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THE PHILOSOPHY OF EVOLUTION

LECTURE SERIES 1 (Complete):

DARWIN AND SRI AUROBINDO

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Abstract: The aim of this course is to present a coherent introduction to the subject of evolution from both the scientific and the philosophical points of view, primarily in order to stimulate philosophical thinking about the subject. Through philosophical thinking a greater understanding and appreciation of the phenomenon of evolution, and of "nature" in general, including human nature, can be achieved. The texts that will be used in the course are taken from a variety of original writers on the subject of evolution, presented in chronological order to illustrate the development of evolutionary thought in general. Some of the authors referred to are Spencer, Darwin, Huxley, Haeckel, Bergson, Whitehead, Teilhard de Chardin, Mayr, Lorenz, Capra, Sheldrake, Dawkins, Dennett, and Sri Aurobindo. Although it is not the primary intention of this course to present the philosophy of Sri Aurobindo in a comprehensive way, his perspectives provide a general context and background for this study. These lectures are followed by a second series titled 'Mind and Supermind'. Complete audio files of both series are available on the website: www.universityofhumanunity.org. This text is a transcription of the audio files of Series 1, minimally edited for readability and clarity, while remaining closely keyed to the rather informal and loosely structured style of the spoken lectures.

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Preface

Scientific and Spiritual Knowledge

When we ask the question, What is evolution?, we want to know, to comprehend, to understand this fantastic something that we think and believe exists, that we already somehow perceive the existence of. We want to raise our consciousness with regard to this process of nature which concerns us. The fact that such a process exists in nature is probably beyond question. Not because we can perceive it directly, but we have perceived ample evidence for its existence, which in fact motivates us to want to understand it fully. It is something indeed remarkable!

But, because the existence of this wonderful process of nature cannot be directly perceived – it is spread out over billions of years – and is therefore only a concept derived from scattered observations and analyses, we have to admit that the urge to know and understand more, on the basis of the sum total of what is already known, regardless of how closely that knowledge reflects the actual truth of the process, is a mental phenomenon. We have to distinguish our knowledge of the processes that we observe in nature from the material, chemical, organic structures and processes of life themselves. As far as we understand them, these natural processes of physical and chemical and biological principles and laws are not themselves mentally conscious of their origins, their behaviors, and their destinies. And yet birds know when and where and how to build their nests and plants produce flowers and fruits with just the right nutrients for the insects and animals that feed on them. There seems to be an intelligence in nature but not an understanding in the usual sense of knowledge. Certainly the carbon atoms in the sugar molecule and the phosphorous atoms in the enzymes of the nerve synapses do not know what functions they perform in order for the animal organism to achieve its goals. The point is that there are distinctly different levels of organization in the world that we perceive and of which we are part, broadly distinguished as the physical, the vital, and the mental levels of organization. Following Sri Aurobindo, we may refer to these as worlds, or as planes: the physical plane, the vital plane, and the mental plane. This point of view has become increasingly accepted in science and philosophy by such prominent thinkers as Konad Lorenz, Karl Popper, A.N. Whitehead, and so on – as we shall discover in more detail as we go forward in this course. According to Sri Aurobindo, we should lose the habit of associating "consciousness" with mental awareness, and we should think of these three planes as planes of consciousness. That idea too is beginning to be accepted.

This brings us to a distinction probably only possible and natural to a mental being – between consciousness and nature, or Purusha and Prakriti. Only a mental being would distinguish between what it knows and what it is and does. That is perhaps the essence of the mental when it becomes fully evolved and operational in the human being. It perceives, it thinks, it understands things or objects, processes and concepts. However practical and matter-of-fact, or imaginative and creative such mental functioning may be, it thinks of itself as other than the things and objects that it thinks about, even though it too is such a process and part of nature. The mental is a level of the threefold world, a level of consciousness, embedded or *grounded* in nature, like life and body. This is Sri

Aurobindo's solution to the mind-body problem. Mental awareness and thought are no more or less levels of consciousness than are emotions, sensations, impulses to action and the expansion and contraction of gasses or inertia and motion. Ontologically there is no duality of mind and body. Nature is threefold: physical consciousness, vital consciousness, mental consciousness, and all are Prakriti. Purusha then is the soul within, the Self which IS, the center of being, and it has three fundamental, possible states – involved in the lower three worlds, liberated and detached, or identified with all as the master of being and becoming, Parampurusha (the self of all), and Ishwara-Shakti (the force of all).

Somewhere along the way this supreme will and spiritual being of which evolutionary nature is the historical embodiment emerged as mind and began to reflect and understand its nature, the natural world. But its idea of separateness from what it thinks and understands, it eventually discovers is an illusion; it is deeply grounded in its world and ultimately one with it on the peaks of liberation, where Purusha and Prakriti are re-united. This is the spiritual and ontological or ontotheological explanation of an evolutionary world in which consciousness emerges as physical energy and organization, vital energy and organization, and mental energy and organization. But we still do not know, directly, experientially, adequately the process itself – how does it work, how does it happen to be mentally aware of itself, why and to what purpose has mind begun to ask such questions? Why has scientific knowledge at its height become preoccupied with these questions; and why has the master of spiritual knowledge himself made such questions central to his message, his philosophy, and his Yoga?

Traditionally, since Vyasa and Plato, knowledge has been characterized by two distinct but equally challenging and interesting fields of pursuit, or objects of understanding – the mind or spirit on the one hand and nature or matter on the other hand. The approaches to the former have been primarily mystical and philosophical and to the latter scientific and practical. This divergence in the pursuit of knowledge has been a prominent theme in the writings of the philosophers that most interest us. Both streams have been wonderfully energetic and productive throughout our recorded history. And as we approach the study of evolution and the development of a "philosophy of evolution", it is necessary that we recognize from the start these two different approaches. One is based on faith and inner experience; the other is based on observation and analysis. The former, subjective approach doesn't tell us anything as yet about the processes of structural evolution and adaptive biochemistry. For knowledge of this tangible realm the scientific approach is needed. The latter, objective approach doesn't tell us anything definite about how the lower three worlds receive their forms and processes from the causal planes, or what the relationship is between the higher duality of Consciousness-Force and the lower prakriti.

The philosophy of Herbert Spencer in the mid-19th Century described the natural world as a mechanistic process of increasing order and complexity determined by an Absolute Force standing outside and unknowable above the worlds of mind, life and body. While this view anticipated the ideas of Bergson and Prigogine about entropy and increasing complexity, it deliberately and necessarily left the unknowable alone, and set the stage for Darwin to define the process of natural selection. The wheels of materialistic science

were set firmly on track to discover how physical energy leads naturally and deterministically to higher and higher levels of organization, culminating in knowledge and values. This train has carried us a long way through fascinating terrains during 150 years of unrelenting pursuit. While, at the same time, the visionaries of higher mind and creative evolution – Bergson, Whitehead, Sri Aurobindo especially – continued to pursue the Spirit, unwilling to accept that either an Absolute outside the world, or an atomistic quantitative and qualitative analysis of process can ever adequately explain the vast interconnectedness, order and unity of the three worlds, as increasingly grasped and known by intuitive mind. According to Sri Aurobindo these two tracks will necessarily converge at some point. For him, the evolution of a higher consciousness means the possibility of participating more consciously and effectively in the process of evolution itself. Many of his most inspiring writings are specifically about this possibility. Both Bergson and Whitehead felt that the spiritual and material planes of existence are engaged in an active dynamic relationship accessible to intuitive consciousness and productive of ever more perfect expressions of truth, freedom and harmony. Each has given this process a high level of importance.

The aim of philosophy, according to Whitehead, is "disclosure" which means simply seeing and revealing the truth of things. And the difficulty of philosophy, he said, is expressing what is self-evident. "The whole effort should be to display the self-evidence of basic truths." Philosophy is kin to poetry, he said. Both of them seek to express that ultimate good sense we term civilization. The *assemblage* of philosophical ideas moulds our civilization. His idea was that by assembling and expressing the ideas that are most important to us, we create our future. Following this beautiful thought, and also Sri Aurobindo's example, if we can assemble and contemplate and express the ideas of evolution in a way that discloses the process itself, we may discover a philosophy of evolution that can help to show the way towards a truer, more unified and enlightened civilization. By applying the method of philosophical assembling, gathering, building (as also defined by Heidegger) – we can create the necessary common understanding of what is most important, what is most valuable, and by doing this we lay the foundations for a civilized society. This is the objective of this course.

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Lecture 1

Whitehead, the Philosophic Method and Evolution

"Philosophy is the critical examination of the grounds for fundamental beliefs and analysis of the basic concepts employed in their expression." This is at least one good definition of what philosophy means. And another from Encyclopedia Britannica: "The philosophy of nature, in particular, is the exploration of the features of natural reality, and their implications for metaphysics or a theory of reality or one's world view." What are the features of natural reality that we base our general theories upon? How do we arrive at an understanding of those features? These are subtexts of philosophy. What do we observe in the natural world that leads us to formulate our theories and principles?

Then we come to another essential axiom of philosophy from A. N. Whitehead: "The assemblage of philosophic ideas is more than a specialist's study. It moulds our type of civilization." It is important to note, I think, that in both the intuitive spiritual direction of mental development and the scientific and analytical direction of mental development, especially in the last 150 years, the idea of evolution has been very prominent and continues to be more and more prominent. It has, in fact, moulded our civilization in extraordinary ways. The ideas of evolution were fundamental to Sri Aurobindo's philosophy and Yoga. In the publication called *The Supramental Manifestation and Other Writings* (1970), there are hundreds of pages dwelling on the topic of evolution, and not just the spiritual view of evolution, but also detailed discussions of the scientific view of evolution. There are extensive commentaries on the theory of natural selection, there and elsewhere in his writings.

Before Sri Aurobindo became a student in London and at Cambridge, Spencer published his Synthetic Philosophy (1st Ed. 1862, 2nd Ed. 1867), and it became a popularly read thesis. It was first published (in part) around 1857 and it was a precursor of (actually contemporaneous with) the *Origin of Species* (1st Ed. 1859, 6th Ed. 1867). At the time that Sri Aurobindo was there (1878-1893), T.H. Huxley was the President of the Royal Society. And he was publishing articles in magazines and newspapers very actively during the period of the 1870s, 80s, and 90s. We will find in the writings of Spencer and Huxley many clues to Sri Aurobindo's ideas, many sources of his interest. And then Bergson published *Creative Evolution* around 1907, and his earlier treatise on *Mind and Matter* around 1893, about the same time that Sri Aurobindo became a professor of French in Baroda. Bergson received the Nobel Prize for his work on the philosophy of evolution around 1928. The work of Ernst Haeckel was also published in the 1890s and the early 20th Century, and he is the one philosopher of evolution whose work is actually cited by Sri Aurobindo and by the Mother. These philosophers were their contemporaries both historically and intellectually.

The fact that Sri Aurobindo, the master of the Supramental Knowledge and Yoga, made the exploration of this subject a very prominent feature of his writings, and at the same time that it has been the most prominent topic of study in biology, physics and psychology in the last century, means that for our civilization – if Whitehead is correct – this way of thinking, this emergent understanding can be seen as the basis of our

civilization's progress, its values, and what it can become. When I posed the proposition of creating a philosophy of evolution, what I meant is that we have the possibility of exploring an aspect of ourselves, nature and reality in such a way that it forms the foundation of our civilization.

Philosophy, according to Whitehead, is first of all the assemblage of ideas of importance. And an extraordinary aspect of human consciousness is that, throughout its history, it has identified and focused on such ideas of importance, which constitute its values. By focusing on these ideas of importance it decides and selects where to put its energies. It defines and refines its project. At various stages of the psychological development of the human being we can see evidence of this pattern. The ideas of religion and ethics and law and science and the organization of human communities are evidence of this assemblage of values and the organization of society and peoples' understanding around these values. The progress of civilization moves from structure to structure of commonly understood values.

When Vladimir was speaking earlier (in his linguistics class) about consciousness being behind certain forms of expression, I'm sure some of us recognized the theme of phenomenology. Husserl's work was focused on discovering the intentionality behind the expressions of things. He identified the possibility of discovering the intentions of things as a way of getting out of the conventional rational limitations of mind back to the original nature of things themselves. And he called this realm of possible consciousness an inter-subjective reality. This is not the inter-subjective reality of Habermas and sociology, but it is a prior inter-subjective reality. It assumes an inter-subjective ground of being from which the nature of everything emanates. Then Whitehead, in his philosophy, said that there is also an expressive side of philosophy, which is the other side of its assemblage of ideas, experiences and values. There is the gathering of important ideas, values and truths, then there is the possibility of their creative expression. For Whitehead philosophy is the assembling and expressing in form of those things which are of most importance to us. He, among a few other modern philosophers, therefore says that poetry and philosophy are closely related. But while philosophy struggles to express the unity and interconnectedness of the ideas and realities that are most valuable, poetry at its height does exactly that, with a high degree of clarity.[1]

As we pursue the assemblage of ideas of evolution, both scientific and intuitive – because both the scientific and intuitive streams of evolutionary ideas have been very strong in the last hundred years, – we may focus on the possibility that, as Sri Aurobindo says, these two streams must converge. The intuitive stream gives us a kind of ecstatic grasp of the unity and interconnectedness of things, but it doesn't really tell us how that consciousness and knowledge of the creative realm transmits its forms to the phenotypes of species, how those forms are communicated and embodied in living structures from age to age. The scientific stream which tracks the incremental emergence of qualities and divergence of structures and functions doesn't tell us anything about their relationship to the realm of values, meaning, and creative emergence or novelty. They constitute the two mysteriously corresponding realms identified by Whitehead as reality and process, and by Sri Aurobindo as Spirit and Matter.

The scientific stream, with which we are very familiar, is able to deduce from the ages of incrementally unfolding life its forms and their continuity. There is a continuum of body plans and there are actually very few, a finite number, which have been evolving for a billion years. Now that the so-called new synthesis in biology between genetics and natural selection theories has been accomplished, we can also see the genetic connectedness of all species. But that doesn't tell us how the transitions were made from species to species. It only gives us very sound evidence of the unity and inter-connectedness of all species, which is now beyond question. But how nature's processes happen to remain within the constraints of established design space and manage to find optimal solutions to the problems of survival is not known; it simply is so, and it is explained by such concepts as homeostasis, variation and natural selection.

If we follow Sri Aurobindo's thinking in the direction of solving the mind-body problem by the theory of the three worlds – the physical, vital, and mental – and we come to understand that these are three levels of consciousness, they each have their characteristic formations and expressions, for example the carbon atom, the reproductive and digestive systems, and the organization of patterns of behavior, which are not separate but they are independent with respect to their principles and levels of energy – still we don't understand how these different levels of structure and function in the life world happen to be so intelligent and precise and meaningful. And these processes don't give us any evidence of being aware. Then mind emerges within this context of matter and life as a self-awareness of the processes. As such, it is not separate from those processes.

At the higher levels of mind, we find intuitive creative spiritual mind, then rational analytic practical mind, and it understands itself well enough. Thus, Sri Aurobindo solves the mind-body problem. But, at the highest levels of that emerging mentality there is an intuitive grasp of the duality of Purusa and Prakriti, and of a creative mind above the rational mind, a higher mind and overmind where Purusa and Prakriti are united. Roger Penrose, the physicist, has suggested that science may evolve beyond its present methods and understand more about these ultimate things.[2]

Sri Aurobindo goes even further and explains that Purusa is not actually Mind, but Self, involved in mind, life and body, from which it can become detached and liberated. Then it knows itself as pure existence. It can also rise beyond this spiritual liberation to the integration of the Self and Prakriti. Then the Param purusha is identified with its three levels of the lower Prakriti – mind, life, and matter, while being at the same time the liberated Master of the three worlds of form. He then explains that this higher, Supramental being is a plane of consciousness which presses down on the plane of Mind to bring forth its expressions in nature, the Mental world presses down on the Life plane to bring forth its forms of expression, and the Life world presses down on the plane of Matter to bring forth its energies and structures, thus effecting the upward dynamics of evolutionary emergence.

This is a vision that is unique to Sri Aurobindo, as far as I can tell. We find, however, that philosophers of nature such as Konrad Lorenz and Karl Popper, and a few others in the past forty years, have accepted the idea of the threefold complex, the mental, vital and

physical, each operating according to its own principles within a unified evolutionary context. Lorenz's *Behind the Mirror* which was published in the 1970s, when he also received the Nobel Prize in biology, is a work of biological philosophy that we will explore in some detail later. So, Sri Aurobindo predicted in the 1920s that science would recognize this threefold nature of the world. Fritz Capra's philosophy of life is based on the principles of self-replication or autopoiesis, the dissipation of energy to maintain forms in an unchanging state, and cognition (see Appendix 1, p. 83), as also recognized by Lorenz, which is the processing of information that goes on even at the most basic level of material life. Both Lorenz and Capra add consciousness (or cognition) to the triad. Both say that the transmission of impulses at the cellular level which lead to behavioral choices is in fact a mental process. We can observe these ideas in Neo-Darwinian thought, generally. For example, as Lorenz writes in 1973:

"The scientist sees man as a creature who owes his qualities and functions, including his highly developed powers of cognition, to evolution, that age-long process of genesis in the course of which all organisms have come to terms with external reality, and as we say, adapt to it. This process is one of knowledge. For any adaptation to a particular circumstance of external reality presupposes that a measure of information about that circumstance has already been absorbed."[3]

Today the field of biological evolution is very closely related to the field of information technology. And the behavior of genes is interpreted in terms of information theory. This perception of Sri Aurobindo of the threefold lower Prakriti is in fact being widely accepted today. If we begin to assemble the early Darwinian ideas and the early intuitive, spiritual ideas of evolution, and follow their development through the early to the mid-20th Century, and then observe their development in the latter 20th Century up to the present, and allow that field of development of ideas to organize itself in our consciousness, we may realize this to be the most important way of understanding reality yet to have emerged in human consciousness. And if it begins to inspire us, and we begin to resonate with that grasp of the nature of reality, we may approach Sri Aurobindo's idea that it's possible for human beings to become participants in the evolutionary process, and begin to interpret our own energies and actions in relation to the threefold Prakriti around us, as an active participation in that most fundamental reality – so that life begins to be very consciously the process of evolution, and not just a scientific understanding or mental awareness that there is such a process. At some point we should expect there to emerge another way of perceiving and energizing our reality which is evolutionary. My proposition is that a philosophy of evolution can emerge in which a philosophic understanding and intention discovers the way to an active participation in the creative evolution of consciousness and becomes the basis of a more meaningful and enlightened civilization. As Whitehead suggested, and as Sri Aurobindo demonstrated, this can be a very important and meaningful process.

Notes

1. See Whitehead (1938), *Modes of Thought*, p. 49-50. Highly recommended reading.
2. I do not mean to attribute mystical inclinations to Penrose. See p. 87 for his comments.
3. Lorenz (1973), *Behind the Mirror*, p. 6

Lecture 2

Darwin's theory of natural selection

We want to engage ourselves in the philosophical process, and to create a philosophy of evolution, if we can. That is primarily a process of assembling, gathering, and understanding. If you are not a naturalist and therefore, by nature, immersed in the processes of nature, then it is important to put oneself in touch with that consciousness, in order to understand something about evolution.

Are there any people here who are naturalists? If you are familiar with the theory of multiple-intelligence you will know that this school of cognitive psychology has identified eight approaches to knowledge commonly developed by individuals throughout the human species. Just as there are subspecies or varieties of butterflies, there are also varieties of human beings, according to the psychology of multiple-intelligence. And one of those, which is prominent and easily recognized, is the naturalist, the naturalist intelligence. This is the one who spontaneously, effortlessly, notices incremental differences among plants, animals, behaviors in nature. It is a cognitive faculty which makes it easy to categorize and understand lineages, and not to be satisfied without knowing and categorizing all that which you see and which you appreciate and love and are overwhelmed by. You have to put some order into all of that, and then you begin to really understand nature. If you happen to be with a person like that, walking about in nature, they will observe a hundred things in the time it takes you to ask about one thing.

Charles Darwin was one of those people. When you read his writing, you have to be amazed at the extraordinary breadth and depth of the observations he makes, and because of that he was able to write the O*rigin of Species*. There were a few other people around in those days who were making similar observations and there is a historical chapter in the beginning of the book in which he mentions a group of people who were making similar observations to his, including Wallace who was partly credited with the theory of the origin of species. In this history he remarks that "In June of 1859, Professor Huxley gave a lecture before the Royal Institution on the 'persistent types of animal life'. Referring to such cases, he remarks, 'It is difficult to comprehend the meaning of such facts as these, if we suppose that each species of animal and plant, or each great type of organization, was formed and placed upon the surface of the globe at long intervals by a distinct act of creative power."[1] Difficult, indeed, to understand how individual acts of creation, which at that time were commonly thought to be the origin of species, - "individual acts of creative power" - could have placed all these species of life on the earth.

Throughout the *Origin*, Darwin frequently concludes a passage by saying that it would be very difficult to explain this series of complex interrelations by the theory of individual acts of creation. And his arguments are very convincing. We will come across some of them. I want us to hear some of Darwin's passages that make very clear the theory of evolutionary descent by variation and natural selection. That's Darwin's theory.

It was obviously a very compelling idea among philosophers and scientists in the mid 19th Century, that what we observe in nature, in terms of lasting groups, species, and genera, was apparently the result of a natural process, a phenomenon of nature. It was a very compelling need that they had at the time to distinguish that idea from the idea that species were a product of individual creation by a power other than nature, a divine power. They were obsessed with two things: making very clear the processes of nature, on the one hand, and on the other defending themselves and arguing persuasively against, for the sake of culture and education and values, the religious idea that species were created by a power outside of nature. They were obsessed with this idea.

In an early chapter called 'Natural Selection,', Chapter 4, of the *Origin*, Darwin says, "Let it be bourne in mind how infinitely complex and close fitting are the mutual relations of all organic beings to each other and to their physical conditions of life, and consequently, what infinitely varied diversities of structure might be of use to each being under changing conditions of life. Can it then be thought improbable, seeing that variations useful to man have undoubtedly occurred, that some variations useful in some way to each being in the great and complex battle of life, should occur in the course of many successive generations."[2]

Can it be thought improbable that useful variations have occurred in species through many successive generations, he asks, because we know that man has, by breeding, created useful variations. "If such do occur, can we doubt, remembering that many more individuals are born than can possibly survive, that individuals having any advantage, however slight, over others, would have a better chance of surviving and procreating their kind?"[3] If useful variations do occur, can we doubt that individuals that have even a slight advantage over others would have a better chance of surviving? This is a kind of logic. If you have an advantage over others, and many more are born than can possibly survive, then doesn't it stand to reason that those who have an advantage will be the ones that survive, under the changing conditions of life?

"On the other hand, we may feel sure that any variation in the least degree injurious, would be rigidly destroyed." Any plant or animal born with a serious defect, along with another next to it with no defects, is probably going to be eliminated in the struggle for survival. We should have no doubt about that. "This preservation of favourable individual difference and variations, and the destruction of those which are injurious, I have called Natural Selection."[4]

That's the theory of natural selection. And then he says, "Variations neither useful nor injurious would not be affected by natural selection, and would be left either a fluctuating element, as perhaps we see in certain polymorphic species, or such neutral variations would ultimately become fixed, owing to the nature of the organism and the nature of the conditions." Darwin then says, "Several writers have misapprehended or objected to the term 'natural selection'. Some have even imagined that natural selection induces variability, whereas it implies only the preservation of such variations as arise and are beneficial to the being under the conditions of life. No one objects to agriculturists speaking of the potent effects of man's selection. In this case, the individual differences

given by nature, which man for some reason selects, must of necessity first occur. Others have objected that the term selection implies conscious choice in the animals which become modified. It has even been urged that as plants have no volition, natural selection is not applicable to them."[5]

Volition means will. And so, some have thought, he says, that natural selection means that plants and animals choose the variations, that there was an element of choice in the theory. Darwin wants to insist that this is definitely not the case. "It has been said that I speak of natural selection as an active power or deity, but who objects to an author speaking of the attraction of gravity as ruling the movements of the planets? Everyone knows what is meant and is implied by such metaphorical expressions which are almost necessary for brevity. It is difficult to avoid personifying the word "nature", but I mean by nature only the aggregate action and product of many natural laws. And by laws, I mean the sequence of events as ascertained by us."[6]

It is difficult to avoid personifying nature. Metaphor is necessary for communication, for us to communicate about nature. Not everyone can perceive relationships of cause and effect in nature, like naturalists do. (Here we can get a pretty strong sense of Hume's influence on the thought of the day, which was committed to empiricism, the belief that we can only know what we observe, and we can only deduce and infer cause and effect relations. We can no more observe choice on the part of nature than we can observe choice on the part of God. We can only know what occurs in perception and abstraction. Such distinctions were of utmost importance to the men of science of Darwin's day.)

"Nature, if I may be allowed to personify the natural preservation or survival of the fittest, cares nothing for appearances, except in so far as they are useful to any thing. She can act on every internal organ, on every shade of constitutional difference, on the whole machinery of life. Man selects only for his own good; nature only for that of the being which she tends."[7]

"It may metaphorically be said, that natural selection is daily and hourly scrutinizing throughout the world, the slightest variations, rejecting those that are bad, preserving and adding up all that are good, silently and insensibly working, whenever and wherever opportunity offers, at the improvement of each organic being in relation to its organic and inorganic conditions of life. We see nothing of these slow changes in progress, until the hand of time has marked the lapse of ages. And then, so imperfect is our view into long past geological ages, that we see only that the forms of life are now different from what they formerly were."[8]

One of the subjects Darwin deals with at length is the causes of variation. First he says the causes of variation are infinitely complex and largely unknown to us. But at the same time he defines many likely causes of variation. One of his discussions is about the idea of the increase of species under natural conditions, in which he quotes from Linnaeus about the geometrical increase of species and the idea that it is impossible that all the products of life, all the progeny of all animals and insects, could survive. And then he has a chapter on the natural checks to increase. Some of the checks that he notices are that,

among egg laying species many eggs are eaten before they hatch. Among seeding plant species many seeds are eaten before they sprout, and many are transported to other locations. At the same time there is the process of spreading which adds to diversity, and devouring which limits the number that survive. He mentions seedlings being stifled by weeds, insects and grazing. He describes the examples beautifully. It isn't at all boring to read his descriptions which flow mellifluously. He mentions limitations of food supply which occur because of weather changes, and deforestation, which of course we are aware of at this time. Global warming is following human habitat destruction, and 25 % of vertebrate species have become extinct in the last thirty years. In addition to climate change he mentions epidemics, being preyed upon, and the combination of climate change and competition for food as being important factors in selection, because variations can occur that allow adaptation to both climate change and competition. These are complexes that can be observed in nature.

Now I would like to point to a philosophical aspect of this discussion. There was a tendency prevalent at that time, and still prevalent today, to think that species are unchanging, that they are fixed and were created once and for all. This is our normal experience, and Teilhard de Chardin, in fact, starts one of his books with this problem. In a period of three hundred or five hundred years, if we look at paintings and drawings and observe nature around us, we actually see pretty much the same species there all the time. In history, especially if we go back to the origins of science in the Greek period, it was universally accepted that species are eternal. The idea that species are created once and for all, not that they have evolved, is largely a product of "sequences ascertained by us", but now that we have scientific instruments and techniques, those sequences ascertained by us include the genome and the whole fossil record which was not available to Darwin. He has raised the issue in several sections, that his theory can be questioned based on the gaps in the fossil record known at that time. There are far fewer lapses today than there were at that time. Lyle, who was a cousin of Darwin, was just discovering earth changes and geological time and it was just beginning to be understood that geological time was basically beyond conception. The same excavations that were enabling the discovery of geological time were turning up enough fossil evidence so that the naturalists could see the recurrence of body plans, over long periods of time, and they could see that horses and pigs and birds had evolved.

One of the things that we will notice in the writings of Haeckel and Darwin is that they use the term "strong inheritance". They knew that generations inherit variations, but they didn't know how it works. They refer to inheritance as a strong factor in the process of natural selection, but Mendelian genetics hadn't been studied yet. They are basing everything on naturalistic observation; they are travelling around observing different species on different islands, varying under different conditions, and they are inferring the process of the connectedness of species through time, and they are inferring the process of variation under different conditions, and attributing the connectedness to inheritance, and they are attributing the selection process to natural conditions, but they don't know anything about genetics. The whole theory, which was in fact substantiated by genetics in the 1940s, was being based solely on naturalistic observation and deduction.

Similarly, in Aristotle's time, - Aristotle was an extraordinary naturalist who wrote a taxonomy of species, who also based his philosophy of nature entirely on naturalistic observation. We will discuss his theory of evolution, which was entirely determined by the perception that species are eternal. And he produced the philosophy of forms. Whether we read Whitehead, Heidegger, Dennett, Sheldrake, or whoever, we will come across a reference to Aristotle's philosophy of form.[9] He came up with four causes of any phenomenon. There is the material cause, the efficient cause, the formal cause, and the final cause. Aristotle says the material makeup of something, its matter, determines a lot of what happens to it. The matter of the human is different from the matter of the snail or the geranium or the volcano. There are material causes. The efficient cause comes from outside and moves something from place to place; it's what we do to the plant to nourish and preserve it or to the children to teach them and encourage their growth. These are external forces. Then there are the formal causes, the species, which limit what something can do or become. You will not become an elephant. An elephant will not grow until it touches the moon. Each thing is limited by its type, its form. So a bird will build a nest, lay eggs, bring food to the young until they can fly; the bird knows how to do these things because of its form, which is eternal. Aristotle learned this from Plato. The final cause is – Guess what ? – Survival, Reproduction, Knowledge, Skill, the Good (for each thing). The ultimate, final cause is called, in our language of evolution, the good, infinite, true, beautiful, powerful - the Supermind. In Sri Aurobindo's writing there are many references to Plato's conception of the Good in relation to the Supermind.

The question can be asked whether everything that happens – the material, efficient and formal causes of things – serves the good or final cause, and this is an important philosophical question. Darwin speaks about extinctions and destruction being as much a part of evolution as variation and selection, and Sri Aurobindo speaks about "nature's harsh economy". We all know that in the ignorance the spur to progress is pain.[10] In my paper called 'Physics and the Philosophy of Evolution' (available as Appendix 1 to this course), I propose the concept of *complementarity* to deal with these dualities. But now we are just collecting material, in the form of great ideas, systematic thinking, reflection on the principles of nature as it is observed, and on the mind observing it. For philosophy these are two important questions: What is the nature of the world we observe, and what is the nature of the consciousness that is observing it? How does consciousness know that what it perceives is the reality? There are answers to these questions, solutions to the problems, that are finite and important, and I hope we come to them as a process of exploration. The important thing is to recognize the *aporias*, the questions, the enigmas.

Whenever a question arises in your mind, that's your hook, follow it.

Notes
1. Darwin (1872, 6th Ed.) *Origin of Species*, p. 23
2. Ibid, p. 23
3. Ibid, p. 121
4. Ibid, p. 121
5. Ibid, p. 121-122
6. Ibid, p. 122

7. Ibid, p. 125-125
8. Ibid, p. 126
9. Aristotle's theory of causation and the purposefulness of nature, *Physics, Book II*, will come up frequently in this course, especially in Lecture 5.
10. This is a fundamental tenet of the Gnostic worldview of Sri Aurobindo. See for example, p. 82.

Lecture 3

Haeckel's theory of causation

The philosophical question is, How do we know that this, or any other, knowledge is the truth? Knowing has an object, it has content. Is this knowledge true and does it enable us to really understand reality? Can we then move from that understanding to ethical judgments? Do we become better people as a result of this understanding, and does it further our civilization? These are philosophical questions. We are taking the subject of evolution from both the scientific and philosophical standpoints, because of its importance. Its importance derives from the fact that science has been totally preoccupied with it for 150 years, and Sri Aurobindo made it the foremost theme of his writing. So if we didn't think it was important before this course began, we should now think it is important! And then we should discover why it is important.

The beginning of the course, then, is an exploration of the beginning of the discovery and elaboration of the theory, in the words of some of those who are the most articulate, and then we will follow up scientifically some of their intuitions and observations, and then move on to other levels of understanding and contemplating this content. So now, we pick up some concepts, reflections, and associations of ideas concerning the theory of evolution.

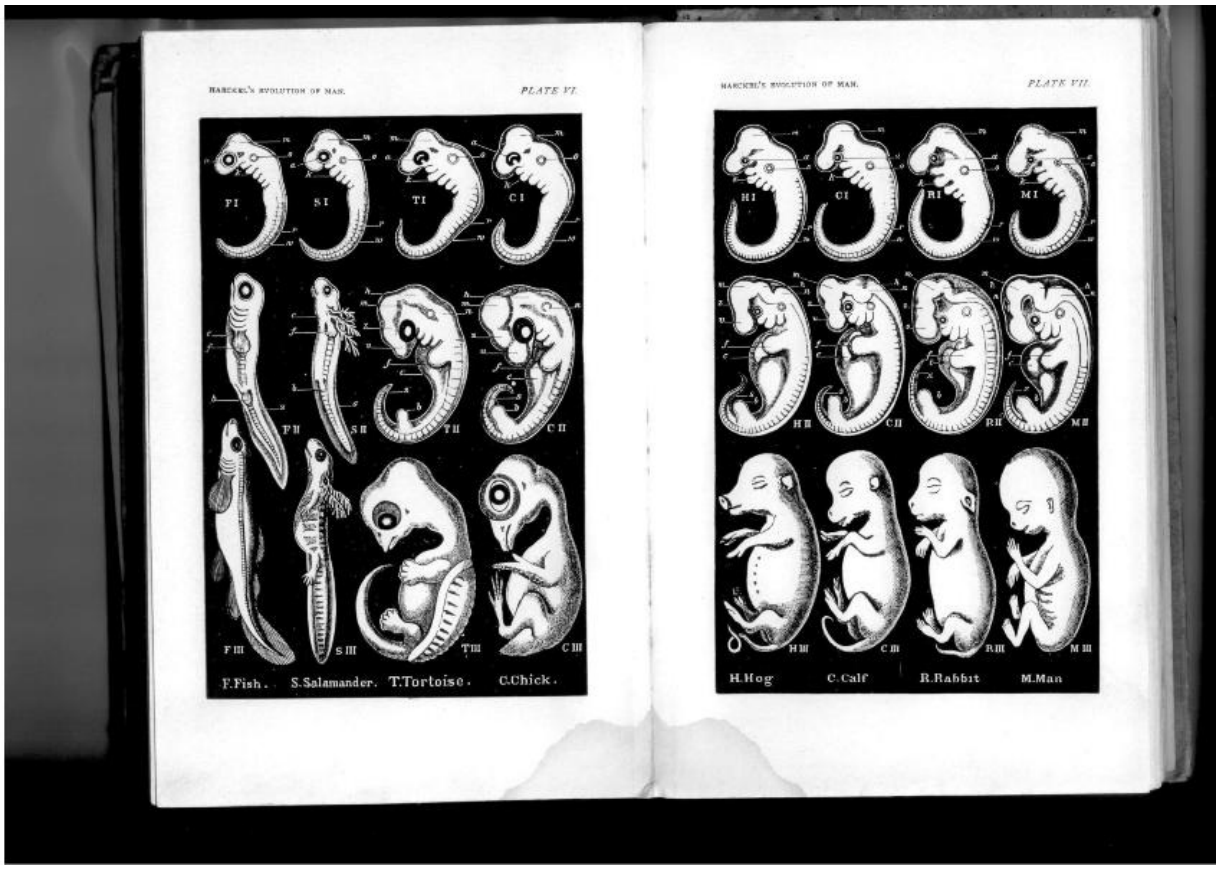
I have given an excerpt of the first chapter of Haeckel's book *The Evolution of Man* (1874).[1] He was the foremost early German philosopher of evolution. He was an embryologist and a very good artist. Many of his illustrations were published in Darwin's books. He has done a lot for the theory of evolution by making hundreds of very precise drawings of comparative embryology. And he arrived at a theory all his own which I think we should review. It leads to some interesting ideas, though Ernst Mayr will tell us that this theory has been refuted and is not true. But that's fine; it was interesting and exploratory and we can still learn a lot from it. Haeckel said,

"The history of the germ (the seed), is an epitome of the history of the descent."[2] The germ carries the history of the descent of the species. This has become a very common idea, but he points out that at that time almost no one, except for a few doctors, had observed embryos, (much less chromosomes or genes). He observed a lot of embryos and knew every stage of the development of the embryo in many different species. His theory is based upon those empirical observations and thoughts. Or, in other words, he says, "Ontogeny is a recapitulation of phylogeny." Ontogeny means the development of the

individual seed (embryo) and phylogeny is the history of the species. “Or,” he says, “somewhat more explicitly, the series of forms through which the individual organism passes during its progress from the egg cell to its fully developed state is a brief compressed reproduction of the long series of forms through which the ancestral forms of its species have passed from the earliest periods of so-called organic creation down to the present time.” [3]

“The causal nature of the relation which connects the history of the germ with that of the tribe,” this is the theory that ontogeny recapitulates phylogeny – by tribe he means the history of the descent of the phylum.

