The appearance of villages and, later, towns, and the strengthening and the numerical increase of interconnections accompanying the agricultural revolution of the Neolithic, is to be compared with the development of Volvox into the Coelenterata.

We should again lay stress upon the fact that with the transition from Protozoa to Metazoa essentially new structures come into existence, and that this is also true, almost to an even greater extent, with the transition of Metazoa to 'Hyperzoa' (social structures). The differences are far greater than those separating the steam engine, the Diesel engine, and the engine driven by nuclear fission.

One cannot directly compare the brain of an animal with the government of a state or the nucleus of a cell; or the blood circulation of an animal with the money circulation of a nation. As structures, they are dissimilar in character. Similarly, one may reject the suggestion from biological quarters that the structure of states and cultures ought to be altered so as to heighten their resemblance to the structure of higher Metazoa. Cells, animals and states are far too different in character. With higher Metazoa as animals, for example, the various organs are incapable of operating independently of each other; they pass on perceptions to the central nervous system, and are in turn totally governed by the central nervous system. In contrast,

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[1] J. T. Bonner, *The evolution of development*. Cambridge, 1958, p. 15.

the various organs of a culture have, even when widely separated, many inter-relations, with the help of which essential measures can be executed without necessarily being instigated by a central government. It is not necessary to have an all-dominating and all-coordinating regime geographically distinct from the other parts of the state.

Each realm or level, be it of cells, animals, plants or states, has an individual specific structure that is essential for the functioning of the whole. One can, however, suggest a number of points in which the various realms of Protozoa, Metazoa and Hyperzoa agree. Each has, in the first place, its own individual character. Among the Hyperzoa, for example, one can distinguish the Egyptian culture in all its historical periods from, for example, the Chinese or the Greek civilizations[1].

Humans, animals and plants have each their individual character. One can probably say this of unicellular creatures as well; each of them has something that distinguishes it as an individual, from all others, even if the distinction is less intensive than with higher creatures.

In the second place, each culture has a particular block of space and time in which it exists.

In the third place, they are all built of simple elements and organs, standing in a relationship to one another. Even cells have organs, such as the nucleus, the chromosomes, the mitochondria, fibrils, etc. Some of these organs form a matrix for the structure of the cell; others provide energy through chemical reactions, or store energy as in an electric battery; still others regulate the mechanism of fission. These cellular organs are in turn composed of elementary structures such as proteins. Protein-like structures can maintain a partly independent existence as viruses, and are in turn (if one wishes to go on into another realm) constructed of simple molecular groups, which are themselves made of a very large number of atoms.

Other comparable characteristics of protozoa, metazoa, and hyperzoa are the ontogenetic development of the individual and the phylogenetic development of the type. Cultures undergo various stages of development in their individual history, as do cells, plants or animals. There is similarly in the course of evolution a development of cultures away from each other. Various higher cultures arise out of the Bronze Age ones, as these did from the cultures of the Neolithic. Similarly, human beings have developed from Tertiary apes, and these in turn have developed from lemurs, and so on.

Protozoa, metazoa and cultures possess a metabolism, a dynamic balance, with a transport system for the supply of raw materials needed for body-building and

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[1] A. L. Kroeber, *Styl and civilisation.* Univ. of California Press. 1963.
'I give Spengler credit for sensing to an extraordiary degree the ideal potentialities of culture styl.'

for energy, and for the disposal of waste. They all have means of perception, or sense organs, to register external happenings. Even single-celled creatures frequently have, in addition to chemical means of perception, those based on sensitivity to light. The refined sensory organs of animals and humans are not, however, by far so far-reaching and perfected as those at the service of the scientific technology of a state, going far beyond the borders of what is possible for sensory organs.

Metazoa and cultures have organs and systems for the transmission and digestion of perceptions, and other centres to register them.

These are only a few examples of the many correspondences that can be noted.

