EVOLUTION, EMERGENCE AND MIND

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Abstract

This thesis examines the philosophy of evolutionary emergentism and its relation to the mind/brain problem in the writings of some of its main theorists. C. Lloyd Morgan is considered to be the originator of this philosophy, though similar but independent writings are noted. Chapter one deals with the views of the evolutionists Charles Darwin, T. H. Huxley, Alfred Wallace, George Romanes and Henri Bergson on evolution, novelty and mind. Chapter two deals with the development of emergentist philosophy in the writings of C. Lloyd Morgan and the influence of the preceding authors on him. It also examines other versions of emergentist philosophy in the writings of Roy Wood Sellars, C. D. Broad and others, as well as the criticism of emergentism due to William McDougall, and the current views of Mario Bunge, Roger Sperry and Karl Popper on evolution, emergence and mind.

Résumé

La présente thèse a pour but l'étude de la philosophie de l'émergentisme évolutionnaire et sa relation avec le problème du rapport entre le cerveau et les facultés mentales. Elle prend comme point d'origine de cette philosophie l'oeuvre de C. Lloyd Morgan, quoiqu'on note des théories similaires mais indépéndentes dévéloppées par d'autres auteurs. On retrace les influences majeures sur Lloyd Morgan dans les écrits des évolutionnistes Charles Darwin, T. H. Huxley, Alfred Wallace, Herbert Spencer, George Romanes et Henri Bergson, et on examine les théories de ces derniers sur l'évolution, les nouveautés et les facultés mentales. La thèse étudie le dévéloppement de la philosophie de Lloyd Morgan et d'autres versions de la philosophie émergentiste dans les écrits de Roy Wood Sellars, C. D. Broad et autres, la critique de l'émergentisme de William McDougall, et les points de vues actuels de Mario Bunge, Roger Sperry, et Karl Popper sur l'évolution, l'émergence et les facultes mentales.

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Introduction

The choice of the thesis topic "Emergentism and the Mind/Brain Problem" was stimulated by a recent debate in the review Neuroscience, published by the International Brain Research Association (IBRO). During the five year period between 1977 and 1982 there appeared seven articles, published as "commentaries", dealing with the mind-brain problem. The articles centered on the debate between emergentism and reductionism, and between materialism and dualism, with contributions by Mario Bunge, Donald MacKay, Roger Sperry, John Eccles, Donald Hebb and Patricia Churchland.

In particular, both Bunge and Sperry defend positions that each characterizes as "emergentist", though there is a major disagreement between the two as to the desirability of linking emergentism with materialism and the approach (holistic or systemic) to adopt towards emergentism itself. In reflecting on this debate, I became interested not only in its contemporary aspects, but also in tracing emergentism back to its origins, including an examination of the context or conditions leading up to its appearance as a philosophic trend.

As things turn out, emergentism in its developed form is a fairly recent idea in the history of philosophy. Its origin as a philosophic trend goes back only to the 1920s, and it is associated with the writings of C. Lloyd Morgan,

C. D. Broad and Roy Wood Sellars, as well as with Samuel Alexander, G. P. Conger and others. Emergentism was a trend which developed almost exclusively in Anglo-American philosophy, though several articles of Lloyd Morgan and Sellars appeared in French translations.

However, among the French philosophers, Henri Bergson played an important role in developing the concept of "creative evolution", a major point of transition between the gradualism of Darwin and his followers and Lloyd Morgan's emergentism. Among the German philosophers, Nicolai Hartmann is notable for his theory of the level structure of reality based on emergentist ideas.

To the best of my knowledge, only one major critical book was written about emergentism, and that by William MacDougall in 1929. Organized discussions were held on emergentism at one of the sessions of the VIth International Congress of Philosophy held in 1926 (with commentaries by Hans Driesch, H. Wilder Carr, Arthur Lovejoy and W.M. Wheeler). and again that year at a meeting of the Aristotilean Society (with commentaries by C.R. Morris, W. Leslie MacKenzie and E.S. Russell).

However, by the mid 1930s and until its re-emergence in the current debate in neuro-philosophy and exact metaphysics (1960s and on), emergentism was eclipsed as an active philosophic trend, though it still had some isolated supporters. It was not until the later 1950s and the mid

1960s, that emergentism once more begun to develop as a trend, as can be seen in the work of Mario Bunge, Roger Sperry, Karl Popper and others. Chapter 2 of the thesis deals with the views, not always identical it goes without saying, of the major emergentists.

If the 1920s was the period of the "emergence" of emergentism, its incubation period goes back to the last half of the 19th century and the theory of evolution. The theory of evolution and its philosophic consequences were essential preconditions for the later development of emergentism. Indeed, the philosophy of emergentism was designated as "emergent evolutionism" by one of its founders (Lloyd Morgan), and "evolutionary naturalism" by another (Sellars).

In chapter 1 of the thesis I examine the evolutionary views of some of the main 19th Century theoreticians, along with their related views on the mind/brain question. Those discussed include Charles Darwin, Alfred R. Wallace, T.H. Huxley, George Romanes, Herbert Spencer, and Henri Bergson. Darwin, Wallace, Huxley, Romanes and Spencer were all contemporaries of each other, and as can be seen in their writings and correspondence, were an intercommunicating group: Henri Bergson is included in this chapter because of his contribution of the concept of creative evolution, though he had little or no interaction with the other theorists in this group. These six scientists and philosophers of evolution had an important influence on

Lloyd Morgan, a further reason for their inclusion in the thesis.

In the sections of each chapter, the emphasis is placed on presenting the structure of the arguments of each theorist on evolution, novelty and mind. I have avoided secondary references so that mistakes of interpretation are my own, and not someone else's. This has meant a considerable dependance on quotes from the original writings of the various thinkers, and has added to the length of the thesis.

The thesis cannot hope to, and does not aspire to be, anything like a complete history of evolutionary thought, emergentist philosophy, or the mind/brain problem. But it does intend to select for discussion some of the more significant thinkers on this related group of questions.

Page and title references are included in the body of the text itself. The bibliography gives full references to books and articles mentioned in the thesis, and includes some other references relevant to the topic but not specifically quoted in the text.

I wish to thank Prof. Mario Bunge, who as thesis director provided counsel and criticisms, and whose philosophic system was the inspiration for my text; and Prof. William Shea, who as graduate director while I was working on my thesis provided aid and support.

Charles Darwin

Charles Darwin (1809-1882), the founder of the modern theory of evolution, was a prolific writer, producing many works on evolutionary theory and specific topics in biology (barnacles, plants and worms). His writings on evolutionary theory include the four books _The Origin of Species by Means of Natural Selection_ (1859), _The Variations of Plants and Animals under Domestication_ (1868), _The Descent of Man and Selection in Relation to Sex_ (1871), and _The Expression of Emotions in Man and Animals_ (1872). As well, the 1842 and 1844 drafts of his theory of natural selection have been published as _The Foundations of the Origin of Species by Charles Darwin_ (1909), and his draft of 1856-58 (of which the first chapter was published during Darwin's lifetime as _Variations of Plants and Animals under Domestication_) as _Charles Darwin's Natural Selection_ (1975).

Darwin also wrote three volumes of geographic, geological and zoological observations based on his 5 year voyage as naturalist on board the ship H. M. S. Beagle (included as vols. 1-3 of _Charles Darwin's Works_, 1894-98), four volumes on the taxonomy of living and fossil barnacles (not included in the 18-volume works), 5 volumes on the biology of flowers (vols 11-15) and one volume on the role of worms in the production of topsoil (vol. 16).

Also available are _Life and Letters_ (_vols. 17-18 of the works_) and two further volumes _More Life and Letters_ (not included in his works), as well as an _Autobiography_, parts of which were included in _Life and Letters_, and part of which was made available only in 1958. However, it is only since the 1960s that Darwin's _Notebooks_ for the period 1936-39 have been edited and published, providing an insight into his scientific and philosophic ideas during the formative period of his thought. Especially important for this section are the so-called _M_ and _N Notebooks_ which deal with Darwin's views on comparative psychology and philosophy of mind. They were written at the same time and are closely related to the _B_, _C_, _D_, and _E Notebooks_ which contain the formation of Darwin's theory of evolution by natural selection.

The view of the young Darwin that emerges from a reading of his notebooks is that of a thinker who in 1837-38 came to two startling conclusions: the first, now known to all, that species were not created by divine fiat, but evolved according to natural laws; and the second, only now becoming known, that mind is a function of brain, in man as well as in animals. It will be argued that he continued to hold both these views throughout the rest of his life, though he ultimately published only the first of them in an explicit and systematic version. It is the purpose of this section of the text to briefly set out these two views and the relation between them.

Natural Selection and Other Factors of Evolution

Others had proposed the thesis of the transformation of species before Darwin - notably Jean Baptiste Lamarck in 1809, but Darwin was the first to propose a plausible mechanism and amass a wealth of facts in support of it. In considering plants and animals in domestication and in the state of nature, Darwin had noted the following:

(1) In domestication, by selecting those plants or animals for reproduction that have a desired quality, horticulturists and breeders are able to develop specific varieties that meet their needs. As a result of many generations of such breeding, the varieties often become dominant among the stock, sometimes to the point of developing into distinct species in this way.

2) In the state of nature the following phenomena are operative: (a) there is continual change in the conditions of life of organic beings - changes in climate, geography and geology being among the most important; (b) There is spontaneous but small variation among the population of a given species, some variations being helpful in adapting to these new conditions, others being hindrances; (c) Animals and plant populations of all species produce far more numerous offspring than can possibly all survive. As a result there is a struggle for survival among and within species.

3) To explain the combined operation of environmental change, spontaneous variation, and over-population, Darwin concluded there is a selection process in the state of nature analogous to that exerted by man in the case of domestic plants and animals. Here, nature 'selects' those varieties which best fit the changing environment. In this way, natural selection determines which organic beings will live to the age of reproduction and which of their offspring will survive. Adaptive variations are inherited by the offspring, and so over a long period of time the given species evolves. As Darwin states in Origin of Species:

> All these results, as we shall more fully see in the next chapter, follow from the struggle for life. Owing to this struggle, variations, however slight and from whatever cause proceeding, if they be in any degree profitable to the individuals of a species, in their infinitely complex relations to other organic beings and to their physical conditions of life, will tend to the preservation of such individuals and will generally be inherited by their offspring. The offspring, also will thus have a better chance of surviving, for, of the many individuals of any species which are periodically born, but a small number can survive. I have called this principle, by which each slight variation, if useful, is preserved, by the term Natural Selection, in order to mark its relation to man's power of selection. (v.i, p.99)

Darwin was not always the most satisfied with the term 'natural selection' and he notes: "But the expression often used by Mr. Herbert Spencer of the Survival of the Fittest is more accurate, and is sometimes more convenient." (ibid). However, he continued to use the term 'natural selection' because of the analogy between it and the artificial selection exercised by humans.

Darwin admits other factors besides natural selection as operative in the process of evolution, though natural selection is the main one. Sexual selection is the next most important of the mechanisms by which populations of organic beings evolve. Darwin had noticed that in most, if not all species where sexual differentiation exists, there are differences between the male and the female as to size, sexual organs, colour, behavior and bodily characteristics besides those directly involved in reproduction. This led him to postulate a further mechanism of evolution to explain these differences - the factor of sexual selection.

Sexual selection results in the development of characteristics that enable one sex to increase its chance of mating with the opposite sex, and thus choose partners more frequently; or which render one sex more attractive to the opposite sex, and so be chosen more frequently. Sexual selection differs from natural selection in that (1) it is a struggle for reproduction and not for existence as such; (2) it effects one sex at a time, and does not produce common modifications to both; (3) it is subordinate to natural selection. Darwin states in <u>Descent of Man</u>:

> This form of selection depends, not on a struggle for existence in relation to other organic beings, or to external conditions, but on a struggle between the individuals of one sex, generally the males, for the possession of the other sex. The result is not the death to the unsuccessful competitor, but few or no offspring. Sexual selection is, therefore, less rigorous than natural selection. (v.1, p.35)

A third factor of evolution postulated by Darwin was that of the transmission of acquired characteristics through the mechanism described by him in his theory of "pangenesis". Darwin accepted Lamarck's thesis that characteristics acquired during the lifetime of an individual could be inherited by its offspring. However, he differed from Lamarck in refusing to accept the latter's view that the acquisition of new characteristics was the result, in least in the higher animals, of "willing" them. Instead, he postulated the mechanism of pangesis to explain the process of transmission from one generation to the next.

Briefly stated, pangenesis holds that all the cells of an organism, even an immature one, produce or "give off" in a way as yet unknown, infinitesimally small particles called "gemmules", which collect together in the reproductive organs, to constitute the essential parts of ova and spermatozoa. The union of an ova and spermatozoa of sexually mature beings leads to the development of the potential of some, but not all of the gemmules so combined, with the rest lying dormant for possible use by later generations. In this way, two phenomena of interest to Darwin were explained:

(1) It was possible for physical and mental characteristics acquired by an animal or human to be passed on to its offspring if gemmules from that bodily part (the brain in the case of mental characteristics) were among those gemmules activated as the result of sexual union.

(2) However, this was not necessarily the case since the appropriate gemmules might lay dormant. The activation of such gemmules in later generations would then explain the phenomenon of reversion or atavism. Darwin explains the process of pangenesis in Variation of Animals and Plants as follows:

> Thus an organism does not generate its kind as a whole, but each separate unit generates its kind... When a cell or unit is from some cause modified, the gemmules derived from it will be in like manner modified... Inheritance must be looked at as merely a form of growth, like the self-division of a lowly-organized uni-cellular organism... An organic being is a microcosm - a little universe, formed of a host of self-propagating organisms, inconceivably minute and numerous as the stars in heaven." (v.ii, pp.398-399)

Darwin was writing at a time when genetics had not yet been developed as a science, despite Mendel's visionary but soon forgotten work of 1865. Consequently, Darwin's theory of pangenesis was no more than a stab in the dark, which he himself recognized as only a "provisional" or "working" hypothesis. He maintained it since it allowed him to include a large number of facts of heredity under a general hypothesis.

August Weismann's hypothesis of the germ-plasm supplanted Darwin's theory of pangenesis by the 1870s. It was much closer to the modern theory of genetics insofar as it made a clear distinction between the germ-plasm and the soma, so that there was a separation between the reproductive material and the material of the body. It was not until the early part of the 20th Century that the chromosome model was reinstated, with the recovery of Mendel's ideas. At that point, any further need to talk of Darwin's infinitesimal gemmules or Weismann's immortal germ plasm was eliminated.

Besides the mechanism of pangenesis, another factor that Darwin considered as operative in heredity included that of correlated variation, according to which modifications of a leading organ resulted in modifications in other organs dependent upon, or led by it. He also admitted a grab-bag of undefined "direct and definite actions of changed conditions" by which the environment, in some way unknown, could directly determine variations in individual organic beings, which could then be passed on to their offspring through the inheritance of acquired characteristics.

Darwin's theory of evolution was thus a pluralist one, admitting three key factors of evolution - natural selection, sexual selection, and the inheritance of acquired characteristics, with natural selection the main one. In terms of the subsequent advance of biology, the first two have, in general, stood the test of time, whereas the third has been rejected, both in terms of the Lamarckian notion of the inheritance of acquired characteristics, and the Darwinian theory of pangenesis to explain its mechanism. It is to be noted that Darwin does not include in his key factors of evolution any reference to cultural evolution -

which today replaces his transmission of acquired characteristics with respect to mental faculties and powers.

The Mind/Brain Relation:

As a result of this isolation on the philosophic plan and his priorities in the scientific arena, Darwin did not develop his views on the mind-brain problem into a systematic theory, as he did with respect to his views on the evolution of species and the origin of man, which were also contained in his 1837-40 notebooks. However, the relevant entries in his notebooks do provide a framework for such a theory, which can be called functional materialism to distinguish it from other variants of materialism. It is therefore necessary to draw out the basic theses of Darwin's approach.

Darwin's argument for materialism on the mind-brain problem involves two theses: (1) that mind is related to brain in a natural way analogous to, for example, the way gravitation is related to matter; (2) that mind is a function of the structure or organization of the brain, and varies with it. The first thesis may be called the thesis of analogy, the second the thesis of functionalism.

In his notebooks and marginal notes to books, Darwin commented on the views of his cousin Hensleigh Wedgwood and the author John Abercrombie concerning the relationship of mind to brain. Wedgwood, in a debate with Darwin that has been preserved in the OUN Notebook, reproduced in Gardner's Mind, Matter and Metaphysics (1976), argues as follows: (1) If mind could be compared to brain as gravitation to matter, then it could be said that the brain thinks and is the organ and cause of mind; (2) but mind cannot be compared to brain since the former is known objectively (by the senses) and the latter only subjectively (by consciousness); (3) As a result, the argument from analogy cannot be set up.

Darwin takes exception to the second of the above points, and asks "How do the senses affect us except by internal consciousness"(p.22), with the implication that both mind and brain are known through a common faculty, and thus may be legitimately compared. The concluding paragraph of Darwin's exchange is quite elliptic, but in the light of what follows he can be seen to be saying that (1) organization of the brain and thought run in parallel series, and (2) they stand in a lawful relation of cause and effect.

In Darwin's marginal notes to the John Abercrombie's Inquiries (1839), which are reproduced in Manier's The Young Darwin and his Cultural Circle (1978), the analogical argument and its functional complement are in clear evidence. Abercrombie argues in a way quite similar to that of Wedgwood above, and he then says that a dualist view of brain as the intermediary between mind and the external world is just as much in accord with the facts as a materialist one. It is at this point that Darwin retorts as follows:

> ?? Will my theory apply here? By materialism I mean merely the intimate connection of kind of thought with form of brain - like kind of attraction with nature of element.(pp. 223-224)

Abercrombie then says that in order to explain plant and animal life, reference must be made to principles whose nature we do not know. He concludes that since we cannot know the "substratum or ultimate essence" of mind or matter, we cannot know, even in principle, whether they are of the same substance. Darwin, however, disagrees and says:

> It is sufficient to point out close relation of kind of thought and structure of brain." (p. 225)

In the Notebooks Darwin often refers to mind as a function of brain. The following are examples of such entries:

> Experience shows that the problem of the mind cannot be solved by attacking the citadel itself - the mind is function of body - we must bring some stable foundation to argue from.(N.5, p. 71)... Can we deny relation of mind and brain ((Do we deny that the mind of a greyhound and spaniel differ from brain??)) (M.43e, p. 78)... Thought, however unintelligible it may be seems as much function of organ as bile of liver.(OUN 37, p. 134)

Among the facts that Darwin marshals to support his functional view of mind and brain, and which this latter thesis explains, are the following: a physical stimulus causing a change in the state of mind (M.18, p. 9); the action of the brain causing sensations of pain (M.20, p. 9); a case of insanity cured by the ingestion of lead (M.42, p. 13), similar or recurrent thoughts being the product of the same part of the brain (M.46, p. 14), trains of thought as being products of the organization of the brain, double consciousness as the existence of two distinct trains of thought in the brain, and thinking of cancer tending to cause it in the body (N. 53, p. 80). It is clear, especially from the last mentioned example above, that Darwin holds to an interactionist model of the mind/brain relation where mind, though a function of the body, can react back upon it and cause changes in it.

As to the reason that people refuse to admit the functional relationship of mind to brain, Darwin speculates that it is a question of humans putting themselves on a pedestal:

> Why is thought being a secretion of brain, more wonderful than gravity a property of matter? It is our arrogance, it('s) our admiration of ourselves.(C166, p. 190)

The application of the argument from analogy and the thesis of functionalism to the mind/brain problem lead to what Darwin considers as a materialist view of the relationship between the two. Besides the reference to materialism in his marginal notes to Abercrombie's book, Darwin refers to materialism on at least three other occasions in his <u>Notebooks</u>, and all in the same context of the mind/brain question.

The earliest is on July 15, 1838, the first day of entries into the M Notebook.

> It is an argument for materialism that cold water brings on suddenly in head, a frame of mind analogous to those of feelings which may be considered as truly spiritual. (M.19, p.9)

Referring to his belief in the inheritance of acquired characteristics, Darwin says on July 22 of that same year:

> To avoid saying how far I believe in materialism, say only that emotions, instincts degrees of talent, which are hereditary are so because brain of child resembles parent stock (and phrenologists state that brain alters). (M.57, p. 16)

In Notebook C, he makes the self-referential remark "oh you materialist" in a similar context of the discussion of heredity and the brain:

> Thought (or desires more properly) being hereditary it is difficult to imagine it anything but structure of brain hereditary, analogy points to this - love of the deity effect of organization, oh you materialist. (C166, p. 190)

In the Origin of Species Darwin does not return to the mind/brain relation at all. Of the 47 occasions that the word "mind" is mentioned, 46 of them are in a metaphorical context, such as "bear in mind", "make up one's mind", "recall to mind"; the sole exception is one reference to "the minds of our domestic animals". One heresy at a time was enough for Darwin, at least in his first book-length exposition of the theory of evolution.

However, in the Descent of Man, published some 11 years later, Darwin is a bit more open about his views. At one point, speaking of certain mental faculties in humans, he says: "and these powers of mind manifestly depend on the development of the brain" (v.ii, p.715). He also refers to the development of the brain as a factor interacting with the development of language and intelligence. In the Expression of Emotions, the intimate relationship between mind and brain is an assumption present throughout the whole book, whose main thesis is that emotions, as faculties of the mind, give rise through the nervous system to definite and distinct bodily expressions, both voluntarily and in many cases involuntarily.

A striking example of Darwin's continued functional materialist view of mind is contained in a letter which he wrote to George Romanes in February of 1880, reproduced in Darwin's More Life and Letters. Darwin is commenting on a book by Romanes which traces the evolution of mind in animals, and Darwin seizes upon the occasion to speculate that mind arose in the lower organisms as the result of the effects of pain and pleasure on the nervous system:

> I have been accustomed to look at the coming in of the sense of pleasure and pain as one of the most important steps in the development of mind, and I should think it ought to be prominent in your table. The sort of progress which I have imagined is that a stimulus produced some effect at the point affected, and that the effect radiated at first in all directions, and then that certain definite advantageous lines of transmission were acquired, inducing definite reaction in certain lines. Such transmission afterwards became associated in some unknown way with pleasure and

> pain. These sensations led at first to all sorts of violent action, such as the wriggling of a worm, which was of some use. All the organs of sense would be at the same time excited. Afterwards, definite lines of action would be found to be the most useful, and so would be practiced...(v.ii, pp. 51-52).

However, Darwin cuts off his train of thought at this point with the self-demeaning remark "But it is of no use my giving you my crude notions."

The above quotations from works and letters subsequent to his Notebooks suffice, I believe, to show that although Darwin did not flesh out his functional materialist thesis on the mind/brain relation he nevertheless held it to the end of his life. There remains to be shown the role that the other theses of his philosophic framework play in supporting these materialist views. Among the most important are (1) his adhesion to the positivist program or approach of Comte; (2) the thesis of the continuity of development between animals and humans; and (3) his belief in the gradualism of change in nature.

Positivism, Continuity and Gradualism

Darwin accepts Comte's distinction of three stages in the development of knowledge - the first being the theological where the cause of all unknown phenomena is attributed to the will of God; the second being the metaphysical where knowledge is centered on finding the ultimate essence or true nature of things; and the third or scientific stage where the goal is the discovery of the lawful relationships of cause and effect between phenomena. Darwin agrees that science progresses by rejecting the first two stages in favor of the third. The contrast between theological and truly scientific explanations is most striking in this passage from the OUN Notebook:

> NB: The explanation of types of structure in classes -as resulting from the will of the deity, to create animals in certain plans - is no explanation - it has not the character of a physical law and is therefore utterly useless - it foretells nothing because we know nothing of the will of the Deity, how it acts and whether constant or inconstant like that of man - the cause given, we know not the effect.(OUN 5, pp. 157-58)

As to the denial of essentialism, this can be seen in a number of instances: (1) In his marginal notes to Abercrombie, Darwin is not effected by Abercrobie's comment that we cannot know the essence or ultimate nature of mind or matter - it suffices to know their functional relationships; (2) In the OUN Notebook after comparing thought as a function of the brain to bile as a secretion of the liver, Darwin says "What is matter? The whole a mystery." (OUN 37, p. 134), and he is not bothered that such a mystery exists, for he is not concerned to know the essence or ultimate nature of the basic categories he deals with. Metaphysics in this sense holds no interest for him.

Rather, it is the discovery of the laws of matter in its different forms of movement which is his concern, and the goal which he attributes to science as such. In one passage, after referring to Lamarck, Darwin says:

> According to the individual forms of living beings, matter is united in different modification, peculiarities of external form impressed, and different laws of movements.(OUN 34, p. 132).

He then continues in a footnote to distinguish the inorganic and organic worlds, both of them governed by laws, and related in an as yet unknown way.

> Hence there are two great systems of laws in the world- the organic and the inorganic - the inorganic are probably one principle for connect of electricity, chemical attraction, heat and gravity is probable - And the Organic laws probably have some unknown relation to them" (ibid).

A cursory reading of Darwin's later published works shows his continued committment to the discovery of the laws of nature, and his denial of recourse to supernatural explanations. Nowhere does he argue in terms of essences or ultimate natures - everywhere he tries to link phenomena in terms of their lawful relations of cause and effect. It is interesting to note that his literary executors censored the statement "Everything in nature is the result of fixed laws" from his Autobiography, recognizing in so doing that the thesis of lawfulness was in intimate relation with Darwin's negation of the theological.

The positivist approach has a direct bearing on the mind- brain issue, for it leads to a naturalist explanation of mind, avoids recourse to the talk of its essence and denies any supernatural character to it.

The thesis of the continuity of man and animals also reinforces the materialist view of the mind-brain relation. Darwin viewed the relationship between mankind and the animal kingdom not as an unbridgeable gap or mysterious jump, but as a line of connected, continuous, development.

> The difference (in) intellect of man and animals not as great as between living things without thoughts (plants) and living things with thoughts (animal). (B214, p. 186)

Darwin argued against those who hold that language represents a sharp demarcation between man and the animals. He held that it is more important to see that they both possess the common ability to communicate though only man has language as a developed form of communication (M96-97, pp.23-24). But even on this point, he notes that some animals possess language in its embryonic form of song.

A particularly important formulation of the thesis of gradualism is the idea that there is no "saltus" between man and animals, but at most a "hiatus" - the necessary but almost instantaneous (or negligibly small) stop between two contiguous elements in a connected series:

> Animals have voice, so has man, so-not <u>saltus</u> but <u>hiatus-</u> animals expression of countenance. They may convey much thus. (C154, p. 190)

In the Descent of Man Darwin says that though there is a difference between the mind of the lowest human and that of the highest animal, this difference is quantitative and not qualitative:

> Nevertheless, the difference in mind between man and the higher animals, great as it is, certainly is one of degree and not of kind. (v.i, p.170).

The thesis of the continuity between man and animals is a powerful tool in Darwin's materialist framework. It may be read in one sense to mean that animals have what man also has, though in a less developed form - therefore, because man has a mind, so do animals. Read in the opposite sense, it means that man does not have what animals also lack - and in particular, because animals lack a super-added soul, or supernatural mind, so does man:

> As in animals no prejudices about souls, we have particular trains of thoughts as far as man... - produced as soon as brain developed, and as I have said, no soul superadded. (OUN 36, p. 134)

Darwin holds to a gradualist view on the pace of evolutionary change. In the Origin of Species, Darwin quotes this thesis as the canon "Natura non facit saltum" and refers to it no less than 6 times, as summing up his gradualist views. Typical is this quote from the concluding chapter:

> As natural selection acts solely by accumulating slight, successive favorable variations, it can produce no great or sudden modifications; it can

> only by short and slow steps. Hence the canon of "Natura non facit saltum"; which every fresh addition to our knowledge tends to confirm, is on this theory intelligible. (v.ii, p.291)

Darwin seems to have several major reasons for this gradualist view: (1) The opposite view, that of saltationism was associated with catastrophism in geology, and this latter, at least in England, with the doctrine of special creation in biology. Since Darwin opposed this latter doctrine, he tended as well to oppose its saltationist relative.

(2) Darwin was personally acquainted with examples of the accumulation of small changes leading to large effects. These included the action of corrals, minute marine organisms, that over the years built up immense reefs, atolls and even islands, and worms, whose continual mulching of the earth surrounding them had produced all the vegetable mold on the surface of the planet.

(3) Darwin felt that geographic, hereditary and embryological considerations ruled out the formation of a new species by large variations in a short time span; rather, new species must be produced by small variations over a long time span. He did not reject a priori the possibility of abrupt or sudden change, but argued that it simply did not occur, excluding it for ex-post facto reasons.

(4) Darwin was aware of the fact that the observation

of present life forms, and investigation of the fossil record, appeared not to support his gradualist claim. Gaps, and major ones at that, separate the species in many genera, and the fossil remnants of the same species. This led him to argue that the fossil record was incomplete, and that if all transitional types had been preserved, a smooth and gradual process of change would be seen.

The thesis of gradualism can be linked with Darwin's functional view of the relation of mind to brain. On his view, all animals with a brain, or some rudimentary nervous system, can be said to have certain mental functions, however slight and primitive they may be. He even grants intelligence to worms which select from among alternative means the methods to construct their burrows and drag leaves into them. As the nervous system gradually increases in complexity in the course of evolution, the minds of the corresponding organic beings slowly develop, until the highest mental state is reached in man. It should be noted that Darwin's theory of evolution is not one of necessary progress - evolutionary change leads to progress only in the case where variations are adaptive; in the contrary cases loss of organs characteristic of parasitism and even the extinction of species may occur.

T. H. Huxley

Thomas H. Huxley (1825-1895) was a close friend and chief supporter of Darwin; he played the role of the public leader in the controversy over evolution to Darwin's private role as theoretical leader. An important contribution of Huxley to the debate was his Man's Place in Nature (1862), where he argues on the basis of similarities in morphological structure and embryological development for the common descent of man and the great apes. Huxley's scientific articles on paleolontology and biology are collected in the 4 volume Scientific Memoirs; his more popular writings, including Man's Place in Nature, are collected in the 9 volume Collected Essays.

In this section the following aspects of Huxley's thought will be examined: (1) his views on evolution and novelty, (2) his theory of protoplasm and critique of vitalism and materialism, and (3) his epiphenomalist view of the mind-brain problem.

Views on Evolution and Novelty

In an 1854 book review of Robert Chamber's view of evolution in the latter's anonymously published Vestiges of the Natural History of Creation (1844, 10th edition 1853), Huxley was highly critical. However, it should be noted that Huxley's broadside was directed more at Chamber's philosophic views on the nature of natural laws and his accuracy in presenting the facts of science, than at the concept of transmutation itself. Indeed, Huxley said that the progressionist idea of transmutation, according to which all living species undergo transformation from lower to higher types "is a perfectly legitimate one, and must be admitted or rejected according to the evidence attainable" (p. 335)

Huxley criticized Chamber's notion of law as explanatory of phenomena, rather than as merely descriptive of their connections; his confusion of theological and scientific concepts in the phrase "creation by natural law", and the scientific errors of fact contained in the book. On the question of transmutation itself, Huxley later described his position at the time as an agnostic one, based on the insufficiency of evidence for transmutation and the lack of a proposed mechanism to explain the phenomena (in "On the Reception of the 'Origin of Species'").

Huxley was won over to the point of view of evolution by natural selection soon after the publication of the joint Darwin-Wallace papers and Darwin's <u>Origin of Species</u> in 1859. "My reflection, when I first made myself master of the central idea of the 'Origin' was 'How extremely stupid not to have thought of that!" (ibid, p.197) Huxley's defense of Darwinism led him to become known as 'Darwin's Bulldog'. But Huxley, though the main English supporter and popularizer of the theory of natural selection, was careful to qualify Darwin's view as an hypothesis, and did not consider that decisive evidence for it existed until be became acquainted with Marsh's work on the series of fossil horses in the mid 1870s.

It is of interest to note that Huxley was initially at odds with Darwin's denial of jumps in nature. In discussing the case of a family of six-toed individuals and the modification of a sheep stock by breeding, he notes in "The Origin of Species" (1860) that "in each, the variety appears to have arisen in full force, and as it were, per saltum." (p. 35) Though holding this difference with Darwin to be minor, he nevertheless returns to it towards the end of the article and says:

> And Mr. Darwin's position might, we think, have been even stronger than it is if he had not embarrassed himself with the aphorism 'Natura non facit saltum' which turns up so often in his pages. We believe, as we have said above, that Nature does make jumps now and then, and a recognition of the fact is of no small importance in disposing of many minor objections to the doctrine of transmutation. (p. 77)

Huxley returned to the problem of the nature of evolutionary steps in the conclusion to his series of lectures to workingmen "On the Origin of Species" (1862). Here he approaches the problem from the angle of the relation of structure to function. He argues that a slight modification to the structure of a mechanism or slight differences between the structures of similar organisms may produce enormous differences in function. He considers and rejects the objection to the theory of evolution that though only minor differences separate the brain of humans from those of the great apes, there is a major difference between them as concerns their mental capacities. In reply Huxley argues that changes in structure and the consequent differences in function may be disproportionate:

> I think that objection is based upon a misconception of the real relations which exist between structure and function, between mechanism and work. Function is the expression of molecular forces and arrangements, no doubt, but does it follow from this, that variation in function so depends upon variation in structure that the former is always exactly proportioned to the latter? If there is no such relation, if the variation in function which follows on a variation in structure may be enormously greater than the variation of structure, then you see, the objection falls to the ground. (p. 142)

Thus a small change in the arrangement of the gears of a watch makes the difference between its proper functioning and its not functioning at all; and likewise, a small difference in the brain of men and apes makes for a large difference in intelligence.

As Huxley continued to write on evolution, his views tended to a greater and greater acceptance of Darwin's hypothesis of natural selection, and also of his view of gradualism as the tempo of evolutionary change. This was most clearly expressed in his "Lectures on Evolution" (1876), delivered in New York during his visit to the United States. After arguing against steady-state and catastrophic theories of species, Huxley adduces three categories of evidence for the theory of evolution by natural selection:

(1) the fossil record in general provides no more than neutral evidence, because of its imperfections; and these gaps can be taken to an extreme as negative evidence against the thesis if they are held to be absolute;

(2) favorable evidence includes those cases where there is fossil evidence of intermediary forms between distinct existing orders - he gives the example of archoëopteryx as the fossil link between birds and reptiles;

(3) demonstrative evidence is furnished by Marsh's work on the evolution of the horse - where a whole series of gradually evolving forms had been assembled; for Huxley such evidence establishes natural selection as a solid and confirmed hypothesis.

It is to be noted, however, that Huxley still desired to see demonstrated the cross-sterility of hybrids bred by artificial selection as a final element of proof for the theory of evolution by natural selection.

Theory of Protoplasm

In 1868 Huxley gave an address in Edinburgh that was subsequently published under the title "On the Physical Basis of Life". Here he argued that there is a physical basis of life common to all its forms, whether animal or vegetable: "Protoplasm, simple or nucleated, is the formal basis of life." (p. 142) As a consequence of this, all living forms are related and "fundamentally of one character", be they human beings, animals, plants or fungi.

According to Huxley, protoplasm is concentrated by plants and used up by animals. It can be broken down into three component parts: carbonic acid, water and various nitrogenous bodies, and these can be further broken down into their component atoms. There are thus three levels of complexity to be examined: (1) protoplasm, the physical basis of life; (2) its molecular components of carbonic acid, water and compounds of nitrogen; and (3) their atomic components of carbon, hydrogen, oxygen and nitrogen. Huxley then employs an argument by analogy: the relationship between protoplasm and its molecular components is similar to that between these molecules and their atomic constituents. Since no new substance is added to oxygen and hydrogen to produce water, it follows that no new substance is needed to go from the components of protoplasm to protoplasm itself.

Huxley notes that the properties of water, such as its fluid state between 32 degrees and 212 degrees Fahrenheit, differ from those of oxygen and hydrogen, which are gases at that temperature. But the new properties of water are the result of the combination of the oxygen and hydrogen atoms in a specific way, not of the addition of some new substance "aqueosity":

> Nevertheless, we call these, and many other strange phenomena the properties of water, and we don not hesitate to believe that, in some way or another, they result from the properties of the component elements of water. We do not assume that a something called "aqueosity" entered into and took possession of the oxidated hydrogen as soon as it was formed."(pp. 151-152)

Huxley hopes that the development of science will eventually explain these new properties, as technology is able to explain the operation of an artifact given its components and their manner of organization: by deducing the new properties of a whole given the properties of the components and the way they are combined. He then extends this type of reasoning to the question of protoplasm, and argues that no new substance is needed to explain its novel property of vitality as compared to the non- living characteristics of its component parts:

> What justification is there, then, for the assumption of the existence in the living matter of something which has no representative, or correlative, in the not living matter which gave rise to it? What better philosophical status has "vitality" than "aqueosity"?... If the properties of water may be properly said to result from the nature and disposition of its component molecules, I can find no intelligible ground for refusing to say that the properties of protoplasm result from the nature and disposition of its molecules.(ibid)

Vital action is therefore the result of "the molecular forces of the protoplasm which displays it" and Huxley extends this argument to thought as well:

> And if so, it must be true, in the same sense and to the same extent, that the thoughts to which I am now giving utterance, and your thoughts

> regarding them, are the expression of molecular changes in the matter of life which is the source of our other vital phenomena. (p. 154)

Thus there is a progression from atoms to molecules, and then to protoplasm and thoughts, without the intervention of any new substances. New properties arise solely as the result of the "nature and disposition" of the component parts of the whole, and it is the task of science to deduce these former from the latter. Vitality is a property of protoplasm, and not a substance in its own right. Huxley is well aware that this is a radical argument, and one that could lay him open to the charge of "gross and brutal materialism", but he has a philosophical defense in mind.

Critique of Materialism

Huxley's strategy is to accept the foregoing analysis as an example of "materialistic terminology", but to reject its extension to a materialistic philosophy. According to Huxley, his view on protoplasm and vitality would amount to a materialist philosophy only on the two further conditions that he hold (1) knowledge to be absolute and not relative, to involve knowledge of the essence of things and not just the appearances, (2) knowledge of cause and effect to be knowledge of necessary laws and not merely knowledge of the order of succession of contingent facts. Huxley extricates himself from the charge of materialism through an appeal to Kant and Hume in order to deny these two propositions.

As to the first point, Huxley states that we cannot have knowledge of the nature of matter, any more than we can have knowledge of the nature of spirit. Matter and spirit are both "names for the imaginary substrata of groups of natural phenomena" (p. 160) In other words, as in Kant, we cannot go beyond knowledge of the phenomena to knowledge of the nouemena, and so knowledge is relative to our consciousness of things, and not to things as they "really" are, in themselves.

As to the second point, Huxley rejects the "iron law" of necessity. Laws of nature are formulated by the use of "will" and not "must". Necessity goes beyond the facts and the laws that link facts: "Fact I know; and Law I know; but what is this necessity, save an empty shadow of my mind's throwing?" (p. 161). Here Huxley explicitly follows Hume. Combining the above two points, he states his rejection of materialism as a philosophy as follows:

> But, if it is certain that we can have no knowledge of the nature of either matter or spirit, and that the notion of necessity is something illegitimately thrust into the perfectly legitimate conception of law, the materialistic position that there is nothing in the world but matter, force and necessity, is as utterly devoid of justification as the most baseless of theological dogma. (pp. 161-162)

Invoking the scepticism of Hume, he states that the fundamental doctrines of materialism, like those of spiritualism, and most other "isms" lie outside "the limits of philosophical inquiry." From all this Huxley arrives at three conclusions:

(1) It is indifferent whether one expresses matter in terms of spirit or vice versa, since both are relative points of view:

> In itself it is of little moment whether we express the phenomena of matter in terms of spirit; or the phenomena of spirit in terms of matter; matter may be regarded as a property of thought, thought may be regarded as a property of matter - each statement has a certain relative truth. (p. 164)

(2) A materialistic terminology is preferable, in science, to a spiritualistic one, because it alone is fruitful:

> But with a view to the progress of science, the materialistic terminology is in every way to be preferred. For it connects thought with the other phenomena of the universe, and suggests inquiry into the nature of those physical conditions, or concomitants of thought, which are more or less accessible to us, and a knowledge of which may, in the future, help us to exercise the same kind of control over the world of thought, as we already possess in respect of the material world; whereas, the alternative, or spiritualistic, terminology is utterly barren and leads to nothing but obscurity and confusion of ideas. (ibid)

(3) Materialistic terminology cannot be extended to a materialistic philosophy, since this would be to confuse language with reality and transgress the limits of knowledge:

> But the man of science, who, forgetting the limits of philosophic inquiry, slides from these formulae and symbols into what is commonly understood by materialism, seems to me to place himself on a level with the mathematician, who should mistake the x's and y's with which he works his problems, for real entities- and with this further disadvantage, that the blunders of the latter are of no practical consequences, while the errors of systematic materialism may paralyze the energies and destroy the beauty of life. (p. 165)

Evolution of Thought

Huxley applies the evolutionary method to the history of ideas since Descartes to arrive at a synthesis of materialism and idealism. He considers Descartes' system as the root of modern philosophy, and sees two branches leading from it. The first path is based on his epistemological views, and via the method of systematic doubt, leads to the idealistic view that all we can know with certainty is that which is given by our consciousness:

> All I wish to put clearly before your minds thus far is that Descartes, having commenced by declaring thought to be a duty, found certainty in consciousness alone; and that the necessary outcome of his views is what may be properly be termed Idealism, namely the doctrine that, whatever the universe may be, all we know of it is the picture presented to us by consciousness. (p. 178)

Huxley notes that this (epistemological) idealism differs radically from the (ontological) idealism of Berkeley - since the same criticism as was previously applied to ontological materialism holds true here as well.