Now we can look at some pictures drawn by Haeckel (see illustration below).[4] We can imagine that the embryo of the animal (man) goes through all of these stages of development, and there is a causal relation which connects this history of the germ with that of the descent of the tribe – all the related species that have developed through time. “The causal nature of the relation is dependent on the phenomena of heredity and adaptation. When these are properly understood and their fundamental importance in determining the forms of organisms recognized, we may go a step further and say that phylogenesis is the mechanical cause of ontogenesis.”[5] All those forms that have preceded a specie’s development come together as a causal determinant of the present form, unfolding sequentially in the embryo, from the worm to the fish to the reptile to the earlier mammalian forms to the present form.



Scientists are looking for cause-effect relationships. We can see that the embryo is recapitulating the species from which it has descended so we must ask how it happens. He decides that it does this because what the parent is, is the result of all that, and somehow, through heredity it causes the same thing to repeat in its offspring. They didn't know about genetics yet. But they knew heredity was happening, that variation and change were happening, and they asked themselves the question How? Haeckel had a very active imagination, and he decided that heredity was the mechanism and it was caused by the historical pattern itself being present in the parent.

Later he says some other very interesting things. "For example, from the fact that the human egg is a simple cell, we may at once infer that there has been at a very remote time a unicellular ancestor of the human race, resembling an amoeba. From the fact that the human embryo consists of two simple germ layers, we may at once safely infer that a very ancient ancestral form is represented by the two-layered gastria. A later embryonic form of the human being points with equal certainty to a primitive worm-like ancestral form which is related to the sea squirts or ascidians of the present day. But the low animal forms which constitute the ancestral line between the unicellular amoeba and the gastria and further between the gastria and ascidian form can only be approximately conjectured with the aid of comparative anatomy and ontogeny."[6]

Modern genetics has established that our species has in fact descended from worms, gastropods, starfish, insects, coelacanths, frogs, and shrews before primates (see illustrations, p. 104-105). This is well established science. It is really remarkable. Haeckel was right, and he got it by observing embryos. It is now absolutely certain what this line of development was. By the way, the worm stage of our development was 600 million years ago, the starfish stage was 570 mil years ago, the coelacanth was only 425 mil years ago, and the shrew stage was about 80 mil years ago, around the time of the extinction of dinosaurs. This is the line of descent of the phylum chordata, of which we are the most recent species. All these guys have the same nervous systems and genetic make up as we do but it has become more complex as time has gone on, and now it is known precisely at what time in history each stage developed.

Now it is known at what time in history the *hox* gene added more nucleotides to make further organ development possible. This is the gene that determines the sequential development of spatial organization and placement of organs in the embryo and where to put the head and tail. It consisted of one nucleotide chain at the time of the worm stage, and replicated itself again and again until at the present time in the human being it consists of 38 nucleotide chains, and each activates some aspect of the development of organs at the right time in the embryo. The stages of the embryo are there as a result of the *hox* genes, which stimulate the sequence of development, not because the parent carries those forms. Developmental forms are in fact often missing in the embryo. (A larger discussion of this topic is given in the audio file.) Much of Haeckel's book is an effort to explain why this is so, because it contradicts his theory. The pre-existent forms are not the causes, although they are a visible sign of connectedness and the continuity of forms.

He was also preoccupied with this idea, that "From this theory we first learn the efficient causes of individual evolution… and we perceive that such mechanical causes alone suffice to effect the evolution of the individual organism, and that the co-operation of designing or teleological causes, that such final causes which were formerly universally assumed are unnecessary."[7] He hasn't actually discovered any efficient causes. He has postulated that the phylogenetic descent of forms causes the stages of embryonic development. But this is a fundamental error in human thought, which was the subject of Hume's philosophy. We infer, from related events that recur, causal relationships. Even today it is not known exactly how the hox genes cause the related stages and sequences of the development of the organs. At the same time, it has been discovered that there are many different areas on the genes that produce chemicals which stimulate different processes, and there is no clear direct causal relationships but only a close observable proximity of chemical events. On this basis there is experimentation, for example transplanting the hox gene, or the related pax gene, which is associated with eye development, from a mouse to the leg of a fly which then grows an eye on that body part. But it doesn't stimulate mouse eye development; it stimulates the compound eye development of the fly. Hox genes are universal in the animal kingdom and yet they stimulate the development that is appropriate in all species. More complex species have more complex genes which determine the body plan. (See body plans, p. 108)

These pictures indicate six different body plans of distinct phyla which have all derived from the same amoeboid cell; they are phyla in the consecutive sense of descent from a common origin. The phylogenetic descent is pictured there, and in the embryo of each we may presume that the forms of the prior species are there. But again, how this happens is not really observable. By comparing the phylogenetic descent of species, and the progressive development of body plans, we can infer along with Haeckel that the earlier forms are somehow contained in the later, and now we also know that their genes have been passed along by heredity in a perfect continuum. And we can infer, along with Mayr, that Haeckel's hypothetical interpretation of forms as efficient causes, or that ontogeny recapitulates phylogeny, is disproven by genetics. (The audio file contains a rather long digression, concerning the appearance of different life forms in deep biological time, deleted from this text. It is taken up later in Lecture 4.)

Let's finish with this section on Haeckel, who says, "The final causes which were formerly universally assumed are no longer necessary. I allude to this matter at this early stage (chapter one), in order to draw attention to one of the most important advances made in any branch of human knowledge during the past ten years. The history of philosophy shows that in the cosmology of our day, as in that of antiquity, final causes are almost universally deemed to be the real ultimate causes of the phenomena of organic life, and especially those of the life of man, the prevailing doctrine of design or teleology."[8] (Teleology means that things that come into existence in the future are determined by a purpose that was already there, called the final cause. We ended our lecture last time with Aristotle's idea that there are four causes – material, efficient, formal and final. He now seems to be saying that the formal cause is the efficient cause.) "The prevailing doctrine of teleology assumes that the phenomena of organic life and evolution are explicable only by purposive causes, and that on the contrary they in no

way admit of a mechanical explanation. The most difficult problems in this respect which have been before us and which seemed capable of solution only by means of teleology are precisely those which have been mechanically solved in the theory of descent. We shall see in the course of our enquiries how through Darwin's doctrine of evolution the most wonderful problems hitherto deemed unapproachable have admitted to a natural solution."[9]

I just want to recall these phrases of Haeckel: "…The series of forms through which the individual organism passes during its progress from the egg to its fully developed state is a brief compressed reproduction of the long series of forms through which the animal ancestors of that organism have passed from the earliest periods of organic creation, …The causal nature of the relation which connects the history of the germ with that of the tribe… Phylogenesis is the mechanical cause of Ontogenesis." The forms of the past create, causally, the development of the stages of the embryo. The shrew form creates in the next shrew body the same form, by heredity, and if it diverges and becomes another species through variation then that new form will create a reproduction of itself. This is the doctrine of formal causes – the human being always creates more human beings because we embody the human "form". It is the doctrine of Platonic forms applied to scientific understanding. (Haeckel seems to say that the notion of teleology has been replaced by the mechanics of ontogenesis.)

Mayr[10] said the idea that ontogeny recapitulates phylogeny is wrong because the relationship is not causal. The forms themselves don't cause anything according to genetic theory. But we can hold that idea, because we do observe that forms reproduce themselves. The material cause is the hox gene, the efficient cause is the sperm or egg, the formal cause is the product which looks like the parent body that grows up. The final cause is the divine life, the Good, the Supermind.

At the same time that Haeckel wants to assert a mechanical cause, the cause that he identifies is the form. All the forms that have evolved before are somehow still exerting a causal effect on the development of the new organism. Few scientists today are going to think that the form of the geranium or the shrew or the human is out there somewhere exerting a causal influence on embryonic development. But there are those today, such as Rupert Sheldrake, who continue to ponder the fact of stability and persistence whereby the form continues to maintain itself virtually unchanged through many thousands of generations. And perhaps we would be well advised to keep in view all four causes identified by Aristotle as necessary to explain the phenomena of life.

Finally, let's turn to Darwin in the O*rigin of Species* for a more exact representation of his theory. Darwin says, "The many slight differences which appear in the offspring from the same parents, or which it may be presumed have thus arisen, from being observed in individuals of the same species inhabiting the same confined locality, may be called individual differences. No one supposes that all the individuals of the same species are cast in the same actual mould. These individual differences are of the highest importance for us for they are often inherited as must be familiar to everyone. And they thus afford materials for natural selection to act upon and accumulate… These individual differences

generally affect what naturalists consider unimportant parts. But I could show by a long catalogue of facts that parts which must be called important sometimes vary in the individuals of the same species."[11] (So, he says, important parts also vary. For example, the brain of five different generations of humans isn't the same, although we don't notice the differences, neither is the location of moles and freckles. We notice only the unimportant variations.)

Then he says, "It should be remembered that the systematists are far from being pleased at finding variability in important characters." Because of this propensity for thinking that species don't change from generation to generation - the shrews have always been there, they haven't changed in 500 years, the grasshoppers haven't changed, the potatoes haven't changed, so - they must be eternal. It is much easier for classification if they are eternal. Then he says, "there are not many men who will laboriously examine internal and important organs, and compare them in many specimens of the same species. …Authors sometimes argue in a circle when they state that important organs never vary; and under this point of view, no instance will ever be found of an important part varying; but under any other point of view many instances assuredly can be given."[12]

It is difficult to see, as Darwin might say, how the idea of pre-existing embryonic forms could possibly explain such important individual differences, which in the end may lead to the evolution of new adaptations and new speciation. What Haeckel has observed is the maintenance and gradual variation of phylogenetic (historical) development – an important aspect of evolutionary theory no doubt, but his theory of ontogenesis does not explain the incremental changes pointed out by Darwin as the most important factor of evolutionary change.

The topic that emerges most directly from this discussion is the topic of the emergence of homologous parts in different species that have varied in the same parts (see illustration, p. 112).[13] These are turtle, dolphin, bat, bird, horse, human fingers. The idea of variation is that under varying conditions of survival, in one species there will be a gradual selection of those members that have begun to vary and diversify in some advantageous way. And at some point there will be a divergence through gradual minimal changes in a bone structure like these, and there will eventually be an advantage to some members who have developed longer or shorter fingers. You can see this clearly. Notice that the horse has been assigned only three digits, four and three, the chicken four, and the others have all five. Let's look at horse leg development through time (see illustration, p. 108). Fifty-five million years ago, the horse had these four digits; forty million years ago the horse had three digits here and one there, twenty-five million years ago the horse had these three that were changing significantly, and as of five million years ago the horse had a hoof. When the horse was only two and a half feet tall and was not far away from the time when he was a shrew and used his fingers to hold things, he gradually found that his teeth were developing for biting off leaves from trees and he didn't need those grasping fingers any more. And those that had better developed jaws, and hooves for running, to get away from predators faster, those are the ones that survived. In good museums you can see all of these reconstructed stages of skeletal structure and development.

So, homologous development of important parts has occurred across the members of these species through the gradual differentiation by adaptation, communicated by heredity, with natural selection of those forms that were advantageous. And if very successful, then radial adaptation takes place and a large number of related species with similar homologous development share different niches and are no longer so competitive, (such as quadrupeds that graze for food and share an African savannah). Nature has figured out how to make the principle of diversity most advantageous. And all of those diverse developments share one common genetic structure. (A longer discussion of the evolution of the eye ensues in the audio file. See illustration, p. 112)

Brief summary of important points

Let us resume for a moment the recurring themes of the natural processes of change in evolution (generally associated with material and efficient causes) versus eternal forms and fixed types, (associated with formal and final causes), and follow the arguments that preoccupied Darwin and Haeckel a bit further. "It should be remembered" says Darwin, "that the systematists are far from being pleased at finding variability in important characters," …because of the human propensity for thinking that species remain the same forever. Shrews haven't changed, grasshoppers haven't changed, elephants haven't changed, potatoes haven't changed in a few hundred or a few thousand years, as far as we can tell, so they must be eternal. And it's much easier for classification if they are eternal. Then he says, "There are not many men who will laboriously examine internal and important organs and compare them in many specimens of the same species. Authors sometimes argue in a circle when they state that important organs never vary. For these same authors rank those parts as important which do not vary perceptibly. And under this point of view no instance will ever be found of an important part varying. But under any other point of view many instances assuredly can be given."

Now Haeckel was one of those who was willing to laboriously examine the internal organs of many specimens, especially the embryos of many species, and he certainly didn't think that important organs were invariable. He perceived many similarities and differences in the "form" of the different stages of an organism's development. And he came to the conclusion that the forms he perceived were the cause, rather than the effect, of the different stages of development. Moreover, he concluded from these observations of the continuity of variation in forms that they were moving towards a common goal. Thus he demonstrated the persistent and compelling influence of Aristotle's idea of formal and final causes even on the great scientific minds of the day. On final causes, he writes in that first chapter:

"In undertaking to describe the most important characteristics of these significant phenomena, and to trace them back to their final causes, I shall assign a much greater scope and aim to the History of the Evolution of Man than is usual. …Phylogeny is the history of the evolution of the descent of man, that is, of the evolution of the various animal forms through which, in the course of countless ages, mankind has gradually passed into its present form… the natural evolution of man through lower animal forms." The implication is clear: man was the final cause from the beginning, and the many forms that emerged along the way were in some sense the carriers of his destiny. Even though

Haeckel attributes the most important advances of the period to the thrust of Darwin's efficient causes, away from the essentialism of the past and towards the primary importance of natural processes to explain evolution – variation and adaptation, and in spite of his own devotion to empirical knowledge, Haeckel's thinking appears to have remained tied to the classical notion of final causes.

Another important topic in the study of Darwinian processes of evolution is "correlated development" – the appearance of organs at the same time in a specie's evolution, although not all are necessary adaptations. They are structures or organs that are always present together in the species, which emerge in the embryo according to a pattern, coordinated in their successive development by the hox gene. This recurring body plan of a species or group of species was known by Haeckel and others of his day as the *bauplan*. Cuvier thought there were four distinct body plans in nature, in the 18th century, and today it is generally agreed that there are about 38, still quite a finite number considering the hundreds of thousands of different species that exist. These basic plans have emerged at different time periods and have persisted for such long periods of time that they may seem to be eternal. Along with each plan there is an infinite variety, and correlated variations which constitute what we know and recognize as a particular species. This is the phenotype – what we see and know. The genetic pattern that underlies the development of its characteristic structures is the genotype. And we still do not understand the relationship between the genotype and phenotype.

From the point of view of genetics, material and efficient causes are more evident than formal and final causes. And yet the structures that are apparently the product of correlated development, in a purely mechanical way, may at a later time in the specie's development become essential for its survival. Then the form and its purpose seem to be determining the processes of natural selection. Could we then infer that nature was looking ahead when she made genes that had potentials other than those that depended on adaptation and natural selection? Well, Darwin acknowledged a variety of processes, in addition to natural selection, that influence the evolution of species and the emergence of diverse variations of form, in complex ways that we simply do not understand.

Notes

1. Haeckel (1st Ed. 1874, 3rd Ed. 1876), *The Evolution of Man*, originally titled *History of the Evolution of Man* (1874). The first chapter is included in readings for students of the course.
2. Ibid, p.6
3. Ibid, p. 6-7
4. Ibid, p. 363-365
5. Ibid, p. 7
6. Ibid, p. 9
7. Ibid, p. 16
8. Ibid, p. 16
9. Ibid, p. 16-17
10. Mayr (2001), *What Evolution Is*, p. 31-32

11. Darwin (1872), p. 76
12. Ibid, p. 77
13. Ayala (2008), *Introduction to evolution*, p. 66.

Lecture 4

Genetics, variation, and extinction

In the last lecture we made the observation, based on Haeckel's ideas, that, as he said, the human being has travelled from the annelida, 540 million years ago, through all the phyletic lines of development up (or down) to the present. Of course the human being wasn't there in the annelida, but the idea we get from this conception of "descent" is that of a continuum of intricately connected development from the origin of life until the present. The picture that emerges from the science of evolution is of an evolutionary continuum that diversifies gradually over an immense span of time.

If we think about the idea of unity in diversity, and the idea of Auroville as a laboratory of evolution, and we contemplate Sri Aurobindo's idea that this unity exists; it is not something to be created; then, possibly, the study of evolution and the inter-connectedness of everything could help us gain a sense of what unity in diversity really means. When we think about that odd word, which is probably pronounced "hox" and not "hoax", which we share with every species and which determines the body plan of every species; or if we think about the pax 6 gene which makes the eye develop in every different type of creature that has an eye – from the earliest eye spot in the paramecium to all the different types of eye that have evolved – if we contemplate this molecular structure that sits in every cell and has been there since the very beginning of animal organisms: in every species the *hox gene*[1] determines the development of the body and where each segment goes. The structural development is stimulated by that gene in all animals, and the eye structure is stimulated by the pax 6 gene in all animals. That is a kind of unity that is shared with untold thousands of species. We also share other types of unity, such as with other chordates with which we share our mammalian body plan, but we do not share it with spiders and starfish. But spiders and starfish are there in the phyletic lineage of which we are the result. Each of the body plans that we discussed last time, and there are about as many as there are hox genes – about 38 different body plans – each one develops according to the stimulation at a particular time in the embryonic process when it is appropriate for the head to form, or some other body structure to form, such as the body cavity, chest, abdomen, legs, etc. Just as in the pax 6 gene, when the eye starts to develop, that gene stimulates the protein processing that forms the different parts of the eye structure, which is a group of cells that have a specific function.

So this is a type of unity. If we observe different animals in nature, if we are naturalists, we recognize behaviors that are familiar to us. It is an incredible experience, and in this south Indian forest environment it is relatively easy to get to know your local termite community and your local mongoose. We observe pets normally in civilization, which are largely products of human selectivity, but we don't notice it as such a natural

phenomenon. In nature we can experience our identity with natural creatures, and we notice that we share not only structures but also behaviors. If we concentrate on similarities between species or between members of a species, if we concentrate on our similarities in this group of human beings, we can experience a very profound identity. We look alike, breathe alike, walk alike, we understand our oneness as human beings, we understand ourselves as the members of a group. But if we look at our differences, we will ask, How can we possibly be products of the same genes? None of us is at all like another in many details. So, in our thinking, we tend to reflect this dual nature of reality. There is a way of looking at things which reveals the unity of form, and structure, type, thought patterns, behavior patterns; there is another way of looking at things which reveals the infinite differences in every thing. We can go either way in our study, our research. In science in particular it is possible to move endlessly through the realms of difference and only to occasionally group things according to similarities. And this is precisely what evolutionary science does. It scrutinizes every single difference. When we follow that kind of thinking we can come to a kind of understanding of genetics which yields information like the concept of heterozygosity, the immense variation within our own chromosomes.

"Techniques for determining heterozygosity have been used to investigate numerous species of plants and animals. Typically, insects and other invertebrates are more varied genetically than mammals and other vertebrates, and plants bred by outcrossing (crossing with relatively unrelated strains) exhibit more variation than those bred by self-pollination. But the amount of genetic variation is in any case astounding. Consider as an example humans, whose level of variation is about the same as that of other mammals. The human heterozygosity value at the level of proteins is stated as $H = 0.067$, which means that an individual is heterozygous at 6.7 percent of his genes, because the two genes at each locus encode slightly different proteins. The Human Genome Project demonstrated that there are at least 30,000 genes in humans. This means that a person is heterozygous at no fewer than $30{,}000 \times 0.067 = 2{,}010$ gene loci. An individual heterozygous at one locus (*Aa*) can produce two different kinds of sex cells, or gametes, one with each allele (*A* and *a*); an individual heterozygous at two loci (*AaBb*) can produce four kinds of gametes (*AB*, *Ab*, *aB*, and *ab*); an individual heterozygous at *n* loci can potentially produce 2^n different gametes. Therefore, a typical human individual has the potential to produce $2^{2{,}010}$, or approximately 10^{605} (1 with 605 zeros following it), different kinds of gametes. That number is much larger than the estimated number of atoms in the universe, about 10^{80}."[2]

Every one of these hundreds of thousands of chromosomes has a different arrangement of genes on it. When one of those genes divides and recombines with a partner gene, one out of those tens of millions of possibilities will result.

"It is clear, then, that every sex cell produced by a human being is genetically different from every other sex cell and, therefore, that no two persons who ever existed or will ever exist are likely to be genetically identical – with the exception of identical twins, which develop from a single fertilized ovum. The same conclusion applies to all organisms that reproduce sexually; every individual represents a unique genetic configuration that will

likely never be repeated again. This enormous reservoir of genetic variation in natural populations provides virtually unlimited opportunities for evolutionary change in response to the environmental constraints and the needs of the organisms."[3]

If we have any skepticism about the ability of different phyletic lineages to produce innumerable varieties in each generation, we should lose that skepticism on the basis of this genetic information. Just because all of the butterflies look the same to us doesn't mean that they are all the same. The fact that hippos and buffalo and pigs and cows and human beings have all descended from shrews should not be so amazing if we have a perspective on the infinite variety of individuals that is produced in every generation of every species. And so Darwin observed that, as a result of these infinite variations which recombine and, if there is any slight advantage, reproduce themselves, at some point there may be an accumulation of variations that enhances the survivability of a certain group under changing environmental conditions. At some point in time that group may become so different from the parent group that they can no longer interbreed. One of the things that helps along the way is a major earth change so that the two groups can't associate at all and they become isolated. Varieties throughout time have periodically become isolated from their parent lineages and completely new lines of development have become possible. The main factor in that new series is the environment. The environment changes and the species that move into a new environment find a niche that is comfortable and survivable, eat another kind of food, inhabit another kind of soil, and Darwin says there is an inherited effect of such environmental adaptations. He gives the example of plants that move from one environment to another and produce different colors of flowers, and the domestic duck which developed lighter wing bones and heavier leg bones as a result of not needing to fly. He gives the example of the mole shrew which as a result of burrowing eventually loses eye sight and develops forelimbs modified for digging.

Question: Does the greater number of genes in a species correspond to size?

Ans: No.

Question: Do fewer genes result in less variety in a species?

Ans: Maybe. If you think about the variety of human beings, which occupy practically every possible niche, it is infinitely greater than the hippopotamus which is confined to the river. Structurally there may be a high degree of diversity in the lower species but not behavioral diversity. The number of genes is not particularly smaller in the hippo, but in the human being there is a leap in consciousness. Diversification among lower species has resulted in speciation. Diversity in human beings has resulted in an infinite variety of human beings who can adapt to every niche. (This point has been strongly emphasized by Teilhard de Chardin in his theory of complexity.) If we had been less adaptable we might have been confined earlier to a particular niche and another species might have succeeded us sooner.

We have a picture of the human beings that have preceded us. And we can look at the horse as an example. The small horse is an example of a relative of ours who fifty million years ago was not so tall; in a relatively short period of time he moved to higher ground, needed to be able to run from predators, and developed jaws for chewing leaves and bark. This is an example of an enormous range of variation within one species. Horse lovers will know that the earth is populated today with an extraordinary variety of horses and they are very intelligent. (See illustrations p. 110 horse and p. 111 human.)

Let us look at our more immediate relatives. We are closely related to the various hominids we see on p. 111. Kenyanthropus was 3 million years ago. We can look quickly at the way these humans moved from 3 million years ago to homo habilis, and homo ergaster who became homo erectus, those guys overlap and interbreed with others, and eventually we get to homo erectus who appears to have moved in the direction of heidelbergensis, with neanderthalis genes apparently present in the human being, and homo sapiens is the one that finally survives and has a larger brain than the others. He appeared, recognizably, around 40-50,000 years ago and was apparently the final result of this movement.

Now, another way of looking at this question of the diversification of species is the punctuated equilibrium view, which I would like to cover tonight. (See the time line, p. 114.) According to this view there have been several major extinctions throughout biological time. This time line shows a few of the mass extinctions that have occurred. When the Cambrian explosion took place, an explosion of arthropods took place in seas all over the world 500 million years ago, which consisted of more phyla and body plans than now exist, prior to which there were only one celled organisms. When almost 85% of life forms became extinct at the end of the Cambrian, there followed a further diversification of species during the 50 million years of the Silurian, when the forerunners of the 38 phyla that now exist evolved. Then after another 150 million years of diversification, another mass extinction occurred in the Devonian, and another in the Permian when 95% of life became extinct. Following the Permian extinction, 250 million years ago, came the age of the great reptiles. And after the Triassic extinction there followed the age of mammals.

Steve Gould suggests that when these major extinctions occur, suddenly all the niches become empty and this rapid diversification can take place, at that edge of time. As more niches become filled the possibilities of diversification recede. He calls this process punctuated equilibrium. After a long period of increasing stability, a sudden mass extinction provides an opening for rapid species diversification.

Question: Does that suggest that the mass extinction we are headed towards next is actually a positive opportunity?

Ans: It may suggest that, if you consider that each major stage of evolution constitutes an improvement on the past. Many writers tell us that we are in the midst of a mass extinction now. The Living Planet report tells us that 25-30% of vertebrates have become

extinct in the last 25 years. This has also been the theme of E.O. Wilson's work for many years.

One curious thing that has been discovered in the last forty years or so is that many of these mass extinctions have corresponded to major geological earth changes. You might be interested to know that during the Ordovician period the earth looked like this. (See diagrams, p. 107. *A brief discussion of plate tectonics and evolution ensues in the audio recording which may be pursued on-line by the interested student.*)

The point I would like to come back to – a way of thinking (between Darwinian gradualism and punctuated equilibrium theories) – whether we choose to become geologists and paleontologists, or biologists and evolutionary ecologists, we can go on indefinitely discovering patterns of the physical environment of life. We can follow both the standard Darwinian gradualism of species variation eventually becoming speciation, as a result of the infinite variety of differences produced in every generation plus major land mass changes which isolate species; we can follow that Darwinian view of gradualism easily and discover the relationships among species through time. And we can also follow the paleontological point of view and discover that there have been sudden explosions of species due to the openness of the niches after major extinctions, and also due to the fact that those species that survived the previous extinction had not yet diversified into stable large groups. And so Gould suggests that the genetic material itself is much more flexible during that period than it is after the diversification has resulted in species that have settled into a niche and reproduced themselves over millions of years, when it is no longer capable of the degree of diversification which existed after the extinction had taken place.

If earth changes due to global warming result in sea level rise, then we will see a migration of species away from all the coast lines, and completely new environmental conditions will be asking us to adapt. Some will be more adaptable than others, and in a another few hundred years without electricity and land covered by seas, our bodies will adjust. In Sri Aurobindo's reflections on this Darwinian picture he already speculates on punctuated equilibrium (known then as saltation), and he questions the process of Darwinian selection itself, not in the sense of doubting that it occurs and not that heredity is not the main process, but he raises some interesting questions about the psychology of the process. What's being carried forward, for example between moles and hippos, is not only physical structure but it is what he refers to as predispositions. Some moles are predisposed to live in that wet dark environment under the earth, and some are predisposed to live in trees. Geneticists today are agreed that shrews are the common ancestors of larger mammals. So some shrews became wetland dwellers and eventually hippos and whales, and some became tree dwellers and eventually primates.[4]

Question; Why do you say shrews and hippos, they are so different?

Well, there is a clear line of development. And think about the time frame we are looking at. This enormous diversification of mammals has happened just since the dinosaurs became extinct 65 million years ago. In just 65 million years all the species we know on

earth today have descended from a few common ancestors. The chordates have evolved an enormous variety of species in a short time. Human evolution has occurred in only 4 to 5 million years. There are many questions that pop up in a field of information like this and they can lead to lifelong pursuits of comparative zoology, embryology, genetics, and so on.

Question: There has been this line of questioning about reptiles being embodied in human beings…?

Ans: …Please read the information handbook and it will answer many of your scientific questions, but it will not answer the philosophical questions.

Philosophically, what can we do with all of this information about unity and diversity? Can we use this information to give ourselves a more intimate sense of being connected to other life forms, starting with human beings. Can we learn to concentrate on the evolutionary behaviors that enhance survival? Because we belong to a single species whose existence may be threatened. And we can easily learn that most species survive through cooperation. There is another branch of evolutionary science which explores the behavior patterns of species which enhance their survival, known as ethology (not ethnology).

Question: But it is not always about survival. It's often only about adaptation and niches.

Ans: It's also about diversification. Diversification is the principle that Sri Aurobindo has dwelt upon as the most fundamental truth of nature. It's unity *in* diversity – it's not unification or uniformity. It is through diversity that the principle of unity is realized. It is through maximum differentiation that maximum unity is manifested.

Question: What is the common denominator of that unity inside diversity?

Ans: There are many common denominators. One common denominator is the genome which is a unifying factor at the sub-microscopic, molecular level. At another level, consciousness, the ability to make judgments that lead to group success is very important. There was a time in the past when social groups (of human beings) understood their unity through language and culture but they considered themselves enemies of the tribes on another continent. Although they were drawn together by various factors they considered themselves enemies of others. Nowadays, because of intercultural sharing, we tend to consider ourselves members of one human group, even though there are many linguistic, cultural differences, different learning styles, predispositions to be more right brain or more left brain, more artistic or more political. Some of our political behaviors or family behaviors that we have brought from the past have questionable validity, but we are able to recognize these limitations and make choices. We are able to see more and more clearly that war is probably no longer the best way to solve social problems, for example.

All of the older forms of human behavior are still present but we are moving as a species towards balancing what we perceive to be the principles of unity and diversity and we are

able to explore farther and farther reaches of diversity out to the Infinite. That infinite includes everything, excludes none, and is One. If we can somehow grasp the relationship between the unity and the diversity, and yet that the diversification leads to more clearly defined unities, we might come eventually to what the Mother struggled with… Philosophically, without going into the question of the future of human evolution, what is possible for us right now on the basis of our knowledge and the clues that we have been given about the higher ranges of consciousness? How can we unify in our consciousness the infinite diversity and the absolute unity? (A longer discussion of stability and change from a spiritual perspective is included in the audio file.)

Notes

1. Ayala, *Introduction to evolution* (the "Blue Book" for this course) p. 73, from **evolution.** (2008). Encyclopædia Britannica. *Encyclopædia Britannica 2007 Ultimate Reference Suite.* Chicago: Encyclopædia Britannica.
2. Ibid, p. 31
3. Ibid, p. 31
4. Dawkins (2004), *The Ancestor's Tale*, "Rendevous 15 takes place approximately 180 million years ago… The southern continent of Gondwana was still just about connected to the great northern continent of Laurasia – the first time on our backwards journey that we find all major land-masses collected into a continuous 'Pangaea'(p. 163). …What did Concestor 15 look like? Fossils of the right vintage in the Jurassic Period belong to various types of small shrew-like or rodent-like animals such as Morganucudon (p. 241)…Concestor 16 looked like a lizard. The gap from Concestor 15, which looked like a shrew, is too great to leave unbridged. …It was a member of a group of mammal-like reptiles called the cynodonts (p.258)."

Lecture 5

From Biology to Philosophy

Aristotle, in the physics, and by the way physics for Aristotle doesn't mean physics as we know it. The Greek word is *phusis*. Phusis means nature. Here is a definition of nature from Aristotle. And Aristotle's physics, by the way, is very readable and rich in interesting ideas. And all philosophers read it, as well as the Metaphysics, which is about morals and God. So - nature as opposed to intellectual and spiritual levels of being. He says,

> A difficulty presents itself: why should not nature work, not for the sake of something, nor because it is better so, but just as the sky rains, not in order to make the corn grow, but of necessity? What is drawn up must cool, and what has been cooled must become water and descend, the result of this

> being that the corn grows. Similarly if a man's crop is spoiled on the threshing-floor, the rain did not fall for the sake of this—in order that the crop might be spoiled—but that result just followed. Why then should it not be the same with the parts in nature, for example that our teeth should come up of necessity—the front teeth sharp, fitted for tearing, the molars broad and useful for grinding down the food—since they did not arise for this end, but it was merely a coincidental result; and so with all other parts in which we suppose that there is purpose? Wherever then all the parts came about just what they would have been if they had come to be for an end, such things survived, being organized spontaneously in a fitting way; whereas those which grew otherwise perished and continue to perish.
>
> Such are the arguments (and others of the kind) which may cause difficulty on this point. Yet it is impossible that this should be the true view. For teeth and all other natural things either invariably or normally come about in a given way; but of not one of the results of chance or spontaneity is this true.
>
> (In other words, the definition of chance and spontaneity is "those things that come about randomly, for no particular purpose. But those things which come about by "nature" come about for a purpose.)
>
> We do not ascribe to chance or mere coincidence the frequency of rain in winter, but frequent rain in summer we do; nor heat in the dog-days, but only if we have it in winter. If then, it is agreed that things are either the result of coincidence or for an end, and these cannot be the result of coincidence or spontaneity, it follows that they must be for an end. And that such things are all due to nature even the champions of the theory which is before us would agree. Therefore action for an end is present in things which come to be and are by nature."[1]

'Action for an end is present in things which come to be and are by nature.' Aristotle's perception was that everything natural comes about for an end, for a purpose. This is the definition of 'nature' under which western thinkers have thought for two thousand four hundred years. If we remember what we have seen over the past four weeks regarding the interconnectedness of life and the variation in species which have lead eventually to a diversification of species, and if we visualize those functions and structures that are the object of the theory of evolution primarily – as far as we can imagine them – we probably would not have a hard time agreeing that, as Darwin said, all of those variations were adaptations for a purpose. All of the ones worth noting, the vast majority of structures and functions, with few exceptions, have helped the entity survive in the context of the environment and in the context of the organs and processes of the body. And so Darwin has said that incident forces cause natural organisms to vary and adapt.

There is the example he gave of the duck whose wings become lighter and legs become heavier, and the mole who lives under the ground and becomes blind, and the mole who

lived in the marshes and becomes a hippopotamus, and the mole that lives in trees and becomes a primate, through millions of years of gradual change.

Question: And if this conclusion is wrong? How do we reach this conclusion?

How can this conclusion be reached? Because all we are concerned with is what is. Whenever we see what is, we can see that it has adapted to a niche, to the field of life, and we don't need to know why it has happened. All we know is what we see. The whole theory of evolution is based on observation. Chances are if you consider all of the evidence, you will come to the conclusion that this theory is a valid one.

The way thought works is by observing, comparing, and seeing patterns, and then comparing those patterns to other patterns, and then eventually concluding that there is such a continuity in the patterns observed that you can draw some conclusions, even if you don't know exactly all the material, infinitesimal processes in between. You can reach fairly reasonable conclusions. For example, we know from genetics now, but formerly it was known only through fossils, that after the extinction of the dinosaurs these shrews were small mammals that survived and diversified very rapidly to fill numerous niches in nature, and the genetic connection is very direct. Or take the horse for example, the horse was very small, and had definable toes, but there are horse fossils all the way through for fifty million years, which show that horses grew larger, their toes receded, they grew hooves, and their jaws developed for chewing. So there are fossils all along the way, and the genetic pattern is there all along the way, and so it is fairly easy to reach the conclusion that variations have occurred - number one, and - number two, those which have survived have adapted to a particular niche in the food chain and the climate and geography and so on. What could possibly be wrong with that picture?

We can observe that nature develops in ways that serve the purpose of survival. We didn't ask the question what pushes nature to survive. All Aristotle is saying is that the variations in nature are for a purpose. Darwinian biologists, evolutionary biologists through a hundred and fifty years of comparative, structural biology, embryology, and genetics have in fact come to the conclusion that nature has the ever-present capacity and mission to vary and adapt in response to changes in the environment. Nature, as Darwin said, and the people who study nature tend to ascribe to Nature, capital N, a general purpose and the power to achieve that; the general purpose is "survival".

Whenever conditions change, she changes her structures and behaviors. Also, the conditions change: the environmental conditions are a part of Nature, especially the way we define Nature today. One of the ideas I ended with last time was the idea of Richard Lewontin[2] who is a very progressive evolutionist at Harvard, who worked closely with Gould, and who observed that organisms create themselves in relation to the environment and by doing that they create the environment. He says that DNA doesn't do or determine anything; it doesn't replicate itself. DNA is a molecule. By interaction with the proteins in its environment in the cell, it separates; it unwinds at a certain moment in time in the gamete and it divides. That whole mechanism is a function of the cell. This is so with the whole development of the body.