The process pictured above of rythmic integration of many individuals to form larger new structures has often been recognized and discussed[1]. The process was, however, extensively described for the first time in a series of works by the philosopher G. P. Conger[2]. He was the first to employ the term 'epitomization'. He begins with the fact that the structures, the realms, the 'levels of integration' (those of the viruses, the cells, the animals and plants, or the social foundations such as cultures) have significant mutual resemblances. Although I cannot agree entirely with everything suggested in these works, I should like to retain this term, which has a certain priority.

The objection is often made against this kind of comparison of organisms, states, etc., that it involves a false use of analogies.

Analogy relates to agreement and disagreement between attributes or relations of things, and not to the nature of things. The following error is repeatedly made:

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[1] O. L. Reiser, *The concept of Evolution in Philosophy*. Anniversary Essays on Charles Darwin's Origin of Species, pp. 38–47. Pittsburgh: University of Pittsburgh Press.

'The theory of *emergent evolution*—momentarily at least—came closer than any other proposed integrative principles to providing a synthesizing nucleus for modern philosophy. This theory of levels, as it was sometimes called, in one form or another had the vigorous support of such outstanding thinkers as Wilhelm Wundt, Lester Ward, C. Lloyd Morgan, Samuel Alexander, Jan Smuts, Alfred North Whitehead, G. P. Conger, C. D. Broad, Roy Wood Sellars, and many others.'

R. W. Gerard, *A Biological Basis for Ethics*. Philosophy of Science. Vol. IX, p. 107.

'I have developed the arguments for regarding a society as a type of 'animorg' or living system, just as is the individual organism of biology an animorg. As the organism is built of subordinate units—cells, tissues—in organized relations, so is the epiorganism, the society, built of subordinate units—organisms, families—in organized relations. The two types of system possess alike the basic properties of all living systems—dynamic equilibrium, specific synthesis, and adaptive amplification. Further, the integrating mechanisms—mechanical force, transported substance, transmitted energy, quantitative gradients—are alike in both; and the same environmental influences (novel stimuli), acting on equivalent functional elements (receptors), lead to the same evolutionary trends (towards greater integration).'

'Any man in a communal setting, then, is in part a complete individual, in part a unit in an individual of next higher order.'

[2] G. P. Conger, *A study in philosophy of the Science*. University of Minnesota Library 1949.

one establishes a number of agreements and therefore concludes that other agreements must also exist. This error is soon recognized as unscientific. But science is based for the most part on the recognition of analogies and not of identities. Many analogies are valuable, others are less so. The more important the analogies between two phenomena, the more we can understand or explain about them. This is the basis of the analogies between structures such as one-celled animals, metazoa and cultures. These are for the most part essential and very numerous.

Important periods for the emergence of new realms were, for example, the Pre-Cambrian, when, some thousands of millions of years ago, cells were first formed from living supermolecules, and thereafter Metazoa from cells. There was then a longer period in which these primitive creatures evolved further and developed into complicated animals such as the saurians and the insects. The vertebrates and the arthropods gradually became the most important large groups.

A new realm, that of social structures, super-organisms or hyperzoa, emerged from the class of insects, as a branch of the Arthropods, probably more than a fifty million years ago. Colony formation was achieved only by the wasps, bees, ants and termites. The basic structure of these colonies rests on the co-habitation and cooperative labour of the offspring mostly of a single large family. This makes, however, extravagant demands on the reproductive capacity of a single individual. The queen has to populate the entire state. The termite queen is an immobile monster. This sets severe limits on the possibilities of development and movement of the group. The capacities of individuals rest for the greatest part on fixed primitive instincts. The volume of the central nervous system and the number of neurons is too small to permit higher intellectual development. Free will and decision is possible only to a very small extent. The external skeleton also limits the size of the individuals to such an extent that they are unable to develop significantly farther. The breathing organs are also incapable of further development. Their structure also sets strict limits on the size of the creatures. It is for these reasons that the insect states were incapable of further differentiation and that their evolution has long stood still.

After the explosive development of the vertebrate mammals in the Tertiary, a second series of experiments occurred which led to the formation of higher realms.