The other path proceeding from Descartes is based on his physiological and physical views, and leads to "that correlation of all the phenomena of the universe with matter and motion", which is materialism. Huxley singles out Descartes's view that the vital activities of animal and human bodies can be treated as purely mechanical. He also analyses the Cartesian and post-Cartesian views of consciousness and shows how they must logically lead to materialism.

In Descartes's view the soul is considered to be superadded to the body and "lodged" in the pineal gland, where it is influenced by and influences the animal spirits and thence the rest of the body. Huxley says that on this view, the soul must be a mathematical point, having place but no extension. But since it can influence and be influenced by the animal spirits "which consist of matter in motion" (p. 189), it must be a center of force, and thus of the same nature as matter when this latter is considered as "a multitude of centers of force".

In the post-Cartesian view, consciousness is seated in the grey matter, the cerebral cortex. But since the grey matter has extension, so must the consciousness which is lodged in it. Again, the conclusion is materialistic. This leads Huxley to affirm that Descartes's physiology, as well as the modern physiology it anticipates, leads to materialism, "so far as that title is rightly applicable to the doctrine that we have no knowledge of any thinking substance, apart from extended substance; and that thought is as much a function of matter as motion is." (p. 190) Drawing on the idea that the human body, like all bodies, is a machine, Huxley speculates that it may one day be possible to determine "the mechanical equivalent of consciousness", just as there is a mechanical equivalent of heat.

Thus for Huxley, starting from the root of Cartesian philosophy, two seemingly contradictory paths are opened up: "the one leads, by way of Berkeley and Hume, to Kant and Idealism; while the other leads, by way of De la Mettrie and Priestley;, to modern physiology and Materialism." (p. 190) The two paths are complementary, not contradictory, insofar as legitimate materialism, considered as "the extension of the methods of physical science to the highest as well as the lowest phenomena of vitality" (p. 194) still requires consciousness as its condition, and this is the epistemologically idealist view that Huxley accepts. He calls "legitimate materialism" a "sort of shorthand Idealism", and the two divergent paths therefore meet. This reconciliation of physics, considered as a generic term for all scientific theory, and interpreted in the light of legitimate materialism, and metaphysics, by which Huxley means the idealist views on consciousness as the condition of knowledge, is the result of each recognizing its faults and its dependence on the other:

> in the confession by physics that all the phenomena of Nature are, in their ultimate analysis, known to us only as facts of consciousness; in the admission by metaphysics,

> that the facts of consciousness are, practically, interpretable only by the methods and formulae of physics.(p. 194)

Epiphenomenalism

In his 1874 article "On the Hypothesis that Animals are Automata and its History", Huxley extends his synthesis of materialism and idealism to the problem of the mind/brain relation, and arrives at his view of epiphenomenalism. He starts off from Descartes's hypothesis that "brutes are unconscious machines". Huxley argues that this hypothesis is wrong in denying consciousness to animals, but correct in treating them as automata, insofar as their bodily functions and activities are the result of reflexes. The problem is that by denying consciousness to animals and reserving it for man alone, Descartes' view leads to a discontinuity, or gap between the two. This contradicts Darwin's hypothesis of the continuity of man and animals, and so Huxley contends that consciousness, if it exists in man, must exist, if only in more rudimentary forms, in animals as well.

He notes the following evidence in support of his thesis of the continuity of consciousness, though of varying degrees, in animals and humans: (1) in individual humans there are differing degrees of consciousness with age; (2) animals possess, though in a less developed way, that part of the brain that is believed to be the organ of consciousness in humans; (3) animals, though they lack language and therefore the capacity for trains of thought, nevertheless have trains of feelings. From this he concludes that consciousness comes in degrees and that animal consciousness "foreshadows" that of humans.

He then continues to examine the nature of the relationship between the action of the nervous system and the appearance of consciousness. Given his previous arguments that molecular changes in protoplasm are the source of vitality and even thought, it is not surprising that he holds that the action of the nervous system causes or evokes states of consciousness, thought the exact mechanism of causation, like that of all instances of causation, is unknown. Since causation involves the temporal succession of cause and event, Huxley is committed to the view that molecular changes in the brain precede the corresponding mental state that they bring about.

On the one hand, Huxley sees no evidence for the reverse form of causation - that of states of consciousness re-acting back on the brain and changing its molecular state. He points to the experiment with a de-cerebrated frog that continues to go through many of the behavioral acts of its repertoire despite the impossibility of its experiencing any consciousness, and says that no feedback from consciousness would seem to be needed for those acts. He holds that even in the normal animal, no such mind to brain causality occurs, and that consciousness is an accompaniment of the functioning of the brain, not an active agent. Using the example of a train and its steam whistle as an analogy to that of the brain and its mind, he says:

> The consciousness of brutes would appear to be related to the mechanism of their body simply as a collateral product of its working, and to be completely without any power of modifying that working as the steam-whistle which accompanies the work' of a locomotive engine is without influence upon its machinery. Their volitions, if they have any, is an emotional indicative of physical changes, not a cause of such changes. (p. 240)

Will is here seen as a state of consciousness corresponding to voluntary acts, as opposed to involuntary or automatic ones. Freedom of the will is re-interpreted to mean that an animal acts in accordance with its reflexes and its nature, and is not restrained by external means.

Huxley also deals with the problem of the soul of animals. If animals have no souls, then consciousness is a direct function of material changes in the brain, as above. If animals are considered to have immaterial and immortal souls, then consciousness becomes an indirect function of material changes of the body, with the soul as the mediating element. In this latter case, "the soul stands related to the body as the bell of a clock to its works, and consciousness answers to the sound which the bell gives out when it is struck.(p. 242) However, he tends to support the view that animals have no souls.

In resûme, Huxley holds that molecular states of the brain, called by him "neuroses", are the cause of the states of mind, called by him "psychoses". Neuroses cause psychoses, but psychoses do not cause neuroses. Thus far, he has dealt only with animals, but having developed his theoretical framework of the relationship between neuroses and psychoses, he now applies it to humans, based once again on Darwin's principle of the continuity of animals and humans, and concludes that humans are thus also conscious automata:

> It is quite true that, to the best of my judgment, the argumentation which applies to brutes holds equally good of men; and therefore, that all states of consciousness in us, as in them, are immediately caused by molecular changes of the brain substance. It seems to me that in men, as in brutes, there is no proof that any state of consciousness is the cause of change in the motion of the matter of the organism. We are conscious automata, endowed with free will in the only intelligible sense of that much-abused term - in as much as in many respects we are able to do as we like - but non the less parts of the great series of cause and effects, which, in unbroken continuity ,composes that which, is, and has been, and shall be - the sum of existence. (pp. 243-244)

He defends himself against the charges of fatalism, materialism and atheism as follows:

> Not among fatalists, for I take the conception of necessity to have a logical, and not a physical foundation; not among the materialists, for I am utterly incapable of conceiving the existence of matter if there is no mind in which to picture that existence; not among the atheists, for the problem of the ultimate cause of existence is one which seems to me to be hopelessly out of reach of my poor powers. (p. 245)

Huxley's views have become known as epiphenomenalism, that consciousness (or mind) is an ephiphenomena of matter. Despite his disclaimers, he has sometimes been construed as a materialist, while others have wondered why, given that Huxley attaches no causal efficacity to mind, he bothers to discuss it at all. But this misses the point of what has been termed his epistemological idealism. For mind, though it cannot act on the brain, does have a function of crucial importance. It is our source, and according to Huxley, our only source, of knowledge of reality and of our emotional reactions to it. Without mind, life would still be active, Huxley argues, using the example of the decorticated frog; but, it might be added, very boring indeed. Mind as source of knowledge and feeling is not superfluous or to be eliminated, for even though it lacks causal efficacity on matter, it is of supreme importance because of its cognitive powers.

Monism, Dualism and Pluralism

There remains the question of determining whether Huxley is a monist, dualist or pluralist in his views. Indeed, he can be interpreted as each: a monist insofar as he accepts the views of physics and physiology as the basis for legitimate materialism; a dualist because he admits mind distinct from, though caused, by brain; and a pluralist if one were to adopt his "bell" model of brain, mind and soul.

Some light as to his ontological views is contained in a letter of May 1863 to Kingsley, reproduced in Huxley's Life and Letters, where he defends a view that closely approximates that of neutral monism. He sets up his argument by stating that there are five possible ontological hypotheses about the "number of x's" where x stands for substance: (1) there is no x (atheism); (2) there is only one x (materialism or pantheism); (3) there are two x's (dualism of spirit and matter); (4) there are three x's (God, soul, matter as in theology); and (5) there are more than 3 x's (polytheism). He then says:

> To say that I adopt any one of those hypotheses, as a representation of fact, would to my mind be absurd; but no. 2 is the one I can work with best. To return to my metaphor, it chimes in better with the rules of the game of nature than any other of the four possibilities, to my mind." (p.263)

Though he admits he may be wrong, "that there are no x's or 20 x's" (p. ibid), the hypothesis of one x seems to be his preference, since it is the simplest solution:

> And until you satisfy me as to the soundness of your method of investigation, I must adhere to what seems to my mind a simpler form of notation - ie to suppose that all phenomena have the same substratum (if they have any), and that soul and body, or mental and physical phenomena, are merely diverse manifestations of that hypothetical substratum. In this way, it seems to me, I obey the rule which works so well in practice, of always making the simplest possible suppositions." (pp. 282-283)

In "Bishop Berkeley on the Metaphysics of Sensation" (1871), he comments as follows on Berkeley's proposition that to be is to be known, and that the existence of consciousness apart from a thinking mind is a contradiction: "I conceive that this reasoning is irrefragable. And therefore, if I were obliged to choose between absolute materialism and absolute idealism, I should feel compelled to accept the latter alternative." (p. 279)

But in the article "Sensation and the Sensiferous Organs" (1879), he reviews three hypotheses of the origin of sensations - that they are caused by the immaterial substance of mind, by the mode of motion of the material brain, or by some other substance which underlies mind and matter. He says that they are also logically possible, and none can be practically refuted, and then notes: "But, if I must choose among them, I take the "law of parcimony" for my guide, and select the simplest - namely, that the sensation is the direct effect of the mode of motion of the sensorium." (p. 307)

Huxley's agnosticism on matters ontological makes it impossible to pin him down to a specific option. Nevertheless, he seems always to have wavered between forms of monism - be it materialism, idealism, or what may be called neutralism. Moreover, he never spoke in favor of dualism in any form.

Alfred Wallace

Alfred Wallace (1823-1913) was the co-founder with Darwin of the theory of evolution by natural selection. His paper on the subject was read to the Linnean Society jointly with that of Darwin in 1858. Wallace's theoretical and philosophical contributions to the question of evolution and mind discussed in this section are contained in his Contributions to the Theory of Natural Selection (1871) and An Exposition of the Theory of Natural Selection (1889). Wallace also accepted Darwin as the originator and the main theorist of natural selection, and held that his own view was a form of Darwinism.

However, there are two important differences between Wallace's theory of evolution and that of Darwin: (1) at the scientific level, Wallace admitted only one factor of evolution - that of natural selection, whereas Darwin admitted at least three - including sexual selection and the inheritance of acquired characteristics as well; (2) at the philosophical level, Wallace was a dualist, accepting both natural and supernatural elements in the world, whereas Darwin was a monist, limiting his ontology to that of material bodies only. Thus, where Darwin was a pluralist, Wallace was a monist, and where Darwin was a monist, Wallace was a dualist.

In this section Wallace's views will be examined on (1) the scope and limits of natural selection, and (2) the dualism of the natural and the supernatural.

Scope and Limits of Natural Selection

Wallace, in Contributions to the Theory of Natural Selection (1871) presents a highly schematic version of the origin of species; it is one of the first attempts, if not the first, to present a deductive model of the theory. Wallace starts off from two facts of biology: (1) in most species, there is a rapid increase in the number of organisms at any given time as a result of reproduction; and (2) in most species, the number of individuals over a period of time is stationary or stable. From this he infers (3) the struggle for existence, with deaths equaling births on the average.

Next, he adds to the above conclusion, now considered as a premise, the further fact of (4) heredity with variation, the general similarity and slight differences between parents and offspring; to conclude (5) survival of the fittest, or natural selection, "that on the whole those die who are least fitted to maintain their existence."(p. 302).

This second conclusion then serves as the point of departure for a third deduction. It is combined with (6) change of external conditions, due to climatic, geographic, and ecological variations, to arrive at (7) changes of organic forms or origin of species "to keep them in harmony with the changed conditions; and as the changes of conditions are permanent changes, in the sense of not reverting back to identical previous conditions, the changes of organic forms must be in the same sense permanent, and thus originate species." (ibid)

The origin of species is thus presented as a chain of three deductions, where the conclusions of the first and second each serve as one of the premises of the second and third respectively:

given (1) rapid increase of population
and (2) stability of population over time
then (3) struggle for existence.

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given (3) struggle for existence
and (4) heredity with variation
then (5) survival of the fittest or
natural selection

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given (5) survival of the fittest or
natural selection
and (6) change of external conditions
then (7) change of organic forms and
origin of species

It is to be noted that no reference is made to either sexual selection or the inheritance of acquired characteristics as factors, even secondary ones, in the process of evolution. Wallace rejected the notion of female choice and explained such phenomena as bright colors and other male ornaments as the result of natural selection operating independently on both sexes. As he states in his autobiography My Life (1908): "The females, being often more exposed to danger than males (as in the case of sitting birds), had acquired more subdued coloration whilst the males had remained bright and comparatively conspicuous." (pp. 236-237). Though initially favorable to Darwin's views on the inheritance of acquired characteristics and the proposed mechanism of pangenesis, he rejected it on the basis of Weismann's theory of the continuity of the germ-plasm, and its independence from the body-soma, a theory which he saw as one that "simplifies and strengthens the fundamental doctrine of natural selection." (p. 237)

In his autobiography Wallace lists as first of the four points of divergence with Darwin the applicability of the theory of natural selection to man; the other points being the above two, his rejection of sexual selection and inheritance of acquired characteristics, and the third a more minor point on the method of propagation of arctic plants found on isolated mountain tops.

The divergence on the applicability of the theory of natural selection to man was the result of the following argument by Wallace, set out in his Contributions to the Theory of Natural Selection: (1) The only natural factor in evolution is that of natural selection; (2) If evolution occurs in a context where natural selection can be shown not to operate, it must be due to some non-natural, or super-natural factor; (3) such contexts do exist, in particular the origin of the brain in man and certain of his mental capacities; (4) thus, there must be a supernatural factor that intervenes in the process of human evolution. In detail, his argument is constructed as follows:

Wallace argues that natural selection acts differently on animals than on humans. In animals, it is a dominant force, because of their "self- dependance and individual isolation". A weak or inferior member of a species is rapidly eliminated, since it cannot assure its survival in a rude and dangerous environment. But in man, even in the most primitive tribes, there are "social and sympathetic factors" at work. The collectivity helps its physically weaker members; and tribes that practice such a "mental and moral" policy are favoured in the struggle for existence with tribes that do not. Moreover, man can use his intellectual and cooperative powers to provide himself with additional means of survival - such as clothes, tools and weapons, which, except in the most rudimentary forms, if at all, animals cannot make. Thus, man, by his superior talents, escapes the grip of natural selection, at least insofar as his body is concerned:

> From the time, therefore, when the social and sympathetic feelings came into active operation, and the intellectual and moral faculties became fully developed, man could cease to be influenced by "natural selection" in his physical form and structure" (p.316)

Wallace notes that natural selection seems still to be operating on the body of man as concerns only skin color and the abundance and texture of hair; this exception is considered as a correlative factor with resistance to certain lethal diseases. But otherwise, he holds that natural selection is operative in man only in the mental sphere. The challenge of a harsh environment (shortage of food, inclement weather, etc.) is the environmental factor that "selects" for the sharpening of intellectual powers to meet these challenges.

Thus, two stages in the application of natural selection to man are distinguished: (1) the purely physical stage, when the distinctive human brain and mind had not yet appeared, and (2) the purely mental stage, when natural selection, with the exceptions mentioned (skin and hair), no longer operates on the human body. How does Wallace get from stage (1) to stage (2)? He does so by invoking an agency other than natural selection. He is aware that the link between the two stages is the result of the development of the large human brain, which he accepts as the organ of mind, and so he argues that the development of the human brain is not the result of natural causes.

Wallace holds that the brain of primitive man was about the same size as that of contemporary man, an assumption which current anthropological research has shown to be false. Based on this assumption, he argues that savage tribes do not need, nor did they use, the full capacities of this brain in higher intellectual or moral activity. Now, according to natural selection, the larger brain must have been evolved in response to some material needs and for some immediate use. This not being the case, natural selection could not have produced the large brain. Wallace also argues that it could not have produced other characteristic human features: naked skin, erect stance, vocal chords, and sensitive hands. If these developments did not occur through natural selection, and since natural selection is the only factor of evolution that Wallace admits, then some "superior intelligence" must have endowed primitive man with these characteristics to be used only later:

> The inference I would draw from this class of phenomena is that a superior intelligence has guided the development of man in a definite direction and for a special purpose, just as man guides the development of many animal and vegetable forms." (p.359)

__Dualism__ __of__ __Natural__ __and__ __Supernatural__:

Wallace's theoretical views as summarized above were also expressed by him in a more philosophical mode. His point of departure in __Contributions to the Theory of Natural Selection__ (1871) is the statement of Huxley that "thoughts are the expression of molecular changes in the matter of life which is the source of our other vital phenomena" (quoted p.362). Wallace reformulates the problem as follows: organic matter is made up of "matter of extreme complexity and of great instability" which explains its continual changes of form. According to Wallace, however, this explains only the possibility, but not the actuality, of the phenomena of vital life occurring in organic matter under the presence of various forces, such as heat, light, electricity and "probably some unknown forces". It is a necessary, but not a sufficient condition. He holds that no quantitative addition of molecules can result in the qualitatively new property of consciousness:

> But this greater and greater complexity, even if carried to an infinite extent, cannot, of itself, have the slightest tendency to originate consciousness in such molecules or groups of molecules... To say that mind is a product or function of protoplasm, or of its molecular changes, is to use words to which we can attach no clear conception. You cannot have in the whole, what does not exist in any of the parts. (p.365)

This latter phrase is a very clear denial of the emergence of new properties in the whole. According to Wallace, two possibilities remain: either panpsychism or dualism:

> There is no escape from this dilemma - either all matter is conscious, or consciousness is something distinct from matter, and in the latter case, its presence in material things is proof of the existence of conscious beings, outside of , and independent of what we term matter. (p. 365)

Rejecting panpsychism out of hand, Wallace opts for the dualism of matter and mind. In the same context, Wallace toys with the idea of idealism as a solution to the mind-body problem. He states that matter is known only to us through its action as a force, and that force is understood on the basis of our own will force. He then suggests that instead of having the three categories of matter, force and mind as distinct categories, it might be "the far simpler and more consistent belief, that matter, as an entity distinct from force, does not exist; and that force is a product of mind." (p. 369) A further conclusion is that "the whole universe, is not merely dependent on, but actually is, the will of higher intelligences or one supreme intelligence." (p. 368)

In Darwinism (1889) he develops and extends his arguments of the supernatural origin of mind. Discussing the mental faculties, he states that natural selection could not have developed the mathematical, musical and artistic faculties, since they have no cash-value in the struggle for the survival of the fittest:

> The special faculties we have been discussing clearly point to the existence in man of something which he has not derived from his animal progenitors - something which we may best refer to as being of a spiritual essence or nature, capable of progressive development under favorable conditions. (p. 474)

Wallace now extends his argument of "exceptions" to natural law to include not only the origin of the human mind, but also two other nodal points: the origin of life and the origin of animals. Thus there are three stages in evolution: "the change from the inorganic to the organic", the "distinction between the animal and the vegetable kingdoms," and "the differentiation of man from the brutes":

> These thee distinct stages of progress from the inorganic world of matter and motion up to man, point clearly to an unseen universe - to a world of spirit , to which the world of matter is altogether subordinate. (p.476)

There are thus two aspects to Wallace's theory: (1) his question as to the origin of the three distinct stages and (2) his supernaturalist response.

George Romanes

George Romanes (1848-1894) was one of the main expositors of Darwin's theory and one of the founders of comparative and animal psychology.

Among Romanes major works are (a) a three part study of animal psychology and mental evolution in animals and humans: Animal Intelligence (1883), Mental Evolution in Animals (1883); and Mental Evolution in Man (1889) ; (b) a multi-volume analysis and defense of Darwin's work: Darwin and After Darwin, 3 vols. (1897-1902, posthumously), along with a comparison of Darwin's and Weismann's theories of heredity: An Examination of Weismannism (1899); and (c) a philosophical study of the mind/brain problem, two volumes in one entitled Mind and Motion and Monism (1895); as well as two volumes on religion, written at different stages of his own intellectual development: A Candid Examination of Theism (1878), published pseudonymously, and Thoughts on Religion (1898), published posthumously.

In this section, three aspects of his work will be examined: (1) His views on Darwinism and neo-Darwinism, (2) his notion of mental evolution and his critique of Wallace's views of the origin of mind, (3) his analysis of the mind-brain problem and his option of neutral monism.

Darwinism and neo-Darwinism

Romanes was an expositor and defender of Darwin's theory. In Darwin and After Darwin he was particularly concerned to distinguish the neo-Darwinism of Wallace and other post-Darwinians, such as Weismann, with its unilateral emphasis on natural selection as the sole factor of evolution, and the richer, multi-factor theory of Darwin himself.

In particular, he points out the following differences between Darwin and Wallace: (1) According to Darwin, "natural selection has been the main means of modification, not excepting the case of man", while according to Wallace, "natural selection has been the sole means of modification, excepting in the case of man" (v.1, p.6) (2) Darwin admits the possibility of Lamarckian factors, which is an empirical question to be decided on the basis of evidence; while Wallace excludes a-priori any possibility of Lamarckian factors, since natural selection is all-inclusive; and (3) Darwin admits sexual selection as a further factor of evolution, while Wallace also rejects it and for the above reason.

To avoid confusing Wallace's own views with those of Darwin, Romanes coined the phrase "Neo-Darwinism" and "ultra-Darwinism" to designate Wallace's views as distinct from those of Darwin. Romanes also takes to task those opponents of Darwin who reject his theory of natural selection in favor of one of supernatural design. He argues against any reference to teleological factors in evolution, and to be consistent, argues that the theory of natural selection does not necessarily imply progress.

Romanes also distinguishes Darwin's theory of pangenesis as a basis for heredity from Weismann's theory of the continuity of the germ plasm. In An Examination of Weismannism, Romanes says that according to Darwin, "all parts of the organism generate anew in every individual the formative material which, when collected together in the germ cells constitutes the potentiality of a new organism" (p. 26). He then notes that Weismann denies this, holding that the germ-plasm is not generated by the body in which it is found, but rather uses the body as a host before part of it is split off in the act of reproduction to help form a new body. Romanes takes exception to the opinion that Darwin's views on heredity and variation are the same as those of Weismann and Wallace, and clearly distinguishes the two related, but distinct, theories of evolution.

One important contribution of Romanes to evolutionary theory is mention of the concept of the intellectual transmission of acquired characteristics as distinct from the physical transmission of acquired characteristics that Darwin tried to explain through his theory of pangenesis. This former notion is a sort of cultural evolution, a factor not theoretically developed by Darwin. In Darwin and After Darwin, Romanes notes that civilized man differs from the savage because of his ability to write down his thoughts, "and the consequent transmission of the effects of culture from generation to generation" (v.2, p. 33)

> Quite apart from any question as to the hereditary transmission of acquired characters, we have in this intellectual transmission of acquired experience a means of accumulative cultivation quite beyond our powers to estimate... Hence, a civilized man inherits mentally, if not physically, the effects of culture for ages past, and this in whatever direction he may choose to profit therefrom. (ibid)

There then ensues aa "kind of non-physical natural selection" of this cultural material:

> For here a struggle for existence is constantly taking place among "ideas", "methods" and so forth, in what may be termed a psychological environment. The less fit are superseded by the more fit, and this not only in the mind of the individual, but through language and literature, still more in the mind of the race. (ibid)

In vol. 3, Romanes adds his own notion of physiological selection to the mix of factors involved in evolution. Romanes states that natural selection, even when combined with the notion of geographic isolation, cannot suffice as the chief factor in the origin of new species. He rejects what he holds to be Darwin's view that slight morphological changes may add up and react on the reproductive system of the varieties so produced so as to render them infertile with the parent type. He notes that in Darwin's system this process is necessary or else the swamping of incipient varieties by inter-crossing would occur.

Rather, he turns his attention directly to the reproductive system and considers variations in this system as the condition for the development of incipient varieties when combined with other morphological differences. Natural selection then operates on this complex:

> When variations of a non-useful kind occur in any of the other systems or parts of organisms, they are, as a rule, immediately extinguished by intercrossing. But whenever they arise in the reproductive system in the way here suggested, they tend to be preserved as new natural varieties, or incipient species. At first the difference would be in respect of the reproductive systems; but eventually, on account of independent variation, other differences would supervene, and the variety would rank as a true species. (v.3, p. 43)

Mental Evolution

Romanes produced three volumes on the comparative intelligence of animals and humans, and the mental evolution of both. In Animal Intelligence (1883), he sets out his basic definition of mind and gives a detailed study of intelligence in animals from mollusks to the primates, exclusive of man. In Mental Evolution in Animals (1883), he develops his theory, particularly as concerns the concepts of consciousness, sensation, perception, instinct and reason, and he provides a comparative table of animal and human mental development, putting into correlation the phylogeny of animal mind and the ontogeny of the human one. In Mental Evolution in Man (1888), he addresses specifically the question whether human intelligence can be explained solely on natural principles, and criticizes Wallace's supernaturalist views.

In Mental Evolution of Man Romanes begins with the question: how do we know mind? In the case of each person's own mind, the problem is answered by saying that each knows his own mind subjectively, through "an immediate cognizance of a certain flow of thoughts and feelings" (p.15), ie as consciousness. The difficulty arises in the case of knowledge of other minds, since there can be no direct or immediate knowledge of these other minds. What can be known, objectively, is the activity of other organisms. If this activity is of the appropriate kind, ie satisfies what Romanes calls the criterion of mind, then it can be inferred that, by analogy with our knowledge of our own minds, that the organism in question also has a mind. This last operation of inferring by analogy is neither subjective, though it involves the subjective aspect of comparison to one's own mind,. nor objective, though it involves the objective aspect of observing another organism's behavior. To highlight the difference with the subjective and objective modes of knowledge, Romanes adopts the term (due to Clifford) of ejective:

> Therefore all our knowledge of mental activities other than our own really consists of an inferential interpretation of bodily activities - this interpretation being founded on our own subjective knowledge of our own mental activities. By inference we project, as it were, the known patterns of our mental chromograph on what is to us the otherwise blank screen of another mind; and our only knowledge of the processes there taking place is really due to such a projection of our

own subjectivity. (p.16)

The term eject is meant to designate, as opposed to subject or object, "the distinctive character of a mind or mental process other than our own in its relation to our own" and so "possible knowledge of other minds is ejective". The study of other minds therefore uses "an ejective method of inquiry" (ibid).

It now becomes important to distinguish those activities of bodies that are indicative of the presence of mind, and those which are not. The observable dividing point between the presence and the absence of mind is the presence or the absence of choice in the behavior of a living organism. Choice, however, must be distinguished from merely choice-like reflex action. Romanes considers that real choice intervenes only when an animal or human being modifies its behavioral repertoire in way not explainable by heredity. In such cases, it learns from its own experience and exhibits novel activities, rather than rigidly adhering to a pattern common to all members of its species. This introduces an element of uncertainty in choice, and distinguishes it from the stereotyped reflex activity. In Mental Evolution of Animals Romanes summarizes this as follows:

> In other words, ejectively considered, the distinctive element of mind is consciousness, the test of consciousness is the presence of choice, and the evidence of choice is the antecedent uncertainty of adjustive action between two or more alternatives. (p.18)

In Mental Evolution in Man, Romanes considers that the physical basis of mind is the brain, and that intelligence is linked with (1) brain size or mass and (2) brain structure of complexity, though the exact nature of the relationship between the physiological and the psychological factors is not spelled out. Consciousness is said to be the product of the cerebral hemispheres, and reflex action of the lower ganglia. Reflex actions require less time for execution, and conscious actions more time. Consciousness evolves from reflex actions as organisms become more complex and enter into more varied relations with the environment. Specialized reflex mechanisms to meet specific stimuli become overburdened, and the higher nerve centers of the cortex take over the task of "focussing" those many and varied stimuli, "in order to attain to that higher aptitude of discrimination in which we have already seen to consist the distinctive attribute of mind." (p.75)

In both Mental Evolution in Animals and Mental Evolution in Man , Romanes includes a diagram comparing animal and human psychological development. The mental faculties of emotion, will and intellect are portrayed in the form of a tree structure, with will as the trunk, issuing from the root of excitability, and emotion and intellect as the branches. The height of the tree is divided into 50 gradations. Excitability, characteristic of protoplasmic organisms in the animal world, and the ovum and spermatozoa in man, occupies the first four gradations; pain and pleasure occur at the 10th, memory at the 17th, reason at the 22nd, use of tools at the 27th, and "indefinite morality", the highest named intellectual category, at the 28th. This level is said to correspond in the animal kingdom to the apes and dogs, and in man, to the baby at age 15 months.

The scale of emotional development begins at level 18 with surprise and fear, corresponding to the primary instincts on the scale of intelligence, and ends at the 28th level with shame, remorse, deceitfulness and the ludicrous as the highest specifically labelled development. Despite its many obviously ad-hoc classifications and comparisons, and its over-simplifications, the diagram is of interest because of its attempt to correlate emotional, intellectual and conative development, and correlate the evolution of animal intelligence with the development of its human counterpart.

Romanes holds that organic evolution, the fact of which he considers firmly established by the evidence of natural history, and whose theory has been best developed in Darwin's work, has as its counterpart a corresponding mental evolution. Romanes develops a number of arguments against Wallace's view that the specifically human elements of mind were not evolved by natural means. He argues

(1) that it is inconsistent to assume the uniformity of evolution in organic life and then interrupt it at its "terminal phase", ie at man;

(2) that in the development of the mental life of the individual humans there is no sudden leap but rather a gradual transition from childhood to maturity and old age;

(3) there is a parallel between the phylogenetic development of animals (from the lowest forms to the highest apes) and the ontogenetic development of man (at least up to infants of 15 months);

(4) in the history of the human species, there has been a steady, if slow, progress in the evolution of intelligence, and no suspension of such gradual evolution among the savages;

(5) there is a very wide area of overlap between human and animal psychology as concerns emotion and intellect;

(6) that those emotions and intellectual capacities unique in humans are based on the foundation of emotions and intellectual capacities common to humans and animals, and therefore evolved from the latter;

(7) that it is illegitimate to limit instincts to animals and reason to man, for though the former is more developed in animals and the latter in humans, both occur to some extent in each;

(8) animals do mentally evolve from generation to generation, if only to meet certain environmental challenges. With these arguments, Romanes considers to have rebutted Wallace's views and placed comparative psychology on a purely natural basis.

In <u>Mental Evolution in Man</u> Romanes also develops at length another psychological argument for mental evolution in his analysis of ideas into three sorts: percepts, recepts and concepts, referring to Locke as the source for his view. Percepts are ideas which are "simple, concrete and particular" (p.395); recepts are the next higher level of ideas, compounded out of percepts by the law of association into "complex, compound or mixed ideas". Concepts are the highest ideas, being "general, abstract or notional", differing from recepts in being generated in a conscious and not in a spontaneous or automatic manner by the mind:

> Hence we see that between the region of percepts and those of concepts there lies a large intermediate territory, which is occupied by what I have called generic ideas, or recepts. A recept, then differs from a percept in that it is a compound of mental representations, involving an orderly grouping of simpler images in accordance with past experience; while it differs from a concept in that this orderly grouping is due to an unintentional or automatic activity on the part of the percipient mind. A recept, or generic idea, is imparted to the mind by the external "logic of events"; while a general idea, or concept is framed by the mind consciously working to a higher elaboration of its own ideas. In short, a recept is received, while a concept is conceived. (p.396)

Now, both percepts and recepts are commonly attributed to both animals and man, while concepts are held by many to be the property of humans alone, linked to consciousness of consciousness, or self-consciousness, and the capacity for language and speech. Romanes introduces two gradations between consciousness and self- consciousness, which he terms receptual self-consciousness (in brutes and infants) and pre-conceptual self-consciousness (in older children). These lead to conceptual self-consciousness. Thus self-consciousness is not an all or nothing affair, and by introducing quantitative gradations and intermediate stages or sub- stages, Romanes hopes to avoid the need to introduce the completely novel properties of the human mind from without, ie from a super- natural origin, as in Wallace's writings.

The Mind/Brain Problem and Monism

In the two essays, Mind and Motion (1885) and the posthumously published Monism (1895), Romanes develops his views on the possible theories of the mind/body problem and expounds on his own preference. In Monism, which is the most developed of his views, though just an extension of the earlier views of Mind and Motion, Romanes distinguishes seven theories of the relation between material and mental changes, which he analyzes in terms of the type of causality each posits between the two types of changes. Two of the theories admit the reality of causal relationships between mind and matter. They are (1) Spiritualism, or animism in its more primitive form, according to which mental changes cause material changes; and (2) Materialism, which holds the opposite view.

The other theories which he enumerates deny that there is a causal relationship. They are (3) Monism, which holds that there is no causal relationship between the two because the two supposedly distinct classes of phenomena - material and mental change, are "really one and the same" (p.42); (4) Pre-established harmony, which asserts that the association between the two types of change is "pre-established by a superior mind"; (5) Chance theory, which holds the association to be due to mere chance; and (6) Pure Idealism, which denies real existence to the material realm. Finally, he notes (7) the view that it cannot be determined whether or not there is any causal relationship because the association of matter and mind is "beyond the power of the human mind to explain"(p.43)

Romanes rejects the last four views out of hand: (a) pre-established harmony diverts attention from the nature of the mind/body relationship to that of a superior intelligence that establishes the parallel between the two, and so skirts the issue or answers the question in line with another view, that of spiritualism; (b) the chance theory is contradicted by the "intimate, constant and detailed" association between material and mental changes; (c) pure idealism interpreted as a sort of solipsism, though incontrovertible by logic, is opposed by common sense; and (d) the argument that the problem is insoluble can be excluded, since worthwhile hypotheses to the contrary are available.

Romanes specifically rejects Huxley's views of epiphenomenalism as inconsistent with the theory of evolution. For if mind cannot cause physical changes, it is useless in the struggle for existence, and so according to the theory of natural selection, should never have been evolved:

> If psychosis is, as supposed, a function of neurosis, the doctrine of natural selection alone would forbid us to imagine that this function differs from all other functions in being itself functionless." (p.73)

In examining spiritualism, Romanes notes that its main advantage is epistemological: its view that mind causes matter proceeds from what is immediately known (mind) to that which is the object of knowledge (matter). On the other hand, its disadvantage lies in its contradicting the scientific principle of the conservation of energy. Romanes argues that if mind can act as a cause upon matter, it must do so by creating or destroying energy; but since the realm of matter in motion is supposed to be closed such an act could only be explained by super-natural or miraculous causes, which Romanes rejects.

The advantage of materialism is held to be its its support by physiology and physics. Romanes notes that research into the functioning and especially the malfunctioning of the brain has shown "the relation between neurosis and psychosis to be a constant and concomitant relation, so that the step between this, and regarding it as a causal relation, seems indeed a small one." (p.56) However, he does not want to take that step, and criticizes both materialism and spiritualism.

The main argument which Romanes develops against both materialism and spiritualism is that each posits (1) a physical chain of causation complete in itself; (2) a mental chain of causation, also complete in itself, and (3) the view that "one of the chains is able to allow some of its causal influence to escape, as it were, in order to constitute the other chain." (p. 81). It is this third contention that Romanes sees as in contradiction to the fundamental principle of causality that there must be "an equivalency between cause and effect, so that you cannot get more out of your effect than you put into your cause." (p. 82)

To this Romanes counterposes the point of view of monism, "that mental phenomena and physical phenomena, although apparently diverse, are really identical".(p.83) Monism is conceived of as a synthesis of the reasonable aspects of both materialism and spiritualism: "For Monism, in the sense of this term as I shall use it, may be metaphorically regarded as the child of the two pre-existing theories, Spiritualism and Materialism" (p.45) Monism satisfies the correct physiological views of the latter and the correct psychological views of the former.

He compares the situation to that of a violin being played - we see the strings being plucked and we hear the sound produced by the plucking of the strings. The two types of changes (visual and auditory) registered by our consciousness are relative to the mode of perceiving the same thing- in the first case, the sense of sight; and in the second, the sense of hearing. This analogy is then applied to the case of the relationship between brain events and thoughts:

> Similarly, we may suppose that a vibration of nerve-strings and a process of thought are really one and the same event, which is dual or diverse only in relation to our modes of perceiving it." (p.84)

Monism is held to have the following advantages: (1) it avoids the contradictions of materialism and spiritualism in positing only one stream of causation and not two; (2) it is in accord with the theory of evolution, since intelligent volition is needed as the mental counterpart to cerebral actions that lead to adaptive behavior; (3) Romanes argues that monism alone is consistent with the freedom of the will and moral responsibility; and (4) he says that it implies only agnosticism and thus leaves the question between atheism and theism open to be decided on independent grounds.

Herbert Spencer

Herbert Spencer (1820-1903) is the last of the English evolutionists to be dealt with in this chapter, though as concerns the date of publication, he was the first of them to defend evolutionism as opposed to creationism in print - 1852 being the date of his first publication of the idea, as opposed to the Darwin-Wallace papers of 1858. However, as will be seen in the analysis, Spencer's view on evolution is quite different from that of Darwin or Wallace; moreover, his is a universal philosophy of evolution, where evolution is not restricted to the organic domain alone, but extended to the inorganic and the social as well.

Spencer was a synthetic philosopher in the sense that he built a system of philosophy drawing upon the various domains of science for its examples and inspiration. His main work was the multi-volume Synthetic Philosophy, consisting of the following parts: First Principles (1st edition 1862, 4th edition 1880), which is a general philosophical introduction to the work, centered on the concept of evolution and Spencer's view of the relations between and among science, philosophy and religion; and the more specific volumes: Principles of Biology 2 vols (1864, 1867), Principles of Psychology 2 vols (1870, 1872), Principles of Sociology 2 vols (1876-1896), and Principles of Ethics 2 vols. (1879, 1893). These multi-volume installments of his system, as their titles suggest, deal with the general principles of biology, psychology, sociology and ethics, and trace the leading thread of evolution through the successive stages of its development in reality. Spencer also published a number of volumes of essays, as well as an Autobiography (1904).