Genes are stimulated at certain times by certain enzymes to turn on and off. They don't turn themselves on and off. We have regulatory genes that enhance and repress, and these are not the only kind. The example of the regulatory gene, for example the hox gene, may determine that you have a head and two fins and a tail, or it may determine that you have a tri-segmented body with wings, or it may determine that you have legs and arms and that your gills have turned into ears. It is the same genes, stimulated in the context of other genes, proteins, chemical influences, and temperature that have evolved in a context.

The internal and external context in which creatures evolve is known as 'constraints'. In response to constraints there is a kind of homeostatic pattern that the being realizes: it stays the same through generations. It doesn't vary in essential ways. Homeostasis is a principle of continuity from generation to generation under certain constraints. Every generation doesn't come out like a creature from Star Wars. Things that work tend to be preserved and continue to work. So there are constraints, and patterns of development, replication, and continuity from generation to generation over millions of years.

Even though, we learned, there are minute variations happening all the time. No two individuals are the same. There is a potential for variation there in the genome all the time. What is even more important, as biologists today are saying, is that there is a tremendous potential in the phenotype for variation. The phenotype, what we see, and what we do, the thing that creatures are actually, has a very flexible boundary that is plastic, and the parameters are unknown.

There are laboratory experiments going on right now at Reed College in Oregon for example, with frogs, a breed that reproduces very quickly, where you get a new generation every few weeks. They are examining, under different conditions they create for the frogs, their range of adaptability and flexibility within that species. This is called 'development'. How they develop under different conditions can be very far from the parent. There are many reports and studies on the flexibility of the phenotype.
There is a diagram in Ayala's *Introduction to evolution*[3], a schematic of a regulatory gene, and it will say that this regulatory gene is for lactose inhibition. The gene for producing the enzymes that break down milk in digestion are only stimulated in the presence of milk or lactose. Otherwise, an enzyme is secreted to inhibit that gene. The system doesn't allow the gene to turn on until the lactose is present. There we have an environmental cause. In the development of the embryo and the human being, in the survival of the species, Darwin observed that the environment has the biggest influence, and is the main influence for change. But, the adaptability range of a species is also quite great. If a species adapts to a change in the environment without any noticeable change in its structure it's because it realized a potential that it wasn't formerly activating. By doing that it becomes a step removed from the parental pattern. As a result of that step of removal, the following generations survive within the new constraints of the environment, and they don't necessarily develop the same potentials that they had developed in the previous environment.

If conditions change again, and they drift a little further into another niche, then gradually the potentials are exploited that were previously unrealized until they become quite far removed from the parent. At the same time, there are coincidental mutations going on in the genome. There are two things working, adaptations, and mutations. There is the accumulation of adaptations to environmental effects, and there is accumulation of minor mutations going on in every generation. Every generation is spontaneously different from every other generation. That is a summary of where we've been already. So, where are we going? We are going in the direction of Philosophy.

Now we have had an introduction to the biology of evolution. The philosophy of evolution is another topic. That is why I have brought in Aristotle, Spencer, and Bergson, and Sri Aurobindo, because what we will be doing now is following another arc of observations and conclusions. All that we have discussed up until now becomes a kind of substratum of accepted scientific information which we can refer to if we need to. I wanted everyone to have that picture of Nature in mind. Last time we concluded with the idea that in all of this diversity of nature that we observe through billions of years and tens of thousands of species, with all of the extinctions and variations and eras of evolution, there are nevertheless certain common patterns we can identify as underlying all of those changes and forms. Especially we know that certain genetic patterns are always there and continuous. So there is a unifying physical substrate, not to mention the quantum physical substrate below that one. In the world we can observe and study scientifically, the living world, there is a principle of unity working. However diverse things may be in terms of both continuity and structure, among all species there are certain unifying factors, one of which is the genetic structure.

Therefore, scientists like Haeckel can say, 'I'm a monist, my theory is monistic because I perceive there is an underlying unity in all-living forms. And, I hope one day, he says, that human beings will be able to realize in their behaviors and structures of society that unity is also there. We are 'one' on all levels. We are one in our behaviors.' We can observe any species' behaviors and find similarities with our own behaviors, individuals, groups, insects, lizards, if we look closely we will see that we all ingest carbohydrates, we all have heartbeats and nervous systems that transmit chemicals which do basically the same things in our bodies, and consequently our behaviors are very similar. On this chemical level, biochemical level, biogenetic level, there are many similarities.

When we decide that we are going to cut down that tree, our brain releases certain enzymes that process phosphorous in the nerve synapses of our whole body and we pick up the saw and we start sawing. So when the woodpecker decides he is going to scale that tree and eat those insects, his nerve synapses are activated by the same chemicals that activate our nerve synapses. He doesn't draw a blueprint, but he knows what he is doing. His little legs wouldn't carry him up that tree if they didn't get a message from his brain saying that is where the insects are today. Up to a certain point in our behavior, we share an environment with all other living things. We share chemical biochemical processes and patterns of protection, and we send signals to alert our friends about what is changing in the environment.

Are there any conclusions regarding the nature of reality, the meaning of nature, that we can draw from these observations? When we start doing that, we cross the boundary into philosophy, love of knowledge, understanding, comprehensive understanding of the meaning of things, not just observations and reflections about what it is, and how it works, and empirical patterns. We have the empirical patterns to observe all the time. Now we step back a little bit and reflect on those patterns of empirical observation and we don't have to restrict ourselves to our own because we have Darwin and we have Lewontin, and we have millions and millions of recorded observations that we can refer to. So then we ask ourselves the question, What does it mean? Do those observations have any impact on our judgments about what we do? Think about that for a minute.

In our first session, we read something about philosophy, the Britannica definition: "the critical examination of the grounds for fundamental beliefs, and analysis of the basic concepts employed in their expression", in the expression of those beliefs. What are the basic concepts that we employ and express that reflect our fundamental beliefs? If we look at these concepts that we have been expressing, do we find there anything that is basic to our fundamental beliefs about the meaning of nature, the meaning of life, and how we judge things and decide the course of our actions? And then the question about the philosophy of nature per se, the philosophy of evolution: "it's the exploration of the features of natural reality and their implications for metaphysics, for a theory of reality, for a worldview" – for an understanding of human being, and social norms, and religious beliefs. Can we explore natural phenomena and find there some of the grounds for our theory of knowledge, our theory of man, our theory of right and wrong? This is the subject matter of philosophy.

Let's try and see if we can derive a theory of meaning, by ourselves, from what we observe in nature. Until we try that, we are not going to be doing what is called philosophy. I can certainly understand that someone might not want to try to do philosophy. Philosophy requires quite an extraordinary effort of concentration, and not everyone is cut out for that. In *The Life Divine*, with regard to the transformation of consciousness, Sri Aurobindo uses this phrase. "It requires an extraordinary effort." It is not a matter of faith, it is a matter of effort to try to understand the meaning of life on the basis of what we observe. Most people don't make that effort.

We can observe just from the example that the regulatory gene responds to a change in the environment, or that one species survives better if they change their habit – we can understand that there is involved in that situation a two-fold concept. There is the external influence, and there is the internal drive and adaptation, which responds to the changing environment. We can identify an important principle. Not everything is caused by external forces; everything that happens in nature is not the result of an external force. There is also for each individual entity in each species a configuration that is unique and responds at each moment to its internal and external stimuli.

While we can broadly generalize on the species' behavior, we know that the species' behavior is also the result of individual responses, from the moment the individual is conceived, until that individual is performing the normal behaviors of its kind. While it is

performing those normal behaviors it is motivating itself. Its motivations are influencing the environment around it which in turn is made up of individuals responding to those stimuli. From this we can arrive at a concept of 'self'. There is a principle of 'entity' in nature. We cannot conclude from this information that all nature is just mechanically determined by shifts in molecular structures and environmental conditions. There are well-defined entities that respond in more or less predictable ways to those environmental influences.

One of the categorical structures that we find when we read through a variety of philosophers is this duality. This duality of things which happen in ways that are not determined by us, and things which happen that are determined by us. Aristotle said Nature is all of that which happens for a purpose, and all of that which happens spontaneously or by chance is something else. There is matter out there which responds to heat and cold and evaporation and hardness and softness, and without life. But then there is this organization of matter that is alive, and it determines its ends. First of all it determines its ends with respect to its functions. For example, it has the ability to hear, speak, eat, build nests, and then it has its relations with other entities, so that it determines certain patterns in the group. It is also subject to environmental changes which it does not determine and which are not determinable, which are the results of sunspots that suddenly heat up things and the field of transmission is affected.

For us, we can interpret any pattern that occurs, and assign to it a meaning. The meaning we assign to it may be the result of an intuitive, direct grasp of its actual meaning. Or, we may be assigning to it a meaning we have learned, already assigned to it by others, or we may assign to it a meaning that is based on a complete delusional state of mind. Paranoia is a very real experience for the person experiencing it. That ray of light that is aiming at my brain right now, that I'm afraid may affect you, is pretty real and it really does mean that.

So my question was simply, and I supplied a partial answer to it, when we observe the patterns in Nature the way that Aristotle observed them, or Darwin observed them, and we put together in our understanding processes, the information we have access to, can we determine meaning that we believe is important for our own decisions, for understanding ourselves and our society, for a true theory of life? The meaning of life. The meaning of the structures of our experience. When we start to do that, it's not necessary for us to recall the principles of phenomenology, or the principles of Vedic mythology.

We can think purely about this information that we have. We can reflect on it. We can draw conclusions from it. Then we start the process of philosophy. Then we can ask, if we can't really solve the problem that occurs to us, then we can ask, would it help us solve this problem if we applied to it some of the principles that we learned from linguistics about language? Can we supply some information that we learned from economics? Sri Aurobindo began to reflect on the theory of evolution (around 1920) and I've selected a few of his observations (see p. 95-96).[4] This first statement goes along the line which I just suggested, "The idea of the struggle for life tends to be modified; this

modification is a concession to reviving moralistic tendencies, not struggle for life only. The real law, it is now suggested, is rather mutual help, or at least mutual accommodation. Struggle exists, mutual destruction exists but as a subordinate movement, a red minor chord, and only becomes acute when a movement of mutual accommodation fails and elbow room has to be made for a fresh attempt, a new combination." This was taken from his article 'Evolution'.

One of the directions for reflection you could take asking this question is what do the patterns of variation and adaptation that we have explored so far tell us with regard to interspecies dependency, or extra species struggle and conflict, or extra species interdependency? Many biologists today, like Lewontin and Gould, have spent a lot of time studying interspecies cooperation. Even Dawkins has written a book called *The Extended Phenotype* [5], in which he describes an elaborate theory that the behavior of a species affects the biochemical behavior and structure of other species in the environment. When those species change, we also change, and at a vast level the world is our body.

Cooperation is about interdependence. There appears to be in life not only an underlying genetic unity but there is a unity on the field of food organization, procreation, habitat management, and so all species are in the process of building the habitat for all other species. The Greeks would have said that the basic principle behind all of this is Love. Then one would ask, What about the tiger eating the deer, is that love? Well, one might say, Yes. On the physical level, there is a principle of unity and interdependence among species, and on the vital level there are many structures that indicate unity and interdependence. What does it take to move to the next level? What observations can we make on the uniquely human, intellectual, mental sphere, regarding this idea of fundamental unity and interdependence? What can we say about the nature of "mind" on the basis of these empirical observations?

Notes

1. Aristotle, *The Basic Works of Aristotle* (1941), The Physics, Book II, p. 249.
2. Lewontin (2000), *It ain't necessarily so*, p. 141
3. Ayala (2008), *Introduction to evolution*. All figures and diagrams have been deleted from the notebook for this course.
4. Appendix 2, *Biology and the Philosophy of Evolution*
5. Ibid, fn. 10

Lecture 6

Bergson and the Limits of Rational Mind

In thinking about the philosophy of evolution, it is important for us to recognize that in the 20th Century soon after Darwin's theory was well digested, there started to be formulated theories of "human" evolution. Human evolution is primarily the evolution of the mind, mental evolution. Then the fields of anthropology and psychology really

exploded. We now need to take up this thinking about the evolution of consciousness, because the human being hasn't changed much in forty thousand years according to most physicalist biological theories. The human being is changing very gradually like everything else, and the reality of life is *constant gradual change*. But the last major changes in the structure of the human being seem to have taken place over a hundred thousand years ago, when the skeletal shape and musculature developed the capacity for speech. And these advances may well be reaching the limits of their viability.

Darwin (or Darwinian thinking) calls this process of correlated development co-evolution or the co-adaptation of parts: when one part changes the other changes automatically and not necessarily as an adaptation, but because of genetic linkages. And so, the upright walking of the human being and the new shape of the head, neck, and jaw that occurred in early humans corresponded to the enlarging of the brain cavity and to the development of the vocal apparatus. All of these changes of the structure of the human being seem to be related and suited the common development of what we know now as the human being. Language development happened at about that time as well. We are speaking about the last two hundred thousand years basically, and that movement culminated about forty thousand years ago with *homo sapiens sapiens*. At that point the apparatus of speech, the large brain, the flexible upright spine had taken place. Two hundred thousand years is a pretty good time span in evolutionary terms - a lot of things can change.

If you think about the lion and the cow, lion-ness and cow-ness and giraffe-ness, these guys came along with us relatively recently, during the later mammalian evolution. They are all pretty distinct as well. All of us guys that evolved in the last fifty million years, lets say, have a lot of similarities and yet each is quite distinct. It takes a good amount of time for a complex species to evolve. Once it does, it is pretty unique and it has carved out a niche for itself which lasts a pretty long time. Lion-ness and cow-ness also happen to work pretty well together. One eats the grass and the other eats the grass eater. Their numbers, sizes, metabolism and habitats are all nicely balanced so they are able to live together in a kind of happy balance for hundreds of thousands of years.

When this kind of evolutionary thinking had been well digested around the first decade of the 20th Century, the human beings who were thinking about these things realized that our history and culture and way of thinking really distinguish us quite radically from the other mammal species, though in many ways we are the same. I have invited you in this course to spend some contemplative, quality time, relating to some lower level species who are related to us and in whom we can observe many of our traits.

In many ways we are closely connected to that phyletic order of things to which we belong – vertebrate animals, but one of the key movements in evolutionary theory and the philosophy of evolution which took place in the first decade of the 20th Century was the reflection upon the abstractness and disassociation that our knowledge creates between us and those others with whom we are closely connected. All of this knowledge that we have of species and classes and patterns of adaptation and variation and connectedness, these concepts are in themselves adequate for a certain kind of knowing, and at the same time there is another way of knowing nature that we can sometimes experience, in which

we actually know the entity itself in a much more complex way. We've used the example of the dog or the horse whose emotions we become sensitive to and whose intelligence we begin to appreciate. We are amazed sometimes by the uniqueness and wonder that are embodied in another species, not to mention in other members of our own species whose uniqueness is unbounded, whose differences and therefore uniqueness is infinite. But here we come up against a limitation in our thinking, which tends to understand wholes. This kind of reflection leads to a certain kind of epistemological understanding. We come to realize that we think in terms of stable eternal unchanging entities: the lion, the cow, human psychology, this pattern and that pattern. We make just enough observations to be able to generalize, and then we "know" something.

That kind of knowledge enables us to accomplish certain things, no doubt. It enables us to breed better strains of cows and rice. It enables us to recognize and treat certain kinds of diseases and abnormalities. It enables us to understand a phenomenon like language, in this way, or a phenomenon like sight in this way, scientifically. We know that the faculty of sight has evolved independently in forty different phyletic lines. Sight is omnipresent in the animal world, from the paramecium to the human being sight is omnipresent. In human beings, language is omnipresent. All human beings, whatever their cultural origins and time period in history, have developed this most extraordinary thing called language, which we can understand and describe incrementally in the way Vladimir has been describing it to us in his course. This linguistic science is very thorough and true.

But, compare that understanding with the phenomenon of language itself, this phenomenon that occurs universally in the human species that enables communication to be understood, to work. But not only is it its utility, it's *what it is* that is so remarkable. There is nothing else like language. It is a power of consciousness. There is of course also nothing else like a giraffe or a lion. The evolution of these entities has undoubtedly followed a certain line of process, so natural selection works incredibly well, and it also goes on in language development. But language is so extraordinarily different from anything we know of that's happening in the structures of the body, the cells of the body, in the neurons, it's like a different world. Our mind sails along on this track of generalization, and so we create a science of language just like we create a science of mammals and plants and other classes and orders of things, and we use them effectively for our purposes - these sciences that we create. And we forget the extraordinary uniqueness of language itself. Something strange happens. We lose contact with the existential quality of the thing itself. It becomes reduced to formulas, and the mental formulations take on the quality of reality. Then we believe that we are actually speaking about language, or about the evolution of species.

This awareness struck philosophers first, around 1910. And I have just recently discovered that probably the most germinal philosophical discovery of this sort took place in the mind of a man named Henri Bergson. From his ideas grew a wide range of explorations of consciousness. Many fields developed along the lines that he began to explore. Not that he can be given credit for all those things, but there was a mind there that penetrated this barrier of rational adequacy that had evolved over the past two thousand, or 50,000 years, or so, quite happily. He realized what was happening; he

analyzed it and stated it and attempted to move beyond the limitations of the rational scientific way of speaking and thinking.

I gave you a handout taken from the last section of the last chapter of his book called *Creative Evolution* (1907/1911). I strongly encourage you to read that excerpt. Even though the language is philosophical and based upon an understanding of four to five hundred years of philosophical thought, which is a continuous stream of thinking from Descartes to Hume, to Kant, Shelling, Nietzsche, Husserl, and the whole western philosophical development is in the background of what he says. But he just picks out certain key ideas in this development of thought in order to illustrate their limitations.

He notices, with remarkable originality, that the fundamental problem of the rational mind, in coming to terms with the world in which it is grounded, is a certain perception of time. He traces this idea all the way back to the beginnings of philosophy and in that time, in the beginnings of traditional philosophy, there are many similarities between eastern and western philosophical thinking, actually. He shows in a very systematic way how our tendency, the rational mind's tendency, is to think like film thinks. We observe a sequence of events and we capture a certain frame, a certain image which represents to us that process that we observe, and we hold on to that and consider that unit the thing, the reality.

You can see this especially in Aristotle, where the whole philosophy of time and space, and evolution and psychology, everything is treated in terms of two principles, form and matter. The form is the thing we know, and matter is the thing that is changing all the time and making the forms. The Greeks determined that the form is the essence. So when we know about, let's say Greek civilization, – the period of Plato, Aristotle, Alexander the Great, and so on – we know that Plato represents a certain amazing compendium of philosophical thinking that has influenced our civilization every day, and year, during every epoch. We know that Alexander began this movement of empire and we are still living with it and its effects, moving through several civilizations. This knowledge is wonderful.

Now, what do we really know about Alexander's conquests and the spirit with which he led and organized, and the impact that spirit and power had on succeeding generations in terms of agriculture, language, philosophy, or anything else? What do we really know about any of that which happened 2500 years ago? We don't really know very much about it. We have a capacity for generalizing. It serves us well for certain purposes. But it doesn't give us real, intimate knowledge of the temporal movement. It gives us a cinematico-graphical frame, which represents the temporal movement. We are engaged 'now' in time. This time-space continuum that brings us back here every week and has us listening right now and speaking, this energy happening right now that is formulating a certain view of history, and a certain philosophy of understanding, an epistemology, this understanding is taking place in a specific space-time continuum, and you are going to capture a few ideas and phrases and take them with you. When you read Bergson you will see the same ideas and phrases that will reinforce a certain understanding grounded in a certain kind of time consciousness, a kind of temporal consciousness that we have.

Our consciousness is limited by a certain way of understanding time. We find it very easy and convenient to measure time in an artificial way, in minutes, hours and days and we think things are happening in those times and frames, but actually these things continue to happen all the time. I continue thinking about these things and it's one continuous thinking process that I have tuned into with the help of Bergson and Nietzsche, and Spinoza, and Aristotle. Bergson said, and he is known mainly for this, that the way reality actually unfolds, the reality of the world, is that each of these things we think about in terms of ideas and forms takes place in a kind of time that endures. It is an enduring, which actually happens. This that we are doing now has a duration; the kind of understanding we will eventually reach has a duration. The kind of energy that was present when the species first began that we are most familiar with, the human, the lion, etc. evolved over fifty million years, during a specific span of time. It has had a specific duration. It has endured.

The picture that Darwin has shown us is of a descent of species that has taken place over a time period of three billion years, and every moment of that time is related to every other moment. The genetic development of species in their vast interconnectedness could only happen as a result of exactly the amount of time that it took for those things to happen. (Sri Aurobindo in *Savitri* speaks about time as the will of the Divine.) Bergson asks us to think about the possibility of knowing things directly in terms of their own duration: to know things by putting ourselves in the stream of actual time. As an experiment, we can put ourselves in relation to a person or animal, - not for the sake of repeating and reproducing the common understanding that we have of each other already, the "knowledge" that we have, - and put ourselves in relation to a dog, a cat or a bird or a forest, with the idea that we might enter into the stream of time which is the duration of that entity. Bergson says many amazing things about the possibility of such knowing. He calls it "intuition", and he says that there must be a physical intuition, and a vital intuition, and a mental intuition, and a supra-conscious intuition. If we could enter into the latter we could replace our rational mode of knowing with a knowing of being. Then we would forget about our grand reified images of how things are and we would know exactly how things are in themselves. He shows how Kant and Spinoza were close to this discovery but missed the track just a bit. He explains very clearly how Plato and Aristotle came to their philosophy of forms, which makes good sense and leads to a metaphysical way of understanding things, but they set us out on a long road that we now must leave behind.

He says, "On the flux itself of duration science neither would nor could lay hold."[1] Scientific thinking cannot lay hold of the actual flux of duration. It requires another knowing, one that is natural to us. We are grounded in the physical, the vital, and the mental, so we can enter into that way of knowing naturally. We will begin to see many similarities and connections between the ideas of Sri Aurobindo, Jean Gebser and Martin Heidegger with regard to this notion of intuition and time-consciousness. It is extraordinary how many streams of human advancement grew out of these fundamental perceptions. So, Bergson says,

"This second kind of knowledge would have set the cinemato-graphical method aside. It would have called upon the mind to renounce its most cherished habits. It is within becoming that it would have transported us by an effort of sympathy. We should no longer be asking where a moving body will be, what shape a system will take, through what state a change will pass at a given moment, the moments of time which are only arrests of our attention…"[2] Time itself doesn't stop, we don't stop changing, change doesn't stop happening, just because we hit upon an idea about something at a certain point. "…the moments of time would no longer exist." The moments of time would no longer exist, - time doesn't have moments, we have moments.

So, Gebser, in the forties writes his book, called *The Ever Present Origin* (1950), the whole vision of which he attributed to Sri Aurobindo, subsequently, when he had read his work and come to India and the Ashram. He has written a psychological interpretation of the evolution of human consciousness, a psychological interpretation based upon time perception. He understands that the integral consciousness, the new mutation, will be characterized primarily by a change in the way that we perceive time. He shows how the whole 20th Century in its art, science, philosophy, and psychology is based upon a shifting perception of time. Bergson says, then,

"It is the flow of time, it is the very flux of the real that we should be trying to follow. The first kind of knowledge, (the rational, scientific) has the advantage of enabling us to foresee the future and of making us in some measure masters of events. In return, it retains of the moving reality only eventual immobilities, that is to say views taken of it by our mind. The other knowledge, if it is possible, is practically useless. It will not extend our empire over nature. It will even go against certain natural aspirations of the intellect. But if it succeeds, it is reality itself that it will hold in a firm and final embrace. Not only may we thus complete the intellect and its knowledge of matter by accustoming it to install itself within the moving, but by developing also another faculty, complimentary to the intellect, we may open a perspective on the other half of the real. For as soon as we are confronted with true duration we see that it means creation. If that which is being unmade endures, it can only be because it is inseparably bound to what is making itself."[3]

(And then, Rupert Sheldrake writes a book in 1995 called *The Presence of the Past*, a book about biological evolution. Sheldrake has given a very interesting synthesis of philosophy and biology in this book, very similar to what I'm trying to do here.)

"Thus will appear the necessity of the continual growth of the universe. I should say, of a life of the real. And thus will be seen in a new light, the life which we find on the surface of our planet, a life directed the same way as that of the universe, an inverse of materiality. To intellect in short there will be added intuition."[4]

Now, there are a couple of things for us to notice. As a result of this shift which began around the first decade of the 20th Century there grew up the whole field of anthropology and the study of mind (and human culture) as an evolutionary phenomenon. In Gebser, for example, we get the idea that there was a period of human evolution characterized by a kind of mind he calls the archaic, and then a kind of mind he calls the magical, and then

the mythical, the rational, and ultimately the emergence of a new kind of mind that he calls the integral. If we read *The Life Divine*, we see Sri Aurobindo speaking about exactly the same stages of the evolution of mind, especially in the chapter called 'Man and the Evolution'. Then we have another stream of thinking called phenomenology, which is based upon the idea for which Heidegger deserves the credit primarily, in his book titled *Being and Time*, of the necessity of giving up the way of thinking that is logical and rational and learning to 'think being' as such. This is a shift from epistemology to ontology, from the philosophy of how we know to the philosophy of 'what is'.

We will see that in the 20th Century there is one major movement of philosophy that represents this shift from epistemology, which characterized the philosophy of the 17th, and 18th, and 19th Century, to ontology: "what is", not what do we think, know, understand, why do we think the way we do, what conditions our way of thinking but, what **is**, what is reality. We can know; it is not true that we have to impose an interpretation on everything and call that "knowledge". We can actually know things directly, wholly, holistically, so the whole movement of psychology in the 20th Century and the discovery of the unconscious and its relationship to the conscious and to the superconscious is about coming to terms with our groundedness in all the levels of reality and getting out of this idea of being on the surface of everything and knowing how to manipulate it. All of these developments in 20th Century thought, in human thinking and being stem from certain fundamental perceptions, a certain grasp. Heidegger had a certain grasp of reality that enabled him to shake the foundations of western philosophy to the root. Sri Aurobindo had a certain grasp of reality that enabled him to push the evolution of consciousness in another direction. Freud had a grasp of reality that enabled him to overturn the scales of values and judgments and the understanding of what the human being is. Just to emphasize the extraordinary quality of Bergson's thinking, I took out a few selections close to the end of his book.

His thinking leading up to these observations is quite detailed and interesting to follow and then he comes to: "If our analysis is correct, it is consciousness, or rather supra-consciousness, that is at the origin of life. Consciousness, or supra-consciousness, is the name for the rocket whose extinguished fragments fall back as matter; consciousness, again, is the name for that which subsists of the rocket itself, passing through the fragments and lighting them up into organisms. But this consciousness, which is a *need of creation*, is made manifest to itself only where creation is possible."[5]

"The whole history of life until man has been that of the effort of consciousness to raise matter, and of the more or less complete overwhelming of consciousness by the matter which has fallen back on it. The enterprise was paradoxical, if, indeed, we may speak here otherwise than by metaphor, of enterprise and of effort. It was to create with matter, which is necessity itself, an instrument of freedom, to make a machine which should triumph over mechanism, and to use the determinism of nature to pass through the meshes of the net which this very determinism had spread."[6]

"Everywhere but in man, consciousness has had to come to a stand; in man alone it has kept on its way. …Man, then, continues the vital movement indefinitely, although he does not draw along with him all that life carries in itself. On other lines of evolution there have traveled other tendencies which life implied, and of which, since everything interpenetrates, man has, doubtless, kept something, but of which he has kept only very little. It is as if a vague and formless being, whom we may call, as we will, man or superman, had sought to realize himself, and had succeeded only by abandoning a part of himself on the way. The losses are represented by the rest of the animal world, and even by the vegetable world, at least in what these have that is positive and above the accidents of evolution."[7]

This is early 20th Century, post Nietzschean, scientific, metaphysical, theological inspiration catching a glimpse of the totality. Sri Aurobindo takes all of these ideas to their higher range, but they are the same ideas. (Sri Aurobindo goes beyond this intuitive inspiration of Bergson, in fact, and shows us that intuition is merely the lower rung of a more powerful Supramental plane of consciousness.) Bergson's version: "These fleeting intuitions, which light up their object only at distant intervals, philosophy ought to seize, first to sustain them, then to expand them and so unite them together. The more it advances in this work, the more will it perceive that intuition is mind itself, and in a certain sense, life itself: the intellect has been cut out of it by a process resembling that which has generated matter. Thus is revealed the unity of the spiritual life. We recognize it only when we place ourselves in intuition in order to go from intuition to the intellect, for from the intellect we shall never pass to intuition. …Philosophy introduces us thus into the spiritual life. And it shows us at the same time the relation of the life of the spirit to that of the body. …Life as a whole, from the initial impulsion that thrust it into the world, will appear as a wave which rises, and which is opposed by the descending movement of matter."[8]

In order to appreciate this for what it is we have to step out of our customary framework of metaphors in the Sri Aurobindo School of thinking; we have to step out a little bit because we find that in all of these philosophers of evolution there is an idea of ascent and descent, all of them have it, from Kant and Darwin up to the present time. But, the way they formulate their systems is unique to each of them. This idea of matter descending and consciousness rising is merely the metaphor that Bergson grasped in order to convey his vision that spirit and matter are co-evolving. And his vision was remarkable, especially in the context of Sri Aurobindo's vision.

"On the other hand, this rising wave is consciousness, and, like all consciousness, it includes potentialities without number, which interpenetrate and to which consequently neither the category of unity nor that of multiplicity is appropriate, made as they both are for inert matter. Our concept of unity and of multiplicity is based upon a certain kind of physical consciousness. The matter that it bears along with it, and in the interstices in which it inserts itself, alone can divide it, this matter alone can divide consciousness into distinct individualities."[9]

This concept of individualization is what characterizes this stage of human evolution whether you think of it in terms of Sri Aurobindo's philosophy, or Jung's, or Gebser's, etc. It is there in the idea that species become more and more individualized; the more complex they become, the more conscious and individualized they become in relation to other species. "Finally, consciousness is essentially free, it is "freedom itself". But it cannot pass through matter without settling on it, without adapting itself to it." Later on we find the idea that it is actually already in it from the first. But then the idea of consciousness emerging in matter can also easily be seen as a relationship between necessity and freedom, resulting in form and change and the particular coincidence of form and change: matter and spirit equals form and change.

"Finally, consciousness is essentially free; it is freedom itself; but it cannot pass through matter without settling on it, without adapting itself to it. All the living hold together and all yield to the same tremendous push."[10]

Now, we must have this question, when we look back over evolution and we realize that we cannot understand anything really, but what we do understand is that it has moved continuously for three billion years and is still moving, even though it appears that it isn't moving most of the time. Yet, and because we can look back at the genetic record and the geological and fossil record, almost to the day, we know that it is moving. We have to ask ourselves, What is moving? It never stays put. 99.9% of species that have ever existed are extinct today. Many more that exist today are becoming extinct daily, and our own extinction is eminent, but evolution just keeps moving. So we have to ask the question, What is it that is moving? Then, our friend Bergson takes the big leap.

"All the living hold together, and all yield to the same tremendous push. The animal takes its stand on the plant, man bestrides animality, and the whole of humanity, in space and in time, is one immense army galloping beside and before and behind each of us in an overwhelming charge able to beat down every resistance and clear the most formidable obstacles, perhaps even death."[11]

There it is: 1907.

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Perhaps we can't understand exactly what he means when he says that we can't move from the rational to the intuitive consciousness. But that's not important. It's only when we engage with a philosopher intimately that we can grasp what he means. Every philosopher means something quite unique. This is the wonder of sight, and of philosophy, and of language. This Creativity that comes to a level of maximization of potential: a work of art, a composition, a work of philosophy, a poem…has a meaning and a uniqueness which is the product of a consciousness that is essentially itself. We can speculate, but we can also move into Sri Aurobindo's understanding. In Sri Aurobindo's psychology the intuitive mind is not something that happens inside our head at all; it is a plane of reality like life and matter, and that plane of reality, that intuitive plane is a sub-plane of the Overmind, and reality is condensing itself into more and more individualized units from that plane of pure principle where everything is known by everything else.

Obviously you cannot move from rational mind to that without a big evolutionary change. I think the hint that Bergson, Gebser, Heidegger caught, and what Sri Aurobindo really knew, is that a change of consciousness is what's required, and it can't happen without silencing *completely* the mind. That "other consciousness" is not mental.

Human evolution means: Moving beyond the human. Philosophy's main project is the study of what it means to be a human being: the meaning of being human, especially mental, rational, conscious being. Philosophy has understood this well. Then Heidegger popped out a tract in the 50s called 'The End of Philosophy' because he knew that this new consciousness, this direct consciousness of being itself, is also an energy of being, it is another way of being that doesn't need rationality. Rationality is needed to understand its necessity. But then, it has to abdicate. Sri Aurobindo and the Mother both use this term quite liberally, abdication of the mind. It can only abdicate when it is really poised and knows That for which it abdicates. In the chapter called 'Man and the Evolution', on pages written in 1940, Sri Aurobindo says there is a double evolution going on. There is the evolution in the three worlds, mind, life, and body, and there is the spiritual evolution going on. For the evolution of the mind, life, and body, it is essential to take the evolution of the mind to its absolute limit. While at the same time the spiritual evolution has always been going on within the three-world complex, and it can step out at any point and realize the Absolute, the spiritual truth. But, for it to manifest itself in the threefold evolution it can't do that. It can only temporarily step out in order to get some leverage. Then it is back in; it is an in and out, up and down sort of process, the double evolutionary path.

He carries this way of thinking into the road. Bergson is catching a glimpse of the path and Sri Aurobindo is going full blast on the road, especially in 1940. He added fourteen new chapters to *The Life Divine* in 1939-40 and revised a lot of the rest of it. In 1944 he was still writing in the margins. The fact that his book was published in the middle of the forties in India and New York and by the fifties was pretty well known around the world is another amazing phenomenon in the life of Sri Aurobindo. If you notice, in the last fourteen chapters, many of them have the word evolution in the titles. This is the theme that he is pumping with every ounce of energy he was able to bring down from that higher consciousness. So were Whitehead, Bergson, and Gebser; there were many along the way around the forties, fifties, and sixties, and Konrad Lorenz in 1970 tuned into the universal thought process of evolution. Evolution is now thinking. Sri Aurobindo said that evolution itself would evolve. Evolution as the Huxleys' said in 1890-1910, is now mental, it is not biological anymore. The biological evolution is just pulled along; where it is really happening is in the mind, in the culture, in the systems. Sri Aurobindo says the same thing. Once the spiritual evolution takes place, he says, then all the rest can be elevated to another type. And yes, there is a necessity, he says, to step out completely from the rational pattern and enter into the silence and emptiness, but with a firm hold on the flame. It is not the old stepping out into the ultimate emptiness. So that was his yogic movement based upon this understanding, taken to its limits.

Notes

1. Bergson (1911, 1st Eng. Ed.) *Creative Evolution*, p. 342

2. Ibid, p. 342
3. Ibid, p. 343
4. Ibid, p. 343
5. Ibid, p. 261
6. Ibid, p. 264
7. Ibid, p. 266
8. Ibid, p. 268-269
9. Ibid, p. 269
10. Ibid, p. 270
11. Ibid, p. 271

Lecture 7

From empiricism to intuition and the evolution of mind

The whole scope of the development of the theory (of evolution) shows for one thing that the analytical deductive mind observes so many instances of change by just observing the fossil record, nature, and embryology, more and more observing in deep time when things have occurred and what occurred. Putting the blocks in place the mind spontaneously notices that there is a temporal continuity over a very long period of time with change always related, always new, but always related to the past.

It is impossible not to arrive at a theory of 'continuity of change', which is known as evolution. There is no mystery about where that theory comes from. It is just a matter of observation. The attempt to utilize that, to draw from that something which gives meaning to being human and civilization, is interesting: the fact that after noticing this process and not being able to explain it, we have a theory of evolution without really knowing what it is. This is the big question that we asked last time: What is it that is evolving?, because everything changes all the time. Nothing is left from centuries or millennia past, and yet life goes on.