The mammalian groups that formed societies through the association of a limited number of individuals, such as the Primate groups described above, may be regarded as the very primitive beginnings of a higher realm of this sort. On approximately the same plane are the human hunting and collecting groups of the Palaeolithic. But the cave dwellers and big game hunters of the European Perigordian, Solutrean and Magdalenian possessed highly specialized hunting weapons, and had artists of very high order. These groups can be regarded as the most advanced and most differentiated of the hunting stage.

These were antecedent stages promising a great future; they first opened out in the Neolithic, when villages and towns appeared and social structures arose that far outdistanced the termite states in differentiation and integration[1].

Thereafter began an explosive growth of the towns, culminating in the modern big cities, which are still involved in a process of accelerated development.

Man evolved somatically until he reached the *Homo sapiens* stage in the Later Palaeolithic. After this stage, somatic development ceased; the human body underwent no further essential changes. The human mind, however, continued evolving at an accelerated rate. One may ask whether there is a correlation between this interruption of somatic development and the appearance of more strongly differentiated social structures.

Population genetics has shown that progressive mutations establish themselves particularly quickly in small groups.

When a large number of individuals are involved in the crossing, new mutations are too easily lost in the group. Possibly more exogamous relations arose in the Upper Palaeolithic, among the already rather larger social groups that inhabited a particular cave area such as the Dordogne. This greatly increased the number of individuals mutually involved in the reproduction of the population, which may have exercised a negative influence on further somatic evolution.

The most important development to follow the emergence of *Homo sapiens* was, however, not the psychic development of the individual humans, but the evolution of human social structures. What occurred in this respect in the course of the Neolithic and Bronze Age, in a period of a few thousand years, is astounding. The Agricultural Revolution began in the Middle East some seven to nine thousand years ago. It extended over great parts of the earth only some five thousand years ago.

The leading social stratum was then no longer the best hunters, but farmers possessing much land and large farming units, the later nobility[1]. Prior to the Agricultural Revolution was a revolution that coincided with the invention of tools and language. The invention of hunting weapons, fire and a symbolic means of communication can probably be placed, in the light of newer discoveries, after the Australopithecus stage in the beginning of the Pithecanthropus stage in Central or

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[1] A statistical method of expressing this process has been elaborated by R. Narrol ('*A preliminary index of social development*', American Anthropologist 58, 1956, pp. 687–715). He takes into account three criteria for each tribe or people, which he evaluates quantitatively. First is the size of the population of the largest permanent concentration of the group, *i.e.* settlement, village or town. Second is the number of independent crafts. Third is the number of the different branches of the administrative organization. These numbers are converted to indexes and combined. In this manner, the Ona Indians of Terra del Fuego and the Ainu receive the number 21, the Crow 32, the Zulu 44, and the Aztecs 58. He estimates that no prehistoric group existed prior to the geologically recent period with a number higher than 50, and none with higher than 35 prior to the last glaciation.

Southern Africa some 500,000 years ago. Between this revolution and the Agricultural Revolution stretches a very long interval. Between the Agricultural Revolution and the third great revolution in the history of mankind, the invention of machine industry in the 19th century in Western Europe, which spread over larger areas in the 20th century, the interval is very much less extensive. This is a proof of the enormous acceleration of the general human evolution referred to above[1].

Evolution since the Neolithic has taken the form primarily of the evolution of cultures and states, which entered upon a mutual struggle for life and death far more intensive and frightful than that between individuals—one need only think of the two world wars in this century—in which only the hardiest triumphed and the law of 'the survival of the fittest' prevailed, as it still does, in even sharper form between groups of states, today. Even with the formation of ever greater groupings of states, the danger of a devastating conflict between blocs of states, using all modern means of mutual destruction, continues to exist. A conscious knowledge of the essential nature of the political and cultural structures of the hyperzoa, their revolutions, evolution and epitomization can contribute greatly to deeper understanding of the tensions, and possibly to their diminution. Unfortunately, the majority of the managers and political leaders who guide these structures are unacquainted in this sence with the nature of what they govern.

Not only has the tempo of the evolution of cultures become much more rapid in recent years, but concentration, integration, differentiation, specialization, and not least, centralization, have grown almost as rapidly as the tempo of evolution. One need only compare a modern state with a feudal kingdom of only a few centuries ago.