Spencer was in contact with Darwin and Huxley. At the terminological level, an important contribution of his was the term "evolution" to describe Darwin's "descent with modification" or "transmutation of species". Spencer also provided the term "survival of the fittest" which Darwin also adopted in later editions of Origin of Species. In this section, the following aspects of Spencer's thought will be dealt with: (1) his concept of evolution, (2) his views on the relationship between and among science, religion and philosophy, and (3) his views on the mind-body relation.

Philosophy of Evolution

The most important characteristic of Spencer's system is the concept of evolution which runs through it and constitutes a unifying thread. Spencer first broached his concept of evolution in the article "The Development Hypothesis" (1852), and expanded it in two further articles: "Progress: Its Laws and Cause" (1857) and "Transcendental Physiology" (1857). Its exposition also forms the subject matter of chs. XII-XXII of First Principles, and articles such as "The Factors of Organic Evolution" (1886), where he compares and contrasts his concept of evolution with those of Darwin and Lamarck.

In the "Development Hypothesis" (reproduced in his Essays, v.1, along with other articles here discussed), Spencer contrasts the thesis of creation with that of evolution. He sees the source of changes in species, and the origin of new ones, as the effect of changed environmental circumstances on organisms. Though admitting that it is not possible to trace the many phases of intermediary changes in a given organism, or describe the mechanism as such, he says that proponents of evolution are able to claim the following:

> They can show that any existing species - animal or vegetable, when placed under conditions different from its previous one, immediately begins to undergo certain changes fitting it for the new conditions. They can show that in successive generations these changes continue; until ultimately the new conditions become the natural ones. They can also show that in cultivated plants, in domesticated animals and in the several races of man, such alterations have taken place.(p.3)

This modifying influence of the environment can create differences among an original stock sufficiently great that " it is a matter of dispute whether some of these modified forms are varieties or separate species" (ibid). Extrapolated over a long period of time and under great differences of environment, such a factor can result in very great changes:

> And thus they can show that throughout all organic nature there is at work a modifying influence of the kind they assign as the cause of these specific differences: an influence which though slow in its action, does, in time, if the circumstances demand it, produce marked changes - an influence which, to all appearance, would produce in the millions of years and under the great varieties of condition which geological records imply, any amount of change." (p.4)

This hypothesis of one influence causing millions of varieties to evolve is considered as more rational an explanation than that of millions of special acts of creation to create each individual species. Spencer argues for his case with an analogy: the circle, ellipse, parabola and hyperbola are considered to be four distinct species of curves; yet there is a well-known mathematical process that results in the transformation of one into the other. Spencer argues that is is just as well founded to argue that, just as a seed produces a tree and a single cell embryo produces a man, "there is nothing absurd in the hypothesis that under certain other influences, a cell may, in the course of millions of years, give origin to the human race." (p.6)

In "Progress: Its Laws and Cause" Spencer uses the term "progress" to replace that of "development"; the term will later give way to that of "evolution". His point of departure is once again embryological, and in particular the work of the German embryologist von Baer:

> In respect to that progress which individual organisms display in the course of their evolution, this question has been answered by the

> Germans. The investigations of Wolff, Goethe and von Baer, have established the truth that the series of changes gone through during the development of a seed into a tree, or an ovum into an animal, constitute an advance from homogeneity of structure to heterogeneity of structure... It is settled beyond dispute that organic progress consists in a change from the homogenous to the heterogeneous.(pp.9-10)

The key to these changes from homogeneous to heterogeneous is the constant differentiation of the cell, a physiological mechanism well known in embryology. Spencer's contribution is to generalize this phenomena into a universal philosophy of evolution:

> Now, we propose in the first place to show, that this law of organic progress is the law of all progress. Whether it be in the development of the Earth, in the development of Life upon its surface, in the development of Society, of Government, of Manufacture, of Commerce, of Language, Literature, Science, Art, this same evolution of the simple into the complex, through successive differentiations, holds throughout. From the earliest traceable cosmical changes down to the latest results of civilization, we shall find that the transformation of the homogeneous into the heterogeneous, is that in which progress essentially consists.(p.10)

And, indeed, this is just what Spencer attempts to show in the succeeding pages, tracing the nebular hypothesis of the formation of the solar system, the formation of the earth, the development of life on earth, and the origin of humanity to this common law of the transformation of the homogeneous to the heterogeneous. He notes, however, that it is not possible to proceed from this universal law to its ultimate cause, for, from the noumenal point of view, "this would be to solve that ultimate mystery which must ever transcend human intelligence" (p.35). But he says that it is possible to go from this law, stated as an empirical generalization, to a formulation which is in the nature of a rational generalization, ie to find a more general law of which this law would be an instance, as Kepler's laws of planetary motion were found to be consequences of Newton's more general law of gravitation.

This explanation of the law of the transformation of the homogeneous into the heterogeneous is found in the further and more general law: "Every active force produces more than one change - every cause produces more than one effect" (p.37):

> This multiplication of effects, which is displayed in every event of today, has been going on from the beginning; and it is true of the grandest phenomena of the universe as well as the most insignificant. From the law that every active force produces more than one change, it is an inevitable corollary that during the past there has been an ever-growing complication of things. Throughout creation there must have gone on, and must still go on, a never-ceasing transformation of the homogeneous into the heterogeneous. (p.38)

In "Transcendental Physiology" (1857), re-titled by its editor as "The Ultimate Laws of Physiology" and restored to its original title by Spencer for inclusion in his Essays, Spencer seeks those truths or laws of physiology which transcend "all distinctions of genus, order, class, kingdom and applies to every living thing." (p.66) Here he makes two further additions to his theory of evolution - he recognizes integration as well as differentiation, and he finds a further general law, the law of unstable equilibrium, which underlies the law of multiple effects mentioned above. As to the first point, he notes that "during the evolution of an organism there occur, not only separations of parts, but coalescences of parts" (p.67) This increased integration of the organism leads to a further type of differentiation - the ever greater differentiation of complex organisms from their environment. As to the second point, Spencer asks why in physical terms homogeneity develops into heterogeneity, and why a cause issues forth into multiple effects; he concludes that the source is that equilibrium in any organism is necessarily disturbed by external forces, and that homogeneity is a situation of unstable equilibrium:

> The instability thus variously illustrated becomes still more manifest if we consider its rationale. It is consequent on the fact that the several parts of any homogeneous mass are necessarily exposed to different forces - forces which differ either in their kinds or amounts; and being exposed to different forces they are of necessity differently modified. The relations of inside and outside, and of comparative nearness to neighbouring sources of influence, imply the reception of influences which are unlike in quantity or quality or both; and it follows that unlike changes will be wrought in the parts dissimilarly acted upon. The unstable equilibrium of any homogenous aggregate can thus be shown both inductively and deductively. (p.83)

As a result of this action of external forces on the unstable equilibrium of the homogeneous (or relatively homogeneous organism), two end states are possible: (1) there may result the breakdown or decomposition of the thing when the outside forces overpower the internal forces holding it together (chaotic heterogeneity), and (2) changes may be induced that do not destroy, but only modify the components, leading to "those first differentiations which constitute incipient organization."(p.85)

In the First Principles (1862), Spencer builds on these elements of his theory of evolution, to arrive at his definitive definition of the concept: "...As we now understand it, Evolution is definable as a change from an incoherent homogeneity to a coherent heterogeneity, accompanying the dissipation of motion and the integration of matter." (p.359) A new feature here is the explicit mention of matter and motion. Spencer holds that matter and motion are intimately linked by what he calls "the law of the continuous redistribution of matter and motion" (p.280). Based on analogies from the study of the solid, fluid and gaseous stages of matter, he concludes that integration of matter is consequent upon the dissipation of motion, since increase of motion of component parts leads to disintegration, as in the transition from solid to liquid and gas.

Another feature of this fully developed Spencerian concept of evolution is the admission that the process can go in the reverse sense as well, a process he calls "dissolution":

> Evolution under its simplest and most general aspect is the integration of matter and the concomitant dissipation of motion; while Dissolution is the absorption of motion and concomitant disintegration of matter. (p.288)

The dual concepts of integration and disintegration allow Spencer to distinguish three stages of change in living things, depending on whether the stage is dominated by the one or the other, or a succession of the two:

> During the earlier part of the cycle of changes, the integration predominates - there goes on what we call growth. The middle part of the cycle is usually characterized, not by equilibrium between the integrating and disintegrating processes, but by alternate excesses of both. And the cycle closes with a period in which disintegration, beginning to predominate, eventually puts a stop to integration, and undoes what integration had originally done. (p.287)

Living organisms are distinguished from non-living ones by the complexity of their structure, so that even when they are evolving under the influence of integration of matter, other, and perhaps opposing motions may also be in operation, a process called "Compound Evolution" as opposed to "Simple Evolution":

> Living aggregates are distinguished by the connected facts, that during integration they undergo very considerable secondary changes which other aggregates do not undergo to any considerable extent; and that they contain (bulks being equal) immensely greater quantities of motion, locked up in various ways. (p.306)

Spencer returns to the question of the evolution of organic life in his <u>Principles of Biology</u>, vol. 1 and it is present as a guiding thread in all the other volumes of his <u>Synthetic Philosophy</u>, applied there to mind, society and ethics. In "The Factors of Organic Evolution" (1886), Spencer situates himself with respect to Darwin and Lamarck.

Spencer admits three factors of evolution: the first, which he calls the "primordial factor" (p.460) is that of the direct action of the environment leading to the differentiation of the homogeneous into the heterogeneous. He notes: "Acting alone, the primordial factor must have initiated the primary differentiation in all units of protoplasm alike" (p.460). Only once such primary differentiation had arisen could natural selection come into play "for inevitably the unlikeness produced among the units had affects on their lives: there was survival of some among the modified forms rather than others". All the while, the "differentiating action of the medium" is seen as a cooperative force, one which takes the lead when a new form of existence appears, and which then takes second place to natural selection as this new form develops:

> Again taking the lead as there arose the composite forms of animals and plants, and again losing the lead with that advancing differentiation of these higher types which gave ever more scope to natural selection, it nevertheless continued, and must ever continue, to be a cause, both direct and indirect, of modifications in structure.(p.461)

As life becomes more complex again in the human species and in subsequent social organization, the Darwinian factor of natural selection then takes second place to the Lamarckian one, which Spencer interprets as the inheritance of modifications of structure resulting from changes in function:

> But gradually with that increase of activity which we see on ascending to successively higher grades of animals, and especially with that increased complexity of life which we see, there came more and more into play as a factor, the inheritance of those modifications of structure caused by modifications of functions. Eventually among creatures of high organization, this factor became an important one; and I think there is reason to conclude that, in the case of the highest creatures, civilized men, among whom the kinds of variation which effect survival are too multitudinous to permit easy selection of any one, and among whom survival of the fittest is greatly interfered with, it has become the chief factor: such aid as survival of the fittest gives, being usually linked to the preservation of those in whom the totality of the faculties has been most favourably molded by functional changes." (p.462)

Thus, Spencer has considerably modified the position he had defended in his "Transcendental Physiology", when he argued that the law of the inheritance of acquired characteristics was the only law of organic evolution then known (p.91) It is of some interest at this point to reproduce Spencer's own resume of the evolution of his thought on evolution,as stated in his Autobiography:

> On glancing over these stages it is, indeed, observable that the advance towards a complete conception of evolution was itself a process of evolution. At first there was simply an unshaped belief in the development of living beings; including, in a vague way, social development. The extension of von Baer's formula expressing the development of each organism, first to one and then to another group of phenomena, until all were taken in as parts of a whole, exemplified the process of integration. With advancing integration, there went that advancing heterogeneity implied by inclusion of the several classes of inorganic phenomena and the several classes of super-organic phenomena in the same category with organic phenomena. And then the indefinite idea of progress passed into the definite idea of evolution, when there was recognized the essential nature of the change, as a physically-determined transformation conforming

to ultimate laws of force. (v.i, p.12)

Mind and Brain

In *Principles of Psychology* mind is defined as being composed of "feelings and the relations between feelings" (p.163) Mind is seen as a product or result of natural evolution, in correlation with evolutionary changes in the brain, developing through the stages of sentiency, sensations and feelings.

Mind is intimately related to the brain, in the sense of a correspondence between the feelings and relations among these feelings, and the nerves and connecting fibres of the brain:

> Speaking generally, feelings and the relations between feelings, correspond to nerve-corpuscles and the fibres which connect nerve-corpuscles; or rather, to the molecular changes of which nerve-corpuscles are the seats, and the molecular changes transmitted through fibres. The psychical relation between two feelings, answers to the physical relation between two disturbed portions of grey matter, which are put in such direct or indirect communication that some discharge takes place between them.(p.190)

Spencer notes a distinction between Mind and Intelligence. Intelligence is seen as having evolved from feelings. As these feelings assume greater and more definite forms, intellect arises to combine and coordinate them. Feelings correspond, in a certain sense, to the quantity of mind, intellect to its quality or complexity; and these correspond, via the nervous system, to the quantity and quality of motion in the brain.

But for Spencer, to ask what is the ultimate nature of the correspondence between mind and brain is to posit a question which is unanswerable. Something may be known of the composition of mind if that term is meant to designate particular, existing minds, considered as phenomena or modifications of some underlying substance. But the analysis of that underlying substance hits against the rock of the Unknowable. In First Principles, Spencer had spent the whole first part (Book I) developing his argument that there is a common truth to both religion and science, a truth which neither could know. He called this the absolute, or the absolute mystery; it cannot be analyzed by knowledge. In Principles of Psychology, he returns to this concept of the absolute as the underlying and unknowable substance of both mind and matter:

> But if the phrase is taken to mean the underlying something of which these distinguishable portions are formed, or of which they are modifications; then we know nothing about it, and never can know anything about it. It is not enough to say that such knowledge is beyond the grasp of human intelligence as it now exists; for no amount of that which we call intelligence, however transcendent, can grasp such knowledge.(p.145)

Against the view that it is possible to reduce mind and intellect to matter and brain, Spencer argues that in the translation of spirit into matter we are only dealing with symbols arranged in equations, not the substance underlying the phenomena of mind and brain:

> Hence though of the two it seems easier to translate so-called Matter into so-called Spirit, than to translate so-called Matter into so-called Spirit (which latter is, indeed, wholly impossible); yet no translation can carry us beyond our symbols... The expression "substance of mind" if we use it in any other way, inevitably betrays us into errors; for we cannot think of substance save in terms that imply material properties. Our only course is constantly to recognize our symbols as symbols as symbols only; and to rest content with that duality of them which our constitution necessitates. (pp.160-161)

Thus, knowledge is a manipulation of symbols expressive of the phenomena of reality, and not of its ultimate nature. Neither the materialist, who expresses mind in terms of matter, nor the spiritualist, who does the reverse, can be correct. The materialist interprets the correlation of mind and brain as proof of his hypothesis, the spritualist interprets the fact of the cognizability of matter only by mind as proof of his hypothesis; Spencer argues that both are wrong, and that neither mind nor matter is basic, since each is but a sign of the ultimate reality which is forever a mystery. Speaking of mind as subject and matter as object, he says:

> The antithesis of subject and object, never to be transcended while consciousness lasts, renders impossible all knowledge of that Ultimate Reality in which subject and object are united...And this brings us to the true conclusion implied throughout the foregoing pages - the conclusion that it is one and same Ultimate Reality which is manifested to us subjectively and objectively. (p.627)

The conclusion of First Principles puts the same thought most clearly:

> The interpretation of all phenomena in terms of Matter, Motion and Force is nothing more than the reduction of our complex symbols of thought to the simplest symbols; and when the equation has been brought to its lowest terms, the symbols remain symbols still... The Materialist, seeing it to be a necessary deduction from the law of correlation, that what exists in consciousness under the form of feeling, is transformable into an equivalent of mechanical motion, and by consequence into equivalents of all the other forces which matter exhibits; may consider it therefore demonstrated that the phenomena of consciousness are mechanical phenomena. But the Spiritualist, setting out with the same data, may argue with equal cogency that all of the forces displayed by matter are cognizable only under the shape of those equivalent amounts of consciousness which they produce, it is to be inferred that these forces, when existing out of consciousness, are of the same intrinsic nature as when existing in consciousness; and so is justified the spiritualistic conception of the external world, as consisting of something essentially identical with what we call mind." (pp.549-550)

Both interpretations are wrong, Spencer says, and from a higher point of view, the philosopher "will see that though the relation of subject and object renders necessary to us these antithetical conceptions of Spirit and Matter, the one is no less than the other to be regarded as but a sign of the Unknown Reality which underlies both." (p.550)

Henri Bergson

It was Henri Bergson (1859-1941), in France, who first highlighted the key role of novelty in evolution and combined this with a dualistic theory involving the "élan vital". His views on this subject were contained in his Creative Evolution (1907), while his views on the mind/brain relation are found in Matter and Memory (1896) and Time and Free Will (1889). Bergson was an important influence on Lloyd Morgan and the subsequent development of emergent evolutionism. This section will briefly examine (1) Bergson's views on mechanism, teleology, and novelty, (2) his theory of creative evolution and the "élan vital", and (3) his dualist views on the philosophy of mind.

Mechanism, Teleology, and Novelty

From the outset of his book Creative Evolution (1907), Bergson situates his views with respect to mechanism and teleology. Mechanism is considered as the view of nature as "an immense machine regulated by mathematical laws" (p. 51); while finalism (or teleology) is the view that the unfolding of nature is the "realization of a plan" (ibid), a pre-arranged program.

At a first, preliminary level of analysis, Bergson recognizes some asymmetry between the two: He says that mechanism can be refuted if it can be shown that there exists one spontaneous event not foreseen by mechanism, while finalism (or teleology) is more flexible and cannot be as easily refuted:

> Yet finalism is not, like mechanism, a doctrine with fixed rigid outlines. It admits of as many inflections as we like... The doctrine of final causes, on the contrary, will never be definitively refuted. If one form of it be put aside, it will take another. Its principle, which is essentially psychological, is very flexible. It is so extensible, and thereby so comprehensive, that one accepts something of it as soon as one rejects pure mechanism. (p. 46)

Bergson distinguishes between internal and external teleology, preferring the latter over the former. Internal teleology is taken to be the view that each part of a thing exists for the sake of the whole, while external teleology is held to argue that one thing exists for the sake of another, and that "living beings are ordered with regard to each other." (p. 47).

But at another level of analysis, one which pervades his book, Bergson sees both mechanism and teleology as opposite sides of the same coin, and situates his own view as correcting the errors of both. Bergson criticizes both for not according to time a creative role. In mechanism time is reduced to the "impulsion of the past" (p. 45), while with finalism, time is merely the "attraction of the future" "Finalism thus understood is only inverted mechanism"(ibid). Finalism goes at once too far and not far enough. It is too broad when it postulates a plan for the whole of nature, and it is too limited when it describes life according to the categories of the intellect.

In Bergson's view, both radical mechanism and finalism suffer from the defect of being concepts of the intellect, which he sees as a lower stage leading up to intuition. The intellect, he argues, is best at analyzing inanimate objects, which it sees as a mechanical assemblage of its parts (mechanism) or as an object built up according to a plan and to serve an end (finalism). Intuition, like instinct, is better suited to to seize the creative category of life and vitality:

> Thus intuition may bring the intellect to recognize that life does not quite go into the category of the many nor yet into that of the one; that neither mechanical causality nor finality can give a sufficient interpretation of the vital process. Then by the sympathetic communication which it establishes between itself and the rest of the living, by the expansion of consciousness which it brings about, it introduces life's own domain, which is reciprocal interpretation, endlessly continued creation. (p. 195)

It is the problem of novelty, of creativity, which is the touchstone of Bergson's philosophy, and his solution to the impasse of the mechanism/finalism dilemma.

Theories of Evolution and the Vital Impetus

Bergson examines at some length various of the theories of evolution - the gradualism of Darwin (insensible variation), the mutationism of de Vries (sudden variation), the orthogenesis of Eimer (directed evolution), and the inheritance of acquired characteristics (neo-Lamarckism of Cope). But he is dissatisfied with all of them. He argues that none of the existing theories can account for the parallel, but independent development of analogous structures in different organisms (such as the eye of vertebrates and mollusks), and that they as well cannot account for the spontaneous creation of novelty in the evolutionary process. At most, he is willing to grant the existing theories a part of the truth, but none has the whole of it, which can be seized only by a philosophic theory which goes beyond the limitations of purely scientific ones:

> On the contrary, each of them, being supported by a considerable number of facts, must be true in its way. Each of them must correspond to a certain aspect of the process of evolution... But the reality of which each of these theories takes a partial view must transcend them all. And this reality is the special object of philosophy, which is not constrained to scientific precision because it contemplates no practical application. (pp. 94- 95)

Bergson's own solution is to postulate a transcendent force, the "élan vital" or vital impetus, which is the source of novelty in the evolutionary process. His position, he admits, its closely related to those of Driesch's vitalism and Eimer's directed evolution; it is partially inspired by Waismann's theory of the continuity of the germ-plasm in heredity as well. However, he does not admit the existence of the complicated set of entelechies of Driesch, nor the notion of a plan of nature of Eimer, and does not limit himself to the purely genetical considerations of Waismann. He concludes his examination of theories of evolution as follows:

> So we come back, by a roundabout way, to the idea we started from, that of the original impetus of life, passing from one generation of germs to the following generation of germs through the developed organisms which bridge the interval between generations. (p. 97)

The vital impetus proceeds through divergence, and its three main paths are those of vegetative, instinctive and rational life. These three, however, do not constitute three stages of a single process, but rather three branches of life. There is a difference of kind and not merely degree among them. Moreover, the vital impetus is not all powerful - it must deal with matter and cannot simply overpower it, but must work through it. In so doing, it occasionally meets with setbacks and regress, rather than following a path of continual progress. The impetus of life introduces novelty and acts freely in a limited, not absolute sense, because of this need to work through existing matter:

> The impetus of life, of which we are speaking, consists in a need of creation. It cannot create absolutely, because it is confronted with matter, that is to say with the movement that is the inverse of its own. But it seizes upon this matter, which is necessity itself, and strives to introduce into it the largest amount of indetermination and liberty. (p. 274)

Mind/Brain Dualism:

Bergson's theory of the mind/brain relation is a complement to his views on the vital impetus. His viewpoint is dualistic, just as the vital impetus is dual to matter.

He tries to avoid the pitfalls of previous dualistic theories by a reference to time and duration. Bergson set forth his ideas on this subject in his Matter and Memory (1896).

Bergson is aware of the twin problems of explaining the nature of the interaction between extended matter and non-extended mind which had bedevilled other attempts at dualism, and the popularity of a naive materialist approach in the neurological sciences. He adopts a double strategy of arguing (1) against materialism that the brain is limited in its powers of imaging and memory, and could not itself produce mind, and (2) for dualism, that the interaction between mind and brain is a temporal and not a spatial one.

Bergson notes that the problem in other attempts to defend dualism was to view the mind-body relation in spatial terms:

> The mistake of ordinary dualism is that it starts from the spatial point of view: it puts on the one hand matter with its modifications in space, on the other unextended sensations in the consciousness. Hence the impossibility of understanding how the spirit acts upon the body or the body upon the spirit. (p. 294)

Instead of this spatial way of looking at the relation, Bergson says that "we substitute a temporal for a spatial distinction", (p. 295) according to which spirit acts to "bind together the successive moments of the durations of things" (ibid).

The concept of duration is an important one in Bergson's system. As he states in Time and Free Will (1889), pure duration is internal to consciousness, "the form which the succession of our conscious states assumes when our ego lets itself live, when it refrains from separating its present state from its former states" (p. 100). Pure duration is wholly qualitative, it cannot be measured unless projected into space, where external to mind, it takes the derivative form of measurable, quantitative time, "the fourth dimension of space" (p. 109). Psychic states are said to be characterized by their intensity, duration and voluntary determination.

Returning to Matter and Memory, Bergson states that in the course of evolution, the nervous system develops and becomes more complicated, providing the organism so endowed with more scope of action, "greater latitude left to movement in space" (p. 332), to which is associated the "accompanying tension of consciousness in time".(ibid).

In his analysis of the brain, Bergson quotes many facts of the neurology of his day. He maintains contact with science, but goes beyond it with a philosophical speculation of his own. The brain is seen as the agent of perception as well as involuntary and voluntary motor movements, but it is excluded as the source of representation and what Bergson calls "pure memory". He distinguishes between this mental "pure memory" which is said to have duration, and the physical "motor memory" which is held to be a preparation for actions in space. Only this latter memory is brain-dependent.

Bergson also distinguishes between the operations of sense perception and pure memory, and attaches great importance to the relation between the two as a model of the mind-body relation. Pure perception is held to be a strictly physical operation, through which an external object impresses itself on the material brain. This is contrasted with pure memory, which as above, Bergson considers to be a completely spiritual operation. But perception occurs in time, it has duration, and to this extent, must call in memory. It is here that Bergson sees the realization of the mind-body relation:

> If pure recollection is already spirit, and if pure perception is still in a sense matter, we ought to be able, by placing ourselves at their meeting place, to throw some light on the reciprocal action of spirit and matter. "Pure", that is to say instantaneous perception is, in fact, only an ideal, an extreme. Every perception fills a certain depth of duration, prolongs the past into the present, as a synthesis of pure memory and pure perception, that is to say of mind and matter. We compress within its narrowest limits the problem of the union of the soul and body. (p. 325)

However, Bergson is opposed to the correspondence theory of cerebral and mental events, by which he means a parallelism or isomorphism. In <u>Creative Evolution</u> he argues that "there is indeed solidarity and interdependence between the brain and consciousness, but not parallelism: the more complicated the brain becomes, thus giving the organism greater choice of possible actions, the more does consciousness outrun its physical concomitant." (pp. 197-198) Priority or greater importance goes to the psychical and not the physical state:

> It is precisely because a cerebral state expresses simply what there is of nascent action in the corresponding psychical state that the psychical state tells us more than the cerebral state. The consciousness of a living being, as we have tried to prove elsewhere, is inseparable from its brain in the sense in which a sharp knife inseparable from its edge: the brain is the sharp edge by which consciousness cuts into the compact tissue of events, but the brain is no more coextensive with consciousness that the edge is with the knife. Thus, from the fact that two brains, like that of the ape and that of the man, are very much alike, we cannot conclude that the corresponding consciousness are compatible or commensurable. (pp. 286-287)

In "The Soul and the Body" (1912), Bergson returns to his solution of the mind-body dualism in terms of time. After a brief discussion of the problem of energy exchange between brain and mind via the will, he says: "I quite agree that, if the will is capable of creating energy, the quantity created may be so small that it would not affect sensibly our instruments of measurement. Yet its effects might be enormous, like that of a spark which explodes a powder-magazine." (p. 30).

He then examines the role of the brain in greater detail, using as his main example the stages of the loss of grammar in motor aphasia. He argues that what happens is not the loss of the various grammatical categories in true memory in the mind, but the growing incapacity of the brain to translate those categories into motor acts of speech, into the life of the individual. He concludes that the brain is not the organ of thought, but an intermediary between thought and life: "...it keeps consciousness, feeling and thought tensely strained on life, and consequently makes them capable of efficacious action" (p. 47). In conclusion he calls the brain "the organ of attention to life" (ibid).

Resume ch.1

In this resume to chapter one a number of points will be made with respect to the interaction, similarities and differences in the views of Darwin, Huxley, Wallace, Romanes, Spencer and Bergson on the factors of evolution and the mind-brain problem.

Charles Darwin's theory of organic evolution was a pluralistic, or multi-factor one, with three key factors of evolution postulated: natural selection, sexual selection and the inheritance of acquired characteristics (linked to the theory of pangenesis as a basis for heredity). Of the three, natural selection was the chief one. Darwin also admitted other miscellaneous factors such as correlated variation and the direct influence of the environment.

At the same time as he was developing his theory of natural selection in his notebooks of 1836-39, Darwin also developed his views on the mind-body problem. His philosophy was a materialist one, with mind considered as a function of the brain, though Darwin avoided consideration of matter as a substance. Linked to his materialist view was his naturalism, influenced here by Comte's positivist critique of theology and metaphysics, and Darwin's commitment to the thesis of the continuity between humans and animals.

Darwin was a gradualist in his attitude towards change, and held that differences between humans and animals were, though certainly great, only differences of degree and not of kind. As a result of his gradualist and quantitative views, he tended not to consider the question of novelty and qualitative change in evolution.

T.H. Huxley, though undecided on the question of evolution during the early 1850s, was won over to Darwin's view after 1858. In his writings he considered many of the philosophical aspects of evolution from the point of view of the philosophy of science. Though initially critical of gradualism, he came to fully accept it on the basis of the paleontological evidence of the stages of evolution of the horse.

Huxley argued that while materialism furnishes a terminology for science, it does not constitute a philosophy for it. He regarded its ontological claims, and those of idealism as well, in the light of the arguments of Kant concerning the unknowability of the nouemena and Hume's views on causality as the linking of phenomena, and came to an agnostic conclusion. He wavered between the two extremes of materialism and idealism, seeing some virtues in each; however, despite his agnosticism, he was a monist as opposed to a dualist.

In his analysis of protoplasm and thought, Huxley admitted the existence of properties of the whole that its parts did not possess, and rejected vitalist and other dualistic factors as the source of novelty. He felt that the progress of science would eventually explain all such properties on the basis of the nature and disposition of the molecules of the protoplasm and of the brain.

Huxley viewed the history of philosophy since Descartes as two branches leading from a common root, with one branch basing itself on Descartes' physiology and physics and leading to ontological materialism, and the other basing itself on his psychology and philosophy of mind and leading to epistemological idealism. He tried to reconcile the two in his epiphenomenalist theory of the mind-brain problem. He held that brain states (neuroses) cause mental states (psychoses) in a one way causal relation, a proposition which he considered as the materialistic (ontological) aspect. But he also saw mind as the sole source of our knowledge of the world, including our knowledge of the brain, a proposition which Huxley considered as the idealistic (epistemological) aspect of his theory.

A.R. Wallace was a monist as concerns the theory of evolution - he came to see natural selection as the only factor of evolution. Where significant qualitative change occurred which he felt could not be attributed to the action of natural selection, he concluded that an extra- or super-natural force had intervened. He felt that this was the case with the appearance of life, mind and rationality.

Wallace's solution is weakened by the fact that he erroneously held that the brain of primitive man was about the same size as that of modern man, and the fact that he was predisposed to the supernaturalist option by an independent belief in the spirit world and spiritism. But his question as to the source of the major novelties in the evolutionary process was an important one, which had been sidelined by Darwin's extreme gradualism and exclusive emphasis on quantitative differences.

George John Romanes objected to the single-factor view on evolution as put forward by Wallace and Weismann. A highly competent expositor of Darwin's views, he distinguished between the single-factor neo-Darwinism of Wallace and the multi- factor views of Darwin himself. Yet he felt that on its own natural selection could not be the chief factor in the origin of new species, and introduced his own factor of physiological selection as a necessary condition, along with natural selection, for the appearance of new species.

On the mind-brain problem, Romanes broke with the agnosticism and epiphenomenalism of Huxley, and combined what he considered to be the best of both materialism and idealism in the standpoint of monism. Mind and brain are seen not as causally interacting, but as identical.

Romanes also criticized Wallace's views on the supernatural origin of mind, and argued instead for a naturalistic conception of mental evolution. He believed that a parallel could be made between the phylogentic development of mind in the animal kingdom and the ontogenetic development of mind in humans, and produced a detailed chart on the basis of this recapitulationist view.

Herbert Spencer, though dealt with in the text after Darwin and the other English evolutionists, was actually the first (after Chambers) to appear in print with support for the idea of what he successively called development, progress and evolution. His concept of evolution, However, was a metaphysical one, a philosophic generalization of von Baer's views. Spencer held that evolution was characterized by the transition from the relatively homogeneous to the heterogeneous, with concomitant integration of matter and dissipation of motion.

Spencer also accepted as factors of evolution the Darwinian natural selection and Lamarckian inheritance of acquired characteristics. The Darwinian factor was seen as operative in the organic domain, the Lamarckian factor as the major one at the level of social evolution. In his synthetic system of philosophy, Spencer held that evolution is a universal source of change functioning at the inorganic, organic and super-organic, or social levels.

Spencer's view of the mind-body relation was one of the concomitance of the mental and the cerebral, considered as aspects of an underlying but unkown and unknowable reality. This absolute mystery was held to be the common basis (or truth) of both religion and science. Spencer admitted an evolution of mind through the stages of sensibility, feeling and on to ideation, this latter the result of the operation of the faculty of intellect.

Henri Bergson has a certain affinity with Spencer, since he too developed a philosophy of evolution which saw evolution as universal throughout nature. But he criticized Spencer's view of evolution as mechanical, laying emphasis on the results of evolution rather than the process itself.

Bergson argued that the various contending scientific theories of evolution each had part of the truth, but that only a philosophic theory could transcend their particular points of view and grasp the full nature of the process. He argued for an evolutionary process creative of novelty, as against the views of mechanism and teleology (though he acknowledged being closer to the latter than the former).

The driving force of evolution and its creation of novelty was to be the "elan vital" or vital impetus which is a factor dual to matter and its modes of motion. The vital impetus must work through matter and its limited by it. At the level of life, the vital impetus splits into three distinct branches - the vegetative, instinctive and the rational.

On the mind-brain problem, Bergson was also a dualist, but he recognized that earlier attempts to unite a non-spatial mind and a spatial body had been failures. He attempted a solution based on time alone, where spirit or mind is held to be the non-material factor which unites the successive durations of things, including that of the brain and its processes.

There is no isomorphism between cerebral and mental states; on the contrary, the latter transcends the former. The brain is concerned only with action in space, and is considered as an intermediary, or liaison between mind and life. Bergson illustrates mind-brain dualism through an analysis of the faculties of perception and memory, and argues that in real perception there is an instance of the union of mind (in the form of pure memory) and matter (in the form of pure perception).

Among the major questions brought up by the above discussions are: (1) Is evolution a single-factor or a multi-factor process? (2) Is the scope of evolution limited to the biological, or does it apply to all domains of reality? (3) Is the solution to the mind-brain problem a monistic or a dualistic one?

In general, for reasons to be discussed in the overall conclusion to the thesis, my sympathy is with the monistic solutions to the mind/brain problem, the pluralistic views on the factors of evolution, and the view that evolution is a universal process.

However, the diversity of views of the above thinkers is certainly a healthy situation, not a harmful one. Even if the solution to a problem put forward by a thinker is rejected, the question which he originally asked may be an important one, and other aspects of his thought may be more acceptable. It is interesting to note that the two dualists dealt with in this chapter - Wallace and Bergson, both played important roles in preparing the way for the development of emergentist ideas by posing the question of the source of novelty in the evolutionary process, a concern much less developed by the more monistic evolutionary theorists like Darwin.

C. Lloyd Morgan

C. Lloyd Morgan (1852-1936) was one of the major proponents of emergentist philosophy in the 1920s. Over a period of nearly 50 years, from 1885 to 1933 he published books and articles on the problems of evolution, both as a comparative psychologist and as a philosopher of science. From 1922 on he situated himself explicitly as an evolutionary emergentist, though the roots of this philosophy go back to his earlier writings.

His earliest major work was Springs of Conduct: An Essay on Evolution (1885), a volume on the theory of evolution with considerable philosophic overtones. He then produced a series of books on animal psychology and comparative psychology: Animal Life and Intelligence (1891), An Introduction to Comparative Psychology (1894, 2nd edit 1903), Habit and Instinct (1896), Animal Behavior (1900), Comparative Biology (1905), and The Animal Mind (1930).

Though he dealt with the problem of the place of novelty in evolution throughout the course of his writings, it was only in the mid 1910s that he crystallized his evolutionary emergentist view. It was with his Gifford lectures of 1922-23, that he produced a systematic exposition of emergentism as a philosophy, in Emergent Evolution (1923), vol. 1 of the lectures, and vol. 2, Life, Mind and Spirit (1926). He continued his analysis of mind and emergence in Mind at the Crossroads (1929) and The

Emergence of Novelty (1933), his last book.

As well, he produced a large number of articles for philosophic reviews, the most important of them being a series of over a dozen articles on the philosophy of evolution that appeared in The Monist from its first year of publication in 1891 and for about 10 years thereafter at the rate of one or two articles per year. After its editor Paul Carus, Lloyd Morgan was its most regular contributor during the first decade of existence in this, the first English language review dedicated to the philosophy of science.

In terms of personal influences of the early evolutionists on him, the two major figures are Huxley and Romanes: Lloyd Morgan studied for a year under Huxley in the mid 1870s, devoting his time to the problem of mind and its physical basis; he was also a colleague of Romanes, the editor of some of his posthumous writings, and co-worker in the scientific study of comparative and animal psychology. Other influences on him include Spencer, whose ideas were used in Lloyd Morgan's philosophy of evolution of the 1890s, Wallace, whose problem of the nature of mental evolution was dealt with by him in the 1880s, and Bergson, whose ideas on creative evolution were an important influence on him in the 1910s.

This section will deal with an examination of Lloyd Morgan's first views on the mind-body problem (1885), his views on neutral monism (1890s), his grappling with the question of creativity in evolution (1910s) and his views on evolutionary emergentism and mind (1920s).

Mind, Body and Brain

As of 1885 Lloyd Morgan began to publish his ideas on the philosophy of mind. His problematic was that of Huxley: what is the relation between neuroses, considered as the physical states of the brain, and psychoses, considered as the "corresponding" states of the mind? However, where Huxley opted for the epiphenomenalist hypothesis, Lloyd Morgan is drawn to neutral monism, the point of view defended by Romanes, among others. Moreover, he adds a certain number of refinements to the neutral monist view, especially as concerns the distinctions between psychoses and hypo-psychoses, kinesis and meta-kinesis, and consciousness and infra-consciousness.

In Springs of Conduct (1885), Lloyd Morgan distinguishes between mind and consciousness: mind is considered as continuous, underlying and including the states of consciousness. These latter are held to be discontinuous - separated by periods of unconsciousness, for example. If mind is compared to a continually flowing river, then consciousness can be compared to "ripples and wavelets on the river's surface" (p.189). Lloyd Morgan then refines Huxley's concept of psychoses to distinguish between psychoses proper and hypopsychoses, according to whether they are conscious or unconscious mental acts. A hypopsychosis is defined as "submerged feelings which correspond on the subjective side to neuroses, but which do not see the light and emerge in consciousness" (p.190). Psychoses proper are mental acts which have emerged into consciousness. Mind is then defined as "the sum total of psychoses and hypopsychoses" (ibid), ie the collection of emergent and submergent mental acts.

Lloyd Morgan then passes on to the problem of what is the organ of mind. He notes that the nervous system ramifies throughout the body through the peripheral nerves, and that this whole system is required for the accomplishment of various human activities, both spontaneous and conscious, innate and learned. From this, following Bastian, he concludes that the whole body is the organ of mind. His view of the mind/body relation is an interactionist one, with body affecting mind (as in the decline of intellectual capacities with old age), and vice-versa (as in the expression of emotions by bodily movements).

At the same time he concludes that the brain, and more specifically the grey matter of the brain (cerebral cortex and perhaps sub-cortical structures such as the thalamus), is the organ of consciousness. Lloyd Morgan mentions two conditions of consciousness as compared to reflex acts: a greater time delay (the distinction due to Romanes), and the greater diffusion of the nerve disturbance (the distinction due to Bain).