Last time we focused on Bergson, who grasped a lot of things in a very original and immediate way. His ideas became developed by many different strains of thought. He grasped the main questions and criticized the main way of knowing. He postulated how knowing has to evolve if we are going to really be fulfilled and understand, and contribute to the process. There has to be a change, and the direction of that change was intuited. He had a strong intuition of the direction of that change. It agrees perfectly with Sri Aurobindo's intuition that the rational mind which has come up with this theory has to abdicate. There has to emerge a consciousness that is one with Nature itself, and knows directly. That perhaps is the purpose of the whole thing from the beginning.

That consciousness, that supra-intellectual higher intuitive consciousness he suggests is Being. Being is That. The whole process of time is for 'Being' to become what it is in Life. With that ignition, something happened then in 1907. It's very clear, the spark of realization of the meaning of evolution.

It seems that Sri Aurobindo's philosophy of stepping out and allowing something else to come in, also comes from that spark. There are many other fields of development which come from that spark. The theories were the products of a consciousness also. The theories were new and based upon another conception of time. There was a shift in the conception of time and space. This is what Bergson perceived as a necessity, a shift in the perception of time, because time is not what we think it is. It is not divided up into moments. He said this new way of knowing would have nothing to do with the moments of time. The moments of time would cease to exist because the moments of time are in us, not in time itself.

The big question I would ask is, Is it possible… this consciousness of Being-itself, of duration, of Being in life, of Being in matter, and realizing that consciousness is not different from that - consciousness is its creativity. That is what Schrödinger was also saying in 1940.[1] There is a way of perceiving existence by identity, in which existence itself is created. That creativity is evolution, and consciousness. It is there all the way along from the beginning. To perceive it, and for us to become conscious of it, implies that it is already a part of nature. Consciousness is already the reality of nature.

I believe that is what Sri Aurobindo says. We in our mental development are perceiving That, but we don't feel fully part of it. We feel like we are outside making a slop of it, as one person said. We are uncomfortable with our "mental" theorizing about that. We perceive that it is more than our mental is making of it. Our mind is making something of it, - that gives us a hint of what it is, but we continue to experience this "mind thing" as separate from the flow, the duration, the energy. That is a question that has been perplexing philosophy for a few hundred years.

What is this mind, how does it work, and how does it happen to Be, in this whole complex of matter, life, and Spirit? What is its role? How does it work? Then philosophy begins to do what Bergson, Heidegger, and Sri Aurobindo did, and it points out that this rational mind is not telling us the truth. It is telling us ideas, giving us frames which we abstract from processes. Then we have the frame, which may or may not be the reality. Then the big question that philosophy arrives at is, Can we get beyond the limitations of mind, or are we stuck with it - to make the best of it?

What evidence do we find to support the ideas of the past evolution of mind and possibly a future evolution beyond mind? What evidence do we find that mind has evolved at all? If it has evolved at all, will it evolve further? When we ask that question, I'm thinking we are aware that human civilization is 'mind directed life'. What makes the difference between the human society, and the animal or insect society? The work of Gebser shows that there are stages of development of mind, historical stages. There is the Archaic, Magical, Mythical, and the Rational, and with the breaking through of the time barrier there becomes possible an Integral consciousness.[2] This is in very close agreement with Sri Aurobindo.[3]

If we look back at mind in its beginnings we can see to some extent what characterized mind from the beginning, and how it has evolved with respect to society. Societies have evolved through laws, organization, religion, and art. Human societies really are mental societies. They are not insect or animal societies and vegetable societies. They are mental societies. We can ask, What is it that is specially human and how has it evolved? Has it evolved, or is it the same as it was to start with? We have to allow ourselves to include in our conception of ourselves what we've been doing for the past fifty thousand years. What is it that human beings do that characterizes us, in the whole picture of evolving life? What is essentially us, the human being?

When human societies started to regulate, economically, the flow of food, and started to regulate behavior, so that the individual doesn't just procure its food, and build its nest, and take care of its young, but regulations are made which require everyone to control their own urges for the sake of accumulating and providing for the whole. So that there is no longer just a vital drive to fulfill the survival of the species need, but there begins to emerge law and order, principles of the organization of life that not only get communicated but are identified with and shared, and recognized, and valued. There emerge in the human species values that control behavior, which becomes voluntarily controlled because of an understanding of values. There are all kinds of spin-offs from that, - philosophies, mythologies, religions, and various institutions that reinforce those values. The thing that strikes me as being the most characteristically human function is that our societies have been organized from a very early time according to principles which require the individual to control her behavior for the sake of the larger collectivity.

Can we live together without law and order? Of course not.

99% of all species are extinct. On the biological level animals continue their species through vital behavior that is augmented no doubt by mind. Animals have abilities to make judgments and avoid dangers and so on, but they apparently are not as concerned as we are about controlling for the sake of survival. We seem to want to have a kind of insured longevity. We want to insure that our food producing and distributing process goes on from generation to generation without a break. We seem to want to insure that our offspring learn, not only how to survive but how to perform increasingly specialized activities in efficient, refined, productive ways that are sustainable. Our society is made of highly developed, systematic procedures for the purpose of allowing our species to thrive. Whereas, on the vital level, species manage to continue to survive just through their struggle, procreation, and eating whatever is there in the niche. When the niche is no longer there, then they either evolve or become extinct.

So it seems that the human being's instinct to survive has pushed it into the stream of organizing "for the sake of". Every civilization, even though they're very different in their arts, crafts, languages, organizational structures and so on, they all seem characterized by the principle of the control of behavior for the sake of organizing sustenance.

Now, as a result of the success of humans, all the niches are being appropriated for the specie's survival. The human species now is not even willing to sacrifice members who are not productive. We save everybody. We are also willing to control our procreation, to a point, with birth control; even though this is pretty ubiquitous, we don't seem to mind appropriating the environment of all the other species for our sake. In order to do that we regulate our own productivity, and we sacrifice for those who are not productive. There is this ethical stance, the human mind seems to be characterized by this ethical behavior, that we want to heal everyone who is sick and prevent them from dying if possible. We want to feed everyone. We want to do that, although there are aberrations that occur and we can tolerate certain levels of poverty. But that level of poverty disturbs us and we know that if we alleviate it and make it more vital and dynamic, everyone benefits from that.

I just want to reinforce the idea that this idea of good and bad in the ethical mind is somehow the essential differentiating factor. There are many indications of that. I would propose that, a proposition we might pursue further, is that in fact what distinguishes the human species from other species is the ethical mind. The idea that we can sacrifice deliberately some of our drives for the sake of achieving our success, and that we can impose upon a whole society the necessity of sacrificing some drives in order to achieve success in some other areas. The problem is we are not always right about it, but we are right enough that our civilization has continued to evolve in comparison with other species. We have not been around that long. Within ten thousand years we have managed to over-populate the earth and suppress all other species, and maximize our gains from all the resources that are available. We have outgrown nature.

We also have come to a critical point of asking ourselves, What do we need to change about our behavior now that we see it's not viable? We speak about global society, global welfare, we somehow have gone beyond nationalism, we've gone beyond tribalism, we are moving toward globalism because we see that our survival depends upon an adjustment of the whole to all of its parts. The mind is functioning ethically now with respect to the whole, not just with respect to the tribe and the community, city, and nation. The big question is whether it can manage the whole because it never got rid of all those other drives. Those vital drives the animal has are still there. The physical needs of the genetic material to propagate itself are still there. There is a limit to what we are willing to sacrifice. But the idea of sacrifice has been there it seems, essentially since the human species began its course.

If we ask the question, What is consciousness?, obviously we ask that question because we perceive the necessity of an adjustment between ourselves, nature, and society that leads us to will some controls on our behavior and to direct our behavior towards certain ends from an abstract point of view. We don't just charge out there, we think about it and we think about why we are going to do it. Our organism is giving us feedback in terms of understanding images, possibilities, right and wrong, and judgment. Judgment is ethical mind. Rationality seems to be a by-product of that ethical mind. Inspiration and intuition seem to be that ethical mind reaching for a larger picture and a more direct effective power. Somewhere in us, is this *pranic* ascending movement to know more, to do better,

to make the sacrifices, whether of ourselves or of someone else or something else, in a way that ensures not only the success of the individual but the success of the group. And each member of the group is making the same judgments, so they are able to agree at a certain point that it is this, this is the way 'we' have to go. There is a group mind that is ethical. It is not just the individual mind that is ethical, it is the group mind. In every species there is a group mind; in birds there is a group mind obviously working in their migrations and in penguins cooperating. The group mind is not just working in us. But, the group mind, behaving ethically, seems to be our unique, essential, qualifying difference. If you think about the appreciation of beauty, the love of beauty and harmony in human societies, and how that has manifested, how part of the human being's survival grasps the importance of a qualitative element, – excellence, beauty, and harmony – the Good.

It seems that religion has been one of the primary evidences, expressions of this qualitative aspect of the ethical mind and it comes through people who are inspired, who have a cosmic consciousness, and who truly impart to others a sense of benevolence, a spiritual sense. That might be the root of the ethical mind. But in the whole picture, it seems like there are other aspects of it that dominate like organization and accumulation, and the mastery of technique, so that what was a tool before now becomes a satellite radar equipment that allows us to drop a bomb on Iraq sitting in Washington. This is a big tool.

Comment on warfare, gender and leadership…[4]

Even Schrödinger believed it might be necessary for human beings to sacrifice and suppress some of their attainments for the sake of another evolution, not just for the human. It seems with Sri Aurobindo, and going all the way back to Bergson, that there is this idea in the human that maybe it can sacrifice for something beyond itself. That is radical ethical behavior.

We can also explore what characterizes the different levels of mind. Is it important for us to discriminate, and not just say "consciousness" as a blanket term? But to qualify it as vital consciousness, vital mind, vital intuition, and physical consciousness, mind and intuition, and to begin to discriminate more clearly now that this human event has arrived at the point where we might be able to consider the "integral being". To explore in detail the different levels of consciousness and not just be satisfied with the blanket term – it's consciousness that evolves. When we ask what is it that evolves? And we answer with the term "consciousness", what is meant by that term? That term itself may have multi-dimensionality.

When we get to the bottom question, what is the evidence that mind evolves at all, we should perhaps think about how consciousness can evolve. Consciousness has undoubtedly evolved up to a point, but if we mean by consciousness what is evolving, then maybe it has a long way to go. If we mean by consciousness something that doesn't evolve, something that is supernatural, then what is the relationship between that and what evolves.

What does the increase of knowledge and the more we know have to do with consciousness?

Good question.

***Group Discussion Notes and Questions**

<u>What are the most interesting questions or problems that arise for us regarding the theory of evolution?</u>

Since man is aware of evolution, he tries to control it. So what kind of a slop are we about to make of evolution by trying to control it?

How did the transition from apes to man happen? Or did it happen? How did we get from shrews to elephants? How did Mind come about?

What role did the ancient kings/civilizations (pre-pharaoh Egyptians) play in the process of evolution? Has there been digression?

Are we part of nature? Why do we seem to think that we are not?

What is really evolving? Is it consciousness? Is the evolution of consciousness different from the evolution of nature?

Why is the study of evolution and philosophy dominated by men? Is something else now happening, a shift towards the feminine? What is the meaning of the evolutionary process, and what is the next step of it? Is "male" (mental) domination over nature a cause of why "we" seem to see ourselves separate from nature?

What is the force that pushes us to find a theory about nature? How does this knowledge of a theory help answer the question "Who am I?"

What is this mind? How does it work? What is its role? Can we go beyond the limitations of mind?

What is the difference between human society, and the societies of animals or insects?

What gives us the sureness that our (the human) mind is so different from other minds (plant, animal, mineral…)?

What characterizes the human mind? How do we (how can we) distinguish it so clearly?

Why do we create law and order? Do we have to?

<u>What answers, propositions, or ideas would we suggest for further exploration?</u>

The theory of evolution results from observation and rational deduction of the continuity of process and change over an immense period of time. It is the meaning of this process and how we are involved in it that is now the important question. Why does consciousness become aware of itself, of being, and the possibility of its own evolution?

We should explore in more detail the different levels of "consciousness"; perhaps Consciousness is not a blanket term for what evolves. And if Consciousness is an eternal

idea that doesn't evolve, What is the relation between Consciousness and what evolves (Nature)?

What evidence do we find to support the ideas of the past evolution of mind, and possibly a future evolution beyond mind?

The use of tools may indicate the evolution of mind. Animals use tools and apparently have thoughts and emotions, but man from the earliest times uses these faculties to plan, to organize, to regulate his life.

Language and abstract concepts emerge very early as specifically human instruments, ethical mind and values become the characteristic or essential principles of human societies as distinct from animal or vegetable societies.

In the early Twentieth Century there was a moment of realization that it might be possible to evolve beyond the limitations of mind: the preoccupation became the definition of the limits of mind. Now the question for mind, and for the human species, is How to evolve beyond itself? The ultimate ethical choice: human sacrifice for the sake of another yet to come.

Notes

1. Schrödinger (1944, 1967 Ed.), *What Is Life?*
2. Gebser (1949/53, Eng. Ed. 1985), *The Ever-Present Origin*
3. Sri Aurobindo (1970 Ed.), *The Human Cycle*
4. Lecture 7 on The Philosophy of Evolution (2008 audio file), http://www.universityofhumanunity.org/newsite/audios.php (Please note: the original audio versions of all of the lectures in this course are available on-line.)

Lecture 8

Konrad Lorenz and the Roots of Cognition

What I am proposing to do here, after making the shift from Darwinism to philosophy with Bergson, is to focus specifically on the work of one mind. This focus follows the discussion that came at the end of last week's sharing and attempts to answer the question raised about the presence of consciousness and the foundation of consciousness in lower forms of life. Konrad Lorenz did a very good job of putting the higher ranges of human understanding back in touch with the lower forms of life and finding the origins of consciousness in matter. That has been very much the project of our age. From Nietzsche to Bergson and Sri Aurobindo and the quantum physicists and biologists, the project is really very much a project of putting consciousness back into matter, and reconnecting consciousness with its origins.

The philosophical project, as I have mentioned more than once, has been defining the frame. Human understanding is abstract, representational, and we are able to know everything as such. But, all of that which we know is actually a frame of what is, a pictographic frame, or a verbal frame, or a systematic frame, and so what has been learned through the last hundred years about consciousness is basically that it is not the frame, but what we know is reduced to the frame. So, when Heidegger declared the end of philosophy he was addressing this idea that now everything has been reduced to the reserve of energy, the reserve of consciousness, the virtualization of existence is complete and it is a very destructive culmination. Technology is the culmination of this mental development and everything is reduced to the formulas of technology. And so, we know everything quantitatively, we know what it is, where it is, how much there is, and what can be done with it, what the potentials are, where they came from, where everything fits with everything else. We know everything now in terms of this abstract formulaic knowledge. And it amounts to a crisis. The project of philosophy in the 20th Century, from Bergson to the present, following Nietzsche's inspiration, has been to define this frame and its limits, the limitations of this human understanding, and the importance of turning it all upside down and reconnecting with the experiential reality. Lorenz goes very far in this direction and begins to discover the roots of consciousness in the simplest structures. He declares that all of evolution is a process of learning; that cognition is the basic process of evolution. And he demonstrates this quite well. He also brings us up to the frame, so we can ask this question again.

In this summary, if this were a regular university class, everyone would expect to be expected to produce something. All of these questions that we put up last time (*p. 48) could constitute themes for papers that you would research and present to the rest of us and then you would really learn something. We don't have that expectation here, which shows in a way the primitive nature of our university project. We are sort of in the religious mode here, where people aren't really expected to learn anything. They are simply to just copy what they are told by the authorities. I'm the priest; I'm giving you the word of the authorities and you're supposed to get enlightenment from it. Of course we all know that doesn't work and maybe we will find a different mode at some point. You have the option and the outline to do your own research in these areas that you have asked about. All those questions came from this group. That means there are some questions there that people have put forth. And we will learn from Konrad Lorenz, that exploratory behavior is really the way we learn to use language meaningfully. When you're in front of something you don't understand really, you explore it. You chew on it, you kick it around, you paw at it and try to eat it, and you figure out something about it. And it's play. The most sophisticated philosophical mind in the world today, who recently died unfortunately, at not too old of an age, - I think he was seventy-five or so, Jacques Derrida - said that the real human function is play. Our highest resource, our way to be most fully, is to play, and learning is play, literature is play, philosophy is play, art is play, theater is play, and life is play. We got it from our lower animal cousins.

Lorenz shows us that one of the important transitions that took place in animal evolution was when stereotypical behaviors which were originally for a purpose related to survival, began to be used for the purpose of play. A whole series of behaviors that you can

observe in an animal under normal survival conditions, you can observe all together at one time in a play situation. The animal will go through all of its inherited and perfected behaviors that it uses in the wild within a few minutes of play, not for the purpose of what any of those behaviors were meant for originally, but just for the purpose of learning, experiencing, showing off and having fun. Moving now to Konrad Lorenz's work, we'll read through some of these things.

The whole theory of constructivist education comes from this understanding. Lorenz called his field *ethology*, and the Greek root of the word is ethos. It means a habit or a way of being, a recognizable form of a people, or a person, or a society. Its ethos is its characteristic behavior. What Lorenz did was study the characteristic behaviors of thousands of species and he compared them, and analyzed them. Ethology is what he called his science. The first concept here is the root concept that Bergson also spoke about in the excerpt from his *Creative Evolution*; it is the fundamental concept of empiricism. Lorenz begins his book *Behind the Mirror* (1973) with this definition of how we know things: "The world of objects, the material world of our experience, only takes shape through our eliminating the subjective and the contingent. What causes us to believe in the reality of things is in the last analysis the constancy with which certain external impressions recur in our experience, always simultaneously and always in the same pattern irrespective of variations in general conditions."[1]

'Contingent or subjective influences' - if we think about the whole process of categorizing, phyla, classes, orders, and genera and so on, what is necessary for us to do is to reduce them to their common characteristics and to eliminate all of the contingencies of their existence. A contingency is something that happens but doesn't affect anything essential. So, whether or not the animal appears at the lake side this evening, has nothing to do with the fact that the animal appears at the lake side regularly. After observing a series of phenomena, we eliminate all of the - what Aristotle called - accidents, and we retain that which is constant. Lorenz describes this activity of abstracting constant properties with the verb *objectivating*, and its achievement by the noun, *objectivation*. This is obviously something that is done by the mind. It is an abstract linguistic activity of the mind.

This is problematic in the end because, once we have done that, we no longer have the thing itself. Our experience of the thing itself is a direct contact, and our nervous system receives the vibrations of the thing itself and returns vibrations to the thing itself and enters into a ground of experience from which impressions are gathered which are then abstracted as knowledge, as concepts. This is a process that Lorenz explores in great detail.

"The scientist sees man as a creature who owes his qualities and functions including his highly developed powers of cognition to evolution. Any adaptation to a particular circumstance of external reality presupposes that a measure of information about that circumstance has already been absorbed."[2] He starts with the example of a gastropod, a snail, and he analyzes how this snail wrinkles itself up and stretches itself out, in order to move in which direction, and he comes to the conclusion that the snail receives input -

heat, moisture, changes in the environment, which shift the surface tension and enable the snail to move in a certain direction. And in that moment, he concludes that the snail has processed information about the environment. The idea that consciousness, our consciousness, evolves from the earliest one-celled organisms is based upon the idea that the earliest one-celled organisms through their level of consciousness enabled the next level of consciousness to emerge, and so on through three billion years. Each big change he calls a *fulguracio*, a lightening flash; the major changes he calls lightening flashes, and he will show how the human being emerges as a result of synthesizing many different streams of development that were undertaken in this way by different species. But, all of these experiments of evolution achieved relationships in the whole field, and everything that exists learned from all of those relationships. And then at some point there was a synthesis, each aspect of which can be traced back to some line of consciousness that had evolved in some other species already.

"Similarly, anatomical development, morphogeny, the forms of things, produces in the organic system actual images of the outside world. …Even the slipper animalcule, the paramecium, which when it meets an obstacle first recoils slightly then swims on again in a random direction, knows something quite literally objective about its environment. …Everything we know about the material world derives from our phylo-genetically evolved mechanisms for acquiring information, mechanisms infinitely more complex than those which elicit the avoidance response of the paramecium. …The method of the genome, the bio-chemical level of species, which evolves, perpetually making experiments, matching their results against reality and retaining what is fittest, differs from that adopted by man in his scientific quest for knowledge in only one respect, and that not a vital one. Namely, that the genome learns only from its successes, whereas man learns also from his failures. The acquisition and storage of relevant information is as basic a function of all living organisms as is the absorption and storing of energy. …*Life is an imminently active enterprise aimed at acquiring both a fund of energy and a stock of knowledge,* the possession of one being instrumental to the acquisition of the other."[3]

And so the behavior of animals is primarily for the sake of storing energy. In order to do it the animal is learning from its environment and when it learns it succeeds. What it learns it passes on genetically because it reproduces its kind.[*] And if the next generation has a better understanding, a more perfect sensitivity, a longer neck or beak, then it learns something that its progenitor didn't know and it survives a little bit better and it reproduces itself more successfully than its progenitor. At this completely unconscious level, in terms of what we call consciousness, cognition is going on at the phylo-genetic level, at the morpho-genetic level, at the physical-vital level, cognition is always going on.

Lorenz says, "It strikes me as a matter of course that we should investigate both the objective physiological processes which provide men with information about the external world, (meaning human beings), and the subjective events of our own experience and

[*] Strictly speaking the transmission of acquired behavior or character is not possible in terms of genetics and this statement must be challenged. In a qualified sense, however, the developmental pathway is reinforced by the phenotypic behavior. The relationship between genome and phenome is still a mystery.

knowledge. Our conviction of the unity of man as a physical entity, the human being, and an experiencing subject, soul, entitles us to draw our knowledge both from physiology and from phenomenology. An investigation of this kind must needs pursue a double aim. On the one hand, it seeks to formulate a theory of human knowledge based on biological and phylo-genetic information, and on the other to produce a picture of the human being, which matches this theory of knowledge. This means making the human mind an object of scientific investigation."[4]

So that is what we are doing, and that is what Sri Aurobindo said would be one of the two ways for human beings to discover that consciousness and force are the essential principles of existence: 1) either by a scientific study of the human mind equal to the scientific study of living things or 2) by an intuitive approach. Either way, he said, could bring the human being to an understanding that consciousness and energy are the same (see Appendix 1). The scientific mind is pursuing that understanding scientifically, by observing nature; the intuitive mind is pursuing it from the top down, reconnecting with the universal consciousness-force at the top. Either way, said Sri Aurobindo, can arrive there. This is the scientific approach: the physiological roots of conceptual thought. I think this is extremely important to be aware of and it is not something that we see with our eyes; it requires a considerable amount of study and analysis. "What our sensory and nervous mechanisms, optical or auditory, convey to us is invariably the product of highly complex if totally unconscious computations which seek to abstract from the chaos of accidental sensory data those data which are constantly inherent in that trans-subjective reality which we realists assume lies behind sense data. The essential function of this unconscious reasoning lies in establishing a correlation or a constellation of certain stimulus data, which remain constant in time."[5]

The sensory system itself selects from experience, learns from experience what happens when it gets this close to that temperature and after a while it doesn't go that way anymore. After a certain number of constant experiences it learns not to go that way. When that odor hits the receptors, the afferent nervous system sends the response to keep going in that direction because it has learned that that is where the ripe bananas are. The physical has incorporated through species and millennia, patterns of behavior that it has learned, that they have learned, and these behaviors are part of the complex, the physical, vital, mental complex. The mind is working in the physical, and in the vital, for survival through billions of years. This has always been known by the human mind. It was a very early understanding, but to substantiate it with certainty has been an obsession for at least twenty-five hundred years of the human species. The intuition was there, Aristotle had it and surely those before him had it better than him because he was already falling into the logical certainty trap. Now that we can observe species with electron microscopes and subject them to all kinds of experiments, we can find out how fast they learn and under what circumstances they learn. We can teach paramecia, and rats, and chimpanzees to do things.

"As has been demonstrated, the visual cells on the frog's retina are united into separate groups and send their afferent neurites, (afferent means nerve tissue that receives and responds to stimuli), to one ganglion cell; the latter responds selectively to messages from the group as a whole. Each aspect of the group sends a slightly different impulse and the

ganglion sort it out and arrive at the nature of the origin of that impression. One gives a signal when a dark shape passes across the retina from left to right, another when its cells register an increase or a decrease in illumination. There are even ganglia which respond only when a convex area of shadow moves in a particular direction. In the strict physiological sense, the actual stimulus is simply the light that falls on a rod or cone cell. That a convex area of shadow is moving across the retina from left to right, (probably an insect not too far away for the jump), is a message transmitted by a highly complex neuro-sensory mechanism which responds to a pattern of individual stimuli."[6] The frog jumps and catches the fly and knows exactly the distance.

For these kinds of recognizable patterns of behavior Lorenz coined the term *key stimulus*. It's not just any kind of stimulus and response, behavioristic concept, but it's a concept of patterns of stimulus and response behavior that are regular features of the behavior of an organism or a species. "A great deal of our knowledge rests on the principle of *pattern matching*. But, our perception of patterns involves a process, which is the equivalent of abstraction, for if messages from the visual cells in the frogs retina combine to provide information of the kind mentioned above, and if this process functions independently of the absolute size of the stimuli, we are dealing solely with relationships and configurations, with abstractions. What is abstracted in this way are properties constantly inherent in the object. This kind of perception we call *constancy phenomena*."[7] These constancy phenomena such as color constancy and form constancy, have different causal origins yet all serve the purpose of enabling us to indentify the objects around us as being the same.

In philosophy in the 20th Century one set of concepts that has been explored repeatedly, because it is the fundamental characteristic of knowing, of the way the human mind functions, is the concept of identity and difference. We know things spontaneously in terms of their sameness and difference. And our tendency, just like the tendency of the frog, is to eliminate the difference and focus on that which is the identity, and to give it a name, and to give it a category, and to give it the status of a law if it's a recurrent behavior. We arrive at the concept of law and generality in the same way as the frog arrives morpho-genetically at its survival behavior. And we are not conscious of those extremely complex underlying transfers of energy that are happening in ourselves which enable us to suddenly perceive the identity between five thousand words written by Martin Heidegger and five thousand words written by Sri Aurobindo, and five thousand words written by Henri Bergson. But, it jumps out at us - the identities of their concepts and the differences of their expressions are processed by us in a kind of subtle audio visual pattern that is the product of a billion years of evolution. We don't know how it happens, we just suddenly know that we become aware of it, and it corresponds to what's there because we can check it out with each other and sure enough we all process it pretty much the same way, some a little faster and some a little more slowly perhaps, depending on training. This is an example of the leaps which happen at an unconscious level to make what we know possible. There are innumerable anecdotes like this.

"It once happened that a calculating machine originally designed to work out compound interest surprised its inventers by showing a capacity to handle integral and differential

calculus as well. Something similar is involved with constancy mechanisms of perception, which were developed under the selection pressure of the need to infallibly identify particular objects in the environment. Surprisingly these same physiological mechanisms are also able to isolate the characteristics not just of one single object but of a whole class of objects, ignoring variable contingent features found only in individual cases, and identifying the basic constant gestalt of class."[8]

That is exactly what we do when we perform complex mathematical operations or write philosophical tracts. "This supreme function of constancy mechanism, (constancy mechanism means that somehow your cells, and your nervous system, are able to tell you what's red every time it sees it), is quite independent of rational abstraction. It is equally proper to higher animals as it is to small children."[9] All these functions of abstraction and objectivation are performed by gestalt perception. It means that you recognize a complex field of stimuli for what it is, without all the unnecessary details. For example, in psychology when you observe the behaviors of a certain pathology in a patient over a long period of time, you eventually come to an understanding of that behavior which is 'that behavior', under all of its different impulses, and deprivations, and idiosyncrasies, and suddenly you get it. And you get the root of it, and you get the idea of how to treat it, and you somehow know the whole without any of its extra, unnecessary, distractions which have preoccupied you throughout many sessions of analysis.

He is speaking about when the thing itself reveals itself to you, as a result of frequent observation, and he's tracing this phenomenon back to very simple organic behaviors where nobody can impose any preconceptions, because the animal deals only with the object. And what eventually becomes clear is that the human being can generalize without the presence of an object. This he says is the sole difference between the way the human being functions abstractly, and the way the animal functions abstractly. The animal always needs an object present to make an association; the human being doesn't need to have an object present. And therefore it is possible to transmit knowledge to others which they can then apply in a situation when it arises, without already having seen that situation. Animals cannot do this, according to what we can observe. They can behave with knowledge based upon the experience of an object, when that object is in the field of experience and their characteristic behavior is stimulated, which is learned through experience. Whereas human culture has taken this fundamental physiological function of the mind and leaped into this plane of pure mental abstraction where, based upon experience, we can keep an object in our consciousness for a very long period time, even a lifetime, and continually develop that object which is now a mental object, that becomes a cultural artifact. (Bergson treated this subject at length in *Matter and Memory*.) And that cultural artifact conveys to others who haven't had our experience quite a lot of information. The attempt here is to draw parallels between these – physiological and mental - phenomena.

"Perception, (by which he means sight and hearing primarily, and touch), even, appears to posses its own mechanism for storing information. I have described in detail how the process by which a gestalt or form crystallizes, emerging against a background of contingent elements, may extend over very long periods, sometimes many years.

Pathologists and doctors find time and again that a recurrent pattern of individual events, such as a succession of movements or a syndrome of pathological symptoms, is only recognized as an invariable gestalt after sometimes thousands of observations. (There can undoubtedly be mistakes made at that time also.) What happens in such a case is remarkable enough. We obviously posses a mechanism that is capable of absorbing almost incredible numbers of individual observation records, of retaining them over long periods, and on top of all that evaluating them statistically."[10] Now, evaluating them statistically is the rational abstract function, but observing them and storing them is not. At least this is a distinction that can be made not only in the human being but at many levels.

"A system that can achieve this must be highly complex. Yet, it is not surprising that in spite of their many similarities to rational actions, all of these sensory and nervous processes take place in areas of our nervous system which are completely inaccessible to our consciousness and our self-observation. …Ratio-morphous functions, (we are talking about subconscious selection processes), are independent of abstract thought and as old as the hills, (like those which happen with the frog's sight). From the practical point of view the perceptual functions of objectivation, (that means storing an impression), and conceptualization, (which means analyzing information), are the precursors of the corresponding functions of abstract thought. (This would be primitive conceptualization; understanding constancy… "are the precursors of the corresponding functions of abstract thought.") As is the case whenever preexisting systems are integrated to form a higher unity, the former are by no means rendered superfluous by the sudden emergence of the latter but constitute its precondition and its component parts."[11]

The intuitive consciousness, therefore, can't be performed or realized by the rational mind; the rational mind is something else. The intuitive mind emerges from it. But it's a different function all together, and when that new function emerges it implies new structures. It's not the rational mind anymore, which is functioning. It has its own characteristic structures. But, if those structures didn't exist, hadn't been evolved, then these new structures could not emerge. This is the bottom up perspective, this is the evolutionary perspective. This is not the involutionary perspective. In *The Life Divine*, which is going to be the focus of our last few weeks, Sri Aurobindo dwells upon this idea constantly: that the new consciousness cannot descend unless the higher mind is developed. But when it does descend it is a completely different type of functioning. The ordinary rational functioning is still there but it is altered and transformed and put in a different light, because it's no longer the dominant power. But it doesn't go away, it can still be used. So the Mother can say, I left my mind behind a long time ago, but every week I'm sitting here with Satprem describing in perfectly logical terms my experiences… It sounds like a contradiction. But not necessarily.

Now we come to the human mind: abstract thought, language, and culture. What evidence is there that the human mind evolves? We began to explore the question last week: What characterizes this human mind? What makes it different from other species' minds? Has it itself evolved in the last five, or ten, or fifty thousand years? Is there evidence of that? Lorenz says, "It is only the development of abstract thought together

with the complimentary development of verbal language that enables tradition to become free of objects, for by means of independent symbols, facts and relationships can be established without the concrete presence of the objects themselves."[12] Tradition, he explains, is a recognizable form of behavior in other species. Chimpanzees can communicate a tradition of tool use to their offspring, if they are in the presence of what the tool needs to be used for, and the material of the tool, and if all the circumstances come together in the right way, then the offspring can learn that under those conditions that thing can be done. But, if a behavior of that kind is isolated the next generation will not know it; it has to be a direct transmission. It is a kind of early form of tradition, which is the passing on of or the inheritance of acquired traits. The inheritance of acquired traits is what can't happen according to Darwinian evolutionary theory, but the thing that makes the difference between highly developed minds and other organisms is that we do pass on acquired traits through exposure, through example. (This is a major theme in the work of Teilhard de Chardin.) Our behaviors do not depend upon genetic transmission. If the transmission of a behavior to subsequent generations does not require genetic transmission, if it is not part of the physical vital complex, it is a behavior that is transmitted essentially as a quality of understanding, an art, a science. These can be passed on through generations traditionally, by culture. Animals do not do that. We share abstraction with animals, but there are some characteristics we don't share - language is one, in the way that we use it.

Lorenz identifies approximately eight different higher consciousness functions[13] that already exist in very low phylo-genetic levels of evolution. The *constancy function* (1), which we have heard about, and related *insight controlled behavior* (2) which is directed to the survival purposive solution of problems, by means of the mechanisms that convey instantaneous information. On the spot, animals can have an insight into the situation in front of them and solve a problem. The most essential of these mechanisms are for spatial orientation, of which among the higher vertebrates the most important are those of sight. Mammals first survey the situation for some time, in order to apprise themselves of the structural details of their surroundings, and then proceed to solve the problems posed by it at one stroke. This is very common animal behavior – insight controlled behavior, and consequent *voluntary movement* (3) in space for a purpose. Animals can move voluntarily not just by stimulus but by choice, not by external stimulus alone but by choice. Perceptions of space and adaptability of motor activity are closely related. The reason why animals perceive space is so they can move in it.

Exploratory behavior (4), is that mechanism whereby voluntary movement develops a new important function consisting in the feedback of information on the spatial parameters, by way of re-afference. So the animal explores, plays, pokes around, gets information back and decides what it's going to do about it. Exploratory behavior is common at all levels, practically, of life. As a tool of imitation, voluntary movement is a prerequisite of verbal speech and therewith for the higher evolution of abstract thought. And he uses Chomsky's examples of how language, which is similar among all subspecies of human beings, follows the same structures, and he uses the example of Helen Keller who learned without any knowledge of language all about language. The idea that these processes of abstract thought which go on at the cellular level for the

purpose of assessing, evaluating, choosing, surviving, – this voluntary movement and abstract thinking which are going on at the cellular level, as Chomsky says, constitute the preexisting structure of language. So when language starts to be used, it is spatial. (With Rudolph Carnap, we may also observe that it is logical.) It is used basically in all cultures in the same way with respect to space, – verbs, nouns, and prepositions, and what we do before and after, and where we go. Most of our basic language patterns are logical linguistic patterns and not just linguistic patterns. They are not separated from our fundamental, logical functioning processes, at least in their early primitive usage.

Imitation (5) is strictly speaking not an independent cognitive process. In man the active imitation appears to be initiated by kinesthetic processes. Both humans and birds have an urge to imitate sounds and they follow this urge for its own sake without concern for its purpose. Many human beings do that too. It's more fun than using it for a purpose; it's called chatting.

Now we get to *transmission of tradition* (6). The transmission of individually acquired knowledge from one generation to the next is known as tradition. Individually acquired knowledge. Birds and lower mammals sometimes pass on knowledge of a particular object in this way, while apes can hand down certain techniques. In all these cases the transmission of knowledge is dependant on the presence of the object. Only with the evolution of abstract thought and human language does tradition, through the creation of free symbols, become independent of the object. This independence is the prerequisite of the accumulation of supra-individual knowledge and its transmission over long periods, an achievement of which only man is capable.

Now the question of *cultural invariance* (7) and how cultures transmit knowledge - human cultures - is our question. Is the human mind evolving? Or are all of these human cultures more or less always the same? Do we just keep doing the same things in more or less the same ways from age to age and culture to culture? One of the images that Lorenz uses is the image of the phyletic tree where, if you look at all the animals at the top of the tree you don't necessarily conclude that they have a common origin. If you look at all the different cultures that have existed in history, their artifacts, their languages, their religions, behaviors, and economic structures, they are all very unique in their expressions of all of these things, even though they share similar patterns. You don't get the idea that one developed from the other. You get the idea that they all developed independently, and that's pretty much the case. The great early civilizations that we know of, developed quite independently. So, what happens culturally from age to age, not from culture to culture, but from age to age in the vertical development of a culture? Do they all evolve in similar ways? This can be studied and has been studied. This is what Gebser has done and in the next few weeks we will look at both Gebser and Sri Aurobindo for this developmental perspective.