An important thing is to establish, with the help of the factual materials of prehistory and proto-history, the direction that the evolution of cultures has followed, what constant lines it reveals, and which of these are likely to continue, and which we must reckon with in our future development. Only with objective data of this sort can we attempt predictions with any certainty, and develop plans for the future modelling of cultural structures. In this connection we are thinking not so much of special plans for particular branches of politics, economy, industry or science, but rather of more general long range plans, to which the more particular short-term plans should be subordinated.

In conclusion, we may remark that in the future the results of archaeological study should not only be used for analysis; they should and will have a part in a creative synthesis.

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[1] In the Industrial Revolution, the big farmers were replaced as the leading stratum by the owners of industry, and later by the managers of production. Perhaps the fourth great revolution, that of science, in which great scientists will replace the production managers as the leading stratum, will occur as early as the 21st century.

Postscript

Teilhard de Chardin attempts, with the help of the factual knowledge of evolution as it has occurred on our planet, to make statements about cosmic intellectual structures or systems of a higher order. He arrives at a transcendental Absolute which he calls Oméga and which exists outside space and time[1].

Were I to repeat this endeavour in a similar, one could say Teilhardian manner, utilizing in general the same factual material based on evolution, I could also arrive at a higher order, as follows:

One could begin by asking whether a higher epitomization of hyperzoa is possible, *i.e.* whether, through a combination of all the hyperzoa or cultures or states on our planet, a single 'Hypatozoön' could come into existence. This question can, however, be answered at once in the negative.

A structure of the level N + 1 is built up of millions or thousands of millions of structures of the level of N. A virus consists of millions of atoms; a cell is formed of at least many millions of proteins; an animal or plant consists of countless millions of cells; and a culture or state incorporates millions of people. A combination of millions or even of thousands of cultures or states cannot exist on our planet; indeed, these are becoming progressively fewer.

It is, however, estimated that there are at least a million to a hundred million stars in our galactic system having planets upon which intelligent beings could have developed (Su-Shu Hang, Life Outside the Solar System, *Scientific American* 1960, p. 4). The biochemical researches initiated by Oparin have shown that life most probably arises automatically out of carbohydrate combinations in the beginning phases of such planets.

A further not entirely improbable assumption is that intelligent life higher than our own has already developed on a considerable percentage of these planets. The explosion of scientific thinking on our planet is only some 250 years old, while life on earth has existed some five thousand million years, so that the former is only 0.00000005 % of the latter; but the planets mentioned above can exist for periods lying between five thousand million and twenty thousand million years. A further not improbable assumption is that radio and television communication has developed among these planets with inhabitants of highly developed intelligence, permitting extensive intellectual communication among thousands or millions of cultures. This can more readily be imagined in regions of the galactic system where the concentration of stars is much higher than it is in our peripheral area.

The last step – that epitomization phenomena should appear among those cultures of intelligent creatures on the several planets – is by no means improbable. When intellectual contact is intensive, the actual distance plays no essential role. In this manner, one or more Hypatozoa of galactic dimensions, consisting of thousands of cultures, could have come into existence. Individual structures of this sort must represent, in comparison with modern states, tremendous concentrations of strength and energy, just as a modern state represents a tremendous concentration compared with the strength and energy of individual human beings.

Teilhard de Chardin has clearly seen that if it is desired to find an objective, precise scientific approach to the existence of a higher Being, the path of evolution and epitomization can be utilized. This path may, indeed, be one of the very few paths, or possibly even the only one, that leads this way, it having been shown that the Vitalism of Bergson or Driesch falls outside the exact sciences. He has not, however, succeeded; since nearly at the end of his chain of reasoning he departs from this path, to arrive at a dualistic cosmos with a transcendental, supernatural God on the Christian model.

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[1] P. Teilhard de Chardin, *Le Phénomène Humain*. 1955 ed. Seuil, Paris, p. 301:

'Si par nature il n'échappait pas au Temps et à l'Espace qu'il rassemble, il ne serait pas Oméga. Autonomie, actualité, irréversibilité et donc finalement transcendance; les quatre attributs d'Oméga.'