That mind is composed of psychoses and hypo-psychoses, that body is the organ of mind and brain the organ of consciousness does not yet establish the exact relationship between psychoses and neuroses, mind and brain, brain and consciousness. Lloyd Morgan considers two basic possibilities: (1) the dualist view, (a) with mind-body interaction (called by him the vulgar view), and (b) without mind-body interaction (called by him the philosophic view); and (2) monistic views of (a) the practical, materialist type and (b) the speculative, idealist type. He says of the dualist views that though not illogical, they suffer from the fault of being too complex, assuming two substances where one would do. As to the materialist view, Lloyd Morgan says that it has the advantage in the practical sense of regarding mind as a property of human beings, and ultimately of matter in motion, rather than reifying mind as a separate entity and needlessly multiplying substances. But a practical answer does not suffice for him, for he desires to go beyond the phenomenal, and "reach the speculative reality which lies behind". Here he feels sympathy for the speculative, idealist approach of the mind-stuff hypothesis of Clifford:

> But can we do so and yet keep in any sense within the bounds of experience? Only, as it seems to me, on the hypothesis of mind- stuff. Thought is the one absolute reality that we known. The elements out of which thought is built up we may call mind- stuff. And it is conceivable that just as the mind is the true reality which underlies that phenomenal mass of matter we call the human organism, so too is mind-stuff the true reality which underlies all phenomenal masses of matter. This is nothing but idealism; but it is idealism in a new form. (p.208)

Lloyd Morgan then argues for a position that combines the practical materialist point of view with the speculative, idealist one; ie combines the points of view of physiology and psychology, and is capable of "rendering conceivable the concomitant evolution of mind and body." (p.208) Here, his thought shifts in the direction of neutral monism:

> The parallelism between neurosis and psychosis is merged in identity. They are not parallel series which run side by side, but one series which we regard under different aspects. To use the old philosophical phraseology, there are not two substances, a substance of matter and a substance of mind, but one substance, the substance of being. (pp.208-209)

Wallace's Problem and Lloyd Morgan's Hypothesis

A major step in sharpening Lloyd Morgan's neutral monist views was his examination of what has previously been called Wallace's problem: the view that if it is denied that consciousness is due to an increase in complexity of the molecular components of the brain, then the following dilemma holds: either all matter is conscious or consciousness is introduced into matter from without, pointing to the existence of conscious being outside of and independent of matter. In Animal Life and Consciousness (1891), Lloyd Morgan addresses himself to the problem, recognizing its importance, but dissenting from the conclusion:

> There is a central core of truth in Mr. Wallace's argument which I hold to be beyond question, though I completely dissent from the conclusion which he draws from it. I do not believe that the existence of conscious beings, outside of and independent of what we term "matter" is a tenable scientific hypothesis.(p.465)

Lloyd Morgan argues that there is a third possibility that Wallace had ignored, the monistic hypothesis that views neuroses and psychoses as identical, distinguished only as the objective and subjective aspects of a single substance of being:

> According to the hypothesis that is known as the monistic hypothesis, the so-called connection between the molecular changes in the brain and concomitant states is assumed to be identity...What an external observer might perceive as a neurosis of my brain, I should at the same moment be feeling as a psychosis. The neurosis is the outer or objective aspect; the psychosis is the inner or subjective aspect. (pp.465-66)

As a physical analogy to the relation of psychosis to neurosis, Lloyd Morgan suggests the relationship between the convex and concave aspects of the same curved surface; he also compares brain states to the physical existence of a spoken or written word, and the mental state to the meaning which is associated with the word. He then proceeds to examine the evolution of neuroses and psychoses, since his aim is to explain their origin in monistic terms. Complex neuroses are said to be evolved from less complex ones, less complex ones from simple ones, simple ones "from organic modes of motion which can no longer be called neuroses at all" (p.466), and these latter from inorganic matter. When a similar reasoning is applied to psychoses, the problem arises that the last two steps do not seem to have a counterpart, since there does not seem to be anything below the level of simple psychoses from which these latter could have evolved.

In order to eliminate this difficulty, Lloyd Morgan introduces the concepts of kinesis and meta-kinesis. He argues that all physical phenomena, including the physiological, are explainable in terms of energy, and specifies that the term "kinesis" will apply to all manifestations of physical energy, including neuroses but wider than it. The term meta-kinesis is then defined to apply to all concomitant mental manifestations of kinesis. He then concludes:

> According to the monistic hypothesis, every mode of kinesis has its concomitant mode of meta-kinesis, and when he kinetic manifestations assume the form of the molecular processes in the human brain, the metakinetic manifestations assume the form of human consciousness. (p.467)

Thus to kinetic phenomena below the level of neuroses and out of which these latter are evolved, there correspond meta-kinetic phenomena out of which psychoses are in turn evolved:

> I am, therefore, not prepared to accept the horn of Mr. Wallace's dilemma in the form in which he states it. All matter is not conscious, because consciousness is the metakinetic concomitant of a highly organized order of kinesis. But every kinesis has an associated metakinesis; and parallel to the evolution or organic and neural

> kinesis there has been an evolution of metakinetic manifestations culminating in conscious thought. (p.467)

This view of concomitant kinetic and metakinetic evolution throughout the course of natural history, combined with the thesis of neutral monism now applied to them, is a position which eliminates any need to appeal to material or spiritual substances. The Kantian-Spencerian influence is clear here:

> According to this view, the two distinct phenomenal orders, the kinetic and the metakinetic, are distinct only as being different phenomenal manifestations of the same neumonal series. Matter, the unknown substance of kinetic manifestations, disappears as unnecessary; spirit, the unknown substance of metakinetic manifestations, also disappears; both are merged in the unknown substance of being- unknown, that is to say, in itself and apart from its objective and subjective manifestations. (p.468)

Lloyd Morgan then examines the contending philosophic views on the mind/body problem - interactionist dualism, pre-established harmony, materialism and idealism, and as before says that each rests on pure assumption. For him, this does not exclude a-priori these views, for assumptions must always be made in all philosophies. "The question is - which assumption yields the most consistent and harmonious results." And it is here that Lloyd Morgan sees the virtues of his neutral monist views, based on the following assumptions of the relationship between noumena and phenomena, concomitance of kinesis and metakinesis, concomitance of brain and mind, and the nature of mental evolution:

> I make, therefore, the following assumptions: First that there is a noumenal system of "things in themselves" of which all phenomena, whether kinetic or metakinetic, are manifestations. Secondly, that whenever in the curve of noumenal sequences kinetic manifestations (convexities) appear, there appear also concomitant metakinetic manifestations (concavities). Thirdly, that when kinetic manifestations assume the integrated and coordinated complexity of the nerve processes in certain ganglia of the human brain, the metakinetic manifestations assume the integrated and coordinated complexity of human consciousness. Fourthly, that what is called "mental evolution" is the metakinetic aspect of what is called brain or inter-neural evolution. (p.470)

He also notes the following limitations of his views, linked to the epistemological problem of knowledge of metakinesis below the conscious level:

> First, we can know directly only product of metakinetic evolution - that revealed in our own consciousness. Secondly, the process of metakinetic evolution must be reached, if reached at all, indirectly through a study of kinetic evolution. Thirdly, we have no right to infer a mode of metakinesis analogous to human consciousness unless the mode of kinesis is analogous to that which is involved in neural processes. And fourthly, the closer the kinetic resemblance we observe, the closer the meta-kinetic resemblance that we infer. (p.380)

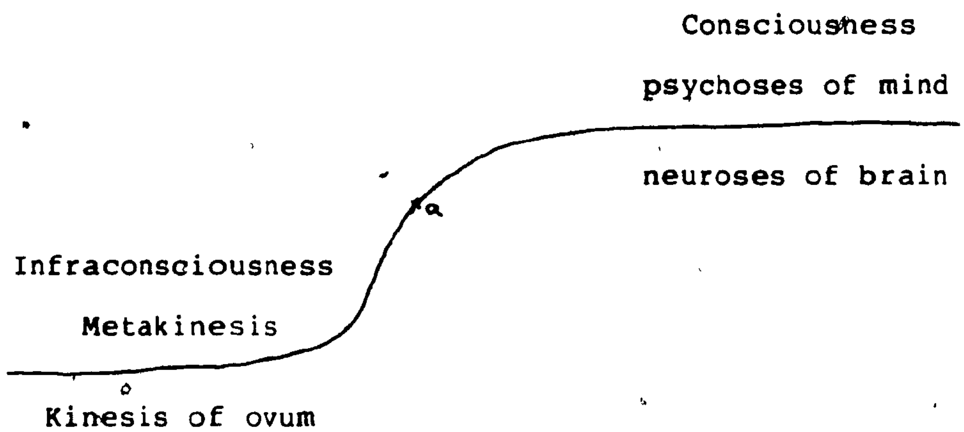
Lloyd Morgan returns to the relationship between the subjective and objective sides of phenomena and their evolution in the article "Mental Evolution" (1892). Here he introduces the terminology of infraconsciousness and subconsciousness to correspond to mental states below the level of consciousness. On the objective side, he sees the passage from organic, non- neural energy to brain processes as such as a continuous process, without admitting that a clearly definable point of distinction can be identified:

> It is true that we cannot indicate the exact moment when, in the increasing complexity of the tissues, the simpler forms of organic energy pass into the higher form of brain energy accompanied by consciousness. But that is just because it is a continuous development, an evolution. (p.167)

Then he coins the term infraconsciousness as the counterpart of the simpler modes of molecular energy, so that consciousness can be said to evolve from infraconsciousness:

> The material structure has been evolved from lower forms of matter: the organic modes of energy (in virtue of which he lives) from lower forms of energy; the mental states (in virtue of which he is conscious), from - what? I suggest in continuation and conclusion of this sentence - from lower forms of infra- consciousness; that is to say, of what is the same order of existence of consciousness, but has not yet risen to the level of consciousness. (p.172)

The following diagram, modified slightly from that given by Lloyd Morgan illustrates his use of the various terms psychosis/neurosis, kinesis/metakinesis, and consciousness/ infraconsciousness. The original diagram is given by Lloyd Morgan to show the development of the neural and mental aspects from ovum to the mind and brain of a higher animal:



The single line is meant to indicate that the objective and subjective are complementary aspects of a single reality, and that point labelled 'a' is taken as a moment of development being studied by a scientist. Lloyd Morgan says that it is frequent to say that at point 'a', the physical development of the brain has generated, or called forth, states of consciousness in the mind. Returning to Wallace's problem, this would be the equivalent of saying that mental consciousness has appeared at a given level of physical complexity. Lloyd Morgan rejects this as follows:

> No conceivable increase in the orderly complexity of the molecular vibrations of brain tissue could give rise to that consciousness which differs 'tota caelo' from any manifestation of energy. (p.173)

But Lloyd Morgan admits that scientists who arrive at such a conclusion are "practically sound because they are still dealing with the same developmental curve", but that their language is "philosophically misleading because they suddenly jump from the subjective aspect to the objective aspect and ignore the great distinction between the two" (pp.173-174) He continues: "When they say that consciousness emerges from the physical conditions at 'a', they presumably mean that at this point we are first justified in speaking of consciousness on the subjective aspect in anything like a human sense." (p.194) Thus, he considers what might be called cross-emergence of the mental from the physical as a manner of speech, practically sound but philosophically misleading.

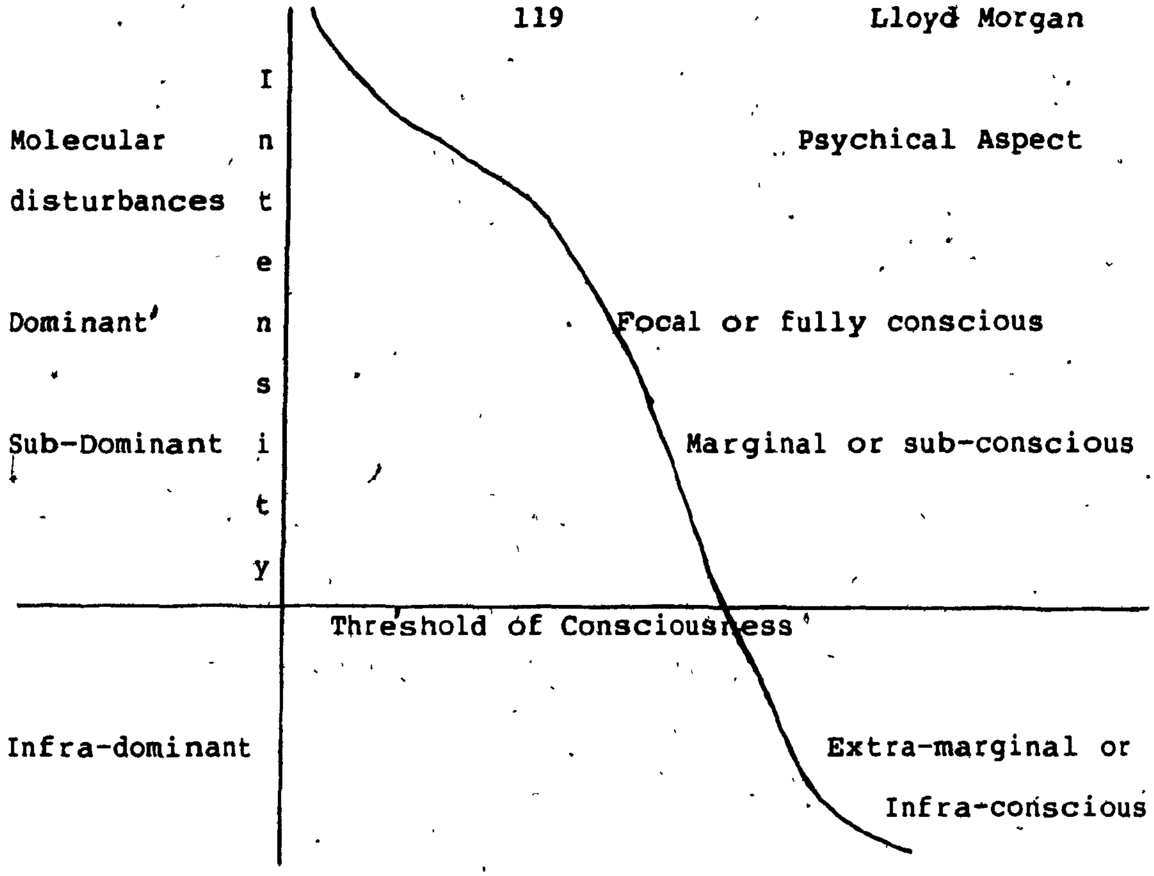
Within the infraconscious domain, Lloyd Morgan distinguishes two types: those forms of infraconsciousness which could become conscious under special conditions and with sufficient effort, which he calls sub-conscious states; and those which lie too deep to ever be brought into consciousness, which are the infra- conscious states proper.

In An Introduction to Comparative Psychology (1892, 2nd 1904), Lloyd Morgan uses the concept of the wave of consciousness to elucidate the notion of the subjective aspect of experience, incorporating in one schema the notions of consciousness, sub- consciousness and infra-consciousness, and their correlative forms of molecular motion. He considers the present as a moment of consciousness, as what is presented to consciousness at a given moment, ie direct awareness. This same consciousness can deal with the past and the future only as memory and anticipation. Thus, consciousness cannot deal directly with the past and the future, but only representations of them. A moment of consciousness must therefore be complex, since it must include immediate sensations, of which there could be many falling simultaneously on the subject, as well as memories of past experiences and anticipations of future ones as well.

The image that he uses is that of a wave of consciousness, part of which is at the focus of attention and part of which is marginal to attention; part of which is conscious and part of which is unconscious (sub- or infra-conscious). There is a variation in the complexity and intensity of experience present to consciousness from one moment to the next, and from one individual to the next, and this can be represented by the height and the width of the associated wave:

> In the psychical sense, intensity may be represented by the height of the wave-crest above the base line which is termed the "threshold of consciousness"; complexity by its width, or the number of constituent elements in the state of consciousness embraced by the wave. (p.18)

Focal elements of the wave correspond to fully conscious elements, marginal elements to the sub-conscious; and the wave can be extended below the threshold of consciousness by including infra-conscious elements as well. Each type of consciousness corresponds to a form of kinesis or molecular disturbance in the nervous system, which Lloyd Morgan calls, using parallel terminology, dominant, sub-dominant and infra-dominant. The wave of consciousness is represented as follows by Lloyd Morgan:



The psychical wave is experienced as "one and indivisible". It is only be introspection that the subject can analyse the wave into its components. But by that time the wave has passed and the analysis is conducted at a later moment on a memory of it. Thus introspection is really "retrospection", and as memory is not completely faithful to the original, some changes are introduced.

<u>Monism, Evolution, and Naturalism</u>

Lloyd Morgan's philosophical system was further developed in the series of 15 articles that appeared in <u>The Monist</u> from 1892-1900. This subsection will deal with Lloyd

Morgan's analysis of three aspects of monism, the relation between naturalism and supernaturalism, and his philosophic concept of evolution (influenced by Spencer).

In "Three Aspects of Monism" (1894) Lloyd Morgan identifies a monistic theory of knowledge, a monistic interpretation of nature, and an element which he calls analytic monism. The monistic theory of knowledge holds that the dualist distinction of subject and object is false; rather, there is posited a primordial and single experience, which exists prior to philosophy and is accepted by common sense. Experience is sundered into subject and object only as a result of philosophizing.

The monistic interpretation of nature is the view "that man as an organism is one and indivisible... that mind is not extra- natural nor super-natural but one of the aspects of natural existence" (pp.322-323). The analytical aspect of monism allows the analysis of experience into subject and object, though this cannot be done at the moment of experience, but only later, through the act of reflection. These three aspects of monism are, according to Lloyd Morgan, essentiall related and must all be examined in order to understand monism:

> In conclusion I must repeat that, in my judgment, the full strength of monism is not apparent until we view it in its three phases as a theory of knowledge, an interpretation of nature and an hypothesis which correlated energy and consciousness. Monism must be judged as a whole or not at all. Its cardinal tenets are: that nature is one and indivisible, though we may

> distinguish its subjective and objective aspects; that man is one and indivisible, though analysis may disclose two strongly contrasted aspects, body and mind. It contends that man in both aspects, biological and psychological, is the product of an evolution that is one and continuous; and combining the results of its theory of knowledge with those of its analysis of man, it identifies mind, as a product of evolution with the subject, as given in experience. (p.332)

Lloyd Morgan's philosophy is naturalistic as well as being monistic. He holds that all phenomena of the world, including the ethical and aesthetic ideas and sentiments must be understood in a naturalistic way. In "Naturalism" (1896), he says:

> We must extend our conception of naturalism so as to include a naturalistic interpretation of nature in all its wealth of moods, neither excluding inorganic nature on the one hand, nor human nature on the other. If the leading doctrines of naturalism are that we may know phenomena and the laws by which they are connected; if for naturalism the world with which alone we are concerned and of which we have any cognizance, is that world which is revealed to us through perception, and which is the subject matter of the natural sciences; we must include under the head of phenomena the loftiest ideals which the human mind has reached, and rank among the natural sciences ethics and aesthetics.(p.82)

The philosophy of naturalism is not taken to include the claim that an adequate and complete explanation can be given at the present time, since knowledge is forever evolving; nor is the evolution of phenomena restricted to the model of natural selection alone. In particular, mental evolution as a supplement to organic evolution must be taken into account, and in this new mode the relations of subservience and the type of environment change:

> But there is this important distinction, that whereas in organic evolution the mental faculties are subservient to the preservation of the organism in self-adjustment to an environment essentially physical and organic, when we come to the mental evolution of man as a social being the organism is made subservient to the development of mind in self-adjustment to an environment of ideas and ideals. (p.81)

Thus, Lloyd Morgan holds that in social evolution among human beings, natural selection is no longer the chief form of the evolutionary process and that mental evolution, the adjustment of mind to an environment of ideas and ideals, becomes dominant. This mental evolution is considered as being just as naturalistic as organic evolution. In Animal Life and Consciousness (1891) Lloyd Morgan developed a view where the preservation of ideas and systems of ideas, including theories of nature and of mind, is determined by the coherence of the ideas among themselves, their agreement with perception and their cohesion to the environment of other ideas and theories:

> But so far as we can judge, the winning species among systems of ideas and interpretations of nature are likely to be those in which the greatest number of ideas are fused into harmonious synthesis; in which all the ideas are congruous; and in which the abstract or conceptual ideas, when brought into contact with concrete and perceptual states of consciousness, are found to be in harmony and congruity therewith. (p.503)

Lloyd Morgan does not exclude supernaturalism as a way of looking at reality. In "Naturalism", he argues that rather than being antagonistic, the relationship between naturalism and supernaturalism is complementary, depending upon one's point of view. For a scientist or philosopher of science, nature is interpreted in a natural way, but not so for the "poet, seer or idealist":

> The "reconciliation" between naturalism and supernaturalism, to use a current but by no means satisfactory phrase, is not to be found in any more or less arbitrary separation of the natural and the supernatural but in the identification of the one with the other, and in the recognition on either part of the fact that there is no minutest detail of the natural that has not, or may not have, for man as poet, seer and idealist, an supernatural aspect. (p.83)

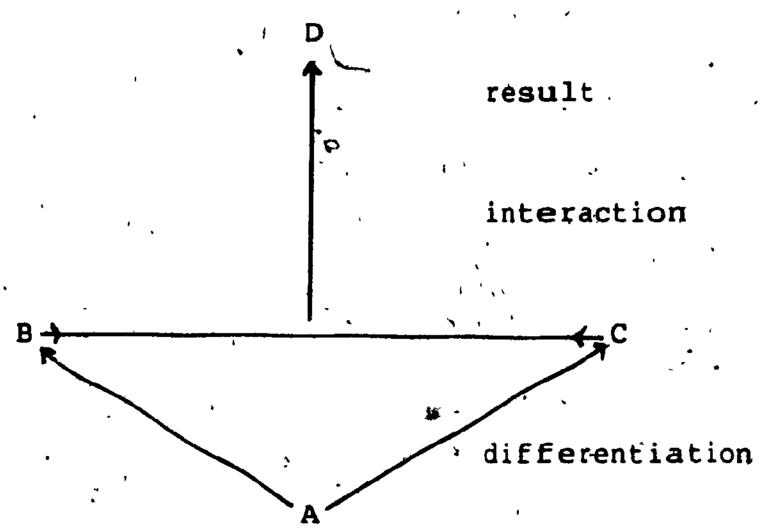
Lloyd Morgan argues that alongside the sphere of the natural investigated by science, there exists the sphere of the supernatural dealt with by religion; that all natural phenomena are "interpenetrated with supernaturalism"; and that this "supernaturalism is not something separate from the phenomena which it is the business of science to investigate, but their inner and deeper aspect which it is the function of philosophy and religion to harmonize".(p.84)

In conclusion, Lloyd Morgan sums up his view on naturalism as follows:

> 1) Naturalism sweeps through the whole range of the knowable.
> 2) It is nowise antagonistic to or exclusive of supernaturalism.
> 3) It takes as its criterion of reality direct experience prior to the analysis of science.
> 4) Of the two aspects of experience which primary analysis first discloses, the objective and the subjective, it regards both as of strictly coordinate reality.
> 5) It assets the inherent and intrinsic worth and dignity of the human ideals
> 6) It refuses to admit that natural selection,

potent as this may be as a factor in organic evolution, is to be regarded as chief naturalistic factor in human evolution. (p.90)

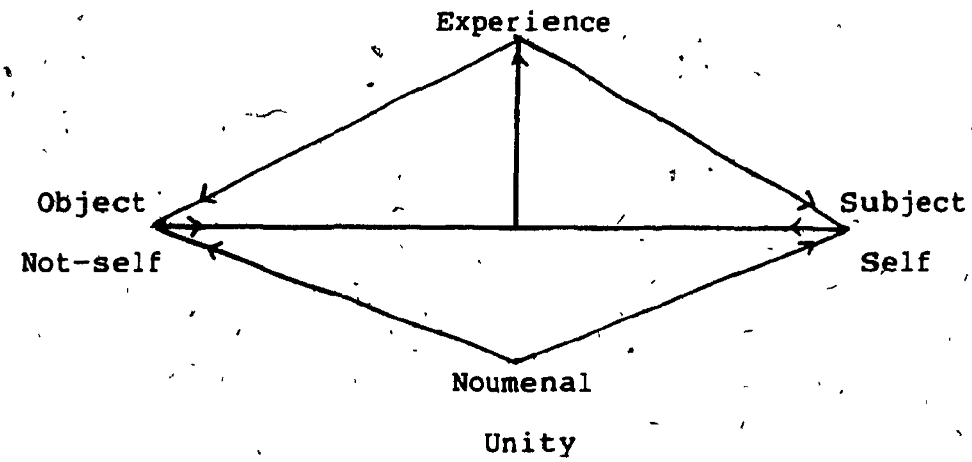
All of the preceding leads up to Lloyd Morgan's philosophy of evolution presented in the article "The Philosophy of Evolution" (1898). Lloyd Morgan distinguishes between the noumenal level, where the concept of evolution is the Spencerian one, and the phenomenal level, where the Darwinian one applies. He reworks Spencer's differentiation of the homogeneous into the heterogeneous into a modified concept of metaphysical evolution. "The root idea of the concept of evolution are, first, differentiation, and secondly, the interaction of the differentiated products." (p.487) Lloyd Morgan represents as follows the process whereby a relatively homogeneous substance A differentiates into two products B, C which then interact to produce a "new and more complex unit" D (p.496)



This scheme is said to apply universally in nature as well, from the formation of chemical atoms to their combination into molecules, and the development of an organism from an embryo. Lloyd Morgan notes that the result of chemical differentiation and interaction leads to novel results not predictable on the basis of any experience antecedent to the actual experience:

> No one, in the absence of observation or analogy based on practical experience (his own or that of others), could foretell what new characters a compound, resulting from the chemical union of well-known elements, would possess.(p.488)

Lloyd Morgan's system is both empiricist and rationalist- he admits sense experience as a means of gaining knowledge of the phenomenal, and he admits rational thought as a means of gaining knowledge of the noumenal. Then he undertakes two analyses of sense experience and rational thought: (1) the unity of sense experience bifurcates into the objective aspect as dealt with by physical science and the subjective aspect as dealt with by psychology; and (2) the unity of rational thought bifurcates into the objective aspect, which he calls the noumenal cause, and the subjective aspect which he calls the rational ego. The schema of differentiation and integration, applied to the metaphysical system of noumena, phenomena, subject, and object yields the following result: the noumenal reality is a unity prior to its initial differentiation into self (subject) and not-self (object); the interaction of subject and object gives rise to experience; and this latter can be analyzed into subject and object when experience, from the phenomenal point of view, is taken as the starting point:



In "Mental Factors of Evolution" (1909) Lloyd Morgan deals with the question of the Darwinian factor of natural selection in organic evolution. He combines the Darwinian factor of natural selection with the Lamarckian factor of inheritance of acquired characters, with the latter, however, as secondary and "foster parents or nurses" (p. 428) to the former. The concept, which Lloyd Morgan calls "organic selection" (and which he sees as also suggested by the work of Baldwin and Osborn), is defined as follows:

> According to this hypothesis any intelligent modification of behavior which is subject to selection is probably coincident in directin with an inherited tendancy to behave in this fashion. Hence in such behaviour there are two factors: (1) an incipient variation in the line of such behaviour, and (2) an acquired modification by which the behaviour is carried further along the same line. Under natural selection those organisms in which the two factors cooperate are

> likely to survive. Under artificial selection they are deliberately chosen out from among the rest. (ibid)

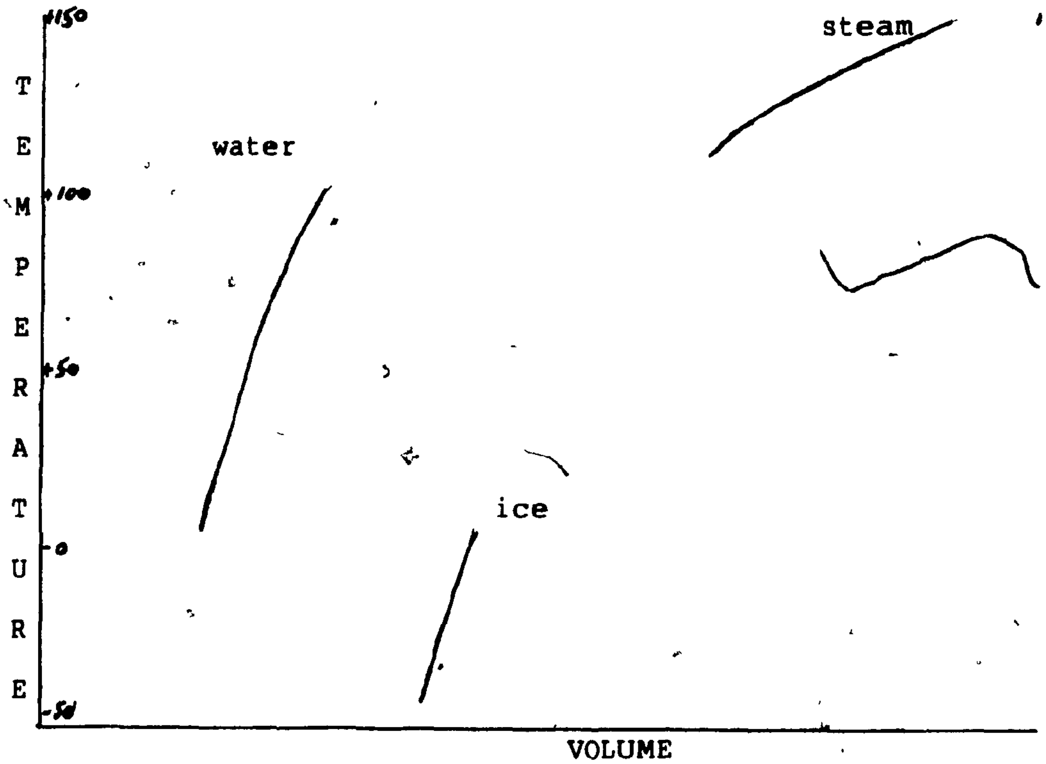
Representing variations by V and acquired modifications by M, Lloyd Morgan symbolizes a variation in the direction of increased adaptation by +V, decreased adaptation by -V, acquired modifications in the direction of accomodation to circumstances by +M, and those in the direction of diminished accomodation by -M. Of the four possible combinations, that of +V and +M are selected for survival, those of -V and -M for elimination, the others being intermediary between these two inevitable results. Lloyd Morgan argues that this is not Lamarckism since the Lamarckian factor enters only as a help to the survival of the adaptive variations, with natural selection the dominant force.

Evolutionary Emergentism

Lloyd Morgan's concept of evolutionary emergentism was made explicit in his Gifford lectures of 1922-23, but its genesis goes at least as far back as his earlier concept of "selective synthesis" in <u>An Introduction to Comparative Psychology</u> (1894, 1903). Here Lloyd Morgan argues that evolution is a single, continuous process that "sweeps through" all of nature in all of its modes - inorganic, organic and conscious. The laws of each mode differ, and at each stage something "new" is introduced which did not exist in the previous modes. This is taken to be the result of the selective synthesis inherent in evolution, and Lloyd Morgan mentions four characteristics of it: (1) selective synthesis produces products that are "special" in nature; (2) it can only manifest itself under the appropriate environmental conditions; (3) there is "an apparent breach of continuity" when a new property appears, though this is considered as "not a gap or hiatus in the ascending line of development, but a new point of departure" (p.338), (4) the requisite materials for selective synthesis to operate upon must be present. The key point is the second,the question of the "apparent breach of continuity". Using a chemical example, the combination of sulphur and carbon when the former is passed over red-hot charcoal, to form carbon disulphate, Lloyd Morgan says:

> Between the physical conditions of the elements before synthesis and that of the compound after synthesis there is an apparent breach of continuity. There does not appear to be a gradual and insensible change from the physical properties of the elements to the physical properties of the compound, but at the critical moment of the constitution of the compound there seems to be a new departure. (p.342)

Another example which he uses is that of water, for which he supplies the following graphic showing its volume transformations in the solid, liquid and gaseous states as a result of the application of temperature at normal atmospheric pressure. The three breaks in the graph occur at the "points of new departure"; the apparent breaches of continuity are quite clearly represented:



In the organic domain the same phenomena occurs. Lloyd Morgan holds protoplasm to be a product of the evolution of inorganic into organic compounds. Of the origin of protoplasm he says: "Whether the natural synthesis of protoplasm is going on now anywhere in the world I do not know, but I believe that it has so taken place at some period or periods of the earth's history." (p.346)

Lloyd Morgan believes that selective synthesis has occurred in mental evolution as well, as in the transition from mere sensations to sentience, and from this latter to consentience and consciousness. This means that apparent breaches of continuity have also occurred at these points.

Lloyd Morgan calls these breaches "natural incidents in the ascending curve of evolution" (p.359).

He then tries to explain away all these apparent breaches of continuity in the transitions from the inorganic to the organic, and from the organic to the conscious stage of life, as holding good only under normal conditions, so that in the absence of such normal conditions, a complete continuity with no apparent breaches would exist. For example, water goes from the liquid to the gaseous stage at 100 C only under normal atmospheric pressure; raising the pressure would continually forestall the transition. He continues, applying this analogy more generally, arguing that apparent breaches of continuity are empirical, and the continuity of evolution is rational:

> Could we only in other matters... find the appropriate conditions, every apparent breach of continuity would probably disappear. We are constrained to believe that evolution as a process is essentially one and continuous. By which we mean that nowhere is there evidence of supernatural interference ab extra. It is imperative to distinguish with due care between the results of empirical observation and their interpretation on a deeper plane of philosophic thought. The apparent breaches of continuity are empirical, and are incidental only to the limiting conditions of phenomenal presentation. (p.359)

This paragraph is ultimately unsatisfactory, since the analogy upon which it is based is strained; and Lloyd Morgan will subsequently accept apparent breaches of continuity as points of emergence of new properties, that do not, however, contradict the continuity of evolution, nor its naturalistic basis.

It is in Instinct and Experience (1912) that Lloyd Morgan makes a major step in his transition to evolutionary emergentism. He does this through a consideration of Bergson's Creative Evolution, translated in 1911 into English. Indeed, the greatest number of references in the index are to Bergson, followed by McDougall and Driesch with less than a 1/3 of the references given over to Bergson. Though critical of Bergson's views on intuition, intellect and instinct, he is much more open as concerns the argument for a creative element in evolution. He examines at length the problem of repetition and creativity in the evolutionary process, to conclude that there is a coexistence of "(1) some measure of substantial but never complete repetition and (2) some measure of the new and unique" (p. 171). He continues:

> Here again, however, we are faced with the same difficulty of interpretation. Is the apparently new and unique a veritable "creative" departure from routine? Or is it the algebraical sum of characters given in previous routines and therefore predictaible if we knew the amounts of these characters and the mode of their summation? I see, at present, no ground for denying, though I am not prepared to assert, that really new synthetic combinations, as contrasted with quasi-mechanical mixtures of old characters, do occur in the natural history of experience. But since as matters now are, we have not the data for proof of either their presence of absence, let us be content to grant that they may occur. (p. 171)

It was not until the article "Mind and Body in their Relations to Each Other and to External Things" (1915) that Lloyd Morgan explicitly adopts the concept and terminology of emergents and resultants developed by Lewes. The relevant paragraph, near the end of the text, is the following, where after having said that all learning presupposes a disposition to learn and "all that functionally emerges in esse is structurally pre-existent in posse", Lloyd Morgan says:

> This may perhaps seem to leave no room for the emergence of anything new in the world. If that were so it is palpably at variance with evolutionary interpretation. But it is not so. There are two factors (1) constitutive structure, and (2) the conditions under which its functioning is called forth. If intrinsic structure and external conditions are both, in any two cases strictly similar, nothing new emerges. But if with like intrinsic structure the conditions are different, or vice-versa, something new may emerge. And if genuinely emergent (as contrasted with resultant in accordance with G.H. Lewes distinction) it may be unpredictable - All prediction is founded on experience; and if the new emergent has never come within the range of experience, there is no basis for prediction.(p.255)

Lewes concept of emergents and its contrast with resultants is in turn derived from the work of J.S. Mill. In his general examination of causation in his System of Logic (4th edit, 1856), Mill had noticed that two types of causation had to be distinguished. The first was the run of the mill causation where given the antecedent causes, one could predict the consequent effect. The example Mill gives is when two forces act jointly on a body. Given the direction and magnitude of each of the two forces, their effect could easily be calculated with reference to the parallelogram of forces that results, and so can be predicted in advance. This was called by him "Composition of Forces".

But in other cases this does not hold. The example Mill gives is that of the composition of chemical elements, as in the combination of hydrogen and oxygen to form water. "The chemical combination of the two substances produces as is well known a third substance with properties entirely different from those of the two substances separately, or both of them jointly". This type of non-additive causation was called by Mill heteropathic, and the laws resulting from it heteropathic laws. The existence of such laws shows that knowledge of complex things cannot be simply deduced from knowledge of their component parts.

Lewes contribution was to return to this distinction in his Problems of Mind (3rd ed. 1875), and baptize the products of the operation of the Composition of Causes as resultants, and the products of the operation of heteropathic laws as emergents.

At the time that Lloyd Morgan recuperated the Mills-Lewes distinction and began to use the latter's terminology, these ideas and terms had lain dormant for some 40 years, at least as concerns English evolutionary thought. It should be noted, however, that Lloyd Morgan was familiar with Lewes' work and quotes from it as far back as Springs of Conduct (1885) where he also used the terms "emerged" and "submerged" in his discussion of psychoses and hypo-psychoses.

After Lloyd Morgan's 1915 article quoted from above, the history of the concept of emergentism was closely tied to the interaction between Lloyd Morgan and Samuel Alexander, who delivered the Gifford lectures in 1916-1918 under the title Space, Time and Deity, 2 vols. (1920). As a result of his contacts with Lloyd Morgan, Alexander adopted the terminology of "emergent" and "resultant", and incorporated the associated concepts in his system. In turn Alexander's system was a considerable influence and prod on Lloyd Morgan in developing his philosophy of evolutionary emergentism, which he did in his own Gifford Lectures of 1922-23, subsequently published as Emergent Evolution (1923) and Life, Mind and Spirit (1926). Lloyd Morgan devotes most of ch. 1 of the first book to an exposition of Alexander's system, and certain of his differences with it.

Just the year before his Gifford Lectures, Lloyd Morgan contributed the preface to the English translation of L. Bianchi's The Mechanism of the Brain and the Function of the Frontal Lobes (1922), where Bianchi argued that the frontal loves are the seat of intelligence. In his preface, Lloyd Morgan defended a naturalist view of neuro- psychology, as opposed to dualist views that see mind as an expression of super-natural intervention, and criticized behaviorism for its neglect of mind. He also provided, in a few paragraphs, what he called a "comprehensive world-scheme" which he argued to be consistent with Bianchi's views on neuro-science. This included a brief exposition of evolution as a natural process going through the physical, chemical, vital and conscious stages, and wherein "new kinds of natural relation among pre-existent things, or groups of events, appear at succeeding stages or levels in the course of evolution." (p.11). He also mentions that higher levels involve lower levels, and that the lower levels, once the higher levels appear, depend on them.

Evolutionary Emergentism and Mind

There remains to be presented Lloyd Morgan's final view of mind in the light of his evolutionary and emergentist philosophy. Lloyd Morgan adds an emergentist schema to his previously espoused view of neutral monism and arrives at a combination of the two.

Lloyd Morgan admits the emergence of new levels of reality in the advent of life, mind and self-consciousness, but also says that within any given level, such as that of matter, new properties are emerging with the formation of each new type of molecule. Within the orderly sequence of events of the world that science and philosophy of science describe and interpret, the emergence of novelty is a frequent and wholly natural affair. In the combination of elements to form a whole there is a relationship between resultants and emergents which Lloyd Morgan describes as follows: "There may often be resultants without emergence; but there are no emergents that do not involve resultant effects also." (p.5) Evolution and emergence are complementary. Continuity is not sacrificed to saltationism since resultant effects smooth out or pave the way for emergence:

> Resultants give quantitative continuity which underlies new constitutive steps in emergence. And the emergent step, though it may seem more or less saltatory, is best described as a qualitative change of direction, or critical turning point, in the course of events. In that sense there is not the discontinuous break of a gap or hiatus. It may be said then, that through resultants there is continuity in progress; through emergence there is progress in continuity. (ibid)

This paragraph is important, since through the interplay of resultants (quantitative continuity) and emergents (qualitative novelty), the overall continuity of evolution is safeguarded, even as the emergence of novelty is admitted, thus solving theoretically the old problem of Lloyd Morgan's "apparent breaches of continuity" that the concept of selective synthesis left in a state of unresolved tension. Lloyd Morgan defends his view as neither mechanical, by which is meant an interpretation of nature in terms of resultants only, nor extra-natural, by which is meant the invoking of entities such as the "elan vital" or entelechies to explain novelty. Emergence is to be accepted, or "acknowledged" as a part of nature, with "natural piety", a term Lloyd Morgan borrows from Alexander.