But the function of culture is this transmission of acquired knowledge, which enables cultures to evolve. And yes they all have evolved and this is how they did it. "Knowledge cannot be stored in any other form than in structures, whether this be the chain molecules of the ganglion cells of the brain or the letters of a textbook. Structure is adaptation in its

finished form. But, if further adaption is to take place and fresh knowledge is to be acquired, a structure must be dismantled and rebuilt at least in part. …All accumulation of human knowledge as a necessary constituent of cultural being depends on the creation of firm structures. These structures need to possess a relatively high degree of invariance in order to become inheritable and to be passed down cumulatively over sustained periods of time."[14]

All of the great cultures have these structures which have been firm for long periods of time and have enabled everybody to acquire certain values, or at least they have expressed the values that everyone values, significantly. Maybe not everyone values them but they have held together the fabric of society for long periods of time and they have undergone wars and they have undergone changes in climate and they've undergone migrations, but the cultures themselves have retained a consistency and a level of invariance. The sum total of the information possessed by a culture residing in its habits and customs - that's ethology - its methods of agriculture and technology – that's science - in the vocabulary and grammar of its language, and above all in its conscious learned knowledge - and elsewhere he calls this ethical norms, ethical values - has to be stored in more or less rigid structures. "But one must not forget that structure is adaptedness, not adaptation, knowledge already possessed, not cognition."[15] Here is an interesting definition of cognition. Adaptedness is not cognition, not acquiring knowledge. And as genetic constancy and variability - constancy on the one hand and variability on the other - identity and difference have to strike a balance in the genome of an animal or plant so it can survive, so also do the invariance and adaptability of knowledge in a particular culture have to be in balance. So, the culture has to have a certain amount of viability and flexibility, if it's going to continue, but, it has to have a kind of invariance that gives it consistency just like in a species.

Now *ritualization* (8) is the most interesting aspect of the whole thing. There is a large complex of behavior patterns, very diverse in origin but remarkably similar in function, which plays an important part in preserving the invariance of cultural tradition. Ritualized behavior is present in various animal species, such as in the dance of bees, and mating displays, and pawing in the cat species, and antler bashing in the deer species, where the behavior is not being used for the purposes it was originally created for but it is used as a demonstration to show that this one is the leader, or this one is only playing, or this one knows where it all is, but it's going to take time for everyone to figure it all out, so we are going to dance around in this circle until everybody knows, and then we are all going to go there - but it's for the purpose of transmitting information, ritualized behavior. And, he says there are remarkably extensive parallels between these processes in the phylo-genetic and the cultural fields, remarkable parallels between the way animals use ritual and the way humans use ritual. Communication, channeling of certain behavior patterns into specific areas, for example, channeling aggressive behavior - so we have our sports events where we channel our aggressive behavior, we have our war games that we play with other countries so that they know and we know how important these things are and how good we are at them and how advanced we are. And we have marriage ceremonies which let everybody know that this means whatever it is supposed to mean even if it doesn't mean that. And everything, this academic situation, this going through the

motions of summarizing information is a kind of ritual behavior that is undertaken in western society, especially. We can all live perfectly well without it. It's not essential to our survival. We require young people to go through this as a prerequisite for entering society. Going to the priest every Sunday and hearing the same message over and over again for generations - this is ritual behavior. Also, sitting in front of the TV, watching the soccer game in the bar with your friends, is ritual behavior.

These are behavior patterns that reinforce our social cultural stability. If there were not a certain invariance in these things, people would fight with each other, more than they do, or they would be less satisfied with their meager incomes. The capitalist society can reinforce these rituals in order for people to be satisfied with a level of sustenance that is much lower than others who have more expensive rituals, who sail their yachts to Morocco and wear their suits in front of slot machines, and that's their ritual, while the average guy goes to the bar to watch the soccer match.

From the superficial convention of manners, – like driving on the right side of the road, unknown in some cultures – to the underlying substance of ethical attitudes and convictions, social conduct bears the mark of the age. (We are not in the bullock cart age any more guys!) And the spirit of that age imposes on man's innate program of social conduct a pressure that increases with the development of the culture in which he lives. Why? Because the morphogenetic structures don't change as fast as the culturally transmitted behaviors do, and the more developed these culturally transmitted behaviors become, the more difficult it is for the common behaviors to adjust to them. One of the reasons why high cultures suddenly collapse may be that a revolt breaks out against a situation in which a culture that is becoming more and more ritualized, more and more sophisticated, imposes a degree of constraint on the lower vital and physical which is felt to be increasingly intolerable, a revolt diagnosed as a decay of morals.

It may also be diagnosed as a leap forward for some, for the few, the elite. But, the elite may see that it is no longer viable the way it is, and so that decay of morals may be a necessity for a recycling of higher values. There are many ways to look at this, but what Konrad Lorenz has done, is give us a scientific picture of the evolution of behavior structures which are rooted in the cells, but which have emerged in highly sophisticated human behavior patterns in the past five thousand years or so. We have subsequently overpopulated the planet and our survival is now an issue. We will see what Sri Aurobindo has to say about this. (This has been a free rendering, with commentary, of the book by Konrad Lorenz, *Behind the Mirror*. What an analysis of these ideas from a spiritual point of view should show, is that these drives and the leaps in cultural values, at every stage of cultural evolution, have to be explained by something other than the mechanisms – the mechanisms don't explain the leaps.)

Notes

1. Lorenz (1973, Eng. Ed. 1977), *Behind the Mirror*, p. 3
2. Ibid, p. 6

3. Ibid, p. 7
4. Ibid, p. 4
5. Ibid, p. 114
6. Ibid, p. 115
7. Ibid, p. 116
8. Ibid, p. 117
9. Ibid, p. 118
10. Ibid, p. 118
11. Ibid, p. 119-120
12. Ibid, p. 161
13. Ibid, Chapter 7
14. Ibid, p. 198-199
15. Ibid, p. 199

Lecture 9

The planes of consciousness

The time before last we asked the question, "Has mind evolved" and "What is consciousness?" In our discussion about 'Has mind evolved?', there was the tendency to use the word consciousness in some kind of comprehensive unspecified manner. It was suggested that we might want to look at what we mean by this word. Do we mean by it mental consciousness, or vital consciousness, or supramental consciousness, or the supreme unqualified emptiness, or do we mean *prakriti*, the forces of nature? What exactly do we mean by this term, *consciousness* ? Does anybody know what they mean when they use this term?

Awareness is the most conventional understanding of the meaning of the word. Force is usually associated with will, or volition, in the human being. In nature, the word for force is usually energy. Awareness is very commonly associated with the word consciousness. In any current study of mind, - and there are many currently - consciousness is defined as awareness. That was something we suggested that we might want to pursue.

Last time, Konrad Lorenz was speaking about the behavior of animals, including human beings, as being characterized by learning. Spontaneous living behavior was characterized by him as essentially a process of cognition. All living things have sensory apparatuses, which enables them to get information about their environment and to decide what they are going to do. There is a processing of information and interpreting that goes on in the nervous system; then the organism decides whether to eat or not eat, or stay and explore, or run away. This is increasingly accepted by Darwinian evolutionists as the way nature selects her preferred modes of development. When she has selected a pattern of behavior that is successful then that tends to be reproduced in other generations. If the pattern of behavior is not one that she prefers, she finds another one, or she dies, or becomes extinct. This relationship between the organism and the environment has been identified now-days by biologists as a process of consciousness. But this does

not mean awareness. It means information processing, stimulus and response, but not in the pure behaviorist sense of stimulus and response, because the organism has already evolved a network of behaviors that are it: what characterizes the organism itself. What it is, is what responds. It responds for a purpose, with self interest and in a way that is characteristic of its type. It is not just learning randomly from whatever stimulus is reinforcing its behavior. It is learning contextually. It is altering its behavior accordingly.

We have at various times in this course identified two principles that seem to characterize living organisms. One is that they share with all other living organisms certain structural similarities, which amount to identities in many cases. For example sight is a perceptual apparatus that is shared by all living things to some extent. Touch is an apparatus for sensing temperature change, and tasting things, etc. These senses are shared by all living organisms to some extent. There are organs for hearing at just about every level of evolution.

We have identified organs of consciousness, perception. Often consciousness is associated with perception, which is almost the same as awareness. When the light stimulus reaches your nervous system you distinguish between this new light and these old lights that we are familiar with, spontaneously. Lorenz identified this activity of consciousness as the 'constancy phenomenon'. There is not only perception of this new light; there is an abstraction of its nature in relation to all the other lights in the room. And one immediately realizes that there is a new light structure in this environment. Before you even look at the black frame and ask yourself, Why is it here? or Where did it come from?, you already know something about it which you don't reflect upon. The nervous system of all living things is storing information all the time, constantly, about itself and its environment.

Let's ask, what is it that we are aware of? You can be aware of something outside, or you can be aware of something inside, and when you look at Samkhya philosophy you learn from these early psychologists (of India) that whether it is inside or outside, it's an object of awareness. The entity that is aware is something else. In modern western philosophy, (phenomenology), this distinction has been made very rigorously between the mind and what it is aware of, the extended world and that which knows the extended world. That is one of the features of the human mind, which we have indentified in our course, that is apparently different from the minds of other organisms.

The human mind is aware of being aware of things. It reflects upon whether this thing is itself or something else. It takes into consideration some of these 'constancy phenomena' and holds them up before its reflecting mental view, - awareness, or consciousness - and in doing so, it makes the perception into objects. And then, it takes these objects for the reality. Then we come to our thinking, along the lines that Henri Bergson suggested. We begin to distinguish between the frame of reference which we call our mind and which holds before itself all these static representations of things, and the ground from which they are taken, which is the ground of perception and energy and extension and experience.

Many of the things that we know are held in a semi-conscious or unconscious state of the mental apparatus. So there is a physical mind, vital mind, intellectual mind; there is an intuitive mind, and so on, and Sri Aurobindo says that these "mental" planes are a function of the relationship between Purusha and Prakriti. The way that consciousness relates to the physical and the way it relates to the vital and the intuitive, constitute planes of consciousness, planes of perception, and planes of reality.

What Sri Aurobindo does is, he objectifies totally the subjective, and says that mind is a plane of reality. It is not something that happens between your ears. That is the mental functioning of the human being. The mind itself is something else.

The vital is not just your processes of preference, and digestion, and greed; it is the whole movement of nature to possess, enjoy, and reproduce itself. The physical is not just atoms and chemicals and cells. The physical is one continuous plane of existence. We exist in these physical, vital, and mental planes, and they are the integrated three-fold complex, known as the world manifestation, the threefold World.

Behind and up a little bit in our awareness, if we can put ourselves on the rack and notch it up a little bit, if we can subtilise it a little bit, if we can learn to see the whole and feel deeply what it means, then we find that there are other planes interwoven here, in this reality that we occupy. We can tune into something outside of us and experience our oneness with it. This is called intuition. We have spoken a few times about being able to identify with the emotions of animals. We can sense them. They are real. When we say we can sense the emotions of animals we are abstracting from that reality.

Now we know everything. We know all about matter and all about life, mind, and where it's all connected, and what it's related to, what its potentials are. Heidegger refers to this as the "frame". It's the reserve of information and experience and knowledge that is held by the mind and held by the information retrieval systems and held in reserve for our will to unlock according to our vital, mental, or physical urges at any particular moment.

We can either run out there and club that dog into submission, or we can cultivate its understanding of what we are doing and it can come and sit quietly by us in the room and listen to us and enjoy it. Or we can just let someone else take care of it. We know all of these things are potentials of the situation. This is one of the things that distinguishes us from other animals: that we reflect upon the frame of objectivity. We can also care deeply about the frame of objectivity, and put it away from us and act in a way that is respectful and sympathetic and nurturing. Most animals do this only with their kin or with at least their own species.

We have this ethical mind - which is the rational mind, plus care, - which seems to characterize 'human mind' more then anything else, because every human society as far back as we know, has put in place rules for the individual to control his behavior for the sake of commonly recognized benefits. Human societies are characterized by ethical behavior to an extent that is far beyond any other species' behavior. Then, Konrad Lorenz tells us that we ritualize this, whereas most species ritualize behavior to communicate

about their own survival patterns. We ritualize everything just for the sake of communicating, because we don't depend upon objects being present in order to determine our response. The objects exist for us always.

Religions ritualize our deepest feelings, inspirations, and rules of conduct, so that we don't commit adultery, and kill our neighbors, and steal what we want just because it will be good for us. We put in abeyance these drives, and even to the point of not procreating, and not eating, for the sake of liberation from the demands of our inner and outer environments (ie., fasting and chastity).

We are looking at a process of the emergence, in the human being, of a vast range of behaviors that we relate to the term "consciousness". The more conscious we are, the more capable we become of putting on hold our animal drives, for the sake of our values. We ritualize this behavior in a vast range of ways from music and theater, to religion, courtrooms, and universities, to sports fields, sports bars, and just about everything we do is some ritualized form of more natural animal behavior.

Sri Aurobindo considers some of these things in a similar way to this. I am going to refer to the chapter called, 'Man and the Evolution' which is the most pertinent one for this course. "It may be conceded that what man has up till now principally done is to act within the circle of his nature, on a spiral of nature-movement, sometimes descending, sometimes ascending, – there has been no straight line of progress, no indisputable, fundamental or radical exceeding of his past nature: what he has done is to sharpen, subtilise, make a more and more complex and plastic use of his capacities. It cannot truly be said that there has been no such thing as human progress since man's appearance or even in his recent ascertainable history; for however great the ancients, however supreme some of their achievements and creations, however impressive their powers of spirituality, of intellect or of character, there has been in later developments an increasing subtlety, complexity, manifold development of knowledge and possibility in man's achievements, in his politics, society, life, science, metaphysics, knowledge of all kinds, art, literature, etc; …This progress has not indeed carried the race beyond itself, into a self-exceeding, a transformation of the mental being. But that was not to be expected; for the action of evolutionary Nature in a type of being and consciousness is first to develop the type to its utmost capacity by just such a subtilisation and increasing complexity till it is ready for her bursting of the shell, the ripened decisive emergence, reversal, turning over of consciousness on itself that constitutes a new stage in the evolution. If it be supposed that her next step is the spiritual and supramental being, the stress of spirituality in the race may be taken as a sign that that is Nature's intention, the sign too of the capacity of man to operate in himself or aid her to operate the transition. If the appearance in animal being of a type similar in some respects to the ape-kind but already from the beginning endowed with the elements of humanity was the method of the human evolution, the appearance in the human being of a spiritual type resembling mental-animal humanity but already with the stamp of the spiritual aspiration on it would be the obvious method of Nature for the evolutionary production of the spiritual and supramental being."[1]

One of the questions that we also asked was, 'Is there any indication not only that mind has evolved but that it may still be evolving beyond its present limits?' The argument that Sri Aurobindo makes throughout the book, continually, is that the presence in the human mind of rationality itself indicates the will to transcend, because human rationality conceives of the ideal in society. It makes these rules governing human behavior because it can imagine a perfectly regulated world. It can imagine making its members better, higher, more evolved, through education and training, and imparting values. But, they are not there now in the form they are envisioned to become. The essence of rationality is that we abstract from the immediate world of constancy phenomena and project a totality that is different from what we perceive.

From the beginning of this course, we have entertained some of the ideas of Aristotle, who said that the form of a thing is its fully realized potential. Nowhere along its line of development do we see that, until it becomes fully realized. His idea was that the development of any living thing towards the realization of its full potential is determined by its form, which is its essence. But, where does that exist? That doesn't even exist in the current space-time dimension, because we are all transitory temporal entities right now in the process of dying. None of us right now is in the process of creating beautiful art, but we know that it is our true nature to be immortal, and to express immortality through poetry, and art, and noble actions. Even right now, we are not fully realized, but this human mind has this capacity to project. Now we can project our ideals on things for the purpose of judging and condemning them. And we make assumptions that aren't true. But it does other things and uses this idealizing mind to transcend its limitations, and also to know things with respect to their truth.

In Western and Eastern philosophy, both, there comes from a very early time the idea that what we perceive is not the truth of things; but that the truth of things is, with respect to the human being, the Self, the Supreme, Immortal Self, the Form, Plato's Form, otherwise known as the Good, and translated by Sri Aurobindo as the Supreme Truth. The Good with a capital G means: that divine luminous potential that attracts everything to become what it really is.

In biology, we learn that nothing becomes what it really is, that it just keeps on changing. With philosophy and science, the idea of the Platonic Idea evolves, and it's no longer the particular possibility of the human or of the state or sculpture or laboring species - it is Goodness itself, in these things, which evolves – in our language it is Consciousness, in these things, which evolves. Sri Aurobindo, in this section of *The Life Divine* refers to the *type* of whatever the species is. The type is a structure through which certain qualities have evolved over many generations. He refers to the human being's ability to cultivate species for particular purposes, and Nature does the same thing but more slowly. The evolution of primates for example, from that first little shrew which decided it preferred living in trees, to the first tarsiers and lower primates, to the most evolved primates, to the first anthropoid species – this is the process of evolving what we are talking about here. The mind is evolving here in these types – in these vital physical structures. The mind is what is evolving.

The mind is capable of evolving beyond all of these structures and behaviors that we are so familiar with on earth today because it isn't finished. It needs some new structures in fact, and new behaviors, but it is already able to have a sense of what those are. This is Sri Aurobindo's main importance, through intuition – and it was Bergson who decided this has to evolve now, because the mental frame isn't serving us very well anymore. But Sri Aurobindo developed a path for evolving the intuition, a methodology, a practice, an intention, and in himself attempted to manifest fully what that intuitive mind could do, what its behavior would be like.

Mind according to his philosophy is a product of evolution in general, and it has achieved in the human species a fairly high level of manifestation of its potentials. And, it has recognized its ability to evolve beyond itself; so it has taken over the responsibility for evolution. Evolution has evolved, and it is no longer happening on the ground of nature through immediate perception and response; it is now happening on a level of rational-ideal-will.

We have mentioned often that we share the structures of mind, life, and matter with all other living things, and we have recognized often that each individual in each species acts from its own center according to its own type to achieve its own ends. From the most basic structure of life there is a "self" that is developing and determining the choices that are being made by it. Its self-choices tend to be made in context with its environment and the choices other individuals are making, and evolution has happened like this. If we look at biology, it tells us there is a principle of innate structure in things, and language is an innate structure in the human being. Hearing and sight are innate structures in all species, and we have this amazing awareness suddenly that the organs of consciousness have been evolving from the beginning. Clearly, if its organs have been evolving from the beginning, then consciousness has been evolving, from the beginning, these structures. This is Sri Aurobindo's fundamental philosophy of Nature.

There is no difference between Nature and consciousness. When we look at the Upanishads we see that the perception of universal Self determining each thing's individuality – *swabhava*, its Will – has been there from the beginning of human awakening. The ability to respect others, to know and identify with others, is based upon the Self in each individual which is totally unique, and at the same time absolutely one with every other individual. Consciousness is not always aware of that because it is stuck in the egoistic mental level of separating the outer and inner, me, you, and how "I" feel today, from larger perceptions and principles. But it has the capacity to transcend conventional perceptions and behaviors and identify with each and every entity. This is Intuition. This is the intuitive mind, which is emerging. It requires the will to set it forth as a goal, and to suppress the ordinary mental behaviors that fragment and abstract, and reduce things to objects.

Sri Aurobindo in the process of analyzing evolution applied the principles of spiritual knowledge to the processes of evolution itself and how to achieve the evolution of a higher consciousness. He then speaks about reversals. One of the principles he observes is that with the emergence of each new type of consciousness there is a reversal that takes

place, and that consciousness realizes itself through all of the pre-existing structures. Life when it emerged utilized matter to realize all of its potentials. Mind when it emerged utilized all the structures of life and matter to realize its potentials. Now, when intuitive or higher mind or Supermind emerges, there is a reversal and it starts to change the way mind ordinarily works. It starts to change the way the vital ordinarily works. There is a reversal by which it integrates itself into the threefold complex. Sri Aurobindo has introduced this idea of reversal in the emergence and integration of new principles.

We still have not had any need to ask a metaphysical question. We have not yet entered into the realm of metaphysics. We have not yet asked, Why? Because, so far, it has been possible to develop a philosophy of evolution that is totally involved in nature. All we have to do is recognize, as science does today, that consciousness and matter are corollaries. One does not exist without the other.

Sri Aurobindo begins *The Life Divine* with this argument by asking, What is consciousness? He says, first of all, what we perceive is energy. So the universe is energy. But, it's energy doing things. It is not random energy. It is energy organizing itself in patterns and producing species, producing life. Matter itself cannot produce life. Matter is matter, but life is produced. Life itself can't produce consciousness. Consciousness gets produced.

He comes up with a conclusion that I was going to refer back to John Locke, 1690, in which the same argument is offered. It is the same argument that Sri Aurobindo repeats almost verbatim. Mind cannot be produced by matter. Nothing can emerge from matter or life, which was not already there. This has been a perception since the very awakening of the rational mind in the period of the Enlightenment. It was already there in the Upanishads as well. At the end of *The Life Divine* there is a kind of a summary of these ideas in the last chapter, page 1016. "It is consciousness and life that must be the key words to what is being worked out in time for without them matter and the world of matter would be a meaningless phenomenon, a thing that just happened by chance or by an unconscious necessity. But consciousness as it is, life as it is, cannot be the whole secret, for both are very clearly something unfinished and still in process."[2]

We have this idea that being still in process means being unfinished. Consciousness and life are there in matter but they are not perfect. They are not what we would like them to be. The scientist would say, that is philosophical thinking. They are just what they are, and you can observe them. If you don't like them, too bad, this is it. But the philosopher says: But we need to try to improve them.

When we look at the changes, we see patterns, and we stop with the pattern, and then we compare it with another pattern, and this is what we call knowledge. Then, we try to apply that knowledge for our own purposes of survival and improvement, beauty, and joy, and we find out that it doesn't give us quite what we would like many times. And even when it gives us what we'd like, it disappears fairly soon in the onrush of time. So we have this sense of being on the way.

Sri Aurobindo has formulated that in this passage: "In us, consciousness is mind. And our mind is ignorant and imperfect, an intermediate power that has grown and is still growing toward something beyond itself." Bergson has explained that well, why it's limited, how it's limited, and why it needs to go beyond itself. Now we know everything and it still is not enough. Consciousness, from now on into the future, is not about knowing things; it is about Being. When we achieve that consciousness of Being, we don't need to make rocket ships and ocean liners and faster motorcycles. We just need to be, because things in themselves are beautiful and Divine, and so on. That is a direction in which some minds have an intuition that we should go. Not all of them by any means; not all of them think that. There are some minds that do think that.

"There were lower levels of consciousness that came before the human mind, and out of which it arose, there must very evidently be higher levels to which it is itself arising, and the main proof of that is spiritual experience."[3] Before our thinking- reasoning-reflecting mind, there was a consciousness – unthinking but living and sentient. Sentient means conscious. 'There was a consciousness unthinking', which means insentient, but able to be cognizant. "After us, or in our as yet unevolved selves, there is likely to be waiting a greater consciousness, self-luminous, not dependant on constructive thought." Here, this concept of the Self, which was there from the beginning, which each type of creature develops to its maximum capacity, becomes a self, which is in itself everything. It has no need for objects. It is self-knowing, self-acting, self-luminous, self fulfilled, Self. One with everything, universal, unique, adequate, self-sufficient.

"…our imperfect and ignorant thought-mind is certainly not the last word of consciousness, its ultimate possibility. For the essence of consciousness is the power to be aware of itself and its objects, and in its true nature this power must be direct, self-fulfilled and complete: if it is in us indirect, incomplete, unfulfilled in its workings, dependent on constructed instruments, it is because consciousness here is emerging from an original veiling Inconscience and is yet burdened and enveloped with the first Nescience proper to the Inconscient; but it must have the power to emerge completely, its destiny must be to evolve into its own perfection which is its true nature. Its true nature is to be wholly aware of its objects, and of these objects the first is self, the being which is evolving its consciousness here, and the rest is what we see as not-self, – but if existence is indivisible, that too must in reality be self: the destiny of evolving consciousness must be, then, to become perfect in its awareness, entirely aware of self and all-aware."[4]

The practice of Yoga is meant to enable us to allow the emergence of that self-aware and all-aware consciousness which is a potential in the human being. "This perfect and natural condition of consciousness is to us a superconscience, a state which is beyond us and in which our mind, if suddenly transferred to it, could not at first function; but it is towards that superconscience that our conscious being must be evolving. But this evolution of our consciousness to a superconscience or supreme of itself is possible only if the Inconscience which is our basis here is really itself an involved Superconscience; for what is to be in the becoming of the Reality in us must be already there involved or secret in its beginning. Such an involved Being or Power we can well conceive the Inconscient to be when we closely regard this material creation of an unconscious Energy

and see it labouring out with curious construction and infinite device the work of a vast involved Intelligence and see, too, that we ourselves are something of that Intelligence evolving out of its involution, an emerging consciousness whose emergence cannot stop short on the way until the Involved has evolved and revealed itself as a supreme totally self-aware and all-aware Intelligence."[5]

Notes

1. Sri Aurobindo (1970, 5th Ed.), *The Life Divine*, p. 872-873
2. Ibid, p. 1016
3. Ibid, p. 1016
4. Ibid, p. 1016-1017
5. Ibid, p. 1053

Lecture 10

Sri Aurobindo and the evolution of consciousness

At the end of the cycle,[1] what I would like to do is review a couple of philosophical questions. The objective of this course is to think about a philosophy of evolution and get some tools for such thinking. A few thinkers, seers, and poets in the last century have compared the goals of poetry, philosophy, and religion and have spoken about poetry and philosophy being very closely aligned with respect to their aims. Those philosophers and poets who speak this way are not the academic philosophers, they are the most creative minds who are most eager to grasp truth and to vivify knowledge. As Whitehead in the beginning of this course put it, their aim is to create the values that give civilization its life and its meaning. Those are the aims of poetry and philosophy at their best, and at other times perhaps mythology and religion, and at others occultism and magic.

When we speak about the possibility of a philosophy of evolution, we do so because the question of evolution is prominent in our consciousness. The fact that Sri Aurobindo, in the last ten years of his life – after thirty years of his spiritual practice, after his realization of the Overmind – devoted an enormous amount of energy to this question of evolution is exemplary of this trend. As I have said a few times, the new chapters of *The Life Divine*, written in 1939-40, are all about evolution - from the most structural mechanistic concepts to the most psychological to the most spiritual - in an endeavor to bring the question of evolution to its fullest possible formulation at this stage of human development. One of the important tools we come across in the philosophy of evolution is these many chapters, about twelve chapters of *The Life Divine*, that dwell upon this question. What is it? How does it work? Why? Why is nature functioning in this way? So his last writings are an indication that this is a worthwhile endeavor: to learn to think about evolution and to know really what it means. It's not just a concept in a textbook or magazine, or something that only biologists do in laboratories; it's an approach to understanding existence. It is a framework for grasping the true meaning of reality, for

learning to think correctly, to be conscious on all the levels of our consciousness in a focused, intentional way.

As Bergson discovered in the early part of the last century, this understanding of reality, and especially this question of evolution, requires the evolution of consciousness. It is not something that is well understood by ordinary mind. It's something that began to be understood only in the last hundred and fifty years. In the last fifty years, it has taken enormous strides. That is why you read about it in magazines like 'The Economist' and 'National Geographic' and hear about it in Auroville. It's not finished in terms of either the understanding of it or the process itself. The philosophy of evolution could therefore be a key to many things, not least of all the revitalization of our civilization, and the unleashing of meaningful creative forces. That was certainly Sri Aurobindo's idea. By understanding this reality we bring into play new powers of it; we make evolution more conscious of itself by aligning ourselves with its meaning, its value.

The question of value is paramount in pursuing a philosophy of evolution. What are our values, what is valuable, what is really worthwhile, and what gives it its value? That is one perspective that the question of the philosophy of evolution brings into focus. When we ask this question, the whole range of the human being's attempt to understand himself comes into view, and that is the subject of philosophy proper. The proper focus of the study and pursuit of philosophy is the human being's understanding, and so when we study Plato and Aristotle and Thomas Aquinas and Locke and Hume we also are trying to come to terms with questions like, What is knowledge? What is the purpose of life?, How does it work?, How does mind play in this picture?, Where does it come from?, What is its scope? The scope of mind and of life, the functions of matter… how is it that we can become an enlightened vital, physical mind capable of blessing nature and humanity and functioning at this almost extraordinary divine level, in this material envelope, as we have seen the Mother do? The Greeks were interested in that question because there were many mystics in Greek civilization and the idea of dematerializing and rematerializing the body and ascending through all the planes of consciousness and transforming matter were there in the Neo-Platonic schools of thought as well. The idea of Christ was that there could be a kind of human existence that was divine, the Word made flesh, when there is some kind of meeting and union of Spirit and Matter.

This way of thinking about the origin and the purpose and how it all works is basically the subject of philosophy, and it is also where philosophy shades into religion and into poetry. It is a thoughtful and inspired human endeavor to raise consciousness towards truth. Then we come to some basic questions in philosophy that are affected by the science of evolution. It is said, for example, that Darwin has made obsolete the concept of essentialism. Let's think about that for a minute. We were exposed to this concept in the ideas of Aristotle, and they had their origins in Plato. Eastern philosophy is permeated with the idea of essentialism. What it means is that when we know something, what we know is not the matter of the thing, but the idea of the thing. We know abstractly what it is. We recognize this filming object sitting on the tripod here, and we know that it is not a living being from outer space invading our private club here. It is a camera on a tripod. It has the form and function of a camera, and in our mind, it is an exact example of the idea

we have of a digital recording device. When we know that, we do not know the mechanisms as they are turning, we do not know in detail the chip which is in there and how the chip stores the light signals the camera picks up. Nor do we know how elephants and societies work. We just know that they are and we know what they are, abstractly. Similarly we know what languages are, and we have been studying more or less how they work. But, if you really think about it, we don't know how they work at all. Language is a miraculous thing. We can analyze it and determine its structures, but the fact is that language is quite an extraordinary phenomenon. Evolutionary life is an extraordinary phenomenon. The process of variation, diversification, and selection, which we have learned are going on constantly, is an extraordinary phenomenon.

We can give those processes names; when we see patterns being repeated, we recognize them whenever they occur. Thus we have a kind of abstract formal knowledge of what things are, and Aristotle calls this the Form. We know the form elephant, we know the form healing, we know the form ionic poetry, but how the healing takes place, how the poetry is created, how the shrew becomes the elephant or the pig, we don't really know any of these things in their actual becoming. We know their essence theoretically. This word *essence* is what we grasp of the meaning of the thing; the form of the thing known is the essence. Aristotle calls it form, essence, definition; and so, for modern science the idea of evolution was shocking, because there was this idea that elephants don't evolve, they just *are*, human beings *are*, apple trees *are*, what they have always been. They are species or genera - another word for essence, which comes from *eidos*, idea. The eidos is the species, the type, the form, the essence of the thing, and it's what we know. Our minds are full of these concepts or forms, and we think that's what things are. The object is a particular material form of the spiritual essence.

Then evolutionary science comes along and takes a good look at embryonics and paleontological changes through eons of time and finds out that ninety-nine point nine per cent of the living species-ideas-forms that everyone thought were eternal no longer exist on earth. Not only do we find out that all these forms that were thought to be eternal no longer exist on earth, but they each were created by processes from previous forms. It was a very gradual incremental and continuous process of becoming and not a collection of permanent essences. This is shocking to the mind which for thousands of years has been convinced that the forms known are the unchanging essence of the things; and that what we know is the reality. So, in the Twentieth Century, from the shock waves of evolutionary theory philosophers began to point out that this concept of knowledge, this "knowing" that we are so proud of, actually is not what's there, and it's not what's happening. What's happening is *process*.

If we look at the history of philosophy, we find that in Aristotle's time his idea was that process, or matter, is totally determined by form. The form preexists eternally, in the spiritual or mind dimension. What the bird is and what the bird does, from the time of its birth to the time of its death, is due to the form of the bird. Birds do what they are supposed to, they know how to build nests, they know how to feed their young. The doctor knows how to heal, and from the moment he meets the patient until the patient is cured is known as healing. These forms are attracting and propelling what exists into its

natural mode. Aristotle calls that form the Final Cause, and everything that happens along the way is either a material cause or an efficient cause. When you strike the match to the candle it starts to light the room, but striking the match to the candle isn't what is really, essentially happening; lighting the room is really what's happening. This lighting is fulfilling the purpose of the candle, which is why we struck the match to start with and put it to the wick. We wanted the candle to light up the room. The form or final cause is always there in the fulfillment of that which is becoming.

The Greek society at the time was in the process of becoming the ruler of the world, and everything else just fell into place because that was its destined pattern; and Alexander the Great was its primary instrumental cause. But he was just the instrument for the realization of that totality of being which was the Greek civilization or the Roman civilization or whatever empire happens to be dominant. Then, in the midst of the British Empire, we found ourselves faced with the idea, the evolutionary scientific idea, that things are not these forms which are just in our minds, these are abstractions. What things actually are is determined from moment to moment by their evolution, and every pattern of behavior is a product of previous patterns of behavior, every structure is the product of previous structures and functions. These ever changing behaviors and patterns are transmitted through heredity, through language, through culture and behavior. The phenotype finds its niche and the genotype tends to evolve in a way that preserves that behavior in that niche, but only temporarily. Permanence is an illusion. The empires fall.

There is a mysterious correspondence between the behavior we see and what the genes do. The behavior actually selects the genes, the genes don't select the behavior. But the genes create and preserve the structure, which makes the behavior possible. And if that behavior works then those genes get passed on. If that behavior doesn't work then those genes don't get passed on. But, they also make possible a wider range of behaviors than are manifested under a particular set of conditions. There may be some other behaviors that work better, and then another genetic pattern can be selected, because those members of the group that manifest the better pattern are more successful, and those that manifested the other pattern drop out. Somehow there is constant communication going on between structure and form. But what is determining it? Darwin says it is one fundamental principle: it is that nature selects those types that are best able to sustain themselves in the context of the existing environment, in the contingent web of life. As soon as some variation can sustain itself more successfully, it replaces those that are less successful.

The flight of birds, for example, - which in itself is as amazing as language – and the climbing of primates, came about through a process of variation, adaptation, selection, from the crawling of lizards and reptiles. So what do we do with this new information? We are told by the Darwinians, and they are very strong on this point, that essentialism has been shown to be a false doctrine by this new understanding. There are no eternal preexistent essences or forms that cause things to be what they are. There are ideas that we have about things, which are derived from empirical observation and analysis, known as forms (structures) and essences (definitions). And as a result, a major change in philosophy comes about, - which was already prefigured by rationalistic philosophy –

and the idea becomes dominant that we create concepts because of some relationship we have with things through perception. We construct the concepts, and we test them and measure them against the patterns that we perceive, and compare them with what other people perceive. And finally we agree about the nature of the forms and behaviors that exist. Moreover, by an equally mysterious reversal of the processes of mind, we manipulate the material forms that we understand to produce electronic weapons systems and information systems and to spin textiles from the fuel oil deposited by the fossils of earlier animals. Knowledge acquires the power to determine what the material forms of things shall become. (Passing these things along to new generations, as established traditions, sometimes conveys the erroneous impression that such knowledge and behavior are eternal and right.) Then Bergson, Heidegger, Sri Aurobindo, and others (mainly critical theorists and phenomenologists), tell us that we are only creating a framework of understanding that we agree upon and that gives us certain powers, but this knowledge is not at all the truth of that world of process that is ongoing, that is ever changing. There is the real creative force of life which has produced consciousness out of matter, which some believe has the possibility of evolving a more dynamic, direct and luminous truth consciousness which would enable us to really know our world and be completely in sympathy with it, because we are continuous with it. Then we would not be abstracting it and formulating it and operating with formulas; we would be one with the world itself because we are in fact that physical, vital, mental force.

Thus, thinking human beings (especially philosophers) have discovered that our wonderful rational mentality is not the whole picture, and that it doesn't tell us the truth about things much of the time. It merely enables us to manipulate things; but our manipulations are only partly successful. We have discovered that our manipulations may actually threaten our existence. Mind has evolved in the human being and it has found ways to extend our longevity; it is helping us to successfully reproduce our type, but it has limits: it doesn't prevent us from behaving in quite unacceptable ways at times, and some of those unacceptable behaviors begin at certain points to threaten our survival, along with the survival of many other species.

And so, two things began to emerge in 20th Century thought. One was a critique of knowledge based upon scientific understanding moving away from essentialism toward process, and a fundamental questioning of consciousness itself. What is it, how does it work? Since Aristotle everyone assumed that consciousness was just a part of nature that has emerged in mind and knows the world it perceives in terms of forms. Lo and behold, however, those forms are not telling us the truth about the world we perceive, they are only concepts. This world is changing every moment and we have some responsibility as members of it to make decisions about nature; we don't have to just accept that one civilization is from time to time rising and another one is taking it over and it's falling, and we live according to the patterns of our societies' established values as best we can and take the consequences. Then we are replaced by another set of patterns and entities, causing us a bit of a shock, and suddenly we step back from all that and question its meaning. And we question the limitations of our ability to understand its meaning.

And then, science does what Sri Aurobindo predicted it would do; it starts to focus on meaning. Then we have physicists like Roger Penrose especially today, and previously Schrödinger and others, asking this question of consciousness, and then we get in the last ten years or so a philosopher like Daniel Dennett who wrote a book called *Darwin's Dangerous Idea*, discussing these things which I am know discussing, and saying incredibly interesting things from a philosophical standpoint about evolution and the limitations of consciousness. He also wrote a book called *Consciousness Explained* and another called *Freedom Evolves*. So we have a so-called ultra Darwinian, someone who is absolutely against the notion of essentialism, saying words like, "There is simply no denying the breathtaking brilliance of the designs to be found in nature. Time and again biologists, baffled by some apparently futile or maladoit bit of bad design in nature have eventually come to see that they have underestimated the ingenuity and shear brilliance and depth of insight to be discovered in one of mother nature's creations. …Darwin shows us how to climb from "Absolute Ignorance" to creative genius without begging any questions, but we must tread very carefully. Among the controversies that swirl around us, most if not all consist of different challenges to Darwin's claim that he can take us all the way to here from there, without invoking anything beyond mechanicity..."[2] That is the theory of natural selection, nature's ability to operate unconsciously but not unintelligently throughout millennia from the inconscient to this consciousness and beyond. This they say, the ultra Darwinians*, is enough for us to know*: that mind is there in matter, that life is there in matter, that evolution is a process of nature bringing out step-by-step through processes of cognition, of transfer of information between the genome and the environment through the phenome exactly what can happen within the constraints of what has already happened and what needs to happen next. And, according to these ultra Darwinians, there is a constant ongoing process of adaptation between these three levels, of the environment, the phenome, and the genome through exchanges of information. And so in 1973 we get an evolutionary biologist named Lorenz treating the most fundamental level of materialization as a level of cognition. And so, this insight that Sri Aurobindo had when he was questioning evolution in 1920, and which he eventually formulated in great detail in 1940, this idea that matter, life and mind are emerging from the basic fundamental structure of nature, has been generally accepted now. *The question is, whether process itself can explain it adequately.*

The reason that this question arises is because if we step back from process and look at **what** it produces - not just how it produces it but, if we look at what it produces, and we look at something like language which is such an extraordinary phenomenon or, if we look at something simpler like the forty completely unrelated paths evolution has taken to develop eyes, to develop sight. Sight is not one continuous evolution. Many different experiments in nature have produced sight. And we look at the fact that every exchange of energy, of information, from the simplest organism to the most complex, can be shown to be a process of cognition, because information does get exchanged and it does influence behavior. Then we think, perhaps, cognition is itself so extraordinary, sight is so extraordinary, the fact that it happens, that beings, that organisms see and behave according to information they accumulate at every level, we have to ask the question, what is it that is evolving here? Is it only structure, process, and function, or is it consciousness that is evolving here? Are all of these different levels of physical, vital,

and mental forms and structures and behaviors producing consciousness, or are all those forms produced by consciousness for its progressive formation and emergence?

Then we find out that philosophy has been asking this question for quite a long time. I brought the other day Locke's book, but I find that the essential passages have been quoted by Dennett in his book *Darwin's Dangerous Idea*. So, just to think for a minute of how this question was viewed by John Locke in 1690, he said this, "If there must be something eternal", now let us think philosophically about that; must there be something eternal? Well things have to start somewhere, everything has to start somewhere. How can there be something starting somewhere if there was not already something started before it? Something does not come from nothing. Matter cannot come from nothing, it must come from something. Or it must have always been there. So this idea of eternity has been around for a long time. It makes the most common sense. So, "If there must be something eternal, let us see what sort of being it must be. And to that it is very obvious to reason that it must necessarily be a cogitative Being. For it is impossible to conceive that ever bare incogitative matter should produce a thinking intelligent being. It is as impossible to conceive of that as that nothing should of itself produce matter."[3] How can nothing produce anything? And how can matter itself, just matter, electrons, and protons, produce intelligence? Intelligence is of a different order than matter, it is about ideas, memory and conscious purposeful action. It is not just about exchanges of energy and reproductive life – yet another order of nature. So this argument has been around since 1690, and then we see Sri Aurobindo on the overhead screen saying, "An original creative or evolutionary power there must be: but, although Matter is the first substance the original and ultimate power is not an inconscient material Energy; for then life and consciousness would be absent since Inconscience cannot evolve consciousness, nor an inanimate Force evolve life. There must be therefore, since Mind and Life also are not that, a secret Consciousness greater than life-consciousness or mind-consciousness, an energy more essential than the material energy. Since it is greater than mind it must be a supramental Consciousness-Force; since it is a power of essential substance other than Matter, it must be the power of that which is the supreme essence and substance of all things, a power of the Spirit."[4]

If we conceive of something powerful enough to create matter, which is necessarily eternal, then that power, says Sri Aurobindo, is what produces material, vital, mental, spiritual and Supramental consciousness. It was there from the beginning and it will be there at the end. So all of the forms and concepts that were there along the way are not what is eternal. All of those structures and forms are changing all the time. However beautiful and powerful the artistic expressions and philosophical formulations… The only thing that is eternal is Spirit. But it can create progressively higher and more perfect embodiments of itself. And it is not other than Nature. Matter and spirit are the same.

Purusha surrenders to Prakriti because it is that energy in motion that has the power to create everything. The Purusha can only sanction what is. The Self is. Its energy is what it can become. To make the transition from mind to supermind, it is absolutely necessary for the mind level of consciousness-force to give itself up, to abdicate, because that energy of mind is not the next stage of evolution; it doesn't have the creative power or

the truth. It has an organizing capacity that has served the survival of humanity fairly well up to now. And it has evolved much faster than the lower forms of life. Each level of evolution is more complex, rapid and diverse than the previous. We are capable of uniting our consciousnesses with all of Nature which is only One. If we abdicate the idea of formal difference, we can allow to emerge a continuum of consciousness that operates from an impersonal center. It is a Supramental center that will create for itself bodies that experience themselves as an infinite diversity of that one power, truth, beauty. If it was there at the beginning, then it will inevitably be there at the end – in a Form, according to Sri Aurobindo.

There are processes of evolution elaborated by Sri Aurobindo that Darwin was not aware of, that Dennett is not aware of, but he is pushing the envelope, when he says that freedom evolves, and because the ethical mind can't solve all its problems, another level of intelligence must emerge. He says that one of the signs of this is the ability of human beings to impose their will on their own group functioning in order to change behavior in a way that is not necessarily beneficial to the reproduction of the individual. This is not a normal way to ensure survival and improvement of the species according to traditional Darwinism. It's possible to sacrifice the normal methods of species survival in order to achieve a more harmonious social structure. For example, voluntary celibacy and isolation from ordinary social relations; women choose, or governments choose to have fewer children, Sri Aurobindo chooses to spend forty years in isolation to write *Savitri* and *The Life Divine*. At some point the powers that he achieved through the processes of Yoga must become the norm. The sacrifices that human beings and society make along the way are indications of new norms to come. Every philosophical, poetic and psychological effort of transformation that human beings make is an indication of the emergence of those new norms, under evolutionary stress. Otherwise known as the will of the divine. The divine is not something outside; it is totally involved from the inside, willing everything from inside. Knowing that, one can cease to be judgmental, because one thing is not better than another. This is not better than that; this is that. It's possible to affirm everything. This was Nietzsche's message: why don't we say Yes, and rise above the nonsense instead of repressing everything to which we say No. It's possible to affirm the material, the sensuous, the intellectual, and idealism gets turned up-side-down, everything is divine – and Sri Aurobindo insists that it is necessary to develop the philosophical mind to its limits in order for the new level of consciousness to descend; but then it has to abdicate. Otherwise it is only turning around in its already evolved vital mental patterns. The poetic philosophical affirmation of existence carries one to the point where one can abdicate to another potential.

The concept of descent, of imposing a higher level of consciousness on the lower members or planes, and bringing the lower to a higher level has been going on in nature all along. The phenome, the behavioral type seeks more energetic and efficient patterns and imposes them on the lower established patterns, then natural selection steps in and assimilates the new behavior to the genome. There are processes of evolution that Sri Aurobindo introduces that have not been addressed by Darwinians but they do not contradict the Darwinian perspective. The Darwinians would feel threatened by the idea that there is a universal vital intelligence pressing on the physical to bring out its

potentials, or a universal mental pressing on the vital, because that is not something most of us can see. But Sri Aurobindo is suggesting a fundamental change in the scientific way of knowing, and that scientific thinking learn to step back from its dependence on sensory impressions and data, and apply the same rigor to psychological data from inside so that it can discover the mechanisms, and "see" more comprehensively and directly what is going on.

Now we have the scientist Roger Penrose suggesting that science needs to evolve new methodologies in order to solve the problem of consciousness. (He is the physicist who discovered the 'big bang".) This question of evolution is for biology, philosophy, psychology and spirituality. It is a process of reconnecting all the material and spiritual levels of consciousness. Discovering the processes of evolution is putting those levels of consciousness in contact with each other and establishing the continuum of consciousness and enhancing creative evolutionary processes. Sacrifice means putting these levels in contact with each other and allowing them to ignite new potentials. This would make it possible to make choices with a full consciousness of the potentials and constraints of all the levels of being and nature. Thus, the philosophy of evolution can possibly further the project of the transcendence of the human.

Notes

1. This is an edited transcription of the recorded lectures 1-12 in the University of Human Unity series, The Philosophy of Evolution (1), 2008.
2. Dennett (1995), *Darwin's Dangerous Idea*, p. 74
3. Ibid, p. 26
4. Sri Aurobindo (1970), *The Life Divine*, p. 705

Appendix 1

Physics and the Philosophy of Evolution

Nature's Dialectic

Few among humanity have yet undertaken the challenge, availed the opportunity, transcended their conventional mental formulas, and achieved the clarity of intention necessary to see the vision of Sri Aurobindo. Fewer have gone so far as to integrate his vision into their thought and life, and so to understand it fully, to grasp its historical significance, and to realize its force, its evolutionary potential. Therefore it can truly be said that Sri Aurobindo belongs to the future.[1] And yet his vision, and the thought forms and literary expressions that he created to embody it, are vibrant within the epoch of human achievement known as the 20th Century – that moment in time and the history of civilization that can be understood today as the culmination of the rational cycle of human development and the beginning of a suprarational, integral cycle - like a subtle ether flowing through everything. It is a momentous vision, perhaps immeasurably

important for the future of humanity, and for this reason it is one that we wish to bring into focus here, and to put in perspective.

Abundant are the signs of that evolutionary transition of which Sri Aurobindo was the harbinger, indications of the integral and supramental structures of consciousness that he said would emerge. But the emergence of creative thought formations, and of new evolutionary forms, takes time. And very little is known about this process of emergence in any case. It is not common knowledge, and it is not the way we have been conditioned to understand how evolution happens. The signs, nevertheless, are most evident in the subtler, more spiritual thought of the century, but clearly perceptible also in the arts and literature, and in the human sciences – philosophy, psychology, sociology. They are progressively apparent in the startling theoretical discoveries of the natural sciences, in physics, evolutionary biology, ecology. But there, in the mental disciplines, the fundamental aporias and enigmas of thought that permeate the epoch are still, as always, the questions of man, of consciousness, of our ability, or inability, to know and conquer our human limitations. We are faced with the mystery of our own evolution. The new consciousness, which might help us penetrate the mystery, has not yet emerged, but its immanent emergence is presaged by new perspectives, flashes, intensities, forebodings, and irrepressible facts, and by the failure and breakdown of old structures.

In an epoch of incomparable human cruelty, depravity and destruction, paired with almost miraculous advances in the products and processes of global technological civilization, when the human has become godlike in its mastery of nature, humanity is being forced, at last perhaps, to seek hope shrouded in its most desperate moment of deficient self-revelations, and the self-realization of its shadow identity as creator of the culture of nihilism and extinction.[2] It is perhaps inevitable, then, that we rewrite Sri Aurobindo, that we revision and rethink his vision as the background of this passing age of scientific and technological hubris, and that we narrate the necessary emergence of the trans-human. For, as he saw and wrote in the first few pages of his massive literary life-work, early in the century, there is an urgency, a necessity, and a hope:

"…today we see a humanity satiated but not satisfied by victorious analysis of the externalities of Nature preparing to return to its primeval longings. …to convert our twilit or obscure physical mentality into the plenary supramental illumination, to build peace and a self-existent bliss where there is only a stress of transitory satisfactions besieged by pain and emotional suffering, to establish infinite freedom in a world which presents itself as a group of mechanical necessities…
"… all Nature seeks a harmony, life and matter in their own sphere as much as mind in the arrangement of its perceptions. The greater the apparent disorder of the materials offered or the apparent disparateness, even to irreconcilable opposition, of the elements that have to be utilized, the stronger is the spur, and it drives towards a more subtle and puissant order than can normally be the result of a less difficult endeavour.[3]

But the dialectic of progress that evolutionary Nature utilizes to achieve her ends is a difficult lesson for us; it is one that we would in fact prefer to ignore. Or, perhaps it is because of our ignorance and unwillingness to learn, that she chooses to use this method.

However that may be, it is by negation that she affirms and by destruction that she creates, as Sri Aurobindo stated unequivocally in those first pages, in 1914:

> In our world error is continually the handmaid and pathfinder of Truth; for error is really a half-truth that stumbles because of its limitations; often it is Truth that wears a disguise in order to arrive unobserved near to its goal.[4]

> The world today presents the aspect of a huge cauldron of Medea in which all things are being cast, shredded into pieces, experimented on, combined and recombined either to perish and provide the scattered material of new forms or to emerge rejuvenated and changed for a fresh term of existence. ...For the march of Nature is not drilled to a regular and mechanical forward stepping. She reaches constantly beyond herself even at the cost of subsequent deplorable retreats. …And these self-exceedings are the revelation of that in her which is most divine or else most diabolical, but in either case the most puissant to bring her rapidly forward towards her goal.[5]

The First World War was then upon us, soon to be followed by the Holocaust and Hiroshima. These were followed, in turn, by the liberation of many new nations formerly subjugated by Colonialism, and the ascendancy of the civilization of affluence, with Germany and Japan, ironically, near the top. It appears that the will to power evolved rapidly in these cases, from a lower, infrahuman and destructive form into a form of creativity, efficiency and excellence. Perhaps a reverse paradox might be represented historically by the invention and widespread use of antibiotics during and after World War II, followed by the exponential increase of the human population from 2.5 billion in 1950 to over 6 billion in 2000. (It had already almost doubled from 1.6 billion at the turn of the century, largely in response to the spread of mechanized agriculture.) If, as a result of the population explosion, pollution, global warming, and the depletion of natural resources this "progress" were to bring an end, or a rapid decline, to our species, we might see a parallel with the end of the age of the dinosaurs, which apparently made room for the rise of primates just a few million years later. This pattern of reversals would apparently illustrate and be the justification for what Sri Aurobindo terms, poetically, Nature's harsh economy, and yet the indication of a process of change that is neither random nor arbitrary, but is rather characterized by order and purpose. It is one in which Nature sets up the oppositions necessary to create the circumstances, structures, conditions for the emergence of that next stage of development, without which her processes could not continue to evolve. Therefore it might be said, to reaffirm the theoretical insights of critical thought with Sri Aurobindo's more holistic, spiritual vision: if the apparent oppositions are terms of Nature's intentional process, there are in fact no oppositions.

Could it perhaps then be said, that the extraordinary developments of scientific thought, knowledge, and technology in the 20th Century have set the stage for the further evolution of consciousness, not so much by what they have accomplished for humanity and the Earth, but rather by having created the possibility of such catastrophic circumstances that survival can only be achieved by overcoming and transcending this "intelligent human"

with his righteous violence? Such speculation is at least not out of place in the context of the English literary traditions of Blake and Huxley to which Sri Aurobindo's prophetic writing might also be said to belong.

Uncertainty and Complementarity

In 1914, Sri Aurobindo wrote, in the context of his speculations about the development of scientific thought, "It will be evident that essential Matter is a thing non-existent to the senses and only… a conceptual form of substance; and in fact the point is increasingly reached where only an arbitrary distinction in thought divides form of substance from form of energy."[6] He was making a comparison between the truths of the ancient Vedic knowledge and the new discoveries of modern science, for the purpose of illustrating a possible trend of the latter towards "a Monism which is consistent with multiplicity, towards the Vedic idea of the one essence with its many becomings."[7] And then, within a few short paragraphs, he formulated the integral knowledge, towards which science only now, at the beginning of the next century, tentatively begins to move: "Life…begins to reveal itself as an obscure energy of sensibility imprisoned in its material formulation; and when the dividing ignorance is cured which gives us the sense of a gulf between Life and Matter, it is difficult to suppose that Mind, Life and Matter will be found to be anything else than one Energy triply formulated, the triple world of the Vedic seers. Nor will the conception then be able to endure of a brute material Force as the mother of Mind."[8] As we shall see, this understanding is still a step before which scientific thought hesitates. And the one beyond, the final destined leap, it does not yet dare to think: "The Energy that creates the world can be nothing else than a Will, and Will is only consciousness applying itself to a work and a result."[9]

Einstein had published the special theory of relativity in 1905 and then developed the general theory of relativity in 1915, definitively altering the traditional conceptions of Space and Time. Commenting on the subsequent development of quantum theory in the 1920s, Capra (1982) says, as if to confirm Sri Aurobindo's prediction, "The most important consequence of the new relativistic framework has been the realization that mass is nothing but a form of energy."[10] And the Nobel physicist, Ilya Prigogine (1984), currently at the forefront of cosmic evolutionary theory, writes: "Quantum mechanics teaches us that… on all levels reality implies an essential element of conceptualization."[11]

The seminal discoveries of quantum mechanics in that theoretical "golden age" of physics in the 1920s, made by Einstein, Bohr, Planck, Heisenberg, Dirac, Schrödinger, etc., have been described by Hawking (2001) as "a new picture of reality" in which, "No longer did any particles have a definite position and speed. Instead, the more accurately one determined a particle's position, the less accurately could one determine its speed, and vice versa."[12] Thus it became uncertain whether matter is something stable and solid or something fluid and in motion. And this "uncertainty principle," as formulated by Werner Heisenberg, has become perhaps the most often cited, because the most profoundly disturbing, discovery of scientific thought in the 20th Century. Let us therefore ask why this should be so, and how it happens to be especially significant in the context of Sri Aurobindo's evolutionary vision.

The theory of relativity presented a conception of the universe in which Space was not a boundless container lasting through an eternal Time, in which material objects move and change in predictable ways. Rather it replaced this static view of the physical universe, which had been held by scientific and philosophical thought at least since Plato and Aristotle, with the view that space and time are relative dimensions of a universe in which everything is in motion. As Capra puts it: "In such a framework space and time are intimately and inseparably connected and form a four-dimensional continuum called "space-time". … Physicists have now lived with relativity theory for many years and have become thoroughly familiar with its mathematical formalism. Nevertheless, this has not helped our intuition very much. We have no direct sensory experience of the four-dimensional space-time."[13] Even physical reality can only be grasped conceptually.

Moreover, with the development of quantum mechanics, which presents a picture that Capra says "clashes with our deepest intuition of reality," subatomic particles, or quanta of matter-energy, do not really appear to exist except insofar as they are defined by observers. Matter is a conceptual form of energy as Sri Aurobindo said. And according to quantum physics, the behavior of this matter-energy is determined by non-local events, as if the "particle" were spread throughout great expanses of space as a "wave" and the existence and behavior of this energy - of which everything is made - is known only through a mathematics of probability. Thus, the principle of uncertainty, defines a dynamic world that appears to be, as formulated by Heisenberg, "a complicated tissue of events, in which connections of different kinds alternate or overlap or combine and thereby determine the texture of the whole."[14] Contrary to the conventional, analytical, and mechanistic paradigm, the part is determined by the whole, rather than the other, common sense, way around.

Hawking, who in the late 60s helped to prove, along with Roger Penrose, that space-time had a beginning with the Big Bang and that the universe is continually expanding and evolving, says that Einstein himself refused to accept these bounded implications of his theory, preferring the classical view of a static, essentially unchanging and eternal universe. And of the implications of quantum theory, Einstein reportedly said, "It was as if the ground had been pulled out from under one, with no firm foundation to be seen anywhere, upon which one could build."[15]

And so, the universe at bottom is not mechanical and not made up of well defined building blocks (atoms, quarks, etc.), with cause and effect relationships that determine the whole in predictable ways, but is rather a whole which determines its parts through an interconnected web of vast energy fields, and this whole appears to be somehow self-determining, and unpredictable by our way of understanding. Several troublesome implications seem to follow. One is that, if the universe is not deterministic and predictable, it must be ultimately random, chaotic, irrational; another is that, if we can neither know nor determine the structures and processes of Nature with certainty, then we haven't much reason for hope. It would seem that we are led necessarily to a position of existential nihilism. And in fact, the 20th Century has often been characterized as such an irrational age of nihilism, by the apparently waning light of its rational intellect.

However, our mathematical understanding of the physical universe has also led to a very impressive sort of control, extraordinarily effective within certain limits, and we are able to construct quite an orderly "picture" or "concept" of this uncertain "reality." As Hawking says, the quantum laws of physics have been "the basis of modern developments in chemistry, molecular biology, and electronics, and the foundations for the technology that has transformed the world in the last fifty years,"[16] referring of course to such devices as digital computers and laser technologies. In addition, the visionary inclinations of many scientists has tended more and more toward the conclusion that the universe is not only orderly and self-determining, but it evolves in ways that tend to produce consciousness. It would seem that Niels Bohr, in formulating the principle of complementarity as a corollary to the uncertainty principle, had given a nod to the idea with which we began: that the contrariness of Nature is quite meaningful in its results. Bohr's principle suggests that both terms of any empirical duality, such as particle/wave, position/velocity, space/time, structure/process, order/chaos, stability/change should be recognized, measured, and considered holistically as multiple aspects of a unity. Thus the uncertainty principle leads us in fact to a more complete and complex grasp of reality.

Evolution and Consciousness

Many scientists, including especially Capra, Prigogine, Penrose, and others who have applied the principles of uncertainty and complementarity, analogically and metaphorically as well as computationally, in the domains of physics, chemistry and biology, have been led to the paradoxical proposition that apparently stable structures in nature are the product of processes of constant energy transformations at all levels: subatomic, molecular, and biological. According to Prigogine's theory of dissipative structures, all physical systems, from electromagnetic fields to molecules, weather systems to amino acids, cells and organs to organisms, are self organizing and self replicating as a result of energy flowing through their systems. The structures of physical systems reproduce their own stable forms through constant structural interactions with their environment. Such self-making, self-sustaining structural transformations are on-going within and between organisms, according to this theory, exhibiting patterns of deliberate response and reaction, memory and choice, which are thought to be parallel to and indicative of mental processes, or intelligent behavior. The ability of organisms to co-exist and co-evolve, through processes of non-local energy-field causation, whether at the quantum, biological or mental levels, and at moments of extreme disequilibrium to diversify or evolve new structures and processes of ever greater complexity and viability, is leading some scientists to conclude that the organization of life itself is in fact a kind of mental process. As Capra puts it in *The Web of Life – A new scientific understanding of living systems* (1996):

> To understand the nature of life from a systemic point of view means to identify a set of criteria by which we can make a clear distinction between living and nonliving systems. …the recent formulations of models of self-organization and the mathematics of complexity indicate that it is now possible to identify such criteria. The key idea of my synthesis is to express those criteria in terms of the

> three conceptual dimensions, pattern, structure, and process. …I propose to understand autopoiesis, as defined by Maturana and Varela, as the pattern of life; …dissipative structure, as defined by Prigogine, as the structure of living systems; …and cognition, as defined by Gregory Bateson and more fully by Maturana and Varela, as the process of life. …Autopoiesis (self-making) and cognition (process of perceiving and knowing) are two different aspects of the same phenomenon of life. In the new theory all living systems are cognitive systems, and cognition always implies the existence of an autopoietic network.(p.160)

Although these theories are still based on observable physical, chemical, and biological processes, and as such remain materialistic and structural theories, it is clear that the wave-fluctuations of this line of thought, from Heisenberg and Bohr to Capra, Prigogine, and Penrose, approach that knowledge of which Sri Aurobindo spoke, and perhaps herald a time when, as he said, scientific knowledge would reach conclusions similar to those of the Vedas. It seems that matter, life, and mind are in fact beginning to be understood as different formulations of one unknown Energy. But a strong reductionist bias is still evident, even in Capra's attempts to formulate a synthetic, unified theory of life and mind, and even more so in Hawking's positivist version of anthropocentrism.[17] Maturana and Varela, two scientists of consciousness whose work forms a substantial part of Capra's synthetic point of view, state the bias unequivocally: "as scientists we can only deal with unities that are structurally determined."[18] And in their interpretation of apparently conscious linguistic behavior, they state the qualifying paradigm "to operate in languages is to operate in a domain of congruent, co-ontogenic structural coupling."[19] What this means is that what the observer perceives and interprets as linguistic behavior in animals is accompanied by a parallel but dissimilar underlying set of nervous and muscular system behaviors characterized as "structural coupling." For these scientists, there is ultimately no difference between structural coupling and conscious behavior or "cognition;" the latter is reduced to the former.

The next step that Sri Aurobindo predicted, "at which stage of development the conception of material Force as the mother of Mind would not be able to endure," has obviously not occurred. If it had, instead of reducing consciousness to structural coupling or an emergent quantum event, there would be the realization that Consciousness was the first principle, from which the structures and processes of the universe proceed, rather than being the penultimate outcome of those physical processes. This next step would make it evident that the reason why stable structures appear to evolve in matter by means of self-determining processes, and why patterns or forms persist without change even though everything of which they are composed is constantly changing, is that there is a Will in them, infinitely diverse and omnipresent, a will of self-manifestation and self-being, and not a merely physical evolutionary dynamism, whether inherently one of chance/necessity or of chaos/order.

This is a form of understanding that is of course more characteristic of philosophy than of science, especially if we look back to the time, in ancient Greece, and perhaps as early as Vedic India, when the distinction between these modes of thought was not yet clearly defined. Aristotle's works are burdened throughout with the attempt to understand the

relationship between form, which is apparently unchanging, and matter, energy, motion, which are the elements of change from potential to actual form. And at that time the distinction was also not being made between form as such, and form as *concept* derived from perceptions and observations of the material world; the idea that the material world is separate from mind, or consciousness, had not yet intervened in the history of knowledge. For Aristotle, who was a biologist, mind was a form of nature whose activity was to know and understand other forms like itself. And especially important to the history of knowledge, the idea had also not yet intervened that our measurements of matter, energy, motion – and on a macro level, patterns, structures, processes - tell us what "reality" is. For the ancient thinkers, the world of stable forms and values that we experience, and that the invisible physical micro-world of change upholds, was the reality. This inversion of the known and unknown, and the reduction of form to mechanical forces or subatomic measurements and mathematical probabilities has been precisely the work of modern scientific thinking.

It would be ironic indeed, if as Hawking and others seem to half-seriously suggest, the universe had necessarily to evolve from an invisible world of Platonic forms (extradimensional space) into a world of Platonic solids (mathematical constants), and through all the forms of carbon-based life and mind, in order for physicists to be able to now reduce everything to a knowledge framework of probabilities, parallel universes, and imaginary dimensions of time – a version of the "anthropic principle". But Hawking's colleague, Roger Penrose, seems to have reached a considerably more serious point of departure in the search for ultimate principles, and one quite pertinent to our present concerns. In his book *Shadows of the Mind – A search for the missing science of consciousness* (1994), Penrose states:

> If Einstein's general relativity has shown how our very notions of the nature of space and time have had to shift, and become more mysterious and mathematical, then it is quantum mechanics that has shown, to an even greater extent, how our concept of *matter* has suffered a similar fate. Not just matter, but our very notions of actuality have become profoundly disturbed. How is it that the mere counterfactual *possibility* of something happening – a thing which does not actually happen – can have a decisive influence on what actually *does* happen? There is something in the mystery of the way that quantum mechanics operates that at least seems much closer than is classical physics, to the kind of mystery needed to accommodate mentality within the world of physical reality. I have no doubt myself that when deeper theories are at hand, then the place of mind in relation to physical theory will not seem so incongruous as it does today. (p.419)

Penrose argues in his book that consciousness – which he defines as awareness, understanding, and will or intention – will be explainable when physical science itself evolves its own theories and methods beyond their present limitations, because consciousness is beyond any possibility of computational understanding. And yet he believes that the ground of consciousness will ultimately be found at the interface between the world of quantum effects and the world of biological structures. While still adhering to the reductionism and structuralism characteristic of the scientific paradigm,

he is able to foresee the possibility of an entirely new understanding yet to come: "For physics to be able to accommodate something that is as foreign to our current physical picture as is the phenomenon of consciousness, we must expect a profound change – one that alters the very underpinnings of our philosophical viewpoint as to the nature of reality."[20]

Perhaps what this means is that the next quantum leap in consciousness, one foreseen by Sri Aurobindo as necessary in order to resolve the dilemmas of matter and mind, will be an even more disturbing paradigm shift than the ones already brought about by the new physics of the 20th Century. In Sri Aurobindo's interpretation of the Vedic cosmology, everything in the universe, from the physical to the mental plane, is an expression of the will-force of consciousness. Therefore it is possible that the non-computational interface between the quantum world and cellular structures theorized by Penrose, which brings about the "objective reduction" of quantum reality to the real-time world of phenomena that we know, is one level where consciousness-will can indeed, in some sense be "found." Penrose's intuition is that the phenomenon of objective reduction will be related to quantum gravity; although his intuition that this phenomenon must be or require a Force is probably true, it is likely to be a Force that is as yet unknown to science. To observe this phenomenon will require a movement of consciousness toward such an understanding, which is not currently a movement characteristic of science. At the beginning of his discussion of this possibility of scientific knowledge, Sri Aurobindo said, "If modern Materialism were simply an unintelligent acquiescence in the material life, the advance might be indefinitely delayed. But since its very soul is the search for Knowledge, it will be unable to cry a halt; as it reaches the barriers of sense knowledge and of the reasoning from sense knowledge, its very rush will carry it beyond and the rapidity and sureness with which it has embraced the visible universe is only an earnest in the conquest of what lies beyond, once the stride is taken that crosses the barrier."[21]

The "stride" that Sri Aurobindo hints at here, and which he refers to in the same context as being "attainable by a supreme effort of consciousness" but also as "escaping the grasp of our thought and speech, instruments which proceed always by the sense of difference and express by the way of definition" implies another methodology than the one normally employed by science, which is always based on observation of the external world, on "sense-knowledge", and on reasoning from that knowledge, even if it is sometimes accompanied by a more global phenomenon of inspired seeing. The proposed methodology entails a process often referred to by Sri Aurobindo as a transformation of consciousness. Vedic knowledge apparently used that method and was of that type. But it was at the same time not "other worldly." It was, however, "spiritual knowledge" achieved by a supra-mental consciousness which can know the world from within. It is knowledge of the Self, which is one with everything in time and space because everything is essentially That. This is obviously a rather mystical view of things, and yet the philosophy of evolution proposed by Sri Aurobindo, in which consciousness and force, spirit and matter are complementary, non-dual polarities at each level of existence – physical, vital, mental, and spiritual – has as its foundation precisely this premise. And such a theory is in fact consistent with the underlying connectedness and evolutionary self-determination of everything in the universe, as proposed by quantum physics. What

is missing from that theory is the principle that would explain the emergence of a highly ordered self-determining physical universe in the first place, and then the emergence of life and consciousness from such a material base. Sri Aurobindo's basic argument for the evolution of consciousness in a material universe is that it could not happen from an inconscient base; consciousness must be a fundamental principle of the universe itself in order for it to emerge; it is "a self-involution of Consciousness in form and a self-evolution out of form." Therefore the fundamental complementarity of consciousness-force provides an explanation at every level of the order that exists in the observable universe, and of every other complementarity that we can identify as being essential to an adequate understanding of things. In this vision of reality, the ancient and modern dualities that have always presented insoluble paradoxes, such as form and substance, stability and change, chaos and order, life and death, self and other, are finally resolved into unities rather than contraries.

Do the current limitations of our knowledge therefore indicate something essential about the limited nature of "mind," or do they indicate an essential indeterminacy and consequent unknowability in the nature of "reality?" Both of these questions, surprisingly, must be answered in the negative. The sense mind, the rational mind, and the inspired imagination, etc., as we know them, are limited, but the limitations are evolutionary, temporal, structural limitations; they are not essential. And the indeterminacy of processes, beyond the conservation of structural histories and patterns of adaptation, especially at the point of disequilibrium where novel forms can emerge, does not make them essentially unknowable simply because they are non-computational. Reality is infinitely complex but it is also only What Is; the evolutionary structures at every level of matter, life, and mind are only structures *of consciousness*, knowable by the Self through Identity. But that requires the evolutionary emergence of another potential of consciousness beyond mind, which Sri Aurobindo chose to call "supermind." In his descriptions of its characteristics, he speaks of the necessity of realizing in oneself an extraordinary force of concentration, an absolute stillness, and a cancellation of the mind's normal patterns of reactions and responses to external stimuli. It is a process in which the personal will merges with the universal Will, the individual mind with universal Consciousness.

So, if we ask then, Is reality Finite or Infinite? the Unchanging or Change? Being or Time? Spirit or Matter? Substance or Form?, the answer in every case is "both," although any particular definition will depend on the point of view, just as Heisenberg said. And after a century of unparalleled advances in both scientific and spiritual knowledge, a scientific mind like Prigogine's can therefore now think, along with the mystic philosopher:

> Each great period of science has led to some model of nature. For classical science it was the clock; for nineteenth-century science, the period of the Industrial Revolution, it was an engine running down. What will be the symbol for us? ...In some of the most beautiful manifestations of sculpture, be it in the dancing Shiva or in the miniature temples of Guerrero, there appears very clearly

> the search for a junction between stillness and motion, time arrested and time passing. We believe that this confrontation will give our period its uniqueness. [22]

During the brief period of historical time known as the 20th Century, as the discoveries of the new physics were taking place, and Sri Aurobindo's discovery of the supermind was being formulated, in the forefront of the "human sciences" also many barriers of consciousness were receding: Husserl wrote *The Idea of Phenomenology* in 1907 and *The Crisis of European Sciences and Transcendental Phenomenology* in 1933. Freud published his theory of the three-fold structure of mind in 1923, Heidegger published *Being and Time* in 1927, Whitehead's *Process and Reality* was published in 1929. And one could go on: Merleau-Ponty's *Phenomenology of Perception* in 1945, Jean Gebser's *The Ever-Present Origin* in 1949/53, Sri Aurobindo's later works,1940-50, Heidegger's writings on technology and language,1950-60, to the newer physics of the 1960s, the post-structural philosophies of the 1970s, the quantum biology of the 1980s, and the super-technology of the 1990s.

As we shall perhaps see, if we explore in greater detail the explosion of ideas that characterized this epoch in the development of thought, within the context of the century's equally dramatic "outer" developments, the arc of the entire project of human consciousness throughout may appear to have been delimited by one evolutionary formula for human advancement: to reconcile Spirit and Matter. To achieve the realization of their unity; to consciously perceive the stillness and force that combined constitute the essence of the infinite energy of existence; and to know directly by a "supramental consciousness" - one with the world it perceives - that unity and diversity, identity and difference are the principles of all Being in Time, could be the outcome of the pursuit of Knowledge, as Sri Aurobindo indicated. But for it to be so, he said, the human mind "must traverse the degrees which our inner consciousness imposes on us and, whether by objective method of analysis applied to Life and Mind as to Matter or by subjective synthesis and illumination, arrive at the repose of the ultimate unity without denying the energy of the expressive multiplicity."[23] A study of the 20th Century in relation to the vision of Sri Aurobindo should reveal the progress made along this arc of potential human development, and also give us a clear indication of the distance still to be traversed if we are to complete the journey.