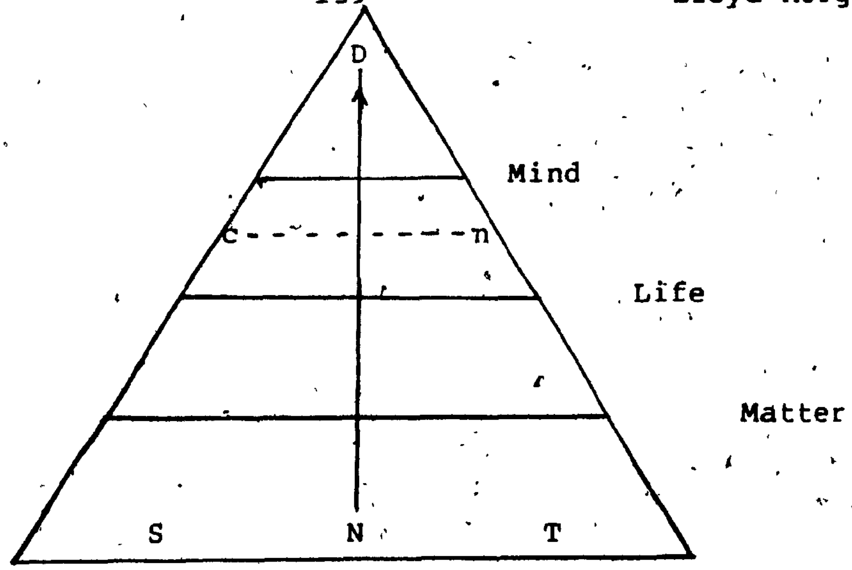
Lloyd Morgan defines two fundamental concepts that express the mutual relations between higher levels and lower levels. A higher level is said to "involve" a lower level, in the sense that the lower level is the basis upon which the higher level emerges. A lower level is said to "depend" on the higher level, in the sense that once it has emerged from the lower level, the higher level influences the way in which the lower level events run their course, which is different after the emergence than before. As an example, mind involves life, since mind arises only in living beings possessed of a developed brain; but once mind has arisen, the life of the beings so endowed depends on their minds. "Dependence" and "Involution" are complementary terms:

> Emphasis on "dependence" is no less essential than that on "involution". In a physical system wherein life has emerged, the way things happen is raised to a higher plane. In an organism within which consciousness is emergent, a new course of events depends on its presence... The new relations emergent at each higher level guide and sustain the course of events distinctive of that level, which in the phraseology I suggest depends on its continued presence. In its absence disintegration occurs.(p.32)

Lloyd Morgan's system of emergentism is based on his earlier view of the correlation or concomitance of the physical and the psychical, to which is now added the schema of emergent levels. The neutral monist component describes, as it were, the horizontal plane of each level and part thereof, which from one point of view is physical or objective and from the subjective point of view is psychical. The evolutionary emergentist component contributes the vertical plane where a series of ordered levels arise out of the basic matrix of space-time, and rise through matter to life and mind. At the same time, Lloyd Morgan adds a third dimension, which might be called the plane of the supernatural or the plane of deity, and which following Alexander, Lloyd Morgan calls "nisus".

On the face of it, this may seem contradictory to Lloyd Morgan's claim that his system is wholly naturalistic and excludes the super or extra natural. But Lloyd Morgan has always qualified this exclusion to concern science and philosophy of science only. He claims, however, that "a constructive philosophy is more than science" (p.2), ie that philosophy includes a part based on science which must be wholly naturalistic, but may also include a part which goes beyond science to encompass "an acknowledgment of God" (ibid). In his article "Naturalism" (1894), he had already stated that he considered naturalism and super-naturalism as not exclusive, but as interpenetrated, depending on one's point of view. As a scientist and philosopher of science, the point of view is a naturalist one, but as a religious believer, the point of view is a supernaturalist one.

The combination of the three planes: (1) psychical/physical, (2) lower/higher and (3) natural/supernatural is represented by Lloyd Morgan in the following pyramidal diagram (p.11) based on a discussion of Samuel Alexander's related system:



The base of the pyramid S-T stands for the space-time matrix out of which, in Alexander's system, the three main levels of matter, life and mind arise through successive emergences. The apex D stands for Alexander's concept of Deity. The dotted line c-n represents the psychical-physical plane, and the vertical arrow N the "nisus" towards deity.

In the religious sense, God corresponds to the Activity which is the source of emergence:

> For better or worse, while I hold that the proper attitude of naturalism is strictly agnostic, therewith I, for one, cannot rest content. For better or worse, I acknowledge God as the Nisus through whose Activity emergents emerge and the whole course of emergent evolution is directed. Such is my philosophic creed, supplementary to my scientific policy of interpretation. (p.36)

Strictly speaking, Lloyd Morgan's scheme has only three levels - mind, life and matter; he tends to exclude from consideration the space-time base of the pyramid an its apex in deity. Further, he says that in point of detail, the three above- mentioned levels are not all of the same type, for the first mentioned is psychical and the other two physical. He presents his schema as follows:

> We name the level mind from the point of view of the psychical approach, - acknowledging (in brackets; so to speak) physical correlates. We name the level of life from the physical approach, acknowledging (in brackets) psychical correlates. And so, too, at the level of matter. Hence our comprehensive scheme runs thus:
>
> C, Mind (with physical correlates)
> B, Life (with psychical correlates)
> A, Matter (with psychical correlates) (p.36)

'Mind' as a term is used in three distinct sense by Lloyd Morgan, according to the dimension of his schema being considered: in the supernatural plane, in the sense of spirit; in the vertical plane, as an emergent quality at a new level; and on the horizontal plane as the psychical correlate of the physical which cuts across all levels:

> We have seen that the word 'mind' may be used in three senses: first, as Mind or Spirit in reference to some Activity, for us God; secondly as quality emergent at a higher level of evolutionary advance; and thirdly, as a psychical attribute that pervades all natural events in the universal correlation. In what follows I use the word in the second of these sense, ie as an emergent quality of correlates. I must repeat here that only in this sense is the word 'emergent' in place or applicable; for Mind as directive of emergent evolution does not emerge; and Mind as unrestrictive and universal correlate is, in Spinoza's terminology, that "attribute of

> the world from which the mind we are now to consider emerges at its level in the hierarchical order. (p.37)

Lloyd Morgan recognizes three sub-levels of mind - presentation, by which is meant the data of sense and also of memory (considered as a re-presentation of sense data), perception, which is the synthesis of presentation and re-presentation; and contemplation, the level of rational thought. These stages of the evolutionary and developmental progress of the mind are considered as emergent in the order of presentation, perception, and contemplation, with the appropriate relation of involution and dependence between them.

Lloyd Morgan also recognizes three basic relations of mind - influence, reference and enjoyment. Influence is the physical influence of life processes on mind, while reference is the converse mental interpretation of physical phenomena. Enjoyment is intended to convey the mind's relation with itself as mind.

C. D. Broad

The main contribution of C. D. Broad (1887-1971) to emergentism and the mind-brain problem is contained in Mind and Its Place in Nature (1926). This section will examine (1) his views on emergentism as an alternative to the mechanism/vitalism antithesis; and (2) his classification of the mind-brain theories along with his own preference for emergentist materialism and the compound theory of mind.

Emergentism, Mechanism and Vitalism

Broad devotes ch. II of his book to the analysis of "Mechanism and Its Alternatives", where he examines mechanism in two forms - pure mechanism and biological mechanism, and considers the alternatives of vitalism and emergentism. He considers pure mechanism as a theory that asserts a monistic view of substance, change, causality and combination, as follows:

> Thus the essence of Pure Mechanism is (a) a single kind of stuff,' all of whose parts are exactly alike except for difference of position and motion; (b) a single change, viz. change of position. Imposed on this may of course be changes of a higher order, eg changes of velocity, of acceleration and so on; (c) a single elementary causal law, according to which the behavior of any aggregate of particles, or the influence of any aggregate on any other, follows in a uniform way from the mutual influences of the constituent particles taken by pairs. (p.45)

This definition of an ideal or pure mechanism is clearly atomistic and extreme in its simplifications and restrictions. Broad holds that Pure Mechanism cannot explain such a cardinal fact as the nature and status of secondary qualities of objects, such as colour. He says that such qualities cannot be reduced to the atoms and their laws of combination as mechanism claims:

> The plain fact is that the external world, as perceived by us, seems not to have the homogeneity demanded by Pure Mechanism. If it really has the various irreducibly different sensible qualities which it seems to have, Pure Mechanism cannot be true of the whole of the external world, and cannot be the whole truth about any part of it. (pp.50-51)

At most, Broad says, Pure Mechanism could apply only to the microscopic world, but it could neither apply to the macroscopic world nor to the relation between the microscopic and the macroscopic worlds. He then proposes for consideration a weaker form of mechanism, one that could actually be defended by some biologists, which he calls "Biological Mechanism". This is the view that the laws of biological phenomena can be deduced from those of physics and chemistry, without any further assumptions or additions, even if the laws of chemical combination were not in turn deducible from those of physics. What both types of mechanism have in common is their view that no additional factor is needed to explain biological phenomena, beyond those already accepted by chemistry and physics. But Broad also rejects biological mechanism for the reason that he rejected pure mechanism - he considers it incapable of explaining secondary qualities.

Opposed to this type of theory is the theory which Broad calls "Substantial Vitalism", a form of dualism expressed by such biological writers as Bergson and Driesch, and which calls for a special component to explain the vitality of living organisms. Broad notes that defenders of such theories claim that the action of the entelechy is necessary but not sufficient to explain vital behavior, and that in addition a study of the structure of the living body is required; that entelechies cannot be isolated and studied apart from the living bodies with which they are related; and that the entelechy is supposed to direct these organisms from the outside.

Broad then argues that this point of view does not correspond to to scientific principles as practiced in chemistry, so that there is a violation of scientific method if Substantial Vitalism be adopted in biology. He compares the entelechy to a unknown chemical complex in a chemical compound , and draws the following negative conclusions: (1) unlike a not yet isolated chemical complex, entelechies cannot even in principle be isolated; (2) in chemistry groups which play a role in compounds but cannot exist independently can at least be transferred from compound to compound, which is not the case with entelechies; (3) entelechies are supposed to differ in kind from the bodies they inhabit or animate, a point which Broad finds objectionable because "it is hard to understand what exactly is meant by saying that a living body is a compound of an entelechy and a material substance, and impossible to say anything in detail about the structure of the total complex thus formed"(p.58).

Having rejected both biological mechanism and substantial vitalism, Broad finds himself in need of a third view, an alternative to the two traditional views which he considers the horns of a dilemma. He recognizes that many scientists, repulsed by the supernaturalist hypothesis of special components, have found refuge in the naturalistic mechanism, while many philosophers, repulsed by the simplistic view of mechanism, have been driven into the arms of vitalism.

Rather, he argues that emergentism is way out of the dilemma. Broad situates the emergentist point of view with respect to its similarities and differences with mechanism as follows: mechanism and emergentism in their biological forms have in common (1) the denial of any special component to explain vital behavior, and (2) the view that the behavior of organisms is determined by the "nature and arrangement of their components". They differ in that the mechanistic theory asserts in addition that "the behavior of the whole could, in theory, at least, be deduced from a sufficient knowledge of the how the components behave in isolation or in other wholes of a simpler kind" (p.59). while emergentism denies the possibility of this derivation:

> Put in abstract terms the emergent theory asserts that there are certain wholes, composed (say) of constituents A, B and C in a relation R to each other; that all wholes composed of constituents of the same kind as A, B and C in relations of the same kind as R have certain characteristic properties; that A, B and C are capable of occurring in other kinds of complex where the relation is not of the same kind as R; and that the characteristic properties of the whole R(A,B,C) cannot, even in theory, be deduced from the most complete knowledge of the properties of A, B and C in isolation or in other wholes which are not of the form R(A,B,C). The mechanistic theory rejects the last clause of this assertion. (p.61)

Broad gives the formation of water out of its hydrogen and oxygen components as an example of the emergence of a new property, with arguments similar to those of Mill, Lewes, Lloyd Morgan and others. Moreover, he says that even the law of the composition of forces involves emergence, whereas authors such as Mill typically give this as an example of the non-emergent or resultant ones. Broad says the consequence of two forces acting on a body could not be deduced from the direction and magnitude of the two forces the first time such a type of system was encountered. Only on subsequent occasions, once the law of the parallelogram of forces had been identified, could the result be predicted on the basis of pure deduction. The law itself is not a logical deduction from the properties of the individual forces, and acts as a "suppressed hypothesis" when it is not explicitly stated by those so used to it that it has become obvious and a matter of routine. Speaking more generally, he says:

> It is clear that in no case could the behavior of a whole composed of certain constituents be predicted merely from a knowledge of the properties of their constituents, taken separately, and of their proportions and arrangements in the particular complex under consideration. Whenever this seems to be possible it is because we are using a suppressed premise which is so familiar that it has escaped our notice. The suppressed premise is the fact that we have examined other complexes in the past and noted their behavior; that we have found a general law connecting the behavior of these wholes with that which their constituents would show in isolation; and that we are assuming that this law of composition will also hold of the particular complex whole at present under consideration.(p.63)

As far as chemical systems are considered, Broad states that even this modified type of deductibility does not hold. Here it is necessary to study the particular type of compound in each case, since he holds that there is no general law of composition to be discovered. Given two types of chemical elements that are combined in a compound, the law connecting the properties of the latter with those of the former is "so far as we know, an unique and ultimate law" (p.65)

Broad considers that there is no way of getting around the existence of emergent properties and laws. He considers the attempt to enlarge the concept of the properties of an element to include the ways in which it combines with other elements to form compounds. This does not solve the problem of emergence, since in this case we can never know all the properties of an element. If a reaction occurs when it is placed in the presence of another element for the first time, a new property would then have arisen, and saying that this new property was "latent" does not explain why or how this was so. Here, emergence is forced down to the level of the components, and involves the emergence of new properties; but emergence is not done away with.

Broad defines two orders of compounds. The first is that of chemical compounds, made up of atoms combined in definite ways; while the second order is that of biological compounds, made up of combinations of compounds of the first order, in particular the organic ones. A living body is thus a compound of compounds , or a compound of the "second order" (p.67). Just as a compound of the first order is emergent relative to its components, so is a living body, as a compound of the second order, emergent relative to its chemical components.

Broad then enumerates the three characteristics he considers essential: (1)the biological whole is determined by the nature and arrangement of its component parts and no special component is involved; (2) the behavior and properties of the biological whole cannot be predicted from that of the behavior and properties of the component parts taken separately or in other surroundings; and (3) the law relating the whole and its parts is unique and irreducible, not a special case of a more general law or a combination of two or more general laws. He concludes "This view about living bodies and vital behavior is what I call "Emergent Vitalism"; and it is important to notice that it is quite different from what I call 'Substantial Vitalism'" (p.69).

Compared to mechanism, emergentism provides a more complex and less tidy view of the world. Where mechanism holds that there is only one level of reality and only one basic science, that of mechanics, of which all others are special cases, emergentism leads to a hierarchical view of the levels of reality and of the sciences that deal with them:

> On the emergent theory we have to reconcile ourselves to much less unity in the external world and a much less intimate connexion between the various sciences. At best the external world and the various sciences that deal with it form a kind of hierarchy. (p.77)

Broad distinguishes two types of laws, the intra-ordinal and the trans-ordinal, depending on whether they encompass only one level of the hierarchy, or span two of them:

> A trans-ordinal law would be one which connects the properties of aggregates of adjacent orders. A and B would be adjacent, and in ascending order, if every aggregate of order B is composed of aggregates of order A and if it has certain properties which no aggregate of order A possesses and which cannot be deduced from the A-properties and the structure of the B-complex by any law of composition which has manifested itself at lower levels. An intra-ordinal law would be one which connects the properties of aggregates of the same level. (p.78)

This leads him to define three types of properties: (1) emergent properties which are ultimate properties characteristic of an order, in that they do not exist at lower levels, and cannot be deduced from the properties of those lower levels; (2) reducible properties which are characteristic of an order, but where such a deduction is possible; and (3) neutral properties which are properties of an order common to lower orders as well. He gives the following examples of each type as follows: sexual reproduction is an ultimate or emergent characteristic of the biological order; the beating of the heart is reducible characteristic, deducible from the mechanical properties of the heart and the chemical and physical properties of its components, while the conservation of energy is a neutral law of both living and non-living matter.

Lastly, Broad examines the problem of teleology and its relation to the mechanistic/emergentist distinction. Broad considers that a system is teleological when it meets two tests: (1) an initial examination of its construction is consistent with the hypothesis that it was constructed by an intelligent being for a specific purpose, and (2) a further examination of it discovers new parts and relations between and among them that is still consistent with the hypothesis. He holds that both parts of this operational definition are needed, since the first alone may merely be a truism that is universally applicable:

> I think that probably both factors are necessary. Of any system whatever we might suppose that it was designed to do what we actually find it dong. But in general, we should not find that this gave us any clue to investigating more minute structure or predicting its unobserved behavior.(p.82)

Teleology is then divided into two forms: external teleology which applies to a system which serves not its own end of self-preservation or reproduction, but an end which was introduced from outside by the maker of the system; and internal teleology where the goal pursued is that of self-preservation and reproduction. Machines of all kinds - clocks, cars and other man-made artifacts are considered as examples of teleological systems of the first, or external kind, while living organisms are identified as teleological systems of the second kind. The first kind of teleology requires a designer who introduces the goal or function of the system from without; the second type is logically independent of the concept of design, and is consistent with the hypothesis of a designer or its opposite. If living organisms including humans were recognized as teleological and designed, as in the case of machines, then a designer other than humans - ie God would have to be admitted, or humans would have to be treated as God-like:

> I conclude, then, that if organisms be the result of design in any intelligible sense, their designers may fairly be called 'Gods', and either we are gods in disguise or there are superhuman beings who make organisms. (p.85)

Now the same conclusion must be arrived at if a biological mechanistic theory is accepted. The argument is as follows: (1) If biological mechanism is true, then all living organisms are machines; (2) all machines were designed by a designer (other than the machine itself); therefore (3) some God or God-like designer created the human "machine": "Thus the proper complement to a completely mechanistic theory about organisms is some form of the doctrine of Deism" (90). But Broad wants his natural philosophy to be independent of any religious commitment, and this provides a key argument for his preference of emergentism over mechanism as a biological philosophy:

> It seems to me on th whole Emergent Vitalism is distinctly to be preferred to Biological Mechanism. It does not necessitate a complicated Deistic supplement, as Biological Mechanism does; and this seems to me to be an advantage. At the same time it is perfectly consistent with the view that there is a God who created and controls the material world; so that, if there should be any good reason to believe in such a Being, the Emergent Vitalist could meet the situation with a quiet mind. (pp.93-94)

<u>Classification of the Mind-Body Problem:</u>

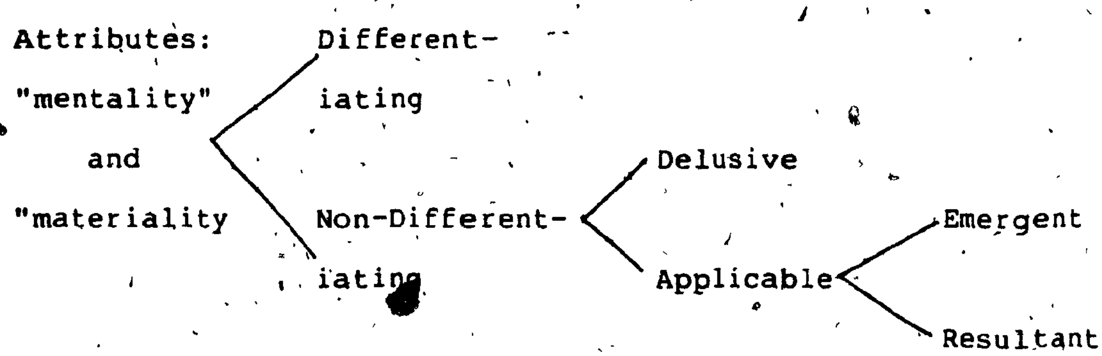
Broad has the honor of having presented the most complex model for classifying contending theories of the mind-body problem, one which provides for 17 different possibilities. His system is based on distinguishing between three levels of analysis of attributes: (1) the distinction between those that are applicable and those that are delusive; (2) among the applicable attributes, those that are differentiating and those that are not; and(3) among the non-differentiating properties, the distinction between those that are emergent and those which are reducible. Applied to the mind-body problem, this results in the 17 theory model that Broad examines.

An attribute is said to be applicable when "there are things in the Universe which have these attributes in some determinate form" (p.607). On the other hand, an attribute is delusive when "it seems to apply to certain things, but does not in fact apply to anything" (p.608). Applicable and delusive characteristics have in common that they could possibly apply to some things; though this is actually the case only with the former.

Of the applicable attributes, some are differentiating, others are not. A differentiating attribute is involved in the definition of a substance; it is a special attribute distinctive of that substance, as extension is of matter, or thinking is of mind, insofar as they are postulated as substances. A differentiating attribute must satisfy four conditions: (1) it must not be characteristic of substance as such, but of some particular substance whose existence is postulated; (2) it must be of the highest order and not merely a particular irreducible quality of a thing; (3) it is not an emergent quality; and (4) it must be simple, ie "it must not be analyzable into a conjunction or disjunction of other attributes." (p.213)

Non-differentiating attributes are divided into emergent ones, which belong to a whole but to none of its parts, and resultant ones, which belong to both the whole and to its parts.

Applied to the attributes of "mentality" and "materiality", the schema is applied in the (slightly different) following order: (1) such an attribute may be a differentiating attribute, determining a distinct substance, or a non-differentiating one; (2) if it is non-differentiating, it may be so because it is delusive, or it may be applicable; (3) if it is applicable, it may be an emergent or a resultant property. In diagram form, Broad's scheme may be represented as follows:

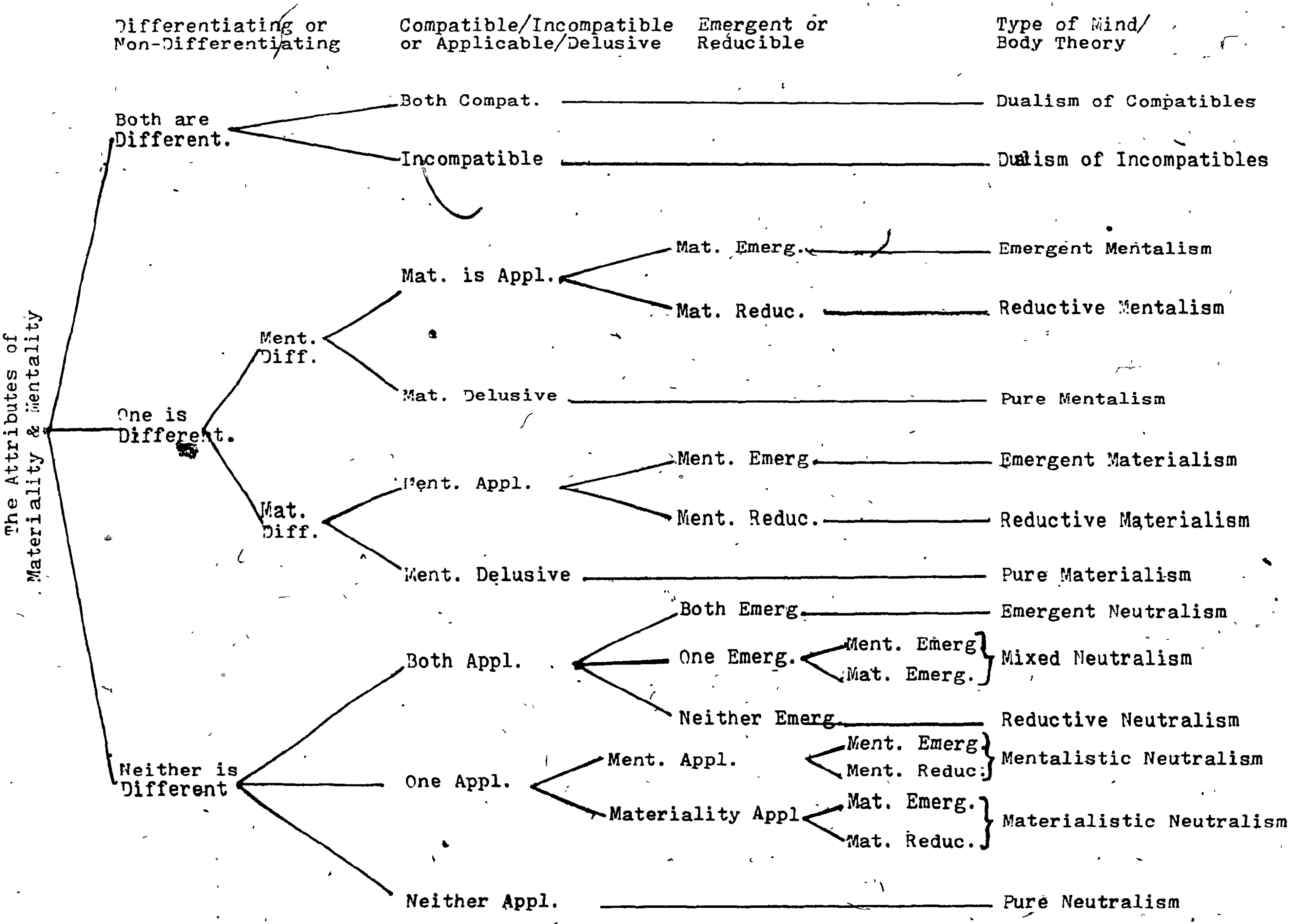


With this scheme as his basis, Broad then develops his model of the mind-body theories in the following steps: First he considers the three possibilities that (a) both mentality and materiality are differentiating characters; (b) that only one is and (c) that neither is. The first case is that of dualism, the second either materialism or mentalism, depending on the characteristic which is chosen as differentiating, and the third is that of neutralism.

Secondly, he subdivides dualism and the various forms of monism. Dualism is subdivided according to whether the two differentiating characteristics are compatible or not. Materialism, mentalism and neutralism are subdivided according to whether the non-differentiating attribute or attributes are applicable or not.

Thirdly, the various forms of monism are further subdivided depending on whether the applicable attribute or attributes are emergent or resultant. After all is said and done, this whole process gives rise to the 17 different theories, each of which is numbered by Broad, and which are regrouped under 14 different titles (in three cases, two forms of neutralism are regrouped under one title, which explains the discrepancy between the number of theories and the number of titles.) This process, quite lengthy to summarize in words, can be represented by the diagram based on Broad's analysis which is given on the next page.

Broad devotes some 60 pages to a detailed examination of the 17 theories of the mind/body relation, with hundreds of arguments developed for and against various of them. But given the way he has set up his view of emergent levels - with the chemical displaying emergent properties over and above the physical, and the biological likewise enjoying non-reductive properties over the chemical, it is perhaps not surprising that he opts for a combination of materialism (the development of of the mental out of material elements) and emergentism (the non-reducibility of mental properties to physico-chemical ones). In his own terms he opts for the



Differentiating or Non-Differentiating
Compatible/Incompatible or Applicable/Delusive
Emergent or Reducible
Type of Mind/ Body Theory
The Attributes of Materiality & Mentality
Both are Different.
Both Compat.
Dualism of Compatibles
Incompatible
Dualism of Incompatibles
One is Different.
Ment. Diff.
Mat. is Appl.
Mat. Emerg.
Emergent Mentalism
Mat. Reduc.
Reductive Mentalism
Mat. Delusive
Pure Mentalism
Mat. Diff.
Ment. Appl.
Ment. Emerg.
Emergent Materialism
Ment. Reduc.
Reductive Materialism
Ment. Delusive
Pure Materialism
Neither is Different
Both Appl.
Both Emerg.
Emergent Neutralism
One Emerg.
Ment. Emerg.
Mat. Emerg.
Mixed Neutralism
Neither Emerg.
Reductive Neutralism
One Appl.
Ment. Appl.
Ment. Emerg.
Ment. Reduc.
Mentalistic Neutralism
Materiality Appl.
Mat. Emerg.
Mat. Reduc.
Materialistic Neutralism
Neither Appl.
Pure Neutralism

position that "(a) materiality is a differentiating attribute, and (b) that mentality is an emergent characteristic" (p. 646). But he adds the proviso that this is the case only so long as what he calls "normal" facts are admitted:

> If there were no facts to be considered except the normal ones, and we rejected all the alleged abnormal facts dealt with by Psychical Research, I should regard Emergent Materialism as on the whole the most reasonable view to take of the status and relations of matter and mind in Nature. (p. 648)

For no sooner has he given his preference to emergent materialism, than he calls in the testimony of parapsychology to qualify and substantially modify his views. Broad considers as an established fact the existence of what he calls the "Psychic Factor", a "something which is capable of persisting for some time after the death of the body and of entering into temporary combination with the brain and nervous system of certain peculiarly constituted human beings called 'mediums'". (p. 651) He notes that were there convincing evidence of the full survival, rather than the temporary persistence (of the order of several days perhaps) of the psychic factor, that he would tend to a dualist view. But he does move towards this position in his final summing up that in the light of psychic research, mentality must be seen as "an emergent characteristic of a compound of a living brain and the psychic factor" (ibid), so that "...I judge the most likely view to be some form of the Compound Theory which is compatible with Emergent Materialism" (p. 653). In subsequent writings, Broad deals exclusively with the psychical factor and drops further reference to emergentist materialism.

Roy Wood Sellars

Roy Wood Sellars (1880-1971) set out his version of emergentist philosophy in Evolutionary Naturalism (1922), though the chapters of which the book is composed had appeared in philosophical reviews as of the middle and later 1910s. Sellars approach starts from the epistemological, and then proceeds to the ontological; his naturalism is more rigorous than that of Lloyd Morgan and eventually took the form of materialism.

Sellars other main works were Critical Realism (1916), Essays in Critical Realism (1920), and The Philosophy of Critical Realism (1932), dealing with epistemology; The Essentials of Philosophy (1917), The Principles and Problems of Philosophy (1926), and Principles, Problems and Perspectives of Philosophy (1969), this latter a 2nd edition of the previous work, issued some 43 years later. He also wrote a number of volumes on logic, religion and politics, and contributed many articles to philosophic reviews, especially "Journal of Philosophy" and "Philosophy and Phenomelogical Research"; he co-edited among others the volume Philosophy for the Future: Quest of Modern Materialism (1949)

In this section, the following aspects of his philosophy will be examined: (1) the double knowledge approach to the mind/brain problem; (2) emergentism and the mind/body problem; and (3) naturalism and materialism.

The Double Knowledge Approach

Sellars evolutionary naturalism was preceded by his work on critical realism as an epistemology. Sellars in a series of books and articles developed the following theses: (1) the content of knowledge is not the same as the object of knowledge (the thesis of epistemological dualism); (2) entities become things through the act of knowledge; (3) perception is broader than sensation, and contains in addition to sense-data the affirmation of objects; (4) objects are affirmed, not inferred in knowledge; (5) the reach of knowledge is objective and realistic, while its grasp is limited to the form of things; (6) this form of things involves knowledge of their dynamic interactions and their effects on the knower.

A further point on which he insists is that (7) epistemological dualism does not necessarily lead to ontological dualism. Rather, in "Epistemological Dualism and Metaphysical Dualism" (1921) he holds that there is no logical connection between the two: "To assert that one's idea in knowledge is numerically distinct from the object does not imply that they are parts of different "worlds". Indeed, he holds that both sense-data in the mind and objects in reality are part of the same natural world:

> To put the argument concretely, I know the tree outside my window in terms of, and by means of, my percept datum. The tree is existentially external to me while still in the same objective physical nexus. The percept datum is subjective only in the sense that it is bound up existentially with me as a specific concrete knower. It assuredly is not subjective in the sense that it is "non-natural" and belongs to "mind" as a mysterious realm apart.(p.484)

It is this investigation of mind, using the epistemological dualist approach of critical realism to arrive at an ontologically monist conclusion which is dealt with next.

In "An Approach to the Mind-Body Problem" (1918) Sellars considered the mind/brain problem as the most important problem in the interface between science and philosophy: "There is no problem more crucial for science and philosophy than the mind-body problem. Here the physical world and mind somehow come together." (p.150)

Sellars argues that there are two sources of knowledge about the mind: the first is the route taken by the physical sciences in the objective study of the brain - including the structure of the brain and its relation to behavior. The second is the subjective knowledge which each person has of his or her own mental states - thoughts, desires, will and so forth. Rather than reject one in favor of the other, Sellars combines the two, joining behavioristic psychology and introspective psychology in his double knowledge approach. This leads him in "The Double Knowledge Approach to the Mind-Body Problem" (1923) to speak of the "larger setting" where the object of knowledge is the mind-brain:

> In the larger setting, however, it is best to speak of the brain as the brain-mind. This combination does justice to the two kinds of knowledge. Brain is the natural term for the physical sciences, while mind has more applications with consciousness and introspection. The union of the two terms indicates that there is no dualism of existence corresponding to the doubtfulness of knowledge and that it is one body that is known in this supplementary fashion. (pp.61-62)

Thus, while introducing a second form of epistemological dualism (the observation/introspection distinction, in addition to the subject/object one), Sellars continues to assert that he is committing himself only to an ontological monism. There is a single organism, which is the starting point for both science and philosophy, and no dualism of distinct mental and physical substances:.

> My thesis is that the living organism, when properly and adequately conceived, includes consciousness and is the sole source of that differential behavior which distinguishes it from the behavior of less integrated bodies. Or to put the argument in another way, I shall maintain that the mind-body problem resulted from false conceptions of both mind and body. I think that it is a good methodological principle that we should not assert a dualism unless there is no escape from it. In the main, modern reflection sinned against this principle because it started with two supposedly given realities, mind and body, whereas it needed to start with only one of these, for only one of them, the organism, is in the strict sense substantial. (1918, p.152)

Sellars adds at this point, in a note: "By substantial I mean the relatively permanent subject of reference of your knowledge. All my knowledge of another person attaches itself to his organism as locus of reference."(ibid). That the common reference of both mind and brain is to the organism is the result of the fact that mind arises in organisms as a means of controlling and interacting with the environment and adjusting its behavior:

> Thus such terms as 'learning by experience', adjustment, coordination, planning, etc, give the content of the term mental. The behavior of the organism is of the mental , or intelligent type. The processes and capacities controlling and expressing themselves in this behavior are the mind of the organism; and these are obviously in the organism as part of its structure. In all this, there need not be the shadow of dualism because there is only one subject of reference for our knowledge. The behavior of the organisms is a function of the organism in its changing relation to its environment. This behavior is of the mental or intelligent type, and its natural expression must lie in the nature of the organism upon which, accordingly, it throws light. (1918, p.154)

Mind is therefore a "product of evolution and of individual development" (1923, p.63), and the system to which it belongs is the organism, and more specifically, the brain of a phylogentically advanced and ontogenetically complete organism. " My thesis is that mental operations are operations of the brain" (p.69).

Related to the mind-brain question is the status of consciousness. Sellars argues that just as the mind is a cerebral product whose function is to help the organism in adjusting to its external environment, so consciousness is a cerebral product whose function is to help the brain in making its internal choices:

> The cerebral process involved in choice, and in fact in any complex process of integration, are processes of internal adjustment within a system in the making. In such systems consciousness is a natural ingredient whose function is to aid in the bringing together of the parts into a new integration by the cues it affords. Literally, it assists the brain in solving problems.(1918, pp.157-158)

Sellars says that "Consciousness is included in mind, just as it is included in the brain" (1923, p.63). The role that consciousness plays in a brain that has evolved and developed to the stage of mind is to direct or guide those internal processes of choice that result in the intelligent behavior of the organism. Its efficacy is internal to the mind-brain system.

Emergentism and Mind

A further major element of Sellar's philosophy is that of emergentism and his view of reality as a hierarchical level structure. Writing in 1918 he notes a certain number of defects of earlier forms of monism that allowed ontological dualism to make inroads. First among these was the "dead-level", non-evolutionary view that "held the whole to be 'nothing but' the sum of its parts, and which at the same time denied 'creative synthesis' or 'critical' moments'. (1918, p.151). Sellars, to the contrary, accepts the concept of a system as more than the sum of its parts:

> It is, to say the least, just as possible that a system is more than an external sum of its parts, that it is an organization in which the whole exerts a control over the action of the parts, that the resulting action is a function of the system. The facts are pushing this latter point of view to the front. But if accepted, it leads to the admission of levels of causality expressive of the creative synthesis which occurs in nature." (p.54)

In Evolutionary Naturalism (1922), Sellars defends naturalism as "the view of the world which founds itself upon the results of science" (p.18) so that philosophy, in his sense of the term, is the"capstone of science". (p.2). He distinguishes between two forms of naturalism: a naive, mechanistic one, which he rejects, and a more sophisticated, evolutionary one which he accepts. The older, naive view, which he associates with positivism and crude materialism, based itself on the view of science that held mechanics as "the master science to which the other sciences were ideally reducible" (p.18). This situation changed with the growth of science, and in particular, the development of evolutionary theory and its application to other fields of knowledge:

> It was the growth of science itself that undermined the older naturalism. Philosophy could only have held naive naturalism at bay had this not been the case. It is , therefore, evolutionary naturalism that I shall seek to develop and defend. Chemistry, biology and psychology have become autonomous, concrete and profoundly expressive of evolutionary ideas. It is no longer possible for a fair critic to identify naturalism with the mechanical view of the world. Scientists are tentatively reaching out for more flexible and

> less dead-level ways of approach. Evolutionary naturalism is not a reductive naturalism. (p.19)

At the same time he sees evolutionary naturalism as a philosophy which will permit a progress beyond the traditional antitheses of the past, in particular, that between mechanism and vitalism. It is to be remarked, however, that nowhere in the course of Evolutionary Naturalism does Sellars use the term "emergence" or "emergentism". He does, though address, the problem of novelty, and poses the question, "But is continuity of an evolutionary type opposed to novelties?" (p.9) He replies in the negative as follows:

> Does continuity imply mere sameness? Does the principle imply that the future is like the past and that change can only be repetition? Surely not. Our whole argument has been against such interpretation. I conclude that continuity can demand only genetic relationship, the absence of causal breaks. It has no right to go further and assert complete logical identity of the sort that comes out in the formerly popular postulate that the effect must be like the cause. As a matter of fact, the effect should not be like the cause, although it should be relevant to it.(p.284)

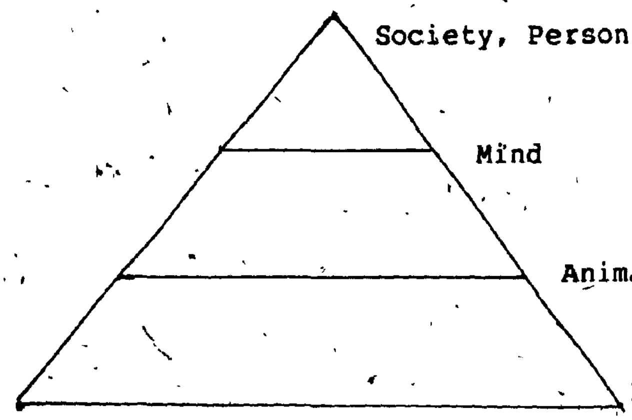
It is in Principles and Problems of Philosophy (1926) that Sellars further develops his emergentist views. Pondering the question of the nature of matter, life, mind and society, he seeks "the most satisfactory hypothesis we can, the hypothesis which seems to comprehend the most facts and to introduce harmony into the largest number of principles." (p.125). The goal is a synthetic hypothesis, and this is found in that of evolution, but not evolution "tout court", rather evolution qualified or enriched by the notion of the emergence of novelty:

> The hypothesis which has appeared to us most illuminating is that of evolution. It is the assumption that there is novelty or origination in the world... This thesis has been given various names of much the same import: creative evolution, emergent evolution, epigenetic evolution, originative evolution." (p.362)

Sellars now formulates his view of emergence through the image of nature as a hierarchy of emergent levels:

> The general plan of nature which presented itself to us with this perspective we likened to a pyramid of a tier-like construction. A process of creative organization led at each stage to the advent of gradients or levels above. Each new level depended on the energies and conditions of the lower level and was adjusted to its wide-spreading foundation. (p.363)

The four levels which Sellars distinguishes are matter, life, mind and society; each of which evolves with the higher levels emerging from the lower. In nature there is a temporal succession of levels which coexist. He represents the 'pyramid' of emergent nature as follows, with organization as the driving force (1970, p.325):



To this hierarchy of nature corresponds a hierarchy of laws formulated by humans to express "invariable correlations between events or between quantities obtained by measurement" (p.364). The logical structure of these laws is that of a discontinuous series, because Sellars holds that laws of one level cannot be deduced from laws of a previous level. "For each level laws must be discovered rather than deduced" (ibid). The genetic continuity of evolution, as an objective process involving the emergence of novelty at critical points, is contrasted with the logical discontinuity of knowledge, where one science (say biology) cannot be deduced from another (say chemistry):

> The evolutionary thesis would hold that things of different orders behave differently and that the laws which formulate this behavior are not deducible from one another. This conclusion is frequently expressed by saying that the laws of nature form a hierarchy which the different levels are discontinuous. This logical, or deductive discontinuity, does not at all conflict with the genetic continuity of orders of things in nature. But it does mean that there are 'junctures' in nature at which critical arrangements occur with the origination of novel properties. Genetic continuity; is not smooth but mutative.(p.364-5)

Here Sellars makes reference to the concept of natural piety (Alexander, Morgan) and says "What nature does we must accept... We must, they say, accept these mutative junctures with natural piety".