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10. Fritjof Capra, *The Turning Point*, p.90
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12. Stephen Hawking (2001), *The Universe in a Nutshell*, p.12
13. Capra, op.cit. p.89
14. Capra, op.cit., p.81
15. Capra (1996), The *Web of Life*, p. 39
16. Hawking, op.cit., p.26
17. Hawking (op. cit. p.85) gives this rather droll characterization of the anthropic principle: "While it may be that intelligent beings can evolve without galaxies and stars, this seems unlikely. …The anthropic principle says that the universe has to be more or less as we see it, because if it were different, there wouldn't be anyone here to observe it." And although he frequently equates the physical universe with "reality," he qualifies his position as a positivist in a manner that is pertinent here (p.59): "From the viewpoint of positivist philosophy, one cannot determine what is real. All one can do is find which mathematical models describe the universe we live in. It turns out that a mathematical model involving imaginary time predicts not only effects we have already observed but also effects we have not been able to measure yet nevertheless believe in for other reasons. So what is real and what is imaginary? Is the distinction just in our minds?"
18. Humberta Maturana and FranciscoVarela (1987), *The Tree of Knowledge – The biological roots of human understanding*, p.96
19. Ibid., p.211
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Appendix 2

Biology and the Philosophy of Evolution: Darwin and Sri Aurobindo

The theory of evolution

When Sri Aurobindo was a student in London and later at Cambridge, Herbert Spencer was one of the most influential philosophers of the day. He coined the term "survival of the fittest" and taught that material evolution was universal, developed according to necessary laws, and was caused by the persistent pressure of an infinite and absolute force; T. H. Huxley was a prominent intellectual of the same time and place, a widely read and listened to defender of Darwin against the religionists, and president of the Royal Society, who concluded that human evolution was more dependent on ethical mentality than physical prowess, and coined the term "agnosticism" to accommodate the spirit of skepticism. And when Sri Aurobindo returned to India and was a young professor of French, Henri Bergson's philosophy of matter and mind (1896), and of

intuition and creative evolution (1907) became influential in both Europe and America, and eventually garnered him the Nobel Prize. At the same time, the "monistic" philosophy of matter and mind of the contemporary German evolutionary biologist and philosopher, Ernst Haekel, was published in English in1900. This author and his work were among the very few sources ever cited by Sri Aurobindo. One may conclude from such historical observations that it was at least no accident, and perhaps it was the time-spirit of the early 20th Century and its destiny, that Sri Aurobindo – gifted scholar, poet, and philosopher – would bring to his interpretation of Vedanta the most interesting and revolutionary thought of the day. The time-spirit was avidly seeking a synthesis of knowledge about the physical universe, the phenomenon of life, and the workings of the mind. The theory of evolution provided a context for such a synthesis.

Let us enquire then, more specifically, into the nature of the questions posed by this compelling urge that defined the thought of the early 20th Century. In addition to existence itself, and the physics of the material universe that we have already reviewed, two of the most engrossing and intractable questions of science and philosophy flowed – then and now – from two fundamental intuitions that we take for granted: the evolution of life from simpler forms at earlier periods to more complex forms at later periods, and the emergence of human consciousness – or mind, in the forms of mental awareness, thought and knowledge. We must presume, as believers in either spiritual or scientific materialism - and the interconnectedness of all things - that the latter phenomena of consciousness are the product of the same processes that produced the infinite varieties of the former: living organisms endowed with such perceptual faculties as sight and hearing. Based on innumerable observations of the structures of life, from the fossil record to the genetic code, Darwin's general theory of evolutionary descent through variation and natural selection has repeatedly been confirmed as the most reasonable explanation for the emergence of all the structures of life, including mind. The problem remains, however, that we do not directly observe the mechanisms of evolution that have theoretically operated during vast periods of deep time, and we also have not been able to observe a direct relationship between the physico-chemical processes and structures underlying life and the less observable phenomenon of consciousness. Our knowledge is still incomplete, and the mind-body problem is therefore just as interesting and vexing for both science and philosophy today as it was for Aristotle, Aquinas, and Descartes.

What is most amazing, perhaps, is that these questions of origin and process have been with us for so long, and yet we still do not have satisfactory answers, in spite of such truly extraordinary advances in science and technology as particle accelerators, laser spectrometry, the electron microscope, and the information micro-processor. The processes of human consciousness that have apparently evolved in the last 40,000 years, and especially since the 5th century BCE, created tools of observation that greatly enhance our powers of induction and deduction, and yet we are not able to adequately observe and explain the most essential and fundamental aspects of our own nature. Such intractable problems of perception and understanding have been among the primary goads of modern philosophy and science at least since Hume's *Treatise on Human Nature* (1734), Kant's *Critique of Pure Reason* (1781), and Hegel's *Phenomenology of Mind* (1807), but these were neither the first attempts nor the last to grasp the profoundest

mysteries of life and mind. Among the earliest were Aristotle's *On the Generation of Animals* and *On the Soul* (340 BCE), Parmenides' *On Nature and Being* (5th Century BCE), and in India the *Darsanas* of the 6th and *Upanishads* of the 8th Centuries BCE. These attempts perhaps marked the beginning in recorded history of the human will to understand what still vexes and compels us some 3000 years later. The more recent attempts are well known: Darwin, Huxley, Bergson, Sri Aurobindo, and the many imminent neo-darwinians of our era.

There has been progress, without a doubt, since *The Origin of Species* (1858) and *The Descent of Man* (1871). Much that was not known then, about both the fossil record and genetics, has been discovered in support of Darwin's theory during just the last quarter of the 20th Century. And since the heliocentric theory of Copernicus displaced the Ptolemaic and Platonic cosmology, immeasurable gains have been made in comprehending the universe as a whole. There has been a sort of vertical, qualitative, convergence of knowledge and technology, since the 17th Century and especially in the 20th Century, that has made most of the observable workings of nature and the cosmos transparent to human inspection and analysis. And there has also been, at the same time, a horizontal, quantitative, dissemination of knowledge that has informed humanity on a much larger scale than ever before. How many thousands would have read the works of Isaac Newton in his lifetime, or perhaps tens of thousands the works of Darwin, while today millions read the works of Richard Dawkins and Stephen J. Gould? And what better indication of the perpetual quandaries presented by the facts of evolution and consciousness than the disagreements between those two contemporary experts on Darwin's theory, Dawkins and Gould? [1]

Darwin himself expressed the essential quandaries in *The Origin of Species* (6th Ed. 1872), although many of the speculations with which he attempted to address the issues as he perceived them may have less weight today, in the light of more concrete contemporary evidence and technologically informed speculation; yet the basic problem was already clear – evolution implies a degree of complexity that exceeds our intellectual grasp. In his first treatises he opened the debate between the strict gradualist and adaptationist views, so popular today, and the more pluralist interpretations of his theory of variability, inheritance, and natural selection championed today by the critics of strict adaptationism. And because they continue to embroil the best minds in the field, it is necessary to examine this divergence for a better understanding of the on-going dilemma. What are the factors that determine the processes of variation and adaptation, what is the relationship between the genome of a creature and its environment, what is the relationship between genetic processes and the vast diversity of phenotypic structures and behaviors that we observe in nature? Are our mental creations really a product of genetic chemistry? These are questions that remain open to exploration and discovery today, long after Darwin and Sri Aurobindo pursued them.

Darwin tentatively observed and speculated, more than a century ago, that: "Changed conditions of life are of the highest importance in causing variability, both by acting directly on the organization, and indirectly by affecting the reproductive system. It is not probable that variability is an inherent and necessary contingent, under all circumstances.

The greater or less force of inheritance and reversion determine whether variations shall endure. Variability is governed by *many unknown laws*, of which correlated growth is probably the most important. Something, but how much we do not know, may be attributed to the definite action of the conditions of life. Some, perhaps a great, effect may be attributed to the increased use or disuse of parts. The final result is thus *rendered infinitely complex*." [2]

The causes of variation, in Darwin's strikingly perceptive view, are governed by unknown laws and are infinitely complex, and he admitted that we are not able to observe precisely what ultimately determines the outcomes of the processes of evolutionary change. We should remember that at the time of his writing nothing was known about the genome and the mechanism of heredity was attributed simply to the "germ plasma". But, nevertheless, he confidently asserts that the net result of the unknowns, however complex, may be attributed in general to the process of "natural selection": "Over all these causes of Change, the accumulative action of Selection, whether applied methodically and quickly, or unconsciously and slowly but more efficiently, seems to have been the predominant Power."

From the processes that he was able to perceive, from the fossil record, from domestic breeding practices, and from embryonic development, etc., he could infer a sort of final cause or first principle that governs the process as a whole. We too can easily observe the same continuous patterns of variation and descent among the phyletic order of species, and we may assume there is one overriding law of nature to which such variation may be attributed. What Darwin meant by his omnipresent power of Natural Selection was clearly explained by him in the chapter of the same title in the *Origin* where he provides a framework for all future discussions of his hypothesis: "Let it also be borne in mind how infinitely complex and close-fitting are the mutual relations of all organic beings to each other and to their physical conditions of life; and consequently what infinitely varied diversities of structure might be of use to each being under changing conditions of life. Can it, then, be thought improbable, seeing that variations useful to man have undoubtedly occurred (*in the laboratory*), that other variations useful in some way to each being in the great and complex battle of life, should occur in the course of many successive generations (*in nature*)? If such do occur, can we doubt (remembering that many more individuals are born than can possibly survive) that individuals having any advantage, however slight, over others, would have the best chance of surviving and of procreating their kind? On the other hand, we may feel sure that any variation in the least degree injurious would be rigidly destroyed. This preservation of favorable individual differences and variations, and the destruction of those which are injurious, I have called Natural Selection, or the Survival of the Fittest." [3]

The sequence of events, life forms, lineages "ascertained by us" through empirical observation of the natural world throughout deep time is a closely related and interdependent descent of organisms, structures and functions, and because we perceive in it a continuum of outcomes, to which a great variety of natural processes have apparently contributed, we may confidently assign to this amazingly vast complexity of natural processes, along with Charles Darwin and his followers, one overarching

explanatory term for the plethora of variations observed: the law of Natural Selection. After 150 years of unparalleled scientific progress Darwin's comprehensive intuition of the matter still holds good. We know that evolution occurs, and we know that there is a process of selection at work in Nature. Moreover, Nature has, or perhaps "is", the power to select *optimal* structural solutions to her problems of survival; she often apparently also prefers beautiful, as well as useful, solutions – to name only two of the many qualities we value in nature; she has produced a vast variety of designs, from the simplest to the most complex, often with faculties of sight and hearing, and with intelligence and power, with the apparent purpose to preserve and replicate her creations of beauty and utility; and she has finally produced highly intelligent (if not quite omniscient), mental beings, capable of knowing and communicating, with depth and eloquence, her amazing achievements. With this scientifically validated understanding we may find ourselves confirmed in our sense of connectedness with all living things, as well as in our justifiable awe at the grandeur of the natural world in which our lives are grounded.

The similarity between the so-called theological argument from design, - which has been used by scientists and philosophers for millennia to prove the existence of an invisible intelligent agency (God) on the basis of an otherwise unexplainably wonderful and infinitely complex world of nature, - and this more economical scientific view which simply attributes the hidden power to Nature itself, is outstandingly evident in the work of Darwin, as well as in that of his more recent followers. Natural Selection serves the ultimate aim of survival just as Intelligent Design serves the ultimate aim of divine perfection. The ultra-Darwinists, such as Richard Dawkins (1982) and Maynard Smith (1999), for example, explain the "mutual organization of all organic beings", as a function of the most fundamental processes of life from the simplest level of genes and chromosomes (the genome), extending out to the most complex structures and behaviors (the phenotypes) of organisms and societies (see fn. 10). From these principles we may infer a vastly unified field of infinitely diverse specialization. These principles of unity, mutuality, and purpose in nature seem to express most accurately the true meaning and spirit of Darwinism; the full understanding and description of their processes is not only a central scientific objective of the school but an inspired mission to reveal the meaning of life. And, as such, it has indeed endowed nature with both meaning and purpose.

The philosophical tendency to settle on an economical and natural simplification of causes and explanations, based on close observation, rather than to add additional magical, spiritual, or speculative explanations, characterizes the modern, scientific approach to knowledge in general. It is this tendency which most distinguishes it from the theological approaches of the eras that preceded it – from Plato to Galileo. Occam's razor, or the law of parsimony, has been applied rigorously and effectively in both science and philosophy, since it was first formulated in the 13th century "Cathedral Schools" of Europe, to eliminate supernatural causes and enhance the importance of observable and demonstrable causes.[4] Thanks to ecclesiastical thinkers like Occam and Aquinas, the way was prepared between 1200 and 1600 for the full emergence of rationality and empirical science. It was an important, and at times perhaps obsessive, aim of Darwin and his followers, to establish the superiority of this way of thinking to the religious and supernatural thought still prevalent at the time they wrote. But the mysteries

of nature's processes, and the limitations of both the empirical and the speculative approaches to ascertaining certain knowledge, still remained just behind the assurances of the rational mind, and they remain today.

Sri Aurobindo and Darwinism

In a series of short essays originally published in his monthly journal *Arya* around 1920-21, Sri Aurobindo stated, in an abbreviated form, many of the fundamental problems of evolutionary theory which he later considered more systematically in his major work, *The Life Divine (1940)*. For example, in "Involution and Evolution", he said this: "The Western idea of evolution is the statement of a process of formation, not an explanation of our being (*note the juxtaposition of "process" and "being"- terms that will define the fundamental problem of philosophy*). Limited to the physical and biological data of Nature, it does not attempt except in a summary or superficial fashion to discover its own meaning, but is content to announce itself as the general law of a quite mysterious and inexplicable energy. …The ancient *(Eastern*) idea of evolution was the fruit of a philosophical intuition, the modern is an effort of scientific observation. Each as enounced (*sic*) misses something, but the ancient got at the spirit of the movement whereas the modern is content with a form and the most external machinery. …The modern scientist strives to make a complete scheme and institution of the physical method which he has detected in its minute workings, but is blind to the miracle each step involves or content to lose the sense of it in the observation of a vast ordered phenomenon. But always the marvel of the thing remains, one with the inexplicable wonder of all existence… We know that an evolution there is, but not what evolution is; that remains still one of the initial mysteries of Nature." [5]

This sums up the critical question with which we have begun this exploration, in order to put Sri Aurobindo's philosophy of evolution in the context of contemporary scientific theory. Although there was a certain openness to the convergence of Western scientific and Eastern philosophical approaches to knowledge during the last decades of the 20th Century in the fields of natural science, this openness was certainly not the case a hundred years earlier. And in fact, as Sri Aurobindo pointed out in his essay, the evolutionary thought of the 19th Century had contributed significantly to "that entire victory of the materialistic notion of life and the universe which has been the general characteristic of the age…" and with it the important corollary effect of "the failure of the religious spirit and the breaking up of religious beliefs." [6]

This dichotomy of approaches – the spiritual and material, or philosophic and scientific – constitutes the basis of the critique with which Sri Aurobindo began his philosophical endeavor to synthesize Eastern and Western thought on the basis of a deep reflection upon both "scientific" and "spiritual" truths. He sought a synthesis and a method by which to handle not only the problems inherent in the theory of evolution and the scientific method, but also a way to unify the basic principles of the structures of consciousness and the cosmos, as a solution to the two types of problem that we have identified – the need for a more adequate understanding and explanation of the phenomena of nature, and the need to discover and develop a power of consciousness

better equipped to attain such knowledge. In other words, he sought to advance both the subjective (knowing) and the objective (known) realms of knowledge.

He began his reflections, as we find in another of his abbreviated essays titled simply "Evolution", with what appears to be a broad visionary grasp of both extremes of the problem – the mechanics of evolution on one end, and their principles and meaning on the other end, and he then proceeded to define the unifying solution. For example, he wrote: "The general idea of evolution was the filiation of each successive form or state of things to that which preceded it, its appearance by process of out-bringing or deploying of some possibility prepared and even necessitated by previous states and previous tendencies. Not only does a form contain the seed of the form that reproduces it, but also the seed of the possible new form that varies from it. By successive progression a world-system evolves out of the nebula, a habitable planet appears in an uninhabitable system, protoplasmic life emerges by some yet unknown process out of Matter, the more developed grows out of the less developed organism. …Force in Matter is the unconscious Goddess who has worked these miracles by her inherent principle of natural adaptation and in the organism by the additional machinery of heredity; by natural selection those species which reproduce new characteristics developed by adaptation to the environment and favourable to survival, tend to propagate themselves and remain; others fall back in the race of life and disappear." [7]

Then, after this seemingly accurate, contemporary account of the matter, corresponding closely to the views of both Spencer and Darwin, he provided a critical supplement based on the perspective of Indian philosophy: "In the first place, the materialist theory of evolution starts from the Sankhya position that all world is a development out of indeterminate Matter by Nature-Force, but it excludes the Silent Cause… it conceives the world as a sort of automatic machine which has somehow happened. …Force in indeterminate Matter without any Conscious-Soul being all the beginning and all the material of things, Mind, Life and Consciousness can only be developments out of Matter and even only operations of Matter. …More and more the march of knowledge leads towards the view that the three (*Matter, Life, Mind*) are different forms of force, each with its own characteristics and proper method of action, each reacting upon the other and enriching its forms by the contact. …If this be the truth, then the action of evolution must be other than has been supposed. For example, the evolution of Life in Matter must have been produced by a Life-principle working in and upon the conditions of matter and applying to it its own laws, impulses, necessities. …The other idea of a still mightier Mind working in Life and upon it has not yet made sufficient way because the investigation of the laws of Mind is still in its groping infancy."[8]

In order to build his case for this more philosophical perspective on evolution which was also adopted by Bergson and Whitehead, and has in fact become more and more widely accepted today, Sri Aurobindo listed a number of exceptions to what has become known as the strict adaptationist interpretation of Darwin. Sri Aurobindo's early observations actually support the more pluralistic stance and broader perspective on the question, which has recently been popularly championed by a diverse group of scientists at Harvard such as Gould, Lewontin, and Mayr. Then, Sri Aurobindo provided the

metaphysical perspective that turned the theory on its head. Intelligence, consciousness, mind are not the outcome of a blind mechanical process; they are principles inherent in matter from the start. And with this move, Sri Aurobindo also turned the conventional spiritual point of view, along with the materialist point of view, on its head as well, in much the same way that Marx had done with the spirituality of Hegel, and Nietzsche with the idealism of Plato and Kant. Let us review and deconstruct Sri Aurobindo's criticism of the questionable ideas of evolution and his own speculations, as he formulated them in 1920.

The dualistic dilemmas

1. Survival of the fittest - "The idea of the struggle for life tends to be modified (*in the contemporary theories of 1920*)… This modification is a concession to reviving moralistic tendencies… Not struggle for life only. The real law, it is now suggested, is rather mutual help or at least mutual accommodation. Struggle exists, mutual destruction exists, but as a subordinate movement, a red minor chord, and only becomes acute when the movement of mutual accommodation fails and elbow-room has to be made for a fresh attempt, a new combination." [9,10]
2. Heredity - "Equally important are the conclusions arrived at by investigators into the phenomena of heredity that acquired characteristics are not handed down to posterity and the theory that it is chiefly predispositions that are inherited; for by this modification the process of evolution begins to wear a less material and mechanical aspect; its source and the seat of its motive-power are shifted to that which is least material, most psychical in Matter." [11] "…The propagation of acquired characteristics by heredity was too hastily and completely asserted; it is now perhaps in danger of being too summarily denied. Not Matter alone, but Life and Mind working upon Matter help to determine evolution. …When the mind-world and life-world are ready, they are poured out freely on fit recipients. This is the reason why it is predisposition that is chiefly inherited. The psychical and vital force in the material principle is first impressed; when that has been done on sufficient scale, it is ready for a general new departure and an altered heredity appears." [12] (The evolutionary philosophy of Konrad Lorenz in 1970 seems to support this idea, as does the Chomskian theory of pre-existent cognitive structures such as language.) [13]
3. Gradualism and punctuated equilibrium - "Instead of slow, steady, minute gradations it is now suggested that new steps in evolution are rather effected by rapid and sudden outbursts, outbreaks, as it were, of manifestation from the unmanifest. Shall we say that Nature preparing slowly behind the veil, working a little backwards, working a little forwards, one day arrives at the combination of outward things which makes it possible for her to throw her new idea into a realized formation, suddenly, with violence, with a glorious dawning, with a grandiose stride? And that would explain the economy of her relapses and her reappearances of things long dead. She aims at a certain immediate result and to arrive at it more quickly and entirely she sacrifices many of her manifestations and throws them back into the latent, the unmanifest, the subconscient." [14]

4. Materialism and Idealism – "Again, the materialist theory supposes a rigid chain of material necessity; each previous condition is a co-ordination of so many manifest forces and conditions; each resulting condition is its manifest result. All mystery, all element of the incalculable disappears. …Once more the conclusion is too simple and trenchant; the world is more complex. …European thought already tends to posit behind all manifest activity an Unmanifest called according to intellectual predilection either the Inconscient or the Subconscient which contains more and in a way unseizable to us, knows more and can see more than the surface existence. Out of this Unmanifest the manifest constantly emerges." [15]
5. Vitalism, Idealism and Science – "Theories of vitalism, idealistic tendencies of thought, which were supposed to have been slain by the march of physical science, now arise, dispute the field and find their account in every change of scientific generalization which at all opens the way to their own expansion and reassertion. In what respects then is it likely that the evolution theory will be found deficient by the wider and more complex thought of the future and compelled to undergo essential changes?" [16]

Toward an integral deconstruction

1. Mutual help is thought to be "superior" to struggle and competition. This is the typical pattern of binary, "logocentric" thought.[17] The former turns out to be the product of the latter, however. In human societies the elite class benefits from technology that raises the standard of living for the workers to a comparable level of affluence, after centuries of struggle. But, as the dominant species of top feeders deplete the food chain base, they may again resort to heavy competition – class warfare. In the sea a certain bottom feeder carries a parasite that drives it toward the upper water where it is eaten by a top feeder, and the parasite larvae mature into a worm in the intestines of the top feeder, to later nourish another bottom feeder: competition and mutuality converge on a point. On the horizontal plane, mutuality is a more prevalent pattern; on the vertical, it is competition. It is a matter of perspective, of x/y coordinates and complementarity, not an absolute. Darwin said the "survival of the fittest" meant only that variation and adaptation would naturally select those best fitted for survival within the niches available; he did not give it an exclusively competitive or cooperative economical twist. The opposite value, or consequence of failure to adapt, was extinction, not poverty or penalty.
2. It is implied that the psychical (mental) factor in the empirically observable phenomenon of heredity is superior to the mechanical (physical) factor. What is observable, by inference, is that somehow an organism's characteristics are passed on from the parents to their progeny. "What" is passed on along this vertical plane of ascent/descent is apparently a combination of physical structures and patterns of individual and social behavior. "How" they are passed on is apparently through the horizontal processes of reproduction: cell division, insemination, and embryonic development first, then nurturing, growth, development and adaptation to the environment. The stages of the process seem to follow the vertical path: first primarily physical, then vital, then psychical, with

reference to the passing on of "predispositions" in the individual. But in the horizontal, psycho-somatic world of the phenotype, where selection takes place, the "life-world" and "mind-world" of the shrews 50 million years ago for example – one preferring the smell and feel of mud in its nostrils, another the cool winds and dry crackle of leaves in its ears, leads eventually to the evolution of hippos and tarsiers respectively. Through "predispositions" – which undoubtedly means inner, psychological drives – niches are found, new patterns established, and later genetic variations eliminate former patterns and the structures that support the new patterns are selected. The current view seems to tend toward the idea that the physical is the "carrier" of the vital and mental behaviors, in the sense that the latter horizontal expressions transcribe the former, and the former, vertical transmission records in genetic script the history of the latter: the genotype and phenotype are perfectly complementary. In such a view, Sri Aurobindo's intuition is understandable and essential.

3. There may be an analogy between the spiral dynamics of the social, economic, and cultural human plane of development and the appearance of species along the path of mass extinctions and subsequent explosions of variation, but, like the analogy between bird wings and insect wings, there may be no direct homological relation. There is apparently both a gradual development toward difference and diversity on the horizontal plane of biological evolution during major intervals of time, and periodically a sudden extinction followed by relatively rapid variation into the open niches, on the vertical plane of deep time. In the human, socio-cultural domain civilizations rise and fall, achievements in science and technology are efficient on one arc of the spiral and deficient on another. New varieties of cultural expression emerge that contain elements of the old but also evident advances while some qualities recede. Some then say the past was superior to the future and others the opposite. The theory of evolution seems to imply the superiority of the future, but Stephen Gould and Jean Gebser dispute this idea. Gould (*Full House*, 1996) discounts "progress" on the grounds that many species have been more successful in the past, some more diverse or more plentiful, biological evolution is very gradual and simpler species are generally more successful than more complex ones; cultural evolution is Lamarkian, much more rapid than biological evolution, and directional; it follows the pathways of mind more exclusively, but some cultures have been more artistic, or more powerful, or more technological, or mythological, etc., and none have lasted more than a second in geological time. Gebser *(The Ever-Present Origin*, Eng. trans. 1985) argues that temporal progression is an illusion since the same principles and potentialities are ever-present and merely evolve to different levels of organization. And the levels he describes: archaic, magic, mythic, rational, integral are all on a higher, cultural scale determined by mind. These dissenting views are not static but they imply a different conception of time, which is possibly what Sri Aurobindo was indicating by focusing on leaps and discontinuities.
4. Again, there are mechanical processes in nature, and there is obviously some kind of determinism. But it is not absolute; there is also novelty. It is the desire for control of nature through accurately predicted occurrences from predetermined

causes, the scientific motive, which postulates a principle of mechanical determinism to explain the world. The motive behind such thinking and exploration is clearly the human being's mental and vital interests in achieving social and economic success. But the pursuit of knowledge to achieve this aim has shown again and again that there is no strictly materialistic determinism, or any other kind of absolute determinism. The universe is completely indeterminate on the quantum level, more constrained on the organized life plane where evolution primarily occurs but still characterized by surprising novelty, and comparatively very free on the mental plane, until it tries to organize life and body and then is almost totally constrained. Each plane has its laws and limits. And all three levels constantly interact and alternately predominate in the relationship. Each is limited by its vertical relationships to the others and operates horizontally according to the limitations and freedoms of its own principle. None is absolutely either determined or free. Therefore, in philosophy and psychology, the ideas of essence and existence, potential and actual, ideal and real, subconscious-superconscious, have been developed in the 20th Century to encompass the entire breadth and depth of the interactions of the three worlds, whose inner workings are largely unknown and unseen (occult), but whose outer forms and processes are known and theoretically necessary. The rational mind tries to account for the unseen with stable generalizations: the whole being, its form or essence, its potential, its good. As Aristotle said 2000 years ago, what we "know" about something is what each thing potentially is. The process of its becoming actual constitutes all the dynamics of the space-time physical, vital, mental complex we call Nature. In the end we are left with a very relative kind of understanding of the latter which in itself is ever-changing, which we reduce and enshrine in more or less eternal formulas and symbols, whether scientific or philosophic – our abstract and rather superficial ideas which we pretend are unchanging.

5. When Sri Aurobindo posed this question, Bergson had already published *Creative Evolution* in which he proposed Consciousness as the absolute principle of existence and *élan vital* as its corollary to "matter" - the force that creatively organizes the material world, moving toward intuitive consciousness of the absolute in the material manifestation.[18] In itself this now appears to have been an extraordinary leap of insight, whatever its short-comings may be. But his approach was philosophical; on the basis of scientific knowledge combined with metaphysics, he proceeded through a critique of knowledge itself – epistemology – to an understanding of the evolution of spirit. He determined that the pattern of intellectual abstraction and fixation on stable forms, rather than process, is a limitation that has to be overcome if we are to really understand evolution; another faculty of intuitive knowing has to be evolved. He was followed by Whitehead, who associated himself with Bergson's critique of scientific thought, but developed a more spiritualized version of the world as an organic entity developing in dynamic relationship with an involved superconscient or ideal plane. The resonance between the thinking of these two "process" philosophers and Sri Aurobindo's later philosophy of supra-mental evolution is quite astonishing. What all three attempted was a theory of reality based on the integration of the material and the spiritual planes of existence; Sri Aurobindo

went even further and tried to *manifest in practice* the integral intuition as an evolutionary fact. In this developing world-view, neither matter nor spirit is necessarily privileged; each is a necessity for the other, and true knowledge, true life, and true matter can only be realized through the process of their actual integration in consciousness.

Conclusions

When we survey the field of evolutionary theory from a Darwinian perspective, the picture that emerges is of a vast continuum of life diversifying gradually over an immense span of time. If we concentrate on the similarities of form and structure we tend to arrive at a static conception of species and classes of species of more or less closely related organisms – related in terms of genetic structure, organic processes and behaviors, faculties of perception, spatial radiation and temporal succession. At the higher levels of complexity the principles of intelligent behavior are widely shared, and at the very top we are all rational. If we concentrate on the processes of development, the interrelationships of entities and environments, the chemistry and sociology of reproduction, growth and extinction, we arrive at a more dynamic conception of on-going and open-ended change and diversification. Either way, we end with a general conception of identities and differences, of unities and diversities, of essences and existences as dual categories by means of which everything is known and understood.

But then we confront a problem. When we glance from our constructed knowledge back into the worlds of matter, life, and mind in which that knowledge is grounded and which it is supposed to explain, we find that we don't really know very much about what is going on there. The reality is astonishingly different from our well designed conceptions, which are in a sense true, nonetheless. Dogs and horses are intelligent, birds and bees organize their lives, termites process the detritus of forests, but do these facts really tell us anything about the dog or horse whose behavior we admire, or the sensory system of the birds and bees as they confront and shape their world and ours? Do we really know the lion or the giraffe; do we at all grasp the extraordinariness of the phenomenon of sight or of language, beyond their structures and functions, and names, the incredible fact that they exist? The faculties of sense perception - sight, hearing, touch, smell – are working in every individual of those tens of thousands of species that we have categorized, right now as we read this, and at every level of the ascending hierarchy of life's complexity, extending to every habitat on every continent, not the least of which are the diverse human habitats of the present and of many other previous civilizations. The immensity and marvel and incremental dynamic processes of that ubiquitous and intelligent life force, we must admit, are far beyond the grasp of our conceptual generalizations.[19]

Our generalizations may enable us to understand certain patterns, predict certain occurrences, influence certain processes and outcomes, and they may enhance our ability to respect and interact with others in the world of which we are all a part. To the extent that they are true, our conceptions are also for the most part "good", which is to say "beneficial". We commonly use our knowledge to improve our conditions, or at least we strive to do so, even if it means harming others. And here we may again pause and

reflect. For if many of the species of the animal kingdom who are at the top of the food chain are currently in danger with respect to their survival, largely due to our actions, and we know that "survival" is Nature's primary purpose, then how "beneficial" is our conceptual knowledge, really? Does it enable us, for example, to avoid an impending disaster, to save an endangered species, to understand another's feelings, to adequately evaluate the plight of those whose survival is currently or soon will be endangered? We know that we are relatively free to understand and to act accordingly, but also that our freedom and understanding are limited by numerous constraints. We do not know how far those limits can be stretched, nor whether our freedom will finally be able to save us.

And it is here that Sri Aurobindo began *The Life Divine*, as we have seen, and perhaps it is where all philosophy really begins – at the boundaries of knowledge. At such a precipice, at times it has become possible for those with a sufficient understanding to be inspired by the theory of evolution, and to see beyond the limitations of mind and its philosophical formulations a ray of real hope. This was clearly the case with both Bergson and Sri Aurobindo:

> *The whole history of life until man has been that of the effort of consciousness to raise matter, and of the more or less complete overwhelming of consciousness by the matter which has fallen back on it. ...It was to create with matter, which is necessity itself, an instrument of freedom, to make a machine which should triumph over mechanism, and to use the determinism of nature to pass through the meshes of the net which this very determinism had spread. …Everywhere but in man, consciousness has had to come to a stand; in man alone it has kept on its way.* [20]

> *It has to be noted that the human mind has already shown a capacity to aid Nature in the evolution of new types of plant and animal; it has created new forms of its environment, developed by knowledge and discipline considerable changes in its own mentality. It is not an impossibility that man should aid Nature consciously also in his own spiritual and physical evolution and transformation. The urge to it is already there and partly effective, though still incompletely understood and accepted by the surface mentality; but one day it may understand, go deeper within itself and discover the means, the secret energy, the intended operation of the Consciousness-Force within which is the hidden reality of what we call Nature.* [21]

Notes

1.Without wishing to express a bias toward either of these two authorities and their respective points of view, it may nonetheless be shown that Gould has given a poignant summary of their differences as he sees them, in an article titled "Darwinian Fundamentalism" (*The New York Review*, June 12, 1997), where he writes, "A movement of strict constructionism , a self styled-form of Darwinian fundamentalism, has risen to some prominence in a variety of fields, from the English biological heartland of John Maynard Smith to the uncompromising ideology of his compatriot Richard Dawkins… Amid the variety of their subject matter, the ultra-Darwinists share a conviction that natural selection regulates everything of any importance in evolution, and that adaptation emerges as a universal result and ultimate test of selection's ubiquity. The irony of this situation is twofold. First…, Darwin himself strongly opposed the ultras of his

own day. …Second, the invigoration of modern evolutionary biology with exciting nonselectionist and nonadaptationist data from the three central disciplines of population genetics, developmental biology, and paleontology makes our pre-millenial decade an especially unpropitious time for Darwinian fundamentalism – and seems only to reconfirm Darwin's own eminently sensible pluralism."

1a. In all fairness, we should point out that each party to this debate derives his position from Darwin: the Dawkins school of thought characterized by "gradualism" derives from the Darwin who wrote in *The Origin of Species, Part Two*, concerning the imperfection of the fossil record, "If numerous species, belonging to the same genera or families, have really started into life at once, the fact would be fatal to the theory of evolution through natural selection. For the development by this means of a group of forms, all of which are descended from one progenitor, must have been an extremely slow process; and the progenitors must have lived long before their modified descendents" (6th Ed. p. 83).

1b. Gould uses paleontological evidence to show that many species have in fact rapidly emerged in the fossil record relatively soon after major extinctions, but says that this doesn't contradict the Darwin who wrote, in the conclusion of "Origin", "I am convinced that natural selection has been the main but not the exclusive means of modification (p.303)," and Darwin also wrote, apparently in support of the pluralistic stance, "It is, however, probable…that the world at a very early period was subjected to more rapid and violent changes in its physical conditions than those now occurring; and such changes would have tended to induce changes at a corresponding rate in the organisms which then existed" (p.90). The pattern of such explosions of new species following major extinctions has been amply documented, and provides an important basis for Gould's theory of "punctuated equilibrium."

1c. For example, we read in Encyclopedia Britannica,"The division of geologic history into a succession of eras and periods is hallmarked by major changes in plant and animal life—the appearance of new sorts of organisms and the extinction of others. Several mass extinctions have occurred since the Cambrian. The most catastrophic happened at the end of the Permian Period, about 248 million years ago, when 95 percent of species, 82 percent of genera, and 51 percent of families of animals became extinct. Other large mass extinctions occurred at or near the end of the Ordovician (about 440 million years ago, 85 percent of species extinct), Devonian (about 360 million years ago, 83 percent of species extinct), and Triassic (about 210 million years ago, 80 percent of species extinct). … Like other mass extinctions, they were followed by the origin or rapid diversification of various kinds of organisms. The first mammals and dinosaurs appeared after the late Permian extinction, and the first vascular plants after the Late Ordovician extinction. (From **evolution.** (2008). Encyclopædia Britannica. *Encyclopædia Britannica 2007 Ultimate Reference Suite.* Chicago: Encyclopædia Britannica.)"