In "An Analytic Approach to the Mind-Body Problem" (1938), Sellars explicitly combines the double knowledge theory and that of emergence to produce what he calls "the double knowledge and emergence solution to the mind-body problem". (p.463) As before, the double knowledge of ourselves" is on the one hand objective knowledge of the mind - brain as disclosed to an external observer, and self-knowledge of consciousness as known by the subject from the internal point of view. Mind is a physical category that designates selective abilities of an organism involved in learning and intelligence, and is emergent from brain:

> These abilities are emergent and are characteristic of evolved organisms with highly developed nervous systems. In this sense,' mind as a physical category is adjectival and not substantival. But these mental abilities must be grounded in the organism, particularly in the brain., It is a minded brain. (p.466)

Consciousness, too, "emerges with nervous organization" (p.464) but differs from mind in that it is known and efficacious only on the internal side of things.

Naturalism and Materialism

A final aspect of Sellar's philosophy to be dealt with is his attitude towards materialism. There is an interesting switch in his position, from the criticism of materialism to the espousal of a modified form of it. In Principles and Problems of Philosophy (1926) Sellars contrasts his system of evolutionary naturalism with the two other monisms of materialism and spiritualism, and with dualism in all its forms. Materialism and spiritualism are seen as inadequate and partial. Spiritualism is criticized as "a one-sided outlook founded on an idealistic type of epistemology dominated by religious demands and by the category of personality" (p.183), while materialism is regarded as " an immature form of naturalism" and it is criticized for its naive epistemology, mechanistic ontology and lack of evolutionary system::

> Its weakness was three fold: (1) it did not ask itself the reach of human knowledge and therefore tended to take the descriptive terms of physical science too literally; (2) it thought of the physical world in terms of atoms in motion and tried to bully mind and consciousness into the framework thus set; (3) it did not take growth and organization seriously because it was essentially a pre-evolutionary system. (p.190)

Materialism and spiritualism are seen as two extremes - the former generalizing the interpretation of nature as supplied by the physical sciences, but unable to deal with society and values; the latter taking its stand from the point of view of human nature and society but cut off from the world-view of physical science. Dualism, recognizing that neither matter nor spirit can be reduced to the other, tried to combine both, a manoeuver that Sellars finds unacceptable because of its inability to explain the hypothesized relationship between two substances and the unnecessarily complex stance of accepting more than one substance. Evolutionary naturalism, based on a critical realist epistemology, a monistic but non-mechanistic ontology, and the double knowledge approach to the mind-body problem is held to be the best alternative.

In the article "Why Naturalism and Not Materialism: (1927), Sellars argues that naturalism is a cosmological theory, while materialism is a more restricted ontological one. By naturalism is meant the view that nature is self-sufficient, while the opposite view, that of supernaturalism, holds that nature is only a part of reality. Materialism is once more criticized for its association with naive realist epistemology, to which is added its tendency to view mind as an epiphenomena of matter, its crude treatment or denial of values and ideals, and its "stress on stuff rather than on organization" (p.221). To the extent that materialism bases itself on the principles of elementary mechanics, Sellars calls it "reductive materialism". However, Sellars says that it is possible that materialism could adapt itself to the new, non-mechanistic concept of science. He says that materialism could relinquish its emphasis on stuff and accept a modern view of organization as the "cement of things" and holds out the possibility of a "new, or emergent materialism" coming into being:

> Materiality must take on the meaning of a common denominator quite harmonious with all sorts of variations in material systems. I am inclined to believe that a transformation of this sort is taking place into a new, or emergent materialism" (p.224)

The tone towards materialism is more optimistic, though still critical. In "Is Naturalism Enough?"(1944), Sellars continues his shift towards materialism. In this article he criticizes Sidney Hook's view of materialism, and pragmatic naturalism as well. In a set of four series of propositions, he sets out what he sees to be the epistemological, psycho-physical, ontological and axiological views of an adequate materialism, which he defends as a "reformed or philosophical materialism".

In his contribution "Materialism and Human Knowing" to the volume Philosophy for the Future: the Quest for Modern Materialism (1949), which he co-edited with V.J. McGill and Marvin Farber, Sellars calls materialism "naturalism with matter" and says:

> By ontological materialism, I shall mean, negatively, a position opposed to mentalistic idealism and any form of mere experientialism. In a general way I shall speak of it as naturalism with matter. But I shall not be thinking of "hard" atoms moving about in absolute space. I shall stress relations, patterns, process, levels. And I imagine the biochemist and the biologist will give detail. Categories are in the making. But epistemology must e on guard also. We may need to appeal to a double knowledge of the human organism and develop a keener sense for the descriptive abstractness of the inorganic sciences. (p.81)

In his final work _The Principles, Perspectives and Problems of Philosophy_ (1970), an update of his _Principles and Problems of Philosophy_ (1926), Sellars, while still critical of the "old materialism", continues to affirm his support for a new type of materialism in the making, a project to be undertaken. "The old materialism must be rejected and a new type put in its place." (p.176)

William McDougall

The foremost critic of emergentism during the 1920s was William McDougall (1871-1938), a psychologist well known for his defense of the "hormic" or teleological, goal-oriented psychology. He was also a prolific writer on the philosophy of psychology and of biology, his major works in this field being _Body and Mind: A Defense of Animism_ (1915), _Modern Materialism and Emergent Evolution_ (1929), and _Riddle of Life: A Survey of Theories_ (1938).

In this section McDougall's critique of emergentism as a philosophy and his dualistic views of the mind-brain relation will be sketched out.

Critique of Emergentism

In _Modern Materialism and Emergent Evolution_, McDougall criticizes emergentism as too general a philosophy, because he believes that there is neither evolution at the inorganic level nor is there emergence. He further states that mind does not emerge from the physical or a non-physical pre-mental. However, he does admit that there are emergent qualities at the level of the products of mind.

In his argument against the concept of inorganic evolution, McDougall argues that evolution is a process of "running up, or progressive realization of potentialities... concentration of energey and the raising of it to higher potentials" (pp. 127, 130), and of "differentiation and specialization of functions" (p.131). This cannot apply to the physical, non-organic world, for there the law of entropy holds and predicts just the opposite: the running down and degradation of energy leading to the heat death of the universe.

Moreover, physical and chemical changes are said to occur independently of the series of events preceding them, while organic evolution is held to require specific pre-conditions. A chemical reaction forming a specific compound could just as well occur today as yesterday or a million years ago, but the evolution of a species could not occur at any time. The origin of species is dependent on its past and some sort of memory of its history (Bergson) in a way that the formation of a chemical compound is not:

> Each kind of organism is the product of along process of cumulative change, no step of which could have been other than it was... Each type of organism is a unit that has its own evolutionary history; and only that course of change could have resulted in that particular organisation. Each organic type, in short, bears the marks of its history; as Bergson puts it, it carries its past along with it; it has a true history, the history of its evolution. (pp. 134-135)

McDougall takes exception to the theories of mind which hold that mind emerges from complex matter, or from pre-mental complexes. "There has been, not evolution of Mind from the physical realm, but evolution of mental capacities - and this evolution has been characterized by a progressive differentiation of the powers of Mind, rather than by emergence of new kinds of relation, causal or other." (p. 155)

In "Mental Evolution" (1925), McDougall contrasts two rival descriptions of mental evolution: the first "bottom-up" which attempts to derive mind from the physical or pre-mental; and the second, more modest "top down" approach, with which he is in sympathy. For the bottom-up approach, mind is a derived concept, while for the top-down approach, it is a primitive concept: "It is content to assume the reality of mind, or of mental activity, as something that we cannot hope to explain in terms of something of a different nature; and aims merely at describing the evolutionary scale of mind from its simplest to its highest manifestations." (p. 336)

Emergentism is seen, as a philosophy, as an unsuccessful attempt at finding a middle path between mechanism and teleology. For McDougall, there is an irreconcilable bifurcation in nature between the inorganic domain where mechanism holds sway, and evolution ~~does~~ not occur, and the organic domain where teleology is dominant and where evolution does occur, with emergent characteristics at the level of mental products. But no amount of emergence can cause the teleological to arise from the strictly mechanical - these represent two distinct realms. As he states in Modern Materialism and Evolutionary Emergence: "There has been no emergence of the teleological from a mechanistic realm" (p. 156).

Insofar as organic evolution is concerned, McDougall was a neo-Lamarckian. He lamented the purging of the inheritance of acquired characteristics from evolutionary theory by Wallace and Waismann, and called for a return to theories such as those of Darwin and Spencer that combined natural selection with Lamarckian and perhaps other (sexual and social) factors. He disliked the neo-Darwinian views for their strict mechanistic explanations, and rejected the critique made by defenders of that theory that Lamarckian evolution had no material basis. It is precisely here that he saw its chief merit, for if Lamarckian inheritance did occur, its lack of a material basis would mean that a non-material mental factor must be at work:

> If the fundamental assumption of Biological Materialism were true, namely the assumption that all vital organisation is material, Lamarckian transmission could not occur: for it is impossible to imagine any material mechanism through which any modification of form or function acquired by the adult organism can impress itself upon the germ plasm as a specific modification of it, ie a modification of it which will determine the appearance in the offspring of the modification acquired by the efforts of the parent... If, then, Lamarckian transmission occurs, it is in itself good evidence of the reality of that immaterial organisation of the facts of memory, the facts of the unity of consciousness, the facts of integration and disintegration of personality, the facts of intelligent purposive activity. (pp. 154-55)

Though an opponent of the evolution of the inorganic and the emergence of mind, McDougall did admit that the products of mind, be they a musical score or a political institution, do possess characteristics different from their parts and so accepted emergentism in this limited domain.

He contrasts the emergence of a new quality in a musical composition to the case of chemical combination where he holds that no emergence occurs:

> Though we loosely speak of the chord or complex clang as formed by the fusion of sensations, this way of speaking is strictly incorrect. The sense-qualities which by introspective analysis we may recognize in the clang or chord did not exist separately before the experience of the clang or the chord; nor can they be recovered from it and set apart as sensations, existing independently of one another. Again, the water is a combination of elements in a synthetic whole, the molecule, which having been formed, may continue to exist indefinitely without further change; the hearing of the clang, on the other hand, is a synthetic activity and the clang exists or subsists in any sense only as long as that activity continues. (p. 127)

The Mind-Brain Relation and Dualism:

McDougall's main writings on the mind-brain relation include "On the Seat of the Psycho-Physical Processes" (1901), Physiological Psychology (1905), Body and Mind: A History and a Defense of Animism (1911), and An Outline of Abnormal Psychology (1926).

In "On the Seat of the Psycho-Physical Processes", McDougall argues that the synapses between nerve cells in the brain are the sites of the mind/brain interaction. His view is given a dualist philosophical hue by his idea, related to the views of Lotze, that the mind is immaterial and that its sites of interaction with the material brain are multiple. Mind/brain interaction cannot be localized in one place, as Descartes and others had tried:

> If the soul is a valid conception, then we must admit of the soul that it is where it acts or is acted upon... And if the view that I advocate should prove to be true, then those who adopt the spiritualistic hypothesis will have to regard the synapses as the places of interaction of the body and soul. (pp. 579-580)

Mind is seen as a complex of mental systems, each of which is concerned with "the process of establishing in the mind relations between one thing and another." (p. 606) To this corresponds the physiological system of the brain, composed of a complex of nervous systems made up of groups of neurons:

> The mass of neurones constituting the nervous system is organized into functional groups and sub-groups, the members of each group being intimately united together so that the excitement of any member of the group is shared by the rest; such a group is the physiological counterpart of a mental system, or better, is the mental system in its physiological aspect. (p. 606)

When an object is presented to consciousness, each aspect of the object is seized upon by a mental system, to which corresponds a physiological system. To the total concept of an object at a given time there corresponds a more complex neuronal system. When a new aspect of the object is incorporated into the existing concept of it there occurs, on the physiological side, the facilitation of nerve-impulses between the neuronal system corresponding to the new feature and the more complex one corresponding to the concept of the object. This facilitation is accomplished by a diminution of the resistance of the synaptic connections between the two systems.

Focal consciousness is involved when such facilitation is established for the first time. Thereafter, as the resistance between the two groups of neurons is reduced by repitition, the degree of consciousness corresponding to it also decreases, until it fades into the "fringe of consciousness":

> for the two groups of neurones have then become one functional group, one mental system, and a presentation, that formerly excited the one group only is now implicitly apprehended and automatically reacted to, the excitation-process set up by it spreads through the whole mental system without having to overcome the resistance of unorganized synapses, and without arousing focal consciousness. (pp. 607-608).

In his little volume <u>Physiological Psychology</u>, McDougall considers and rejects two arguments against interactionist dualism: that of the violation of the principle of the conservation of energy and that of the inconceivability of such an interaction. McDougall says that the law of the conservation of energy does not rule out interation of two substantially distinct substances because: (1) the law is only an empirical generalization of the tranformation of those kinds of energy that can be measured by a common standard, and so may not apply to the creation and destruction of mental energy which cannot be measured like the more traditional physical kinds; (2) to make the law of the conservation of energy work, potential energy must be added in order that its equations will balance: "The 'interactionist' therefore may deny that the physical system of energies is a closed and finite system, or may ask what right have we, while including potential energies in the system of energies to which the law of conservation is held to apply, to exclude psychical energy from that system? (p.9)

McDougall then says that the inability to conceive psycho- physical interaction in familiar terms is not an objection to it, because some universally accepted forms of physical interaction cannot also be so conceived. He says that while action by impact can be conceived in such terms, this is no longer the case in gravitation, where action at a distance is involved, and "which cannot be represented in terms of any more intelligible mode of physical interaction." (p.10)

At the conclusion of Physiological Psychology, McDougall introduces an image of mind-brain interaction based on an analogy with magnetic and electric fields and their interaction. He notes that when an an electric current is passed through a wire it also generates a magnetic field about it. If a second wire is set alongside the first and current also passed through it, a complex interaction results, with mutual modifications of the electric currents and magnetic field until a new equilibrium is reached. He then considers a more complex system with many wires through which currents are passed, the addition of each modifying the magnetic field and as a result, the flow of current in the other wires: "As the currents ebb and flow in any of the wires, so the magnetic field varies and the current in other wires delicately respond." (p. 168) He then applies this model of electrical-magnetic interaction to physical-psychical interaction as follows:

> In this crude simile the wires stand for nervous arcs, the electric current for the flow of nervous energy through each arc, the magnetic field generated by the current in each wire flowing separatelyl for a psychical element, and the total magnetic field, when several or more wires are in action, for the state of consciousness. (p. 168)

In this analogy, the flow of nervous energy in nervous arcs "generates" psychical elements, which interact back on the flow of nervous energy in the arcs and modify them as well. The system of many nervous arcs in action, through a complex operation which is more than the simple sum of the flow in the individual brain circuits, then generates the overall state of consciousness. It is undoubtedly this model of mind-brain interaction which McDougall refers to in his "Autobiography" (1930) some 25 years later as previsaging the emergentist and holistic views of later authors:

> I continued to hold the view... that the psychical qualities are engendered by (or as would now be said "emerge from") the complex conjunctions of brain-processes (now called "configurations") but not as mere epiphenomena, but rather as synthetic wholes that react upon the physical events of the brain or have causal efficacy within the whole complex psycho-physical event" (pp. 205-206)

To this interactionist, emergentist and holistic view McDougall in Physiological Psychology then adds a further analogy between the soul and the aether to bring the model in line with his dualistic ontological views. He says that in the electro-magnetic model the wires cannot suffice for the production of the magnetic effects, and that "we are compelled to postulate, as a necessary condition of the development of the magnetic field, a medium or substance which we call the ether." (p. 168):

> Just so we are compelled to postulate an existent, an immaterial being, in which the separate neural processes produce the elementary affections which we have called psychical elements, and this we call the soul. The soul then is the ground of unity of psychical process, of individual consciousness." (pp. 168-169)

In Body and Mind McDougall continues to defend the interactionist dualist position, but any notion of the emergence of mind from brain has been dropped. McDougall refers to his view as "animism". Writing in his "Autobiography", he admitted that the choice of this term to refer to his preferred solution of the mind-brain problem was mainly polemical, though its rational basis was the defense of the soul:

> Souls were out of fashion, as James had said. But I had a predilection for unfashionable doctrines. And seeing that so many scientists seemt to find satisfaction in shocking the bourgeois, I would shock them by putting up a defense of an exploded superstition. In this spirit of defiance I wrote my Body and Mind and gave it defiantly the subtitle A History and A Defense of Animism. (p.23)

In <u>Body and Mind</u> McDougall says that one reason for defending a soul-theory is the belief in an after-life, a belief which he feels is required in the interests of morality and religion and which he holds is at least partly confirmed by parapsychology.

> Animism is the only solution to the psycho-physical problem compatible with a belief in any continuance of personality after death; the empircal proof of such continuance would be the verification of animism... But though, in my judgment, this verification of Animism has not been furnished by "psychical research", a very important result has been achieved by it, namely, it has established the occurence of phenomena that are incompatible with the mechanistic assumption. I refer specifically to the phenomena of telepathy. (p. 394)

A constant factor in McDougall's writings is his rejection of mechanism in favor of teleology. He notes the following phenomena as having led to the dominance of the mechanistic view in psychology: the fact that the search for the seat of the soul has been fruitless, the rise of the doctrine of the reflex nature of nervous processes, the existence of unconscious cerebration entirely explicable in physico- chemical terms, the dependence of thought on brain function as demonstrated by the mental effects of pathological cerebral conditions, the composite nature of the mind as shown by the phenomena of multiple personalities, and the consistency of mechanistic views with association psychology. Against the claims of mechanism, McDougall marshalls the following arguments:

(1) Embryological development does not proceed in a

mechanical way, as evidenced by Driesch's experiments which show that mechanical interruptions of the ontogenetic process, at least in those organisms (sea-urchins) studied by him do not cause disruptions of the qualitative end result, which would presumably be the case if only mechanical factors were involved.

(2) According to the mechanical theory of energy, the law of degradation or entropy holds of all systems, so that energy runs down to the lowest level; but in living organisms there is a "raising of energy to higher levels of potential" (p. 245)

(3) The mechanistic principle in evolution, according to which phylogenetic change is the result of the accumulation of selected variations does not suffice to explain the building up of complex structures and functions the intermediary stages of which have no survival value for the organism.

(4) Mechanistic explanation of animal behavior, according to which behavior is the result of simple reflexes combined into compound ones and elementary sensations and ideas associated into complex ones, does not do justice to the synthetic and unitary actions of organisms, where these actions are determined in addition by considerations of meaning, purpose and value.

In addition to the physical factors responsable for the mechanical properties of behavior, McDougall concludes that a psychical factor is needed to explain the purposive, goal-seeking or teleological behavior. Moreover, as one advances in the phylogenetic scale, the relative importance of the teleological factors vis-a-vis the mechanical ones increases, "until in human behavior they dominate the scene" (p.171).

The chief arguments against dualistic interactionism which McDougall considers - the apparent violation of the law of the conservation of energy, the supposed inconceivability of interaction and the failure to localize the seat of the soul are arguments already dealt with him in his earlier writings of 1898-1905. What is new in Body and Mind are the negative conclusions he arrives at concerning the capacities of the brain. In his earlier writings he had been strongly influenced by physiological psychology, to which his belief in the soul was added. Now, he leaves behind detailed neurological considerations, and argues not what the brain can do, and how this can be reconciled with dualism, but rather what the brain cannot do, and how this supports dualism. For example, he states that the brain is not the source of the unity of consciousness:

> When two stimuli are simultaneously applied to the sense organs of any normal human being, they produce a change in his consciousness, which is their combined effect or resultant. This composition or combination of their effects does not take place in the nervous system; the two nervous processes are nowhere combined or compounded; they remain throughout as distinct as if they occured in separate brains; and yet they produce in consciousness a single effect, whose

> nature is jointly determined by both nervous processes. The facts can only be rendered intelligible by assuming that both processes influence or act upon some one thing or being; and since this is not a material being, it must be an immaterial thing. (p. 297)

McDougall then presents a corollary series of arguments which all point to similar limitations of the brain in explaining psychic phenomena: he argues that meaning and value as well as "true" memory as opposed to immediate recall, have no neural correlates and must similarly be explained by reference to the non-material soul.

McDougall then arrives at his final conception of the soul intermediate between what he considers as two extreme views, the first that the soul does not develop, and the second that all development is due to the soul. The soul is said to undergo a certain development, and at least a part of the personality an individual develops during his lifetime is imprinted on it and survives the death of the body: "...it is open to us to believe that the soul, if it survives the dissolution of the body, carries with it some large part of that which has been gained by intellectual and moral effort" (p. 372). Such a soul could not think or communicate as could a mind linked to a brain and body, but McDougall speculates that it might think in "imageless thought" and communicate via telepathy, possibly in relation to some other living body as medium.

A final theory of mind in its relation to personality was developed by McDougall in his <u>Outline of Abnormal</u>

Psyhology, and contained in his Riddle of Life as well. His experience as a medical officer during the First World War furnished him with many cases of split or dissociated personalities. In order to explain the phenomena of multiple personalities he postulated that the brain is made up a of a complex of neural sub-systems, each of which is controlled by a mental element, or monad. The neural systems form a hierarchy, the top-most system being controlled by a mental element which is the self- conscious ego.

The higher systems have no detailed knowledge of the lower levels, receing only a "condensed extract" of their workings. The instructions given by the higher monads are general ones, with the details worked out by lower levels that discharge more specific functions. Breakdown of the integration of this complex of monads leads to disintegration of the personality and in extreme cases, multiple personalities.

McDougall also calls in his belief in the para-normal to formulate the hypothesis that within the hierarchy, as he states in Riddle of Life "communications are telepathic and immediate" (p. 214) McDougall is troubled because this theory of multiple monads is in apparent contradiction with the view of a single soul, and he tries to resolve the problem by reserving the pluralistic theory of monads for the specific area of the study of personality, with the unitary conception of the soul reserved for the general ontological problem of mind-brain interaction.

Others

Though for the purposes of this thesis Morgan, Broad and Sellars were the most important theorists of emergentism and the mind/brain problem during the 1920s, they were not the ony writers on the subject, of emergentism, during that period. Other authors who incorporated a concept of emergence in their systems include E. G. Spaulding ("creative synthesis"), J. E. Boodin ("cosmic evolution"), G. P. Conger ("evolutionary epitomization") and Samuel Alexander (whose system was closely related to that of Morgan), Oliver L. Reiser ("creative monism") and George Herbert Mead (what might be called social emergentism). This section will review their work, as well as writings on emergentism by James K. Feibleman, Nicolai Hartmann, P. E Meehl, Wilfrid Sellars and T. A. Goudge

E. G. Spaulding

E. G. Spaulding was a professor of philosophy at Princeton. He developped his version of emergentism in his The New Rationalism (1918). Though a supporter of realism, Spaulding was a critic of naturalism. He felt that naturalism denied ideals and held that the ideals of truth, beauty, justice and goodness were outside of nature and thus not subject to evolution. Nevertheless, he did accord an important place to evolution within the realm of nature.

Spaulding says that evolution is creative of novelty, and distinguishes between additive and non-additive wholes. "In the physical world (and elsewhere) it is an established empirical fact, that parts as non-additively organized form a whole which has characteristics that are qualitatively different from the characteristics of the parts." (p. 447) He refers to this process of the appearance of novelty in the course of evolution by the term "creative synthesis".

Spaulding admits a level structure of reality, and distinguishes between causal and functional relationships. Causal relations hold within a level, while functional relations hold between higher and lower levels. These latter are said to be compatible with one another, but not reducible. Spaulding does not give a specific enumeration of the levels of reality, but he does not that the biological level, though made up of physico-chemical complexes, is not reducible to it, nor is ethics reducible to biology.

Spaulding includes a teleological notion in his view that evolution is heading towards the realization of the extra-natural ideals of justice, truth, goodness and beauty. A theological note is introduced by his statement that God is the sum-total of these ideals, transcendent insofar as the ideals are outside nature, and immanent insofar as they serve as the principle of progress by which values evolve towards them.

In his volume, Spaulding refers to Hobhouse's

Development and Purpose, and also to Bergson's Creative Evolution, though his references to this latter are in the context of a criticism of Bergson's views on continuity and analysis.

J. E. Boodin

J. E. Boodin's contribution to emergentist philosophy was contained in his volume Cosmic Evolution (1925). Boodin was a professor of philosophy at Carleton college, the author of previous works including Time and Reality (1904), Truth and Reality (1911), and A Realistic Universe (1916). Boodin notes that the catalyst for his cosmic philosophy was a reading of Alexander's Space, Time and Deity, but he was both a borrower of and a critic of the concept of emergence. Boodin was also influenced by H.F. Osborn's The Origin and Evolution of Life (1917), which is commented upon in the first chapter of Boodin's book.

The point of departure for Boodin is that the universe is divided into levels, and that new qualities arise at higher levels of evolution. But for Boodin, this is merely a description of the universe, not an explanation of its processes:

> To say that the higher levels of existence emerge from the simpler levels is to beg the question. How can they emerge from them? How can any process lift itself by its bootstraps? We are really asked to believe in a series of miracles which have no intelligible basis in what is supposed to precede. (p.25)

Boodin is opposed to the idea that order can emerge from chaos, and excludes any chance factors in evolution. His solution as to the source of emergence is to posit, as pre-existing, a complete level-structure in the cosmos as a whole, with which our planet interacts, drawing from the whole the impetus or guidance to the emergence of new levels locally. Thus, what appears to us as an advance from lower to higher is really the effect of the interaction between a pre-existing higher level of the cosmos and a lower level on earth:

> While it is true that in a particular life history the simpler stages are prior in time to the more complex and so seem to produce them, yet if we look at reality as a whole, the more advanced stages are prior to the more elementary stages; the actual is prior to the potential and furnishes the plus factor which makes a given level of development potential of a higher one. The stream of evolution does not rise higher than its source. (p. 78)

In this sense, Boodin's system is teleological. He does not, however, say how this interaction occurs, stating that the elucidation of the mechanism must wait for further research. Boodin also says that his view reconciles epigenesis (from the local point of view, the higher levels are not implicit in the lower ones), and preformationism (from the overall point of view the higher local levels are the result of the action of pre-existing cosmic levels).

Boodin postulates four main levels of the universe — the material, the vital, the mental and the spiritual, this latter corresponding to God. He argues that his system satisfies the legitimate desires of both materialism (life and mind emerge from matter) and idealism (spirit as the highest level and guiding force). He states that his system incorporates emergentism but goes beyond it by explaining emergence as the result of interaction: "The claims of the emergence theory, so far as it is truly descriptive, are recognized; viz. there is creative synthesis and emergence of properties, forms, levels, but a reationale is furnished for this emergence in the conception of interaction of the particular history with the structure of the cosmos" (p. 128)

George P. Conger

Another American philosopher of emergentism was G. P. Conger, professor of philosophy at the University of Minnesota. He was directly influenced by Spaulding, but developed his own system which he called "epitomization" because of his theory of the recapitulation of structures and processes are different levels of reality. His views were developed in the articles "Evolution and Epitomization" (1921), "The Doctrine of Levels" (1925), "What are the Criteria of Levels" (1926), "A Hypothesis of Realms" (1928) and "Epitomization and Epistemology" (1933), and in the books New Views of Evolution (1929) and A World of Epitomizations. (1931)

Conger distinguishes between three physical realms - the cosmological, the biological and the neuropsychological, which are in turn divided into levels. The exact number of levels and their names varied from article to article that Conger produced. According to his thesis of epitomization, there are common structures and processes at each level. This is formulated in A World of Epitomizations as "the occurence, at the so-called later stages of evolution of structures and processes which are essentially analogous to those occuring at the so-called earlier stages." (p. 539) He mentions those of individuation, interaction, production/ reproduction, and integration; this latter corresponds to Spaulding's creative synthesis. Conger says that "creative synthesis is similar to the emergentist conceptions of Lloyd Morgan, Alexander and Sellars." (p.536)

Moreover, not only are there similar structures and processes at each level (epitomization by analogy), there are also parallels between corresponding levels in each realm (epitomization by parallels). Further, each realm is related as container and contained, so that the last level of a preceding realm leads on to the first level of the succeeding realm, furnishing the milieu in which the further levels of the new realm develop. Thus, the cosmological realm leads up to the biological, which in turn leads up to the neuropsychological.

As his thinking developped, Conger also added the three further realms of logic, mathematics and what he called geometry- kinematics. Like the three earlier mentioned realms, each one leads up to the other, so that the last level of logic is the ~~first~~ level of mathematics, and mathematics in turn leads to geometry-kinematics, conceived of as the realm of space-time events. This in turn is the milieu for the development of the cosmological realm.

Samuel Alexander

Samuel Alexander produced his two volume work Space, Time and Deity as the Gifford lectures in 1916-1918. Both volumes were published in 1920. His work draws on the concept of emergence which Lloyd Morgan had resuscitated and renewed. Lloyd Morgan was in turn influenced by Alexander's views when he came to write his own Gifford Lectures in 1922-24.

Two basic groups of categories in Alexander's system are mind and body, on the one hand, and space and time, on the other. It is the relation between the two groups, and on this basis, a theory of the emergent levels of reality that forms the basic structure of Alexander's work. For Alexander, the mind/body relation is the most fundamental relation in the universe, and is a paradigm for all other inter- level relationships:

> It would be most convincing if minds were first mentioned in their place at the end of the scale. But this procedure would compel me to use conceptions which would remain difficult until their application to minds was reached. Moreover, the nature of mind and its relation to the body is a simpler problem in itself than the relation of lower qualities of existence to their inferior basis; and for myself, it has afforded the clue to the interpretation of the lower levels of

existence. (vol.ii, p.3)

Alexander distinguishes between two psychological relations - that of enjoyment and that of contemplation. Enjoyment is the relationship of mind with itself, while contemplation is the relationship between the mind and an object. He holds that in any experience, there is both enjoyment and contemplation, and that the two are united by the relation that he calls "compresence" or "togetherness". He applies this epistemological distinction to distinguish consciousness and brain as two aspects of one reality, the former as that which is experienced from the inside by enjoyment, the latter as that which is contemplated from the outside. Through experience and reflection, it is further concluded that the conscious process occurs at the "same time and place" as the neural process, and Alexander concludes that the two are identical. "We are forced, therefore, to go beyond the mere correlation of the mental with these neural processes and to identify them" (vol.ii, p.5) As with Morgan, an emergentist schema is added to a neutral monist basis, and Alexander also speaks of mind as "the new quality which emerges at this higher stage of vital complexity" which corresponds on the physical side to the brain.(v.ii, pp.5-6)

Alexander says that while every psychosis is a neurosis (ie has a neural basis), not every neurosis is a psychosis (ie has a mental aspect). Only those neuroses of a sufficient degree of complexity give rise to the emergent quality of mentality. Though he is opposed to the epiphenomenalism of Huxley, psycho-physical parallelism and the animism of McDougall, he does admit mind/brain interaction, in the following sense. He denotes psychical states by capital letters and neural states by small letters, so that the series of neuro-psychological states is represented by Aa, Bb, Cc and so on; with the understanding that A does not cause a, but is identical with it.

Now a as a neural state causes b, and b is identical with the psychological state B. In this case, Alexander permits the statement that a (the neural state) has caused B (the mental state) as a shorthand statement for the above process. Conversely, if the psychical state A which is identical with the neural state a causes the psychical state B identical with the neural state b, he allows us to say that A has caused b, again as a shorthand statement.

The concept of emergence is key to the mind/brain relationship: "Mind, is according to our interpretation of the facts, an 'emergent' from life, and life is an emergent from a lower physico-chemical level of existence." (v.ii, p.14) The source of this concept of emergence is LLoyd Morgan:

> I use the word 'emergent' after the example of Mr. Lloyd Morgan. It seems to mark the novelty which mind possesses while mind still remains equivalent to a certain neural constellation. Consequently, it contrasts with the notion that mind is a mere 'resultant' of something lower. The word is used

by G. H. Lewes... as Mr. Lloyd Morgan reminds me. (ibid)

Having sketched out his emergent view of the relation of mind to body, Alexander uses this as a paradigm for his view of the space-time relation:

> It is that Time as a whole and its parts bears to Space as a whole and its corresponding parts a relation analagous to the relation of mind to its equivalent bodily or nervous basis; or to put the matter shortly, Time is the mind of Space, and Space the body of Time. (v.ii, p.38)

Alexander, however, qualifies the analogy between Space and Time, and Mind and Body on two counts. Firstly, he says that space, unlike the brain, cannot exist on its own, and so time cannot be strictly considered as a new quality which emerges from space. Space-Time is a single level, the basic one in his system. Secondly, he says that the enjoyment/contemplation distinction does not apply at this level. In fact, he admits that it would be more correct to say that Mind is a form of time, than to say that time is a form of mind.

Alexander has thus back-tracked from the striking statement that time is the mind of space and space the body of time, to the weaker one that mind is a form of time, and presumably, that body is a form of space. He then goes on to develop his theory of the level structure of reality in which space-time, mind and body all find their proper places. Space-time is considered as the first level, and is said to possess no quality other than that of motion. As this motion becomes more complex over time, new qualities emerge and structure of reality is built up. In a general sense, the emergence of new qualities and levels is a "brute fact", to be accepted with "natural piety". As Alexander puts it: "It admits no explanation" (v.ii, p.47) But in what he calls a special sense, time is considered as the generator of new qualities, so that the hierarchy of levels forms a temporal series.

Alexander admits the following levels in his metaphysical system: (1) Space-Time with its basic quality of motion; (2) matter along with its primary qualities; (3) the secondary qualities; (4) life; (5) mind and (6) Deity. He says that any enumeration is tentative, and wonders whether electricity and light might not constitute a level between Space-Time and Matter. The highest level is that of deity, and Alexander says that there is a "nisus" or movement of the whole universe towards the attainment of this highest level.

George Herbert Mead

George Herbert Mead developed his views on emergentism in The Philosophy of the Present (1932), and in some of his writings of the 1920s, published posthumously as Mind, Self and Society (1934), and The Philosophy of the Act (1938). Mead, who was strongly influenced by pragmatism and behaviorism as well, defended a theory of mind laying emphasis on its social as well as its emergent character, and the relation between these two aspects.

A preliminary aspect of Mead's philosophy is his notion, as stated in The Philosophy of the Present, that "reality exists in a present" (p.1), and that it is the present alone which is truly existent, two which the past and future are subordinate. He says that the point of reference of humans is always to the present, with the past and future as constructions based on it. It is the task of science to "unravel the existent past in the present and on the basis of it to previse the future" (p. 33)

Mead does not deny the reality of the passage of time from the past to the present, but states that this passage is dependent on the appearance, or emergence of the novel. Without the novel, there is only being and no becoming:

> A present then, as contrasted with the abstraction of mere passage, is not a piece cut out anywhere from the temporal dimension of uniformly passing reality. Its chief reference is to the emergent event, that is, to the occurence of something which is more than the processes that have led up to it and which by its change, continuance or disappearance, adds to later passages content they would not otherwise have possessed. (p. 23)

In a reversal of the traditional notion of cause and effect, Mead says that the novel creates its own past, as well as its own future:

> Given an emergent event, its relations to antecedent processes becomes conditions or causes. Such a situation is a present. It makes out and in a sense selects what has made its peculiarity possible. As soon as we view it, it becomes a history and a prophecy. (p.27)

Mead adopts an organismic and systemic point of view wherein a living body is always to be examined, not as an isolated thing, but as an organism interacting with its environment. Moreover, his theory includes a relativistic element, on analogy with the theory of relativity in physics. He says that any organism can be viewed as being part of many different systems, depending upon one's frame of reference. For example, a plant or animal is a physico-chemical complex from the point of view of the physical scientist, a goal-directed life from from the point of view of the biologist. In this sense both mechanism and teleology can be accepted as particular points of view, though they cannot be admitted as general ontologies.

Given his views of the primordial reality of the present, his notion that the emergent in the present conditions its past, and the view that an object can be in different systems at the same time, he defines emergence as follows: "...I have defined emergence as the presence of things in two or more different systems, in such a fashion that its presence in a later system changes its character in the earlier system or systems to which it belongs." (p. 69)

The transtion between the old and the new system is called by Mead the "social" aspect of reality, "...this phase of adjustment which comes between the ordered universe before the emergent has arisen and that after it has come to terms with the newcomer." (p. 47). He also associates sociality in a second sense with an object being in more than one order or system at the same time: "Sociality is the capacity of being several things at once." (p.49)

Mead examines three overall levels of reality, which he calls fields - the physical, the biological and the mental, with sociality in the above sense present in each field, along with the associated emergence of the novel:

> But in all three of these fields the principle of sociality nevertheless obtains. In all three there is emergence, and the character of this emergence is due to the presence in different systems of the same object or group of objects. Thus we find that ine one system with certain space, time and energy characters, an object moving with a high velocity has an increased mass because it is characterized by different space, time and energy coefficients, and the whole physical system is thereby affected. In like manner, it is because an animal is both alive and a part of a physico-chemical world that life is an emergent and extends its influence to the environment about it. It is because the conscious individual is both an animal and is also able to look before and after that consciousness emerges with the meanings and values with which it informs the world. (pp. 66-67)

Consciousness is seen as an emergent at the level of life when animals not only select from their environment that which is required for their maintenance, but also take their own behavior as an object of selection: "Life becomes conscious at those points at which the organisms own responses enter as part of the objective field to which it reacts." (p.73)

In Mind, Self and Society, Mead argues that social life and communication via language are necessary conditions for the emergence of mind. Mentality is associated with the ability to "point out meanings to others and to himself" (p. 132). This occurs in the context of the relationship between an organism and its environment wherein the organism controls the latter. Mead says that such control is possible only in the social context where the organism is able to engage in linguistic communication: "Out of language emerges the field of mind" (p. 133).

It is a characteristic of Mead's philosophy of mind that this latter does not emerge from the brain alone, but from the social nexus of many brains linked by a communication network: "It is absurd to look at the mind simply from the standpoint of the individual human organism; for although it has its focus there, it is essentially a social phenomenon; even its biological functions are primarily social" (ibid). In Philosophy of the Act, Mead says that the mind-body relation is a relation "between a social animal and its environment" (p. 361).

In the Philosophy of the Present Mead mentions both Lloyd Morgan and Alexander, but his main philosophic debt is to Whitehead's organismic and process philosophy, and to the

American trends of pragmatism and behaviorism.

Oliver L. Reiser

Oliver L. Reiser wrote a number of articles on the topic of emergentism, including "Creative Monism" (1924), "Life as a Form of Chemical Behavior" (1924), "Probability, Natural Law and Emergence" (1926), "Mathematics and Emergent Evolution" (1930), and included the concept of evolutionary emergentism in his book, Philosophy and the Concepts of Modern Science" (1935)

In "Creative Monism" Reiser criticizes Bertrand Russell's neutral monism, and endorses the idea of mind as an emergent from the neural as put forward by Lloyd Morgan, Alexander, Broad and others. In "Probability, Natural Law and Emergence" he tries to ground emergence as the result of what he calls the central tendancies of statistical distributions: "Now, if order can be produced from the 'chaos' of random distributions through an averaging process, perhaps the 'emergents' which are figuring so prominently in the speculations of contemporary evolutionary philosophy are but the 'central tendancies of statistical distributions'" (p. 431).

In "Mathematics and Emergent Evolution" he argues that two different types of mathematics must be used in the study of reality - one for transitions between levels (a form of statistics), and another for relationships within a level (a form of calculus). In Philosophy and the Concepts of Modern Science, he formulates the distinction between additive (resultant) properties and non-additive (emergent) ones as follows:

> When dealing with wholes (W), the properties of which are additive (W add.), the result can be represented by a linear equation symbolized in the most general form as follows:
>
> W add. = f(A) + f(B) + f(C) ..... n.
>
> But the properties of a true emergent, or gestalt, are non-additive; the properties of the whole (W non-add.) are not the sum of the properties of the constituents, and mathematically we can only indicate:
>
> W non-add. = f(A, B, C,..... n) (p.127)

James K. Feiblman:

James K. Feibleman, professor of philosophy at Tulane University, incorporated an emergent view of levels of reality in his volume Ontology (1951). Here he speaks of a graded series of being including both theoretical and empirical fields. In his listing the theoretical field is given first, including the three domains of the ontological, the logical and the mathematical. The empirical field includes the five domains of the cultural, the psychological, the bioloigical, the chemical and the physical. The order of rank is given by reading off the above series from the physical through to the cultural and then from the mathematical to the ontological, which is the highest level.

Within the empirical field Feibleman states that there is both emergence and continuity in the series of domains. There is an assymetry between the domains in the sense that "each domain organizes those below it, and exhibits one emergent qualitly at its own level. Each domain also serves all those above it." (p. 252)

In "Theory of Integrative Levels" (1954), Feibleman developed the following theses of the level structure of reality: each level organises the level or levels below it plus one emergent quality; the levels become more complex as one proceeds higher; higher levels depend on the lower while lower levels are directed by the higher; the mechanism of a phenomena lies at the level below it, its purpose at the level above it; a disturbance of an entity affects all the levels it involves; change occurs more rapidly at higher levels; higher levels have fewer entities among their population; higher levels cannot be reduced to lower ones.

Besides Feibleman, other authors, mainly in the biological sciences, wrote on the level structure of reality. These include Joseph Needham, J. H. Woodger, Ludwig van Bertalanffy, Alex Novikoff, T. C. Schnerlia.

J. H. Woodger in his three-part series of articles "The Concept of Organism and the Relation between Embryology and Genetics" (1930-31) examined the part/whole relationship in biological organisms, and attempted to formalize it using the methods of mathematical logic.

Joseph Needham in "Philosophy and Embryology: Prolegemona to a Quantitative Science of Development" (1930), "Integrative Levels: A Reevaluation of the Idea of Progress" (1937) and other of his writings of the 1930s also suscribed to a level structure of reality. In addition he argued that such views were consistent with the Marxist point of view that he came to espouse, especially the principle of the transformation of quantity into quality.

Alex Novikoff in "The Concept of Integrative Levels and Biology" (1945) distinguished the physical, chemical, biological and sociological levels. He argued that there is both continuity and discontinuity in evolution, and that new properties emerge at higher levels through the combination of lower-level units.

Two contributions to Philosophy for the Future: Prospects of Materialism, (1949), edited by Sellars, McGill and Farber also defended the point of view of the level structure of reality. These were "Levels in the Psychological Capacities of Animals" by T. C. Schneirla, a comparative psychologist, and "A Biological Survey of Levels" by J. C. Herrick, the neurologist. Ludwig van Bertalanffy devoted a chapter to "Levels of Organisation" in his book Problems of Life (1952).

Nicolai Hartmann

Nicolai Hartmann also developed a theory of the level structure of reality based on emergentism in his book <u>New Ways of Ontology</u> (1952), the authorized translation of his <u>Neue Wege der Ontologie</u> (1949). This latter is itself a summary of the more substantial <u>Der Aufbau der realen Welt</u> (1940).

Hartmann is concerned to break with what he calls the "old ontology", which he sees as a doctrine of essenses involving the hypostatizing of universals, as in Hegel. His effort is devoted to a "new ontology", based on the categories that emerge from scientific research, but as a philosophic effort, going beyond the empirical limits of positive science. Hartmann also criticizes the static concept of being. Rather, he prefers a dynamic concept with being intimitely related to becoming. In his words, ontology must deal with the "Being of Becoming" (p.29)

For the purposes of this subsection, the most important aspect of Hartmann's work is his notion of the stratified structure of the world, and the associated strata and categorial laws. Hartmann distinguishes two realms of being, corresponding in a certain sense to the Cartesian "cogitato" and "extensio": the realm of things in space, and the realm of things that are not spatial. "By their whole mode of being these two realms are different, and therefore, do not gradually shade off into each other." (p.44) But he hastens to add that the distinction between the two realms is not that between two different substances, but rather that between two strata of a single reality.

The same type of division recurs within each realm: the spatial world is itself divided into two strata - inanimate things and animate things, while the non-spatial realm is divided into the two strata of the psychic and the spiritual. Thus, according to Hartmann, reality is divided into four different strata: the inanimate, the animate, the psychic and the spiritual.

In particular, the spiritual realm is constituted by "speech, knowledge, evaluation, legal order" (p.45) and "custom, morality and science" (p.80). Its contents transcend individual consciousness, which partake to a certain extent of spirit. In this sense, consciousness is individual and spirit collective: "Consciousness divides, the spirit unites" (p.80) Hartmann nowhere mentions religion or the concept of God; his concept of spirit is therefore atheistic or at least agnostic, though well within the German tradition of "geist".

Hartmann ascribes the following properties to the hierarchy of strata: higher strata emerge from lower ones; some properties of lower strata recur in the higher ones (ie are resultant); and some properties of higher strata are new (ie are emergent); the lower strata are included in the higher strata, though some recurring properties are modified by the influence of the higher strata; higher strata are never included in the lower ones; lower strata are the basis of the higher ones, though these higher strata enjoy autonomy relative to their basis because of their novel properties.

Hartmann expresses the regularities of the level structure in a series of five laws: (1) the law of superimposition, (2) the law of recurrance, (3) the law of superinformation, (4) the law of novelty, and (5) what may be called "the law of demarcation":

> (1) In the superimposition of ontological strata, there are invariably present those categories of the lower stratum which recur in the higher. But never are there categories of a higher stratum which recur in the lower. The encroachment of categories of one stratum upon another is upwards only, not downwards.
>
> (2) The recurrance of categories is always a limited one. It does not hold good for all categories of the lower stratum and does not in every case include all higher strata. At a certain level there is a cessation of recurrance.
>
> (3) With their encroaching upon higher strata the recurring categories are modified. They are superinformed by the character of the higher stratum. Only a basic categorial moment goes through the strata without suffering alteration.
>
> (4) The structure of lower categories never determines the character of the higher stratum. This character always rests on the emergence of a categorial novelty which is independent of the recurrent categories and consists in the appearance of new categories. The modification of the recurring elements is contingent upon the emergence of novelty.
>
> (5) The ascending series of ontological forms consititues no continuum. Since, at certain points of incision in the series, the categorial novelty affects many categories at a time, the ontological strata are clearly marked off against each other. This demarcation is the "distance of strata" - a phenomenon characteristic of their hierarchical order. (pp. 75-76)

The strata laws make mention of the concept of categories, and there is an intimate connection between the two. Of particular importance are the categories of time and individuality, as contrasted with those of space and matter. In his concept of reality, Hartmann stresses time and individuality, and views space and matter as secondary. Time is said to run through all the strata of reality, but space is applicable only to physical and biological objects. He holds that the mental and spiritual are outside of time and independent of matter. There is thus a certain dualism inherent in his system, at least as concerns the division between spatial and non-spatial objects.

Individuality, in the sense of singleness or uniqueness, is also considered as basic to his ontology. The universal, though timeless, is not higher in order than the particular, "it is rather a dependent, a merely ideal being, and the universal has reality nowhere else but in the real particulars which are both temporal and individual." (p.26) Thus, there is a second sort of dualism here, between the being of particulars (in time) and the "ideal being" of universals (outside of time), though this is limited by the statement that the latter is dependent on the former.

Among the other categories which are listed by Hartmann are: unity and multiplicity, concord and discord, contrast and dimension, discretion and continuity, substratum and relation, element and structure, form and material, inner and outer, determination and dependence, identity and difference, generality and individuality, possibility, actuality and necessity, along with their negative counterparts. He notes that besides the category of time, those of process and causality also run through the whole level structure unchanged.

However, in the book under consideration, Hartmann does not give a detailed analysis of all the categories. He does, however, summarize their general characteristics in a series of categorial laws which are complementary to the strata laws: (1) the law of strength, (2) the law of indifference, (3) the law of matter, (4) the law of freedom:

> (1) Categorial dependence is dependence only of the higher categories upon the lower, not conversely. Hence, the lower categories, measured by their determinate power, are the stronger ones. Strength and neight in the order of strata stand in inverse relationship.
>
> (2) Although the categories of a lower stratum afford the basis for the being of the higher, they are are indifferent in regard to them. They admit of superinformation or superimposition without requiring them. The higher ontological stratum cannot exist without the lower, but the lower can exist without the higher.
>
> (3) The lower categories determine the higher ontological stratum either as matter or as a basis for its being. So they only limit the scope of the higher categories but do not determine their higher form or peculiarity.
>
> (4) The novelty of the hgiher categorial stratum is completely free in relation to the lower stratum. Despite all its dependence, it asserts its autonomy. The superior structure of the higher stratum has no scope "inside" the lower stratum, but "above" it. (pp. 87-88)

On the basis of the above analysis of the four strata and their associated categories, Hartmann criticizes materialism, biologism, psychologism and idealism as philosophies which universalize the categories of one level and neglect the specific and novel categories of the others. Materialism is seen as "metaphysics from below" (p.59), which deductively elaborates the characteristics of higher levels solely on the basis of those of the lowest level. ~~Idealism is~~ seen as "metaphysics from above", committing the opposite mistake of deducing all characteristics of lower levels solely on the basis of those of the highest level. Biologism and psychologism base themselves only on the second and third levels respectively.

Hartmann characterizes his own ontology as a combination of unity and multiplicity: "In every quest after the unity of the world the categorial heterogenity of the strata must be conserved under any conditions" (pp. 60-61). He says that the nature of the world "surely must consist in the unity of just this multiplicity" (p. 60). His ontology may be described as a monistic pluralism, with a single substance divided into a multiplicity of levels. His conception of that substance is neither wholly materialistic, nor wholly idealist, and in this sense has some affinities with the theory of neutral monism.

Hartmann approaches the mind-body problem from the point of view of the unity of man. Just as the world is a unified structure consisting of the four strata, so too is man a unity involving elements of the physical, biological, mental and spiritual. Hartmann accepts "the genesis of consciousness from unconscious life" (p. 120) as a fact of nature, a product of evolution which each individual recapitulates in the course of its ontogenetic development: "The result is the dovetailing, mysterious and yet so natural, of inorganic and psychic processes in human life. This we come to know through an immediate awareness within ourselves of the indivisible unity of the two given spheres, the inner and the outer aspects." (p. 121) However, despite the above mention of evolution, Hartmann does not further analyze the concept, nor is the notion of the "dovetailing" of the physical and the mental developed in any greater detail.

P. E. Meehl and Wilfrid Sellars

The article "The Concept of Emergence" (1956), by P. E. Meehl and Wilfrid Sellars appeared in vol. 1 of the "Minnesota Studies in the Philosophy of Science". It is important because it re-introduced the question of emergence into the main-stream of philosophical debate, and led to further discussions by Herbert Feigl, Ernest Nagel and others.

Meehl and Sellars (the son of Roy Wood Sellars) present their paper as a rebuttal of Pepper's 1926 article "Emergence". The heart of their argument is that Pepper has overstated his case by having his two functions f1 and f3 (where f3 includes variables representing emergent qualities and f1 does not) hold in exactly the same domain of definition. "However, once we drop...the assumption that f3 and f1 are intended by the emergentist to hold for the same regions of qrst-space (f3 presumably holds for all regions, f1 only for the lower level of integration) the argument falls apart." (p.248) They conclude that "whether or not there are any emergents in the sense we have sought to clarify is an empirical question. Our only aim has been to show that Pepper's 'formal' demonstration of the impossibility of non-epiphenomenal emergents is invalid." (p. 252)

Meehl and Sellars say that what they call "raw feels" or sense qualities, sensa or sensory consciousness are candidates for emergent status. In this case the f1 function would describe the action of organic compounds such as complex hydrocarbon molecules, potassium ions, free iron and electromagnetic fields outside the brain. The function f3 (including emergent variables for raw feels) would cover the situation in the brain when the above components are united to produce consciousness.

The two authors also introduce the distinction between physical1 and physical2 events and entities. Physical2 events and entities are those which can be defined on the basis of properties that exist before the appearance of life. Physical1 events and entities are any which are part of a space-time network, and could include such events and entities which possess emergent properties consequent upon the appearance of life.

Herbert Feigl, in The Mental and the Physical (1958), canvassed various views on the mind-body problem. He particularly refers to the Meehl and Feigl article, and agrees with them that emergent qualities with causal efficacy are theoretically possible. This article also appeared in "The Minnesota Studies in the Philosophy of Science", vol. 3, and was followed by a "Postcript", the two parts being issued as a book. Its consideration of emergentism, though not an endorsement, was nevertheless also of significance in rehabilitating the concept in mainstream philosophy.

T. A. Goudge

T. A. Goudge has written extensively on the history of emergentism. His writings on the subject include his article "Another Look at Emergent Evolutionism" (1965), and the related entry "Emergent Evolutionism" in The Encyclopaedia of Philosophy (1967), as well as separate articles on Darwin, Huxley, Romanes, Wallace, Spencer, Bergson, Sellars, and Lloyd Morgan, among others. Goudge also wrote the article "Evolutionism" in The Dictionary of the History of Ideas (1973). His own views on evolution are contained in the book The Ascent of Life: A Philosophic Study of the Theory of Evolution (1961)

Others

In the article "Evolutionism", he situates emergentist evolutionism as one form of metaphysical evolutionism, the others being mechanistic evolutionism (Haeckel, Spencer), vitalist evolutionism (Schopenhauer, Bergson), and pragmatic evolutionism (Mead, Peirce).

In "Another Look at Emergent Evolutionism" he considers the three key elements of emergent evolutionism as emergence, levels and novelty. He considers the doctrine of emergent evolutionism as logically unobjectionable and useful in biology, but believes that it has been abused as a general cosmological view. In particular, he says that the attempt to combine neutral monism with emergentism by Lloyd Morgan and Alexander is a weakness of the philosophy, and seems to hold this as an essential weakness of emergentism's cosmology. The bibliographies in his articles contain many valuable references to the literature on evolution and emergence, and were indispensable for this thesis.

Mario Bunge

The writings of Mario Bunge (b. 1919) on the problems of emergentism and the level structure of reality go at least as far back as the late 1950s. These problems are discussed in his volume Causality: The Place of the Causal Principle in Nature (1959), where emergence is situated in its relation to causality and determinism; in Metascientific Queries (1960), which includes a chapter on ontic and cognitive levels; various journal articles in the 1960s, one of which is reproduced in The Myth of Simplicity (1963); and in his two-volume Scientific Research (1967).

The question of the status and formulation of materialism is dealt with in Method, Model and Matter (1973), his Treatise on Basic Philosophy (1974 - date), 6 volumes of which have appeared and which is to be complete in 8 volumes, and Scientific Materialism (1982). The mind-body problem is specifically dealt with in articles since 1977 and in detail in The Mind-Body Problem (1980).

This section will deal with the following aspects of Bunge's thought: (1) the level structure of reality; (2) the concept of emergentism; (3) ontological emergentism and epistemological reduction; (2) the development of scientific materialism as an ontology; and (5) emergentism and the mind-brain problem.

Level structure of reality

One of the first writings by Bunge on the level structure of reality is the chapter "Do the Levels of Science Reflect the Levels of Being" in Meta-Scientific Queries (1959), a chapter based on a talk given in 1956. Bunge defines a level or reality as "a section of reality characterized by a set of interlocked properties and laws, some of which are peculiar to the given domain, and which are assumed to have emerged in time from the (lower or higher) levels existing previously." (p.108) He states that ontic levels are characterized by relative stability while cognitive levels are more fluid, and that there is no isomorphism between the two, though they are closely related.

In "Levels, A Semantic Preliminary" (1960), Bunge reiterates the above definition of levels as the result of an examination of eight shades of meaning of the term. He refers in this article to the writings of Lloyd Morgan, Alexander, Sellars, Hartmann, Needham and Schneirlia, among others. It is held that levels may be divided into sub-levels, emergence of new properties at a level may be accompanied by the loss of some properties of the contiguous levels, lower levels may arise from higher levels through a process of degeneration, higher level processes may produce changes at lower levels, and that level structures are dynamic and not static.

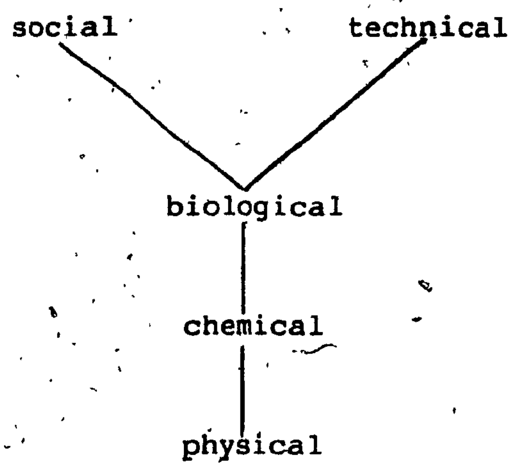
In "On the Connexions among Levels" (1960), Bunge further states that levels enjoy a comparative autonomy or degree of self-determination, freedom exists insofar as lawful self-determination holds; radical emergence rises at the junction between levels; three sets of laws are involved in two contiguous levels - the laws of each level and those "border-zone laws" between them; and that the level structure should not be seen as a hierarchy, since not all interactions are top-down.

In "The Metaphysics, Epistemology and Methodology of Levels" (1969), Bunge defines a level structure L as an ordered pair <S, E>, where S is a family of sets of individual systems and E is a binary relation in S such that (1) every member of S is a natural class (an equivalence class of systems sharing basic properties and laws), (2) E is a one-many, reflexive and transitive relation in S, (3) "E represents (mirrors) emergence or coming into being of novelty of qualitatively new systems in a process" (p. 160).

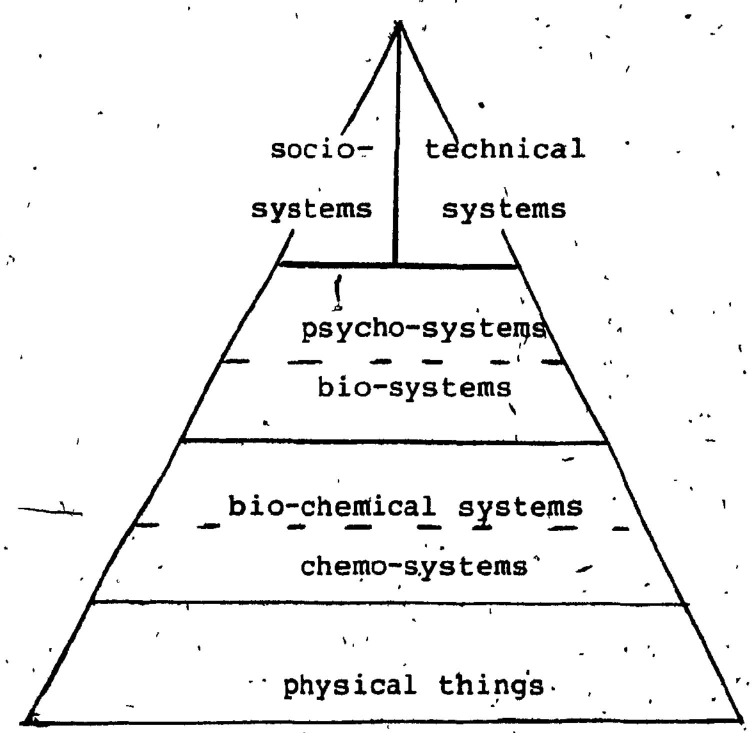
In his <u>Treatise on Basic Philosophy</u>, v. 4, a level is defined as a set of concrete things, each of which is composed of things at preceding levels. (Presumably, at least one component of each thing is a member of the immediately preceding level). The level structure of reality is then the set of these levels ordered by the relation of precedence. Each level is a set whose members are material things, and the level structure itself is a set of sets. Thus, both levels and the level structure are sets. Inter-level interaction, and for that matter upward and downward control are then only an "elliptical or metaphorical" way of speaking, and cannot be taken literally, since sets do not interact or cause each other.

Bunge's views on the number of levels have also undergone a certain evolution. In 1960, he argued for a three level model of the structure of the world with inanimate matter, life and psyche as the levels of nature, to which correspond under the social aspect the levels of artiphysis (artifacts), economic and social life, and culture. Later, by 1967 four levels of reality are distinguished: the physico-chemical level, the biological level, the psychological level and the socio-cultural level, and corresponding to this are various types of intra-level and inter-level laws. In Scientific Materialism five levels are identified: the physical, chemical, biological, social and technical, each further subdivided into three sub-genera, though in his Treatise in Basic Philosophy these five are considered as systems-genera and organized in four levels, with the social and the technical as branches from the biological level.

The following two diagrams express the current status of Bunge's views on the level-structure of reality: the first is a branching-diagram of the five genera arranged in four levels(Treatise on Basic Philosophy v.4, p. 250):



The second is a pyramidal representation of the level structure of reality in greater detail (ibid, p.46):



The main change has been the separation of the physical and the chemical levels, based on the argument that the laws of chemical valency cannot be deduced from those of quantum mechanics; and the exclusion of the level of mind or psyche as a distinct level. Psycho-systems are now included as a sub-level of the biological level.

Concept of Emergence

Bunge's view of emergence has also undergone a certain evolution. In *Causality, the Place of the Causal Principle in Modern Science* (1959), where emergence is discussed in the context of an examination of causality. Bunge distinguished three meanings of causality: (1) causality as causation, the objective relation of cause and effect between events in the world; (2) causality as the causal principle, considered as a statement of the law of causation; and (3) causality as causalism or causal determinism, the view according to which all events have a cause, ie that causality is universal.

Bunge argues that while some events are causally related, not all of them are. For example, chance events obeying statistical laws must also be taken into account. Causalism, or causal determinism, is too restrictive as an ontological thesis, and other forms of lawful relationships between events must be admitted, such as stochastic connections. General determinism is a wider category than causal determinism, and includes it as one of its components, along with statistical determinism and others.

Having situated causality as only one among various forms of determinism, Bunge argues that by itself it can produce quantitative novelty only, and that the full range of determining factors (including the stochastic and others) is required to bring about qualitative novelty. Thus, this first view of emergence holds that it occurs in a lawful way (determinism), that it can be explained (rationalism), that it involves more than one factor (pluralism), so that causality, though part of the determining mix, does not suffice in itself to bring about the full range of emergent novelty.

In his Treatise on Basic Philosophy a new definition of emergent as opposed to resultant properties is given in systems terms. A system is defined as the order triple <C, S, E> of its composition or its component parts, its structure consisting of its internal and external relations, and its environment, those extra-systemic things with which it interacts. A property P is said to be emergent when it is a property of a system none of whose component parts has the property P, otherwise it is a resultant property.

Bunge acknowledges that evolution occurs at levels other than the biological, but he centers his attention at this level. In vol. 7 of his Treatise he makes the following points: (1) it is not a species, which is an abstract concept, but populations, which are groups of material entities, that evolve; (2) there have been three stages in the development of the modern theory of biological evolution: (i) the synthesis of the hypothesis of descent with variation (already present in Lamarck) with Darwin's theory of natural selection; (ii) the synthesis of the Darwin's theory of evolution with population genetics in the modern synthesis of the mid 1930s to mid 1940s; and (iii) the current fusion of the synthetic theory of evolution with population ecology into a theory of evolutionary population ecology.

Epistemological reductionism

Traditionally, the concept of emergentism has been opposed to that of reductionism. While this is the case insofar as ontological emergentism and ontological reductionism are concerned, Bunge holds that ontological emergentism and epistemological reductionism, at least in its weak form, are complementary, rather than contradictory. Epistemological reduction is seen as a theoretical operation that does not alter the postulated ontology:

> In other words, reduction does not imply levelling: it relates levels instead of denying that they exist. Reduction, then, is a theoretical question that does not alter the level structure of the world. (p.79)

He distinguishes the two forms of reductionism- weak or partial and strong or full as follows:

> Let T1 and T2 be two theories or hypotheses and let S be a nonempty set of assumptions not contained in either T1 or T2. Then (i) T2 is fully reducible to T1 if and only if T1 entails T2 (ie T2 follows logically from T1) and (ii) T2 is partially reducible to T1 if and only if T1 jointly with S entails T2 (ie T2 follows logically from the union of T1 and S. (p.80)

Bunge considers and rejects two extreme positions – the first, anti-reductionism, denies the possibility of understanding a higher level through knowledge of lower levels, and the second, radical reductionism, claims that knowledge of lower levels suffices to understand higher ones. Rather, he upholds moderate reductionism, which he defines as "the strategy consisting in reducing whatever can be reduced without however either ignoring emergence or persisting in reducing the irreducible" (p.80). Moderate reductionism is thus "reduction without levelling", while radical reductionism involves a process of levelling. Radical reductionism implies ontological reductionism, while moderate reductionism is consistent with ontological emergentism.

The above discussion fits in with the distinction that Bunge makes between atomistic (or individualistic), systemic and holistic approaches. As was mentioned above, a system is defined by Bunge as the ordered triple of its composition, its structure and its environment. Individualism puts a unilateral accent on the composition, which is considered sufficient to explain all the properties of the whole, while holism does not analyze the system into its factors, and denies the importance of the composition, structure or environment to explain these system properties. Systemism takes all three factors into account, and examines which properties of the system can be explained with reference to its parts only (resultant properties) and which cannot (emergent properties).

Bunge clearly espouses the emergentist, moderate reductionist and systemic point of view. Some semantic confusion may occur because of the appearance of the term 'reductionist' under both the ontological and the epistemological headings, but once the conceptual issues are clarified, with the distinction between full and partial epistemological reduction, the semantic ambiguity causes no problem.

In vol. 6 of his <u>Treatise</u>, Bunge notes that reduction is not the only mechanism of explanation, and that it needs to be supplemented by that of integration - the inclusion of a phenomena in a wider context. This may go as far as the merging of theories or whole disciplines in a unification of knowledge that is complementary to its specialization in separate fields. Thus, ontological emergentism is to be placed in the context of epistemological reduction and integration.

<u>Scientific materialism</u>

As can be seen from what precedes, Bunge's ontology combines a monistic and a pluralistic aspect. The pluralistic aspect is the multi-level structure of reality, where the main levels are not collapsible or reducible to each other. But there is also the monistic aspect - the world, or reality, is one; there is no mention or intention of each level constituting a distinct substance. This is clear insofar as the elements of lower levels are the components of those of higher levels, and emergent properties are never construed as super-natural. In Bunge (1966) mention is made of "integrated pluralism", or "analytical monism" as terms that could characterize his ontology, "For, after all, is not philosophy a search for unity and difference, and a disclosure of difference within unity" (p.70).

In this context, Bunge in Matter, Method and Model (1971) examines critical realism and what he calls dynamicist and pluralist materialism. In his discussion of materialism, the following two theses reaffirm the level structure of reality:

> Organisms are material systems satisfying not only physical and chemical laws but also certain emergent laws (genetic, ecological, etc.) The mind is the activity of the central nervous system-hence, not a prerogative of man. Society is a system of organisms... The world has a multi-level structure. Every level of complexity and organization has its peculiar properties and laws. No level is totally independent from its adjoining levels (pp.172-173)

In his conclusion, Bunge endorses critical realism and dynamical materialism, noting that contemporary science presupposes critical realism, and supports both dynamical materialism and integrated pluralism. He also calls for a critical philosophy which could assist science and be supported by it.

In "Materialism Today" (1981), Bunge defines his ontology as that of scientific materialism, a term he had previously used in his "Strife about Complementarity" (1955). But the concept of materialism is a new one, closely linked with change in the state space approach. An object is defined as a material object, or entity when it can be in more than one state:

> An object x is a material object (or entity) if, and only if, for every reference frame y, if Sy(x) is a state space for x, then Sy(x) contains at least two elements. Otherwise x is an immaterial object (or non-entity). More briefly: u(x) =def (y)(If Sy(x) is a state space for x then |Sy(x)| 2). (p. 22)

He then states the first postulate of his system, that of materialism: "An object is real (or exists really) if, and only if, it is material. (Shorter: All and only material objects are real). (p.23) To this he adds the second postulate, that of systemism: "Every real (material) object is either a system or a component of a system." (p. 25) Other postulates of his system, further developed in his Treatise, volumes 3 and 4 are the theses that (3) all systems have at least one emergent property, (4) systems at all levels have emerged from the assembly of lower level entities, and (5) that some systems have evolved: "some processes are evolutionary" (p.25)

The mind/brain relation

Bunge's main writings on the mind-brain relation include "Emergence and Mind" (1977), parts of volumes 3 and 4 of his Treatise (1977, 1979), "The Mind-Body Problem in an

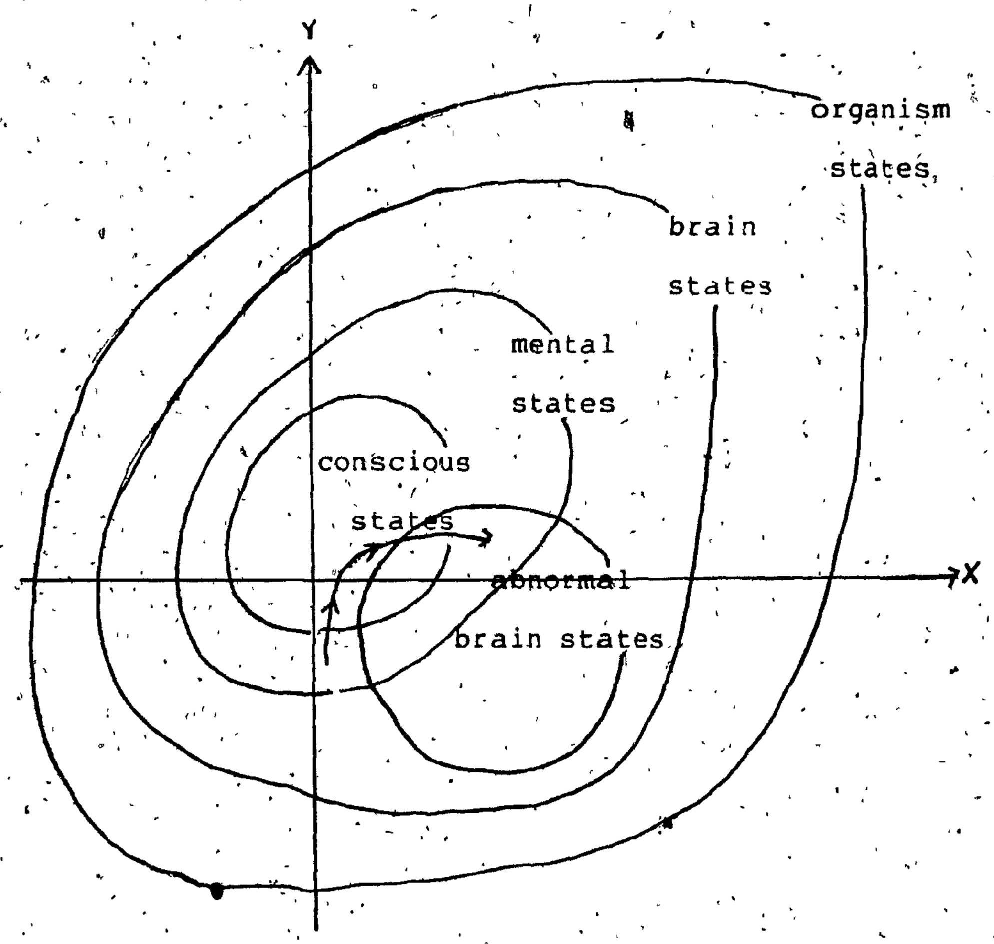
Evolutionary Perspective" (1980), "From Neuron to Behavior and Mentation: An Exercise in Levelmanship" (1980) and the book The Mind-Body Problem: A Psychobiological Approach (1980).

"Emergence and Mind" was Bunge's contribution to the on-going debate in the review Neuroscience on the mind-brain problem; it was the first article in that series. He presented his state-space approach, the distinction between emergents and resultants, and the notion of the level structure of reality. The main levels of reality are said to be the physical, chemical, biological and social. His view of the mind-brain relation is stated in terms of emergentist materialism as follows:

> (i) All mental states, events and processes are states of, or events and processes in, the central nervous systems of vertebrates;
>
> (ii) these states, events and processes are emergent relative to those of the cellular components of the CNS;
>
> (iii) the so-called psychophysical relations are interactions between different subsystems of the CNS, or between them and other components of the organism. (p. 506)

The first clause is that of materialism, the second that of emergence, and third a monistic form of interactionism. In The Mind-Body Problem, he says that "emergentist materialism can be summed up in a single sentence, to wit: 'mental states form a subset (albeit a very distinguished one) of brain states (which in turn are a subset of the state space of the whole animal)" (p. 22)

The following diagram is included by Bunge to represent this emergentist materialist view of the mind-brain relation. The X and Y axes represent two physiological properties under consideration which determine a state-space in which the organismic, brain and mental states are distinguished as subsets of each other. The directed arrow represents the passage from an unconscious but normal brain state through consciousness to an abnormal brain state in the individual.



Roger Sperry

Roger Sperry (b.1913), a scientist best known for his research on the psychological effects of the split-brain in humans and animals, argues for a position on the mind-brain problem which is emergentist, holistic, monistic and mentalistic. Since his article "Neurology and the Mind-Brain Problem" (1952), he has published a series of articles on this neuro- philosophic problem, including "A Modified Concept of Consciousness" (1969), "An Objective Approach to Subjective Experience: Further Explanation of an Hypothesis" (1970) and "Mind-Brain Interaction: Mentalism, Yes, Dualism, No" (1980). Since 1965 he has defended his version of an emergentist theory. A characteristic of his view is an attempt to combine ontological and axiological considerations into an integrated world view. This section will deal with the following aspects of his thought: (1) his "modified" concept of mind based on emergentist ideas; (2) his notion of downward control of mind over brain; (3) his view on reductionism; and (4) his ideas on mentalism and materialism.

Reformed Concept of Mind

In his "Neurology and the Mind-Brain Problem" (1952), Sperry defends a behavioristic view of the brain, and concludes that conscious experiences, even the highest of them, consist of brain patterns involved in the organization of behavior, though he claims that this does not distract from their meaning and importance.

> One need not feel distressed at the suggestion that all our noblest and most aesthetic psychic experiences may be found, on analysis, to consist merely of brain patterns designed, directly or indirectly, for the adjustment of muscular contraction and glandular secretion. This distracts nothing from their meaning and importance. In the same way our finest deeds consist only of patterns of muscle-fibre twitches, our greatest printed messages only of ink marks on paper, while our most ravishing music, as pointed out by William James, is but the rasping of hairs from a horse's tail on the intestine of a cat. (p.310)

He states that mental phenomena are not to be found at the neuronal level, but as functions of higher levels of the interaction of complexes of neurons, grouped in cortical centers:

> Significance and meaning in brain function do not derive from the intrinsic protoplasmic or other analytic aspects of neural excitation; but rather from their higher-order functional and operational effects as these work upon successive brain states, upon the motor system and thereby into the environment and back into the brain. We should not expect to find that a single neuron or an isolated patch of neurons, or even a cortical center could sense, feel, experience, or think anything in isolation. These psychic properties we envisage as depending upon a specific design and complexity in its vortex of neural activity, generally involving a reciprocal interplay of many parts. (pp. 310-311)

In the mid 1960s, Sperry developed an interest in a view of evolution recognizing the appearance of novelty and levels, as can be seen in the following quote from "Problems Outstanding in the Evolution of Brain Function" (1964):

> We need pause here only to note for future reference that evolution keeps complicating the universe by adding new phenomena that have new properties and new forces and that are regulated by new scientific principles and new scientific laws - all for future scientists in their respective disciplines to discover and formulate. Note also that the old simple laws and primeval forces of the hydrogen age never get lost or cancelled in the process of compounding the compounds. They do, however, get superseded, overwhelmed, and outclassed by the higher-level forces as these successively appear at the atomic, the molecular and the cellular and higher levels. (p.2)

But the re-evaluation of his ideas went further, and the behavioristic concern with motor-output and the related view of conscious activity as pre-motor preparation, though not denied, was considerably reduced in theoretical import. In its place, Sperry developed his view of mental states as emergent from brain processes and reacting back causally on them. A common feature of the two theories is the view of consciousness as what Sperry calls an "operational derivative" of "higher-level" cerebral processes.

In "A Modified Concept of Consciousness" (1969), Sperry summarized his view as follows: "A theory of mind is suggested in which consciousness, interpreted to be a direct emergent property of cerebral activity, is conceived to be an integral component of the brain process that functions as an essential constituent of the action and exerts a directive holistic form of control over the flow pattern of cerebral excitation." (p.532)

Mental events or conscious experience are "inseparably tied to the material brain process with all its structural and physiological constraints" (p.533), yet are at the same time distinct from them: "They are different from and more than' the collected sum of the neuro-physico-chemical events out of which they are built." (ibid). They 'encompass and transcend' the neuronal and nerve circuit level "in the same way that the properties of the organism transcend the properties of its cells, or the properties of the molecule transcend the properties of its atomic components, and so on" (ibid).

Sperry further distinguishes between low-level and high-level brain processes. The lower level processes are made up of individual neurons and simple circuits, and the higher level processes are made up of these lower level ones; both are considered as entities. It is from some of the higher level processes that consciousness emerges:

> These larger functional entities have their own dynamics in cerebral activity with their own qualities and properties. They interact causally with one another at their own level as entities. It is the emergent dynamic properties of certain of these higher level specialized cerebral processes that are interpreted to be the substance of consciousness. (p.534)

The conscious properties of these higher level cerebral processes are said to "supersede" the basic physico-chemical forces just as molecular forces supersede those of nuclear forces in chemical interactions. In "An Objective Approach to Subjective Experience" (1970), Sperry notes that the same conscious effort may be produced by different neural events "provided the critical operational result at the holistic functional level is the same " (p.587) and that the same neural process may produce different conscious properties "depending on the contextual activity in which it appears" (ibid). Thus, there is a type-type relationship between neural and conscious events, and not a simple token-token one.

Downward control of mind

Another major characteristic of Sperry's view is the notion of the downward control of mind over matter, which he expresses in "A Modified Concept of Mind" as follows:

> Just as the holistic properties of the organism have causal effects that determine the course and fate of its constituent cells and molecules, so in the same way, the conscious properties of cerebral activity are conceived to have analogous causal effects in the flow of neuronal excitation. In this holistic sense the present proposal may be said to place mind over matter, but not as any disembodied or supernatural agent. (p.533)

Sperry states that once mind has evolved from matter in the phylogenetic sense, and emerged from brain in the ontogenetic sense, it then assumes "the position of top command". In "An Objective Approach to Subjective Experience" he says: "The course of events within each subsystem, relative to the rest of the brain, is governed by the properties of the higher level systems within which each is embedded." (p.588)

Sperry makes the distinction between events which supervene on other events and events which intervene on other events, and says in "Mind-Brain Interaction": "The mental forces do not violate, disturb, or intervene in neuronal activity but they do supervene" (p.657). However, Sperry does not define the distinction between supervening and intervening (in these articles); he only illustrates it with an analogy with a TV program and the electron flow on the TV screen. Sperry argues that knowledge of the "electronic and physical theory that enables us to fully understand, build and repair the TV set does not permit us to understand the content of the program that appears on the screen. The meaning of the program "cannot be explained in terms of the laws and concepts of electronics" (p.658); and this is analogous to the mind and brain control:

> Yet these higher order, supervening, program variables do control at each instant, and determine the space-time course of the electron flow patterns to the screen and throughout the set - just as a train of thought controls the pattern of impulse firing in the brain. The shift to a new program or to a new channel can be compared to a shift in the brain to a new mental act, focus or attention, or to a new thought sequence. (ibid)

Sperry recognizes that the TV analogy breaks down when pushed too far: the brain is a self-programming system, whereas the TV is not; different mental programs compete, cooperate and interact simultaneously within the brain, while TV programs are selected one at a time; but the analogy, up to this limit holds: " I have stressed that the term 'interaction' is not to imply that the mental forces intervene in, or disturb or disrupt the physiology or chemistry of the brain, but only that they supervene like TV programs over the electronic processes." (ibid)

Thus Sperry's system is, on his own terms, interactionist. Moreover, there is a downward control of mind over brain that is to be considered in the sense of the supervening of mental processes over cerebral ones, and not their direct intervening in neuronal activities.