1d. But, as the ultra-Darwinian philosopher Daniel Dennett stubbornly argues in his book *Darwin's Dangerous Idea* (1995), against the Gould-Chomsky position that language, by virtue of the rather sudden universal appearance of its structures in the human species, along with an equally sudden increase of brain size, may not necessarily be the result of gradual adaptation, "No matter how suddenly the punctuation occurred that jogged our ancestors abruptly to the right in Design Space, it was still a gradual design development under the pressure of natural selection – unless it was indeed a miracle…" Here Dennett, in his anti-religious passion, seems to forget that the issue is between gradualism and a relatively sudden process of speciation, not between natural selection and miraculous intervention! In any case, as Herbert Spencer wisely observed more than a century ago, such questions cannot be settled on the basis of either empirical data or logical deduction, which says more about the limitations of our knowledge than about the theory of evolution. If, however, the argument is between the processes of adaptation and natural selection versus the existence of innate structural principles, then as we have seen in the previous discussion of physics, it will in all probability be best resolved if we understand them as necessary complementarities.

2. Charles Darwin, *The Origin of Species* (6th ed., 1872), p. 73.

3. *Ibid, p. 121-122*

4. ***Occam's razor,*** *also called the* ***law of economy,*** *or* ***law of parsimony,*** the principle stated by William of Ockham (1285–1347/49), a scholastic, that *Pluralitas non est ponenda sine necessitate;* "Plurality should not be posited without necessity." The principle gives precedence to simplicity; of two competing theories, the simplest explanation of an entity is to be preferred. The principle is also expressed "Entities are not to be multiplied beyond necessity." (From **Ockham's razor.** (2008). Encyclopædia Britannica. *Encyclopædia Britannica 2007 Ultimate Reference Suite.* Chicago: Encyclopædia Britannica.)

5.Sri Aurobindo, (1st ed. 1971). *The Supramental Manifestation and Other Writings* (2nd Ed.), p. 138.
6. Ibid, p.320.
7. Ibid, p.320.
8. Ibid, p.316.
9. Ibid. p. 320;
10. John Maynard Smith and Eors Szathmary, (1999). *The Origins of Life*, p. 17. In his 1999 book on the origins of life, the British biologist John Maynard Smith gave a compelling analysis of the beginnings of cellular evolution, which features *cooperation* as an inherent principle of the most basic and original formative structures of life: "We think that the first objects with the properties of multiplication, variation, and heredity were replicating molecules, similar to RNA but perhaps simpler, but not informational because they did not specify other structures. If evolution was to proceed further, it was necessary that different kinds of replicating molecules should cooperate, each producing effects helping the replication of others. We argue that, if this was to happen, populations of molecules had to be enclosed within some kind of membrane, or 'compartment'.…In existing organisms, replicating molecules, or genes, are linked together end to end to form chromosomes… This has the effect that when one gene is replicated, all are. This coordinated replication prevents competition between genes within a compartment, and forces cooperation on them." Richard Dawkins, who follows a similar theoretical path in order to establish a case for a direct causal relationship between the smallest and the largest components of life, from the gene to group behavior, provides a corresponding image of a network of co-dependent life: "Loci in germ-line chromosomes are hotly contested territory. …the weapons with which they won, and the weapons with which their rivals lost, are their respective phenotypic consequences. These phenotypic consequences are conventionally thought of as being restricted to a small field around the replicator itself, its boundaries being defined by the body wall of the individual organism in whose cells the replicator sits. But the nature of the causal influence of gene on phenotype is such that it makes no sense to think of the field of influence as being limited to intercellular biochemistry. We must think of each replicator as the centre of a field of influence on the world at large. (Richard Dawkins, (1982). *The Extended Phenotype*, p.237.)

11. Op. cit. p. 316
12. Ibid. p. 320

13. "…the idea that some motivated behaviours are the result of innate programs manifested in the nervous system had been proposed by James and McDougall in the late 1800s and early 1900s. These early instinct approaches fell into disfavour during the 1920s because of their proponents' inability to discriminate between instinctive and learned behaviours and because of the realization that labeling an observed behaviour as instinctive did not explain why the behaviour occurred. In Europe, however, a group of biologists interested in the evolutionary significance of animal behaviours kept the concept alive and continued to study the genetic basis of behaviour. Three of these researchers (the Austrians Karl von Frisch and Konrad Lorenz and the Netherlander Nikolaas Tinbergen) were awarded a Nobel Prize in 1973 for their work on the subject. They were early entrants in the field of study known as ethology, which studies the behaviour patterns of animals in their natural habitat. Ethologists argue that the evolutionary significance of a particular behaviour can best be understood after a taxonomy of behaviours for that species has been developed as a result of observation in nature. They propose further that the significance of a behaviour is often clearer when observed in the context of other behaviours of that animal. Ethologists use naturalistic observation and field studies as their most common techniques. The research conducted by the ethologists showed that some behaviours of some animal species were released in an automatic and mechanical fashion when conditions were appropriate. These behaviours, known as fixed-action patterns, have several salient characteristics: they are specific to the species under study, occur in a highly similar fashion from one occurrence to the next, and do not appear to be appreciably altered by experience. Furthermore, the stimulus that releases these genetically programmed behaviours is usually highly specific, such as a particular colour, shape, or sound. Such stimuli are termed key stimuli or sign stimuli and when provided by a conspecific organism (a member of the same species) are known as social releasers." (From **motivation.** (2008). Encyclopædia Britannica. *Encyclopædia Britannica 2007 Ultimate Reference Suite.* Chicago: Encyclopædia Britannica.)

14. Op. cit. Sri Aurobindo, p. 320

15. Ibid., p. 318. This discussion of materialism and the "unmanifest" has to be elucidated by the Platonic and Medieval notions of the Idea (eidos) and the appearance (phaneros), or the temporal/actual and the eternal/potential aspects of reality. See: Marcuse (1968), "Concept of essence" in *Negations* for a detailed discussion of the evolution of this concept of Being, from Platonism through Phenomenology to Materialism.

16. Ibid., p. 317. This essay on Evolution provides the basis for a philosophical departure toward the thought of Bergson and Whitehead, the former vitalistic and the latter mentalistic elaborations of the philosophy of evolution, necessary steps toward the transition to a spiritual philosophy. Each one influences, qualifies, and attempts to elevate the pull toward a purely materialistic interpretation of the processes of nature.

17. "The philosopher Jacques Derrida (*L'Écriture et la différance* [1967; *Writing and Difference*]) contributed to 20th Century philosophy his poststructuralist project to "deconstruct" the binary structures of thinking on which Western culture appeared to be based and to expose the hierarchies of power sustained by such simple oppositions as the favouring of speech over writing or masculine over feminine. Derrida challenged the conventional cultural markers of authority, attacking "logocentrism" (the belief in the existence of a foundational absolute word or reality) and "phonocentrism" (lodging authenticity and truth in the voice of the speaker)." (From: **"French literature." (2008)** Encyclopædia Britannica from *Encyclopædia Britannica 2007 Ultimate Reference Suite*)

18. As we shall see, there is much in Bergson's *Creatve Evolution* that anticipates Sri Aurobindo's general point of view, and that may well have provided the latter with a starting point for the elaboration of his own theory. For example, in the commentary on "Heredity" quoted here from the essay Evolution, Sri Aurobindo uses language and observations almost identical to Bergson's when he wrote: "After having been affirmed as a dogma, the transmissibility of acquired characters has been no less dogmatically denied, for reasons drawn *a priori* from the supposed nature of germinal cells. …But if, perchance, experiment should show that acquired characters are transmissible, it would prove thereby that the germ-plasm is not so independent of the somatic envelope as has been contended, and the transmissibility of acquired characters would become *ipso facto* conceivable… But it is just here that the difficulty begins. The acquired characters we are speaking of are generally habits or the effects of habit, and at the root of most habits there is a natural disposition. So that one can always ask whether it is really the habit acquired by the soma of the individual that is transmitted, or whether it is not rather a natural aptitude, which existed prior to the habit." (*Creative Evolution*, Eng.ed.1911, p. 78-79)

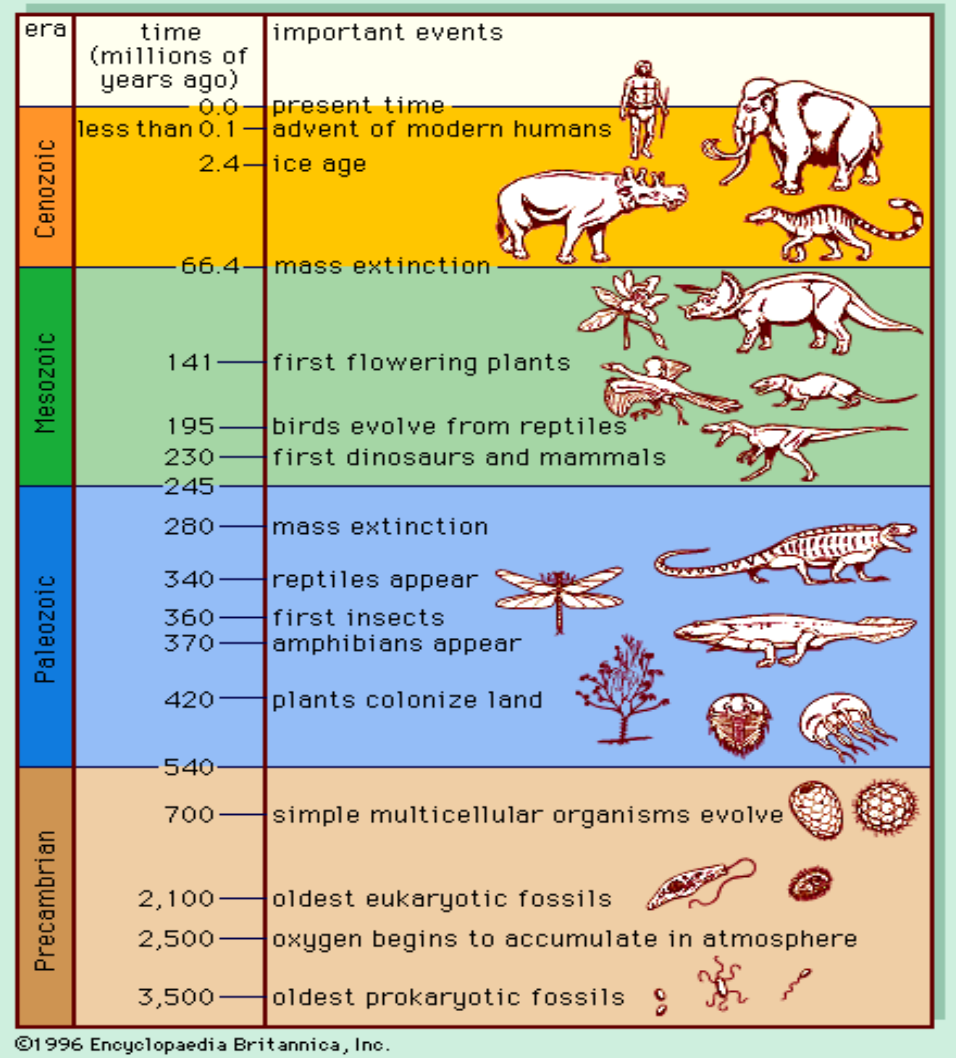
19. Of this immense prospect of "consciousness", Sri Aurobindo writes in *The Life Divine*, "When we speak of subconscious mind we should mean by the phrase a thing not different from the outer mentality, but only acting below the surface, unknown to the waking man, in the same sense, if perhaps with a deeper plunge and a larger scope. But the phenomena of the subliminal self far exceeds the limits of any such definition. It includes an action not only immensely superior in capacity, but quite different in kind from what we know as mentality in our waking self. We have therefore a right to suppose that there is a superconscient in us as well as a subconscient, a range of conscious faculties and therefore an organization of consciousness which rise high above that psychological stratum to which we give the name of mentality. And since the subliminal self in us thus rises in superconscience above mentality may it not also sink in subconscience below mentality? Are there not in us and in the world forms of consciousness which are submental for which we can give the name of vital and physical consciousness?" (1914/1970 Ed., p. 86)

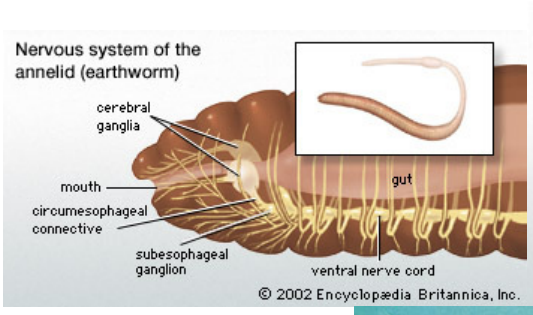
20. Henri Bergson, *Creative Evolution* (Eng. ed. 1911), p. 264,266.

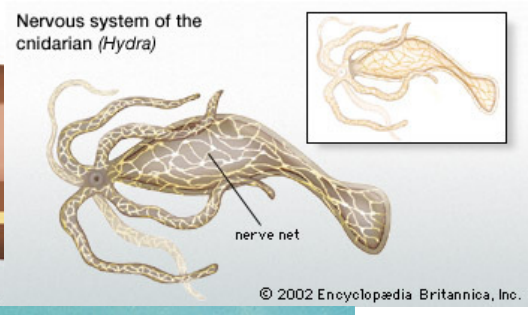
21. Sri Aurobindo, *The Life Divine*, (1st ed. 1939-40/) p. 844.

Appendix 3

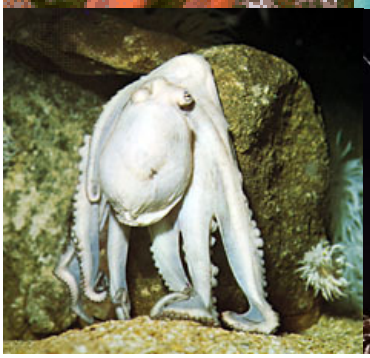
Illustrations

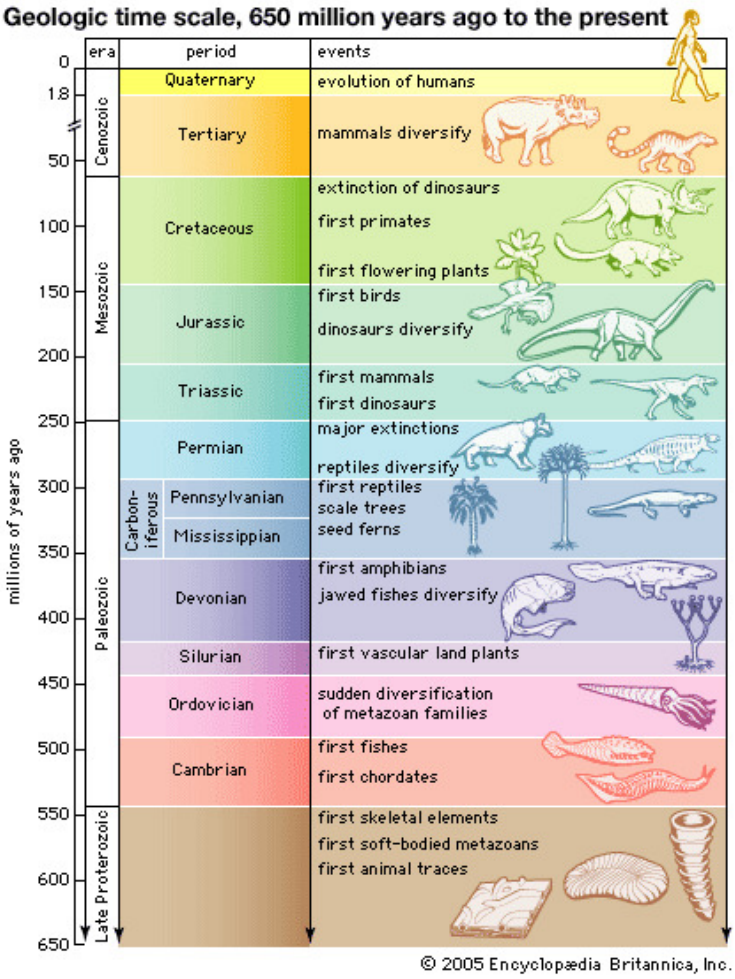



Nervous system of the
annelid (earthworm)
cerebral
ganglia
mouth
circumesophageal
connective
subesophageal
ganglion
gut
ventral nerve cord
© 2002 Encyclopædia Britannica, Inc.


Nervous system of the
cnidarian (Hydra)
nerve net
© 2002 Encyclopædia Britannica, Inc.


Video/Animation




Geologic time scale, 650 million years ago to the present
era
period
events
millions of years ago
0
18
50
100
150
200
250
300
350
400
450
500
550
600
650
Cenozoic
Mesozoic
Paleozoic
Late Proterozoic
Quaternary
Tertiary
Cretaceous
Jurassic
Triassic
Permian
Carbon-iferous
Pennsylvanian
Mississippian
Devonian
Silurian
Ordovician
Cambrian
evolution of humans
mammals diversify
extinction of dinosaurs
first primates
first flowering plants
first birds
dinosaurs diversify
first mammals
first dinosaurs
major extinctions
reptiles diversify
first reptiles
scale trees
seed ferns
first amphibians
jawed fishes diversify
first vascular land plants
sudden diversification of metazoan families
first fishes
first chordates
first skeletal elements
first soft-bodied metazoans
first animal traces
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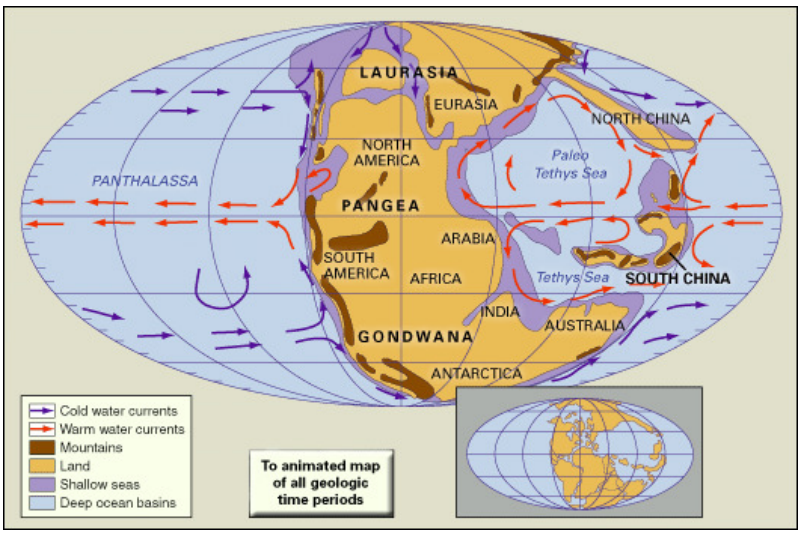
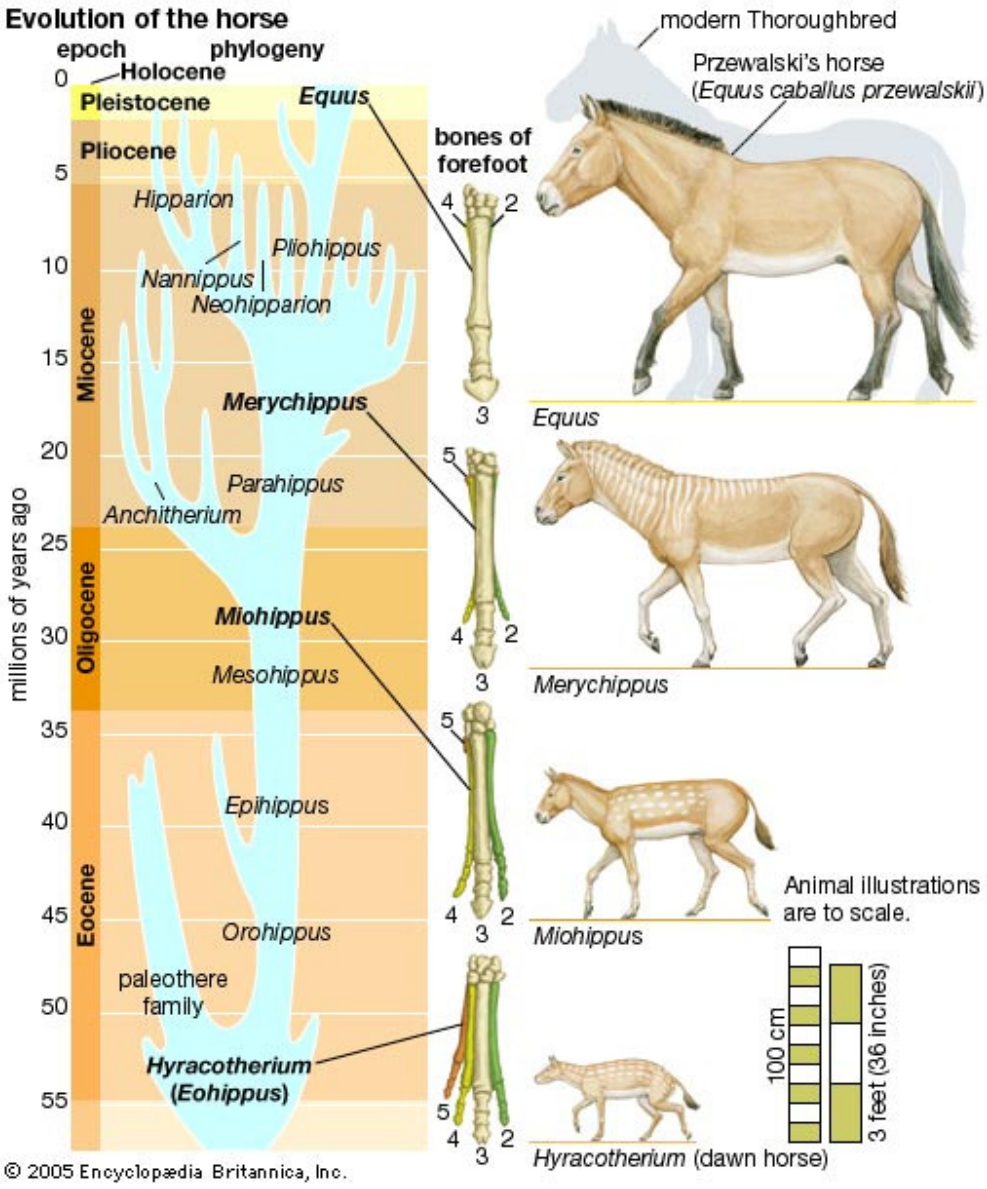
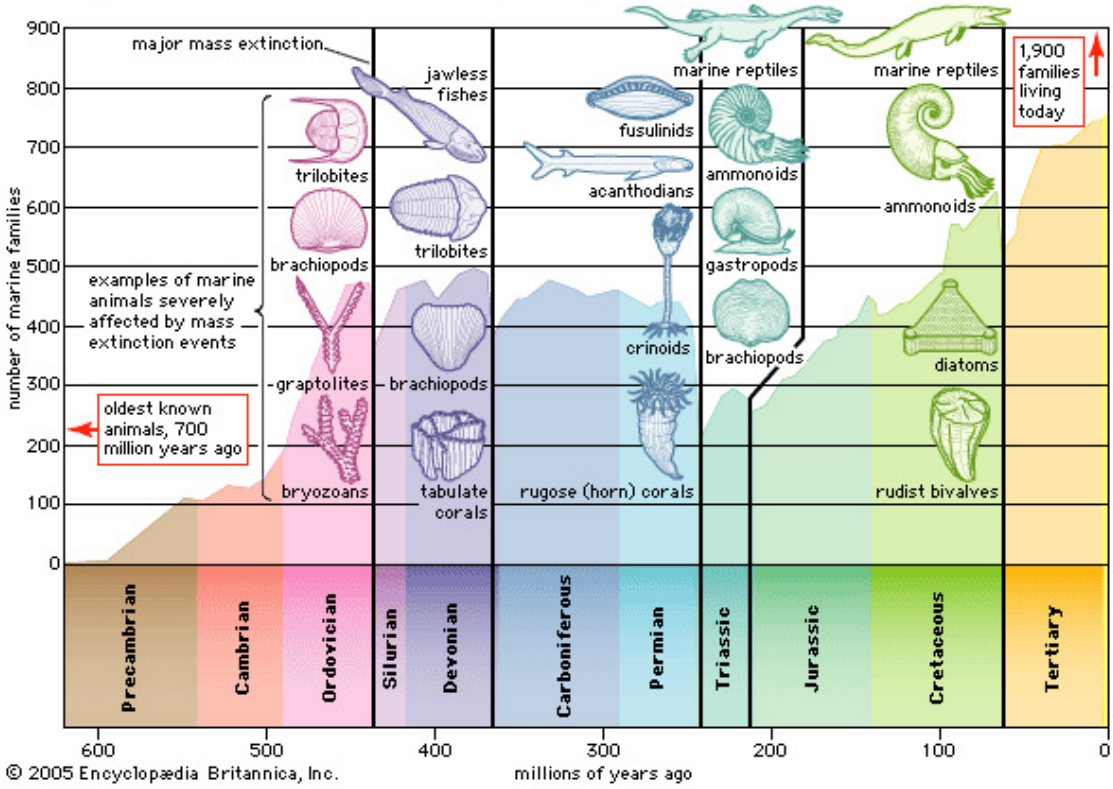
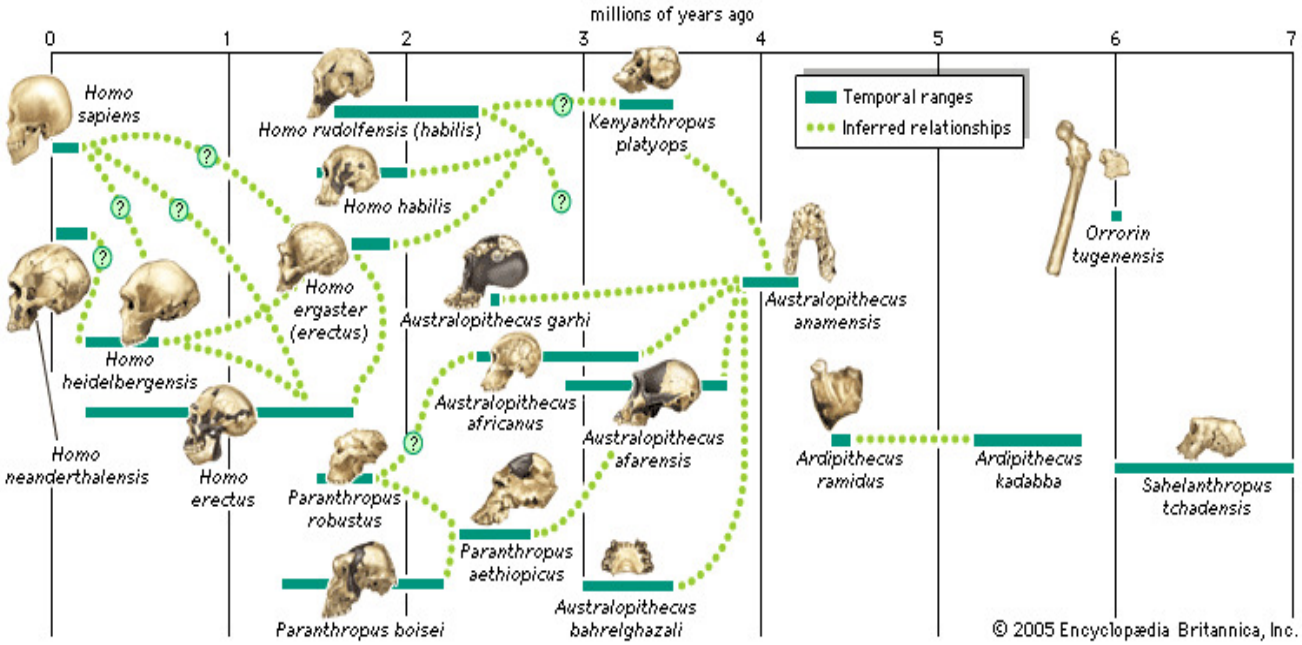
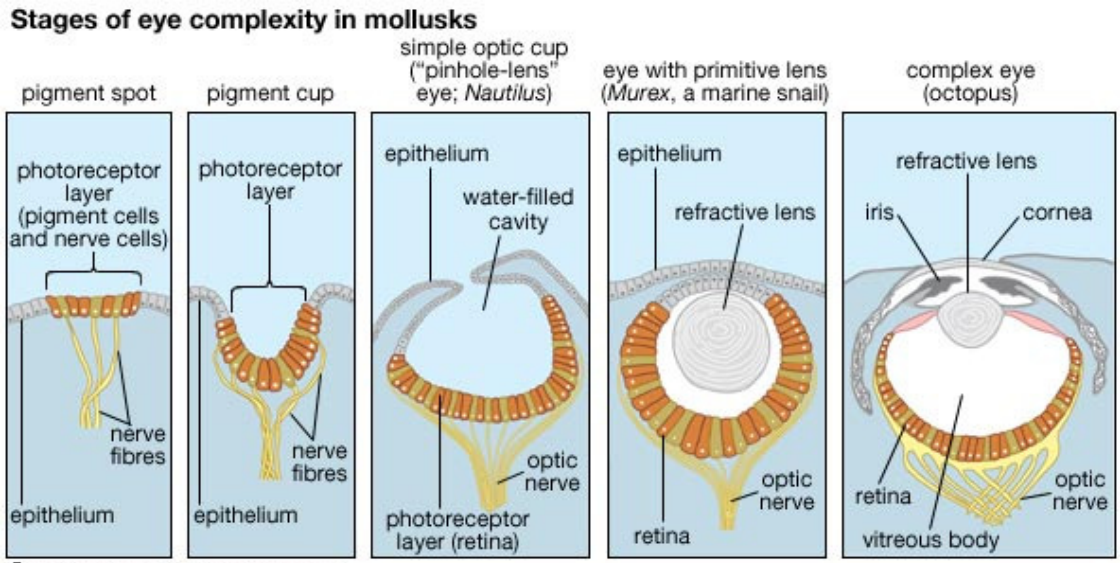

LAURASIA
EURASIA
NORTH CHINA
NORTH AMERICA
Paleo Tethys Sea
PANTHALASSA
PANGEA
ARABIA
SOUTH AMERICA
AFRICA
Tethys Sea
SOUTH CHINA
INDIA
AUSTRALIA
GONDWANA
ANTARCTICA
Cold water currents
Warm water currents
Mountains
Land
Shallow seas
Deep ocean basins
To animated map of all geologic time periods

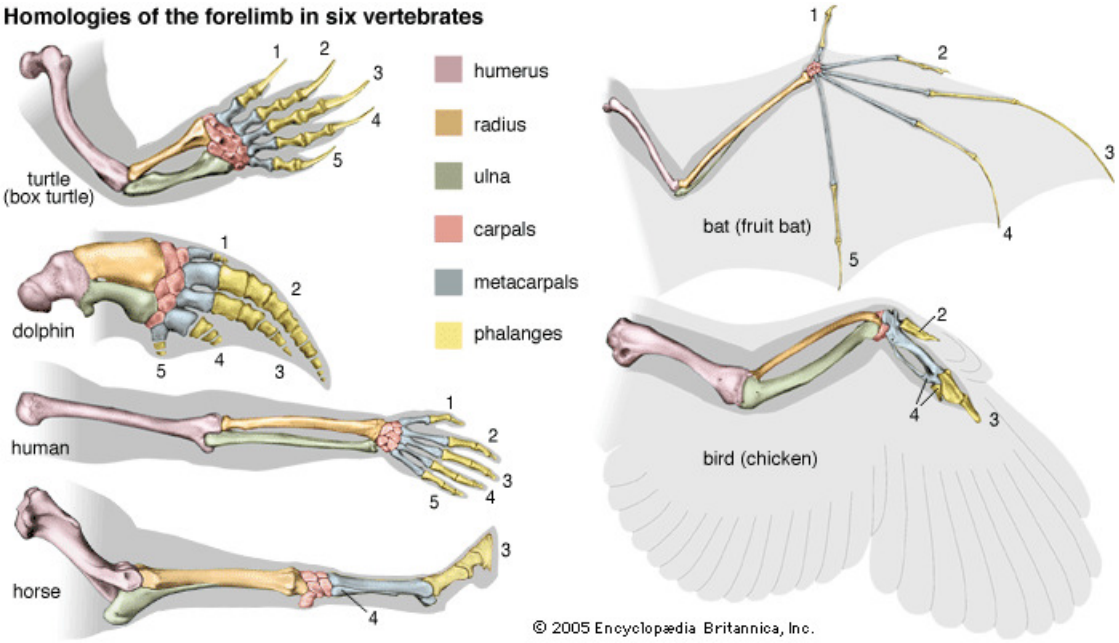

Evolution of the horse
epoch
phylogeny
Holocene
Pleistocene
Pliocene
Miocene
Oligocene
Eocene
millions of years ago
0
5
10
15
20
25
30
35
40
45
50
55
Equus
Hipparion
Pliohippus
Nannippus
Neohipparion
Merychippus
Parahippus
Anchitherium
Miohippus
Mesohippus
Epihippus
Orohippus
paleothere family
Hyracotherium (Eohippus)
bones of forefoot
modern Thoroughbred
Przewalski's horse (Equus caballus przewalskii)
Equus
Merychippus
Miohippus
Hyracotherium (dawn horse)
Animal illustrations are to scale.
100 cm
3 feet (36 inches)
© 2005 Encyclopædia Britannica, Inc.

Diversity of marine animal families over geologic time



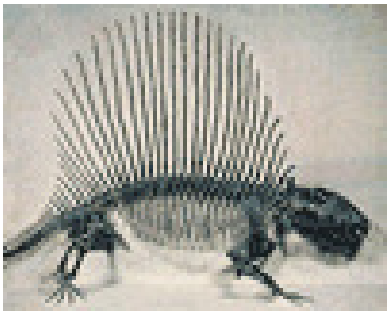




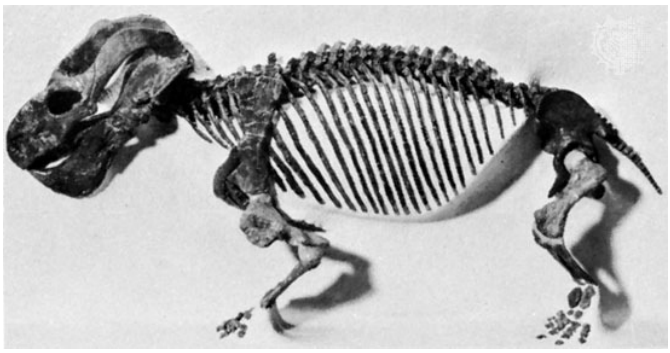


evolution. (2008). Encyclopædia Britannica. *Encyclopædia Britannica 2007 Ultimate Reference Suite.* Chicago: Encyclopædia Britannica.

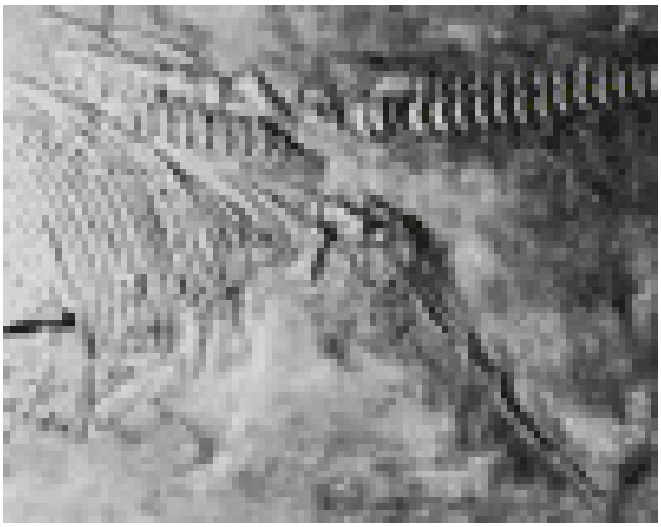
Late Permian



Dimetrodon 300 mil (early vertebrates)



Dicynodon 200 mil (Therapsids were the stock that gave rise to mammals. A few therapsids were still present in the Late Triassic and even into the Jurassic, but most had by then become extinct or had evolved into primitive mammals.)



Ichthyosaurus (largest inhabitants of Triassic)

Time-table of evolution

MYA

Devonian	400
Permian	300
Triassic	200
Cretaceous	100
Tertiary	66
Quaternary	1.6

Homo habilis	2
Homo erectus	1
Homo heidelbergensis	.6 (600,000)
Homo neanderthalis	.4 (400,000)
Homo sapiens	.15(150,000)
Homo sapiens sapiens	.05 (50,000)

Archaic 160,000-40,000 (120,000 yrs)
Magical/symbolic 40,000-10,000 (30,000 yrs)
Mythical/typal 10,000-1000 BCE (9000 yrs)
Religious/conventional 1000 BCE-1500 CE (2500 yrs)
Rational/individual 1500-2000 CE (500 yrs)
Integral/supramental 2000 -

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