Emergence and reductionism

In the 1980 article, Sperry deals with his view of the relationship between the emergent status of mental events and the problem of reducibility. He distinguishes between two senses of reducibility, a common sense one and a philosophic one. In the first, an object is said to be reducible to the component parts out of which it was built, and in this sense, since mental states are "built of, composed and constituted of physiological and physico-chemical elements" they are therefore reducible to the latter. But Sperry then notes that while a building is "reducible" to the bricks out of which it was built, this reduction, as in an earthquake, reduces it to rubble, and its structure is lost.

In the second sense, mental events are held not to be reducible to brain components and activities. According to Sperry, the reason that a whole cannot be reduced to the sum of its parts in the philosophical sense is that an entity must be considered not only as a system of material components, but as a "combined space-time-mass-energy manifold" (p.658). Space is said to be "bent around and moulded" by material parts, and time by events; the two are combined in the space-time components of changing systems. It is because of the space-time components that reduction in the strong sense is not possible:

> The process of reducing an entity to its material components, physically or conceptually, inevitably destroys the space-time components at the affected level... The spacing and timing of the parts with reference to one another largely determine the qualities and causal relations of the whole but the laws of the material components fail to include these space-time factors" (p.657)

Reduction as a method in science is not rejected, since "the properties of an entity are determined largely (but not entirely, and in some cases more than others), by the properties of its parts." (p.659). But since the determination is only partial and excludes the properties determined by the space-time factors, reduction becomes less and less relevant as the number of levels between part and whole increases. Quantum events have little relevance to mental phenomena, though they are not totally irrelevant; brain physiology is more relevant, standing in a relation to it similar to that which molecular theory stands to chemistry. Mental events however, have their own laws which "are different from and cannot be reduced to those of neurophysiology".

Mentalism vs. materialism

For Sperry, mind and brain are "inseparable parts" of one reality, a monistic view where higher levels emerge via evolution and cannot be fully reduced to previous ones:

> On the proposed scheme, one can proceed continuously in the same universe of discourse, following the path of evolution from sub-atomic elements in the brain up through molecules, cells and nerve circuits to brain processes with conscious properties and on upward through higher compounds all within the one "this world" mode of existence. (p.659).

Sperry as of 1969 argued that his position was a compromise between materialism and mentalism. It was consistent with mentalism because it recognized the existence of mental elements that transcend the brain components and it was related to materialism because it denied that these mental forces could exist independently of the brain processes from which they emerge. At that time he suggested the terms "emergent interactionism", or "idealistic materialism" for his theory. Sperry says that he is opposed to dualist theories which grant mind the status of a supernatural agent or disembodied entity.

In his 1980 article, Sperry accepts the term "mentalist" to describe the aspect of his philosophy according to which mind, having emerged from the brain, controls it:

> In calling myself a 'mentalist', I hold subjective mental phenomena to be primary, causally potent realities as they are experienced subjectively, different from, more than and not reducible to their physicochemical elements. At the same time, I define this position and the mind-brain theory on which it is based as monistic and see it as a major deterrent to dualism. (p.652)

Mentalism as a concept is borrowed from psychology where it is held to be a view primarily opposed to behaviorism and its elimination of the mental; not as equivalent to the philosophic concept of idealism: "A mentalist is defined in behavioral science as one who, in opposition to behaviorist doctrine contends that mental activities and laws are involved in determining behavior and are needed to explain it." (p.660).

In general, Sperry tends to assimilate materialism and behaviorism and does not consider the point of view of materialist emergentism. He holds that the key philosophic distinction is that between monism and dualism, and between a causal or an a-causal role for mind, and not that between mentalism and materialism

> If common usage in the long run should tend to favor the stretching of the meaning of materialism and / or physicalism to encompass mental phenomena in the causal, emergent, embodied, non-reductive form, we now envisage, there would be no great loss provided there was no resultant confusion in regard to the actual conceptual changes themselves and their new implications and connotations. Of all the questions we can ask about conscious experience, there is none for which the answer has more profound and far-reaching implications than the question of whether or not consciousness is causal. The alternative answers lead to basically different paradigms for science, philosophy and

culture in general. (p.661)

Sperry considers that the term materialism is too closely associated with behaviorism in psychology, and has been pre-empted by Marxism in politics. In his article "Changing Priorities" (1981), he argues that axiological and ideological considerations militate in favor of the monistic and mentalist emergentist view he defends, since his aim is to bridge science and values, and develop a unified world view wherein science, freed from a mechanistic and reductionist position that denies mind would be an arbiter of ultimate values.

Karl Popper

Karl Popper (b. 1902) is best known for this conjecture and refutation view of scientific theory: that hypotheses are conjectures not inductively derived from the facts and that their scientific status involves the possibility of their refutation. The progress of science consists in a series of such conjectures and refutations, whereby a more "truth-like" theory replaces less truth-like ones. This theory was developed in Logic of Scientific Discovery (1934), and Conjectures and Refutations: The Growth of Scientific Knowledge (1963).

A second major theme in Popper's writing is that of the philosophy of mind and related to it, the question of evolution and emergentism. It was with the publication of Objective Knowledge: An Evolutionary Approach (1972) and The Self and Its Brain: An Argument for Interactionism (1979), co-authored with J. C. Eccles, that these questions take the fore. In this section, the following points will be examined: (1) Popper's attitude toward evolution; (2) his concept of emergence; and (3) his interactionist view of mind and brain as expressed in his three world theory.

Views on Evolution:

Popper's views on evolution have themselves undergone an evolution. Before the mid 1960s he was only peripherally concerned with evolution, the main focus of his attention being the philosophy of physics and the criticism of historicism in the philosophy of history and politics. In The Open Society and its Enemies (1945) and again in The Poverty of Historicism (1957), he criticizes the view that the evolutionary hypothesis has a lawful status. He holds this to be the case because evolution deals with a set of events for all we know unique to our planet; we don't know if it holds elsewhere in the universe. As he states in Poverty of Historicism:

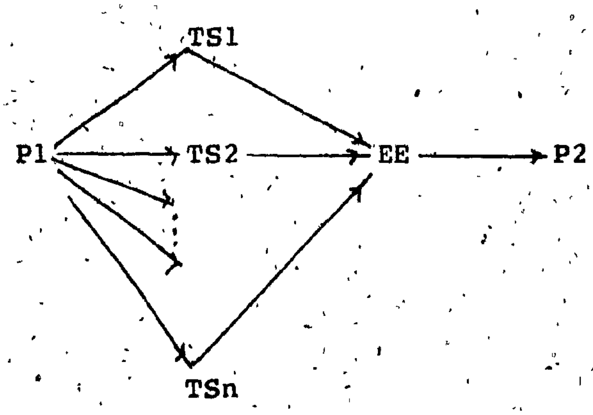
> What we call the evolutionary hypothesis is an explanation of a host of biological and paleontological observations - for instance, of certain similarities between various species and genera - by the assumption of the common ancestry of related forms. This hypothesis is not a universal law, even though certain universal laws of nature, such as laws of heredity, segregation and mutation enter with it into the explanation. It has, rather, the character of a particular (singular or specific) historical statement. (It is of the same status as the historical statement: 'Charles Darwin and Francis Galton had a common grandfather.' (p. 107)

In Objective Knowledge (1972), Popper criticizes evolutionary theory for its (partly) tautological character, but he also reformulates it in a form more amenable to his views on conjecture and refutation, and incorporates it into his philosophy, subtitling his volume "An Evolutionary Approach", with evolution conceived in this modified form. His main criticism is reformulated as follows:

> Quite apart from evolutionary philosophies, the trouble about evolutionary theory is its tautological, or almost tautological character: the difficulty is that Darwinism and natural selection, though extremely important, explain

> evolution by 'the survival of the fittest' (a term due to Herbert Spencer). Yet there does not seem to be much difference, if any, between the assertion 'those that survive are the fittest' and the tautology 'those that survive are those that survive'. For we have, I am afraid, no other criteria of fitness than actual survival, so that we conclude from the fact that some organisms have survived that they were the fittest, or those best adapted to the conditions of life. (pp.241-242)

Popper modifies the concept of evolution to make it more consistent with his own philosophy of conjectures and refutations, restating it in terms of trial and error in the course of an organism's "problem solving" relation to its environment. Trials correspond in a sense to conjectures and natural selection acts as an "error-elimination" mechanism, ie a sort of refutation for faulty conjectures. This Popperian philosophy of evolution is represented by him as follows, with P standing for a problem, TS a trial solution, and EE for error-elimination:



Given a problem P1, various organisms of a specific species may try various test solutions, TSi, which by error- elimination lead to, not a final solution, but some new problem P2 and the continuation of the process. In this form, the theory can be applied not only to the evolution of species (where the error-elimination mechanism is the classic one of the death of the individual), but to problems in individual development as well, where the error-elimination mechanism is the rejection via feed-back of behavior unsuitable to a goal of the organism.

In The Self and Its Brain (1977), Popper accepts evolution through natural selection as an important hypothesis of organic evolution, and extends the use of the term evolution to the pre-organic level of atoms and molecules (physical evolution) and to the super-organic level of the products of mind (cultural evolution). Along with the correlative concept of emergence, evolution is dealt with within the framework of the three world-theory (cf next section). However, Popper is still wary of granting natural selection a truly scientific character, and considers it to be a "metaphysical conjecture" or what he calls in his autobiography Unended Quest (1974), a "metaphysical research program" (p.167).

Popper's appreciation of evolution as a scientific hypothesis underwent a major development in his 1977 Darwin lecture at Darwin College, Cambridge. In that article "Natural Selection and the Emergence of Mind" (1977), he makes a self-criticism for his previous views, and accepts natural selection as a scientific hypothesis, one which can be tested and not only can be refuted, but has already (in part) been refuted.

The key to the modification of Popper's position is his recognition, somewhat belatedly, that in Darwinian theory, natural selection is not the only proposed mechanism of evolutionary change, so that its status is not universal and hence non-scientific or metaphysical. Not all changes in species are due to its operation, and he gives as a counter-example those changes in the color of bird feathers due to the operation of sexual and not natural selection. He therefore holds that natural selection, if formulated in a universal way, is testable, with negative results: "If formulated in this sweeping way, the theory is not only refutable, but actually refuted." (p.345)

In conclusion, he says that natural selection can be formulated as a scientific theory and function as a scientific research program:

> The theory of natural selection may be so formulated that it is far from tautological. In this case it is not only testable, but it turns out to be not strictly true. There seems to be exceptions, as with so many biological theories, and considering the random character of the variations on which natural selection operates, the occurrence of exceptions is not surprising. Thus not all phenomena of evolution are explained by natural selection alone. Yet in every particular case, it is a challenging research program to show how far natural selection can possibly be held responsible for the evolution of a particular organ or behavioral program. (p.346)

Concept of Emergence

Along with the rehabilitation of evolutionary theory, in particular natural selection, first as a metaphysical, then as a scientific research program, Popper accepts emergentism as an expression of the creativity of evolution. For example, in Objective Knowledge, Popper distinguishes between the original problem P1 and the problem P2 that arises at the end of the problem solving cycle; the second problem may and often does involve the emergence of novelty:

> The theory here proposed distinguishes between P1 and P2, and it shows that the problems (or the problem situations) which the organism is trying to deal with are often new, and arise themselves as products of the evolution. The theory gives implicitly a rational account of what has been usually called by the somewhat dubious names of 'creative evolution' or 'emergent evolution'. (p.244)

In The Self and Its Brain he says that the idea of evolution "refers to the fact that in the course of evolution new things and events occur, with unexpected and indeed unpredictable properties; things and events that are new, more or less in the sense in which a great work of art may be described as new." (p.22)

Popper's emergentism is opposed to deterministic, atomistic and dispositionalist views - views that argue that no novelty can appear because everything is predetermined, that novelty is merely a re-arrangement of existing parts, or that novelty is just the actualization of potentialities implicitly present at an earlier stage of an entity's development. Popper argues, contra determinism, that quantum mechanics has jettisoned the determinism of classical mechanics and injected the idea of objective probabilities into the new concept of indeterminism. Atomism is held to have been abandoned with the advent of quantum mechanics and the discovery of sub-atomic particles. Further, the objective probabilistic view of modern science also replaces the earlier dispositonalist view, and asserts that the emergence of new entities changes the probabilities of the occurence of events.

As a result of emergence, new levels of reality appear and a hierarchical structure results. Popper argues that not only do lower levels cause higher levels (the principle of upward causation), but also that higher levels can act upon and direct the lower ones through downward causation. Indeed, once emergence has occurred, downward causation is the key process. The levels of reality interact, and any level is open to causal influence from both lower and higher levels. According to Popper, it is the fundamental indeterminism of the physical universe that permits this, and that in a completely deterministic world no interaction would occur.

In "Natural Selection and the Emergence of Mind" he further says that randomness plays an important role in the mechanism of downward causation by which a higher level controls a lower one:

> I suggest that downward causation can sometimes at least be explained by selection operating on the randomly fluctuating elementary particles. The randomness of the movement of the elementary particles - often called 'molecular chaos' - provides, as it were, the opening for the higher level structure to interfere. A random movement is accepted when it fits into the higher level structure, otherwise it is rejected. (p.348)

In "Natural Selection and the Emergence of Mind" Popper recognizes four chief levels of emergence: (1) the emergence of atomic nuclei and molecules, including organic ones; (2) the emergence of life; (3) the emergence of conscious states; and (4) the emergence of the products of mind (pp. 342-343) He also identifies four stages in the emergence of consciousness: (1) the warning stage when pain or discomfort first appeared, (2) a stage where imagined or vicarious trial and error replaces real trial and error, (3) the stage of conscious aims, and (4) the stage of language and the critical attitude towards one's own hypotheses. Natural selection is said to favor organisms which develop through these stages.

Interaction and Pluralism

Prior to the mid 1960s, Popper's writings were concerned with scientific method and the philosophy of physics, and little was written on the philosophy of mind, with the notable exception of "Language and the Body-Mind Problem: A Restatement of Interactionism" (1953) and the follow-up "A Note on the Body-Mind Problem" (1955) Here Popper gives an indication of the interactionist and non-monistic views he would later develop in great length in his three world theory. In these papers he argues that the non-translatability of the physical and mental languages is an indication of the distinct substantial status of mind and body.

It was with the articles "Epistemology Without a Knowing Subject" (1967) and "On the Theory of Objective Mind" (1968) that Popper developed his views on what the called the three world theory. Here Popper not only accepts the dualism of mind and body as constituting two distinct substances or "worlds" in his terminology, he also includes a third world made up of the objective contents of thought, distinct from the second world of mind and the first world of matter. This new position, a radical extension of his 1953-55 views on interactionist dualism, is an almost complete reversal of his negative appraisal of Plato and Hegel expressed in The Open Society and Its Enemies (1945), though he recognizes an even greater influence of Bolzano and Frege. As he states in Objective Knowledge:

> Thus what I call the 'third world' has admittedly much in common with Plato's theory of Forms or Ideas, and therefore also with Hegel's Objective Spirit, though my theory differs radically in some decisive arguments, from Plato's and Hegel's. It has more in common still with Bolzano's theory of a universe of propositions in themselves and of truths in themselves, though it differs from Bolzano's also. My third world resembles most closely the universe of Frege's objective contents of thought. (p.106)

In order to illustrate the distinction between the 2nd and 3rd worlds; Popper distinguishes between knowledge in the subjective sense, which is part of the 2nd world, "consisting of a state of mind or of consciousness or a disposition to behave or to react" (p.108), and knowledge in the objective sense, "consisting of problems, theories, and arguments as such"(p.109), and part of the third world. Second world subjective knowledge makes explicit reference to an epistemological subject, third world objective knowledge is "totally independent of anybody's claim to know... it is knowledge without a knowing subject." (p.109). In his 1968 article, he defines the third world as "the world of intelligibles, or of ideas in the objective sense; it is the world of possible objects of thought: the world of theories in themselves, and their logical relations; of arguments in themselves; and of problem situations in themselves" (p.154).

An important question is the relationship between and among the three worlds. Popper holds at this point that the first world can interact with the second, and the second with the third; while the third cannot directly interact with the first or vice-versa, but only indirectly through the mediation of the second. Moreover, the third world, is simultaneously a natural product of minds and a supernatural order transcending its origin:

> I suggest that it is possible to accept the reality or (as it may be called) the autonomy of the third world, and at the same time to admit that the third world originates as a product of

> human activity. One can even admit that the third world is man- made and, in a very clear sense, supernatural at the same time. It transcends its makers.(p.159)

The third world is transcendent because it deals with possible or virtual contents rather than actual objects of thought, and an infinity of them at that. Thus, natural numbers are a creation of mind in the second world, but since there are an infinity of them, along with the relationships between and among them, they also transcend their origin, and become autonomous in the third world. In the same way, the solving of a problem never before solved is in a certain sense the discovery of its solution by a second world mind 'grasping' the solution in the third world.

In his contribution to The Self and its Brain Popper changes his terminology to talk of worlds 1, 2 and 3. He also says that world 3 objects can be embodied in world 1 objects (ie a sculpture, its form a world 3 object, is embodied in granite, a world 1 object), though some world 3 objects (such as numbers and mathematical theories) are not so embodied.

As concerns the mind-body problem, two interactions are of importance: that of the mind in world2 with the brain in world1, and that of the mind with the product of mind in world3. The mind-brain interaction is seen as one where the mind or self is principal. The "owner of the brain", mind programs the brain just like a computer is programmed, and is said to pilot or animate it.

> I have called this section "The Self and Its Brain" because I intend to suggest that the brain is owned by the self, rather than the other way around. The self is almost always active. The activity of selves is, I suggest, the only genuine activity that we know. The active psycho-physical self is the active programmer to the brain (which is the computer), it is the executant whose instrument is the brain. The mind is, as Plato said, the pilot. It is not, as David Hume and William James suggested, the sum total, the bundle, or the stream of its experiences: this suggest passivity.(p.120)

The world2 - world3 action is also important in defining the self, for not only does in interact with the brain, but it also orients itself with respect to theories and problems, it is "anchored in world 3":

> What characterizes the self (as opposed to the elctrochemical processes of the brain on which the self largely depends - a dependence which seems far from one sided), is that all our experiences are closely related and integrated; not only with past experiences, but also with our changing programs for action, our expectations, and our theories - with our models of the physical and the cultural environment, past, present and future, including the problems which they raise for our evaluations, and for our programs for action. But all these belong, at least in part, to world 3. (pp. 146-147)

Resume ch.2

This resume to chapter two will deal with the interactions, similarities and differences between and among Lloyd Morgan, Broad, Sellars, McDougall, and Bunge, Sperry and Popper.

Lloyd Morgan is the key figure in the development of evolutionary emergentism, though Alexander had a role to play in taking up the emergentist concept and reinforcing Morgan's standpoint, while at least Spaulding and Sellars also developed emergentist ideas in the late 1910s. Morgan's 1915 article can be said to have set out the key element of evolutionary emergentist philosophy for the first time, subsequently developed in his Gifford Lectures of 1922-23.

The evolutionary theorists dealt with in chapter one influenced Morgan in different areas and to different extents. Insofar as organic evolution is concerned, Morgan tried to synthesize in his concept of organic selection the Darwinian factor of natural selection with a modified version of Lamarckian acquired characteristics as help-mates.

Lloyd Morgan, adopting Huxley's terminology of neuroses and psychoses, but not his epiphenomenalist philosophy, refined the latter concept and distinguished between hypo-psychoses (submerged feelings not in consciousness) and psychoses proper (feelings that have emerged into consciousness). Mind was considered as the sum-total of the two. Following Bastian, he argued in his writings of the 1880s that the whole body is the organ of mind.

After considering the relative merits of materialism and idealism, he opted for a solution of the neutral monist type, as in Romanes' philosophy, with psychoses and neuroses merged in identity, concomitant aspects of the substance of being. This would be a constant feature of Lloyd Morgan's philosophy.

Lloyd Morgan also addressed himself to Wallace's problem, the choice between a supernatural origin of mind or the view that all matter is conscious, and rejected the dilemma involved. He introduced an evolutionary aspect to his neutral monist concept of mind with the notion that associated to every form of molecular motion, or kinesis, there is a concomitant metakinetic aspect of a psychic, but not necessarily conscious character. Only after the kinetic process has reached the degree of complexity of the human brain does the metakinetic manifestation assume the form of human consciousness or mind. In other writings of this period he also introduced the ideas of infra-consciousness and sub-consciousness as pre-conscious meta-kinetic forms, and combined them in his idea of the wave of consciousness.

In his philosophy of evolution of the 1890s, Lloyd Morgan incorporated the Spencerian notion of the differentiation of the relatively homogeneous substance into two products which then interact to form a new and more complex unit. He continued to characterize his views as monistic and naturalistic as well, but allowed for supernaturalism in the non-scientific sphere of religion.

Lloyd Morgan returned to the problem of novelty in the 1910s, prodded by the recently published work of Bergson on creative evolution. Previously, in his concept of selective synthesis in evolution, he had considered qualitative changes as apparent breaches of continuity. After the mid 1910s, he fully accepted the existence of such novelty, and he recuperated Lewes' distinction between emergents and resultants to describe it, situating such emergents in the evolutionary context. In his philosophy of the 1920s, he argued that resultants provide quantitative continuity which underly the novelty introduced by emergence, with this latter considered as a qualitative change in direction of a continuous evolutionary process.

The end-result of Lloyd Morgan's 50 years of writing on the subject was a philosophy of evolutionary emergentism, with three dimensions of reality being distinguished: the levels of matter, life and mind; the concomitant aspects of the psychic and the physical at each level; and the nisus towards deity which was the driving force of advance from level to level. In his philosophy of mind, the process of emergence of the mind from the pre-mental was added to the neutral monist ontology he had long defended.

The main problem with Lloyd Morgan's system is the triple use of the term 'mind' to denote the quality or level emergent from brain, the concomitant aspect of the physical at all levels of reality, and the supernatural activity which is posited as the source of evolution and emergence. The double aspect theory of the physical and psychical, which goes back to Lloyd Morgan's writings of the 1880s, was maintained even after the emergentist theory was developed in the mid 1910s. But at that point, it is no longer needed, and an emergentist materialist, rather than an emergentist neutralist point of view has the advantage of logical simplicity, as Sellars and others came to see. Similarly, the idea of the coexistence of the natural in science and the supernatural in religion can be said to involve an unecessary complication to a monistic point of view.

C. D. Broad approached the problem of emergentism from the point of view of the mechanism/teleology debate. In this, he followed the lead of Bergson, who also situated creative novelty as an alternative to mechanism and teleology; ~~but~~ Broad rejects teleology more clearly, and adopts an emergentist concept similar to that developed by Lloyd Morgan.

His classification of possible solutions to the mind-brain problem is the most complicated of all the authors examined in this thesis - with 17 different options identified. Of these, Broad opts for emergentist materialism as his preference on the basis of considerations based on science, especially chemistry. But he then moves to the compound theory, a form of dualism where he admits the para-psychological phenomena of limited persistence of mind after death.

Roy Wood Sellars combines epistemological dualism (the non-identity of the object and the subject of knowledge) with ontological monism (the common reference of mind and brain to the organism). His double knowledge approach to the mind/body problem sees mind as that which is known by introspection, brain that which is known by observation and experiment. To this is added the notion that mind emerges from brain.

Sellars initially defended a naturalist, as distinct from a materialist point of view; he criticized materialism for its atomistic and mechanistic tenets. As his thinking evolved, he adopted materialism, but of a new, or emergentist type. The key concepts of Sellars's overall philosophy were thus naturalism, emergence and materialism.

William McDougall was the foremost critic of emergentist philosophy in the 1920s, and the only one to devote a full-length book to the examination of it. He argued that neither evolution nor a fortiori emergence occured at the inorganic level; and that mind did not emerge from matter or from a pre-mental complex, but was an independently existing and distinct substance that evolves through the differentiation of its faculties. He did, however, admit emergentist qualities at the level of the products of mind (intellectual creations or human institutions).

McDougall held a dualist view of the mind-body problem. In his earlier writings, he based himself on the facts and theories of neuro-psychology and tried to show how dualism was consistent with science. His view of the mind-brain based on the analogy with electro- magnetic interaction had certain affinities with what were later called emergentist and holistic views. But in his later writings, reference to neuro-psychology gave way to preference for para-psychology, especially telepathy, an important shift in methodology.

With both Broad and McDougall, there is a shift from neuro- to para-psychology, and it is here argued, a deterioration of their philosophy. Broad's emergentist materialism seems to me to be superior in quality to his compound theory, and McDougall's earlier mind-body dualism with the electro-magentic analogy of the 1901-1905 period seems more interesting than his animistic dualism of 1915 on.

During the period from the mid 1910s to the mid 1930s many other authors advanced versions of emergentist philosophy, including Spaulding, Boodin, Conger, Alexander, Reiser and Mead. Panel discussions on emergentism were held in 1926 at the VIth World Congress of Philosophy, and at a meeting of the Aristotlian Society that same year. The 1920s seem to have been the period of the flowering of emergentism, with the greatest production of systems of philosophy based on or including that concept.

The subsequent period up to the later 1950s saw a considerable reduction in the production of systems of and new views on emergentism, though the concept of the level structure appears in the work of numerous biologists (such as Needham, Woodger, Novikoff and von Bertalanffy), and in the work of the philosophers James Feibleman and Nicolai Hartmann.

It is from the later 1950s to date that a renewed interest in emergentism has developed. The article of P.E. Meehl and W. Sellars did much to reintroduce the concept of emergentism into the mainstream of philosophy, as did the essay of Nagel. More importantly, emergentism was incorporated into the ontological theories and views on the mind/body problem defended by such authors as Mario Bunge, Roger Sperry and Karl Popper.

Mario Bunge has examined the problems of level structure of reality and the emergence of novelty since 1960 at least. He has analyzed these concepts using the tools of mathematical logic and set theory to formulate exact elucidations of them. He has also situated ontological emergentism in the context of epistemological reductionism, and argued for a combination of real emergence and moderate reductionism.

Bunge has combined these analytic achievements with a synthetic sweep to develop a system of philosophy based on systemism, emergentism and materialism. The only other author examined in this thesis to develop such a broad system is Spencer. Bunge's system differs from Spencer's in the rejection of any claims by religion, the use of mathematical and logical methods, and the more restricted role that the concept of evolution plays in his system.

Bunge's view on the mind/brain problem are part of his emergentist materialist ontology - mental states are states of the brain, with properties emergent relative to the cellular components of the central nervous system, and which interact with other nervous and bodily states. Mental states are thus a particularly distinguised subset of brain states, which are themselves a subset of the bodily states of an organism.

However, an objection can be made to the current level structure proposed by Bunge insofar as it does not include mind as a distinct level, and it will be argued in the conclusion that it would be better to maintain mind as an autonomous level rather merge it into the biological level.

Roger Sperry, since the middle and later 1960s, has argued for what he calls the "modified concept of mind", introducing an emergentist and holistic view to replace the behavioristic and reductionist views he favored in the early 1950s. Mind is held to be an emergent property of certain high level brain states, which, having emerged, then assume a position of command over the brain. Sperry styles his views as mentalistic as opposed to materialistic and monistic as opposed to dualistic. The holistic aspect is what seems to explain his preference for mentalism and the downward control of mind over brain.

Karl Popper has also become interested in evolution and emergence in the mid 1960s. He reconsidered evolution in the light of his conjecture and refutation hypothesis, with variations as analogous to conjectures and selection as analogous to refutation. The model also applied to individual development in a trial-and- error view of behavioral change and problem-solving. Popper also, though somewhat belatedly, came to recognize that evolution is more than a metaphysical research project and acknowledged it as a scientific one as well.

At the same time, Popper admitted emergent properties in an evolutionary context, with the stages of matter, life, consciousness and the products of mind being identified. Emergence was also applied to mental development, with the stages of pain and pleasure, vicarious trial and error problem solving, conscious aims and finally critical thought being recognized.

Parallel to this Popper developed a pluralistic ontology, including the three worlds of matter, mind and culture, with relations of interaction between the first and second, and the second and third. However, it seems that the evolutionary emergentist views that Popper defends are independent of his pluralistic ontology, and this latter seems to be superfluous once an emergentist view is adopted, since emergentism already provides for the qualitative novelty which the three worlds are supposed to introduce.

The new questions brought up in the above discussion are (1) What is the relation between evolution and emergence? (2) What is the relation between emergence and reduction? and (3) What are the levels in an emergentist view of reality? These questions will be examined in the general conclusion, along with the questions raised at the end of the conclusion to chapter one.

Conclusion

This conclusion will deal with the following questions: (1) the factors and scope of evolution, (2) the concept of evolutionary emergentism, (3) the level structure of reality and (4) the mind/brain problem.

It can be seen that there was considerable controversy among the 19th Century English evolutionists as to the factors of evolution. Darwin argued for a multi-factor theory, and was supported by Romanes, while Wallace and the neo-Darwinians argued for a single-factor theory where natural selection was not only the chief, but the sole factor of organic evolution.

Though it is not my intent in this conclusion to decide for or against any particular factor of organic evolution (this can only be done in biology, not in philosophy), an examination of the Darwin-Wallace controversy does lead me to conclude in favor of a multi-factor theory. The problem is that a single factor theory is unlikely, (and, it would seem, unable) to explain all types and cases of evolution. Committment to a single-factor theory as in Wallace's theory leads one to abandon the naturalist framework once that single factor fails to apply to a specific case. Appeal to the supernatural as a definitive solution cannot but put an end to scientific inquiry. But in a multi-factor theory, what is inexplicable by one natural factor of evolution may be explicable at a later date by another, presently unknown one.

A second question in evolutionary theory is the scope of evolution. Does it apply only to organic life, or is it a general process applicable in all domains of reality? Here the views of Spencer seem to lead the way, the idea that evolution sweeps through the inorganic, organic and super-organic. Though the specific factors responsable for evolution in these (and possibly other) domains may vary, a universal concept of evolution has the advantage of bringing the diverse forms of systematic change under a common head. The evidence for the universality of evolution comes from biology and from other scientific disciplines as well, where evolution of non-biological entities (physical and social for example) is accepted.

In the general sense used in this thesis, evolution plays a role in ontogeny (the philosophical theory of becoming), similar to the role substance plays in ontology (the philosophic theory of being). Change is not chaotic, though it may sometimes be random. Change manifests a certain order characterized by increased complexity of organisation and related to this increased complexity of modes of activity.

The complementary concept of dissolution or regress in complexity of organisation and activity is also accepted. Up to now it would seem that evolution has dominated over dissolution, according to the 'big bang' theory of the origin and expansion of the universe. However, no necessary progress is assumed, and a period of overall dissolution as hypothesized in the theory of the contraction of the universe into a 'big crunch' is also possible.

Closely linked to the question of evolution is that of emergence: whether qualitative novelty appears at certain levels of complexity of organisation during the course of evolution. The strongest argument for emergence is that is a middle path between the extremes of mechanism and teleology (cf Bergson and Broad in particular for this argument). Mechanism posits the notion of evolution proceeding by mechanical processes only, like the working of the gears of a huge machine whose next state is causally determined by the preceding one. Teleology sees evolution as the working out of a giant plan where the future goal causally determines the present state. Both squeeze out novelty, mechanism by the push of the past, teleology by the pull of the future, and both imply a designer of the plan or machine, a designer which is outside of the evolving universe.

The concept of evolutionary emergentism was originally due to Lloyd Morgan (though he himself borrows ideas for his synthesis from earlier writers and was not the only one working on that line of thought in the mid 1910s). It has been taken up, with myriad individual differences, by other authors, some of whom, like Broad and Bunge, have analyzed and even formalized it. From what has preceded in the examination of these diverse views on a common theme, the following can be designated as the common core theses of evolutionary emergentism as a trend in philosophy:

(1) The universality of evolution: This thesis includes the propositions that (i) there is an evolutionary process that runs throughout all of nature – inorganic, organic, social and other domains; (ii) evolution itself is a multi-factor process, with possibly different factors or mixes of factors dominating in different domains; (iii) evolution is creative of novelty in the form of new entities, properties and relations; (iv) evolution is a continuous process, with major novelties marking points of change of direction, not gaps in the process.

(2) The level structure of reality: This thesis includes the propositions that (i) reality is composed of entities which can be arranged in levels that are distinct and irreducible; (ii) higher levels include some things, properties or relations which do not occur in lower levels; (iii) higher levels depend on the lower levels for their raw material; (iv) entities at different levels can interact, either directly or indirectly.

(3) The part/whole relationship: This thesis includes the propositions that (i) some wholes have properties that none of their parts possess; (ii) in these cases, the novel properties of the whole cannot be predicted on the basis of the sole knowledge of the properties of the parts; (iii) the

properties of the whole can be explained in terms of those of the parts and some other assumptions not derivable from propositions about the properties of the parts; (iv) wholes can be studied as autonomous structures, as well as analyzed into their parts or situated in a synthetic context of further wholes of which they themselves may be parts.

The concept of the level structure of reality has given rise to debate over the number and type of substances involved, and the number, type, and order of the levels. These are the key questions that are examined in this part of the conclusion: (1) as concerns substance- (i) are the objects comprising the various levels parts of one or more substances? and (ii) what is the nature of the substance or substances involved? (2) as concerns the ~~levels~~- (i) is there a lowest level and if so, is it matter or does matter emerge from a still lower level? (ii) is there a highest level, and if so is it mind, society or deity? and (iii) what is the order of the intermediate levels?

To the question of the number of substances, there are three possible answers: monism, dualism or pluralism. Substance monism asserts the proposition that there is only one substance in the universe (its nature as yet unspecified), dualism asserts the existence of two (their nature and type of relation as yet unspecified), while pluralism extends the reasoning of dualism to three substances (triplism) or more, up to and including a possible infinity of substances.

The advantage of monism is that of simplicity and the avoidance of the problem of the nature of interaction between different substances; its disadvantage (at least in its eliminative or reductionist forms) is the danger of denying the autonomy or existence of qualitatively different properties. On the other hand, the advantage of dualism and pluralism is the recognition of qualitatively distinct properties, but their main disadvantage is the vexed problem of how totally different substances interact.

Emergentism of a monistic type combines the best of both worlds - the advantages of monism with only one substance recognized, and the advantage of pluralism with the recognition of different levels of reality and the multiplicity of properties. In this sense, it is a bit like having one's cake and eating it too. As a result, attempts such as Popper's to combine evolutionary emergentism with substance pluralism seem unecessary, as the latter proposition can be eliminated in favor of the former.

Turning now to the content of the monistic point of view, three possibilities can again be distinguished - materialism, neutralism and idealism. Materialism is the view that everything, mind included, is made up of matter (or matter in motion, in the more traditional formulation); idealism holds that everything, the brain included, is made up of spirit; while neutralism occupies an intermediate position, holding that ultimate reality, though one substance, is neither material nor spiritual, but a neutral stuff of which both matter and mind are aspects.

One alternative can be ruled out of court at this point – that of ontological idealism. For in a philosophy based on science, the existence of material objects independent of our ideas of them is a basic assumption. A hitherto unknown biological species or astronomical object is discovered, not invented. It is an unecessary complication to argue that everything is in reality a transcendent, divine or supernatural idea or spirit.

That leaves materialism and neutralism. The advantage of neutralism is that it is intermediate between materialism and idealism. It has been a compromise or middle of the road position between these two extremes for many of the philosophers dealt with in this thesis (Romanes, Lloyd Morgan, Alexander, Roy Sellars in the 1920s, and others). Its disadvantage is the mysterious nature of the neutral substance it posits as underlying mind and matter – all that we known about it and can learn about it is that it is neither material, nor mental. Knowledge reaches an arbitrary and unjustified limit.

The strongest argument for materialism is that physics (of the large and the small) has accepted matter as the most basic type of existence, even if the forms of matter today recognized by astrophysics and microphysics differ radically from the atomistic and mechanistic conceptions of the past. In the past neutralism, idealism, dualism and pluralism have criticized, and to a large extent with justification, atomistic and mechanistic forms of materialism for their elimination of the richness of reality. But an emergent materialism, as advocated by Broad in 1926, Sellars from the 1940s on, and Bunge today, appears to circumvent that objection.

An acceptance of materialism as an ontology answers the question of what is the first level of reality- matter. This level can be subdivided into the sub-levels of the physical and the chemical. The argument that chemical compounds have emergent properties over their atomic components does not necessarily mean that the atomic and molecular form two distinct levels, since processes of emergence may occur within a level as well as between them. It seems to me preferable to designate matter (in general) as the first level of reality, since the difference between the atomic and the molecular does not appear as great as that between inanimate matter and living matter, or life, the next level.

Turning now to the problem of the highest level, I would argue that it is not deity. Deity must be interpreted in a religious sense as non-material, and the acceptance of the level of deity leads to a dualistic ontology, to be rejected for the reasons mentioned above. The choice for highest level is between that of society and that of mind.

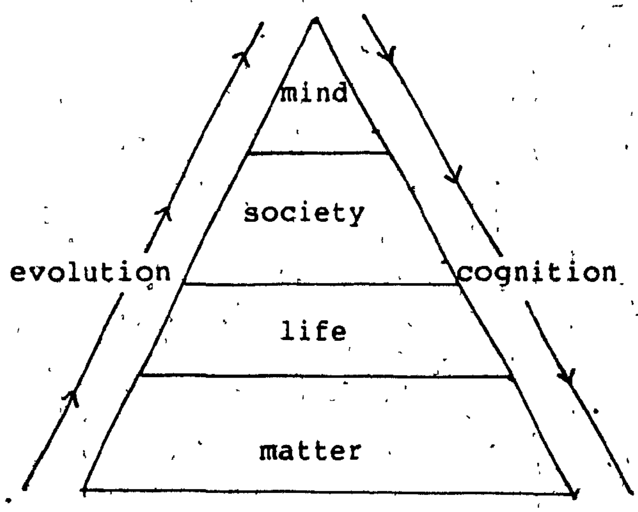
An argument for society as a level higher than mind is that society is a collection of minded individuals. However, referring here to Mead's argument, it can also be said, and with greater force, that social organisation is a condition for the emergence of mind.

A further argument is that there are social animals which cannot be said to have minds - among the invertebrates, the ants, bees and other social insects, where behavior can be explained on strictly bio-chemical and reflex grounds. At the same time, all minded animals are parts of social entities and social intercourse has been shown to be essential for the proper development of mind.

It appears important to recognize mind as a distinct level, made up of minded individuals which are socially organized. The mind-body problem has traditionally been a key philosophic problem, and its solution the basis for ontological conclusions. Incorporating mind into the biological level, though not necessarily reductive or eliminative in character, could tend to diminish the significance of the concept.

I would solve the problem by concluding that mind is the highest level of reality, and by situating society as the immediately preceding level from which mind, in conjunction with the nervous system from the vital level, has emerged.

The intermediate levels of the structure of reality now follow. Life is emergent from matter at the stage of complexes of organic molecules. Society is emergent from life both from the vertebrates in general and in some cases from the invertebrates, but not from plants or lower forms of life. The pyramid of the level structure of reality I argue for would then look like this:



Two basic processes run through this "pyramid". The first process is that of evolution, which is the overall form of change of complexity of organisation and activity. (Its complement is that of dissolution, and the accompanying submergence as opposed to emergence of levels). The second process is that of cognition, which is a unique capacity of mind, by which entities at the highest level get to understand both their own level and those below it.

Higher levels emerge from lower levels in the course of evolution and may submerge or fall back into them through dissolution. At the same time, cognition may reduce higher levels to lower ones, or situate lower ones in a more general context through integration (referring here to Bunge's concepts of reduction and integration in the epistemic sense.)

In a certain way, the level-structure of reality postulated in this conclusion, with matter at the base and mind at the apex, and the associated processes of evolution and cognition, harks back to Huxley's desideratum of the combination of ontological materialism and epistemological idealism. The ontology is that of emergentist materialism, according to which all levels arise from the lowest material one by evolution and the associated process of emergence. The epistemology is "idealist" in the sense that knowledge of this is possible only through mind and its acts of cognition. Whereas in ontology one starts from the lowest level, that of matter, in epistemology, the point of departure is the highest level, that of mind.

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