

AN ABSTRACT OF THE THESIS OF

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Jean Baptiste Lamarck (1744-1829) is considered here in the context of the Enlightenment effort to develop a science of man. His Philosophie zoologique (1809) and the Système analytique (1820) are the two principal relevant works examined in depth to discover how he meant to base a science of man on his biologie. A central problem to the formation of a science of man was to account scientifically for the soul. The fate of the soul is investigated in this study not only to shed light on the meaning of Enlightenment but above all to understand that union of philosophe and naturaliste by which Lamarck characterized himself.

Descartes' attempt to formulate a purely materialistic science of man, notwithstanding the classical split he made between body and soul, foreshadowed an important naturalistic current in the 18th century of which Lamarck was a brilliant exponent. Descartes' divine soul was dropped completely; consequently a most important role was given to a material soul, which, under the influence of Newton's physics, assimilated forces. The debate over the nature of this material soul involved such physiological issues as sensibility,

irritability, and the production of feeling and thought from animal organization. Lamarck intended his evolutionary biology to supply a natural history of the soul, and to provide a convincing proof for the argument that the physique and the moral, "two orders of phenomena apparently so distinct," had a common basis of organization.

Lamarck epitomized the evolution of life as a progressive interiorization of certain material forces or subtle fluids from the environment into, and correlative with a progressive elaboration of, animal organization. The chief subtle fluids involved were heat (or caloric) and electricity, and they acted like forces in causing the motions of the organs essential to life. In addition, these subtle fluids were apparently endowed with a vital soul although Lamarck does not explicitly admit it. In man, at least, the subtle fluids undoubtedly amount to an unconscious inner man or traditional soul. While an analysis of Lamarck's ideas enables one to characterize him as a vitalist--in spite of his professed mechanicism--it is necessary to study the intellectual climate of his day in order to understand the significance of that vitalism.

In one way Lamarck's vitalism is a return to ancient Greek and Ionian ideas, a continuation of the Renaissance, which of course the Enlightenment was. Lamarck's vitalism was also a brilliant, even if not popular, solution to the problem of providing a scientific account of the natural origin of the soul. A successful solution would have been an invaluable victory for science, which was bidding against the Church for greater authority. In another way, Lamarck's vitalism points up the failure of mechanistic thinking

in some central biological problems, for, as Diderot saw, mechanism itself gives rise at its limits to vitalism. If natural science would not adopt vitalist thinking, it would not adopt Lamarck's approach to understanding life and man; the problem of the soul would have to be quietly ignored, at least until experimental approaches had become more sophisticated. Into this vacuum moved such human sciences as psychology, and out of this ignorance rose a Romantic awareness.

Lamarck's Approach to an Understanding of Man

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PROLOGUE

Socrates: I must try to tell how it is that a living being is called both mortal and immortal. The soul, in its totality, has charge of all that is souless. It traverses the entire heaven, appearing sometimes in one form, sometimes in another. When it is perfect and fully winged, it soars on high and it is responsible for all order in the universe; but if it loses its wings, it is carried down until it can fasten on something solid...

--Plato (Phaedrus)

LAMARCK'S APPROACH TO AN UNDERSTANDING OF MAN

I. INTRODUCTION

Convinced that in all things the truth is good, even important to know, I desired to devote myself to its research, at least of those truths which it would be possible for me to attain, and to attach myself principally to the most general ones, all others thereon being dependent.--Lamarck, Système analytique

Jean-Baptiste-Pierre-Antoine de Monet de Lamarck was born at Bazentin in northern France on August 1st, 1744. He died at the age of 85 in 1829.¹ Lamarck was destined by his father for the Church, but in 1760 at age 16 he joined the army. After an injury ruined his military career, Lamarck turned to scientific studies. Ten years later he classified the plants of France and produced his very successful Flore française (1778) which paved the way into the Academy of Sciences in 1779 at age 35.

For several years Lamarck held a botanical position at the Jardin du roi. In 1793, with the revolutionary fervor spreading through France, the Jardin du roi was reorganized into the Muséum d'histoire naturelle. Two chairs in zoology were created and Lamarck was appointed to the one responsible for the invertebrate animals. Lamarck taught courses and pursued the classification and comparative anatomy of this vast group of creatures eventually publishing the famous Histoire naturelle des animaux sans vertèbres in several volumes between 1815 and 1822.

While his expertise lay in botany and zoology, he published in geology (Hydrogéologie, 1802), in meteorology (Annuaire météorologique, 1800-1812), in chemistry (Réfutation de la théorie pneumatique, 1796), and in physics (Recherches sur les causes des principaux faits physiques, 1794). Of course the breadth of his

¹ for more complete accounts of Lamarck's life and works see: Marcel Landrieu, Lamarck, le fondateur du transformisme, Paris, 1909; Alpheus S Packard, Lamarck, the founder of evolution: his life and work, New York, 1901; Leslie J Burlingame, "Lamarck," Dictionary of scientific biography, C C Gillispie (ed.), New York, 1972

interests and knowledge was important for the form his thoughts finally took--not only for their evolutionary cast but as well for the very conceptualization of biology.² At the age of 65 in 1809 he published the Philosophie zoologique which was a concise but comprehensive account of his view of biological principles, in which man receives a conspicuous amount of attention. This work was an expansion of the earlier and shorter Recherches sur l'organisation des corps vivans (1802). Lamarck was one of the first to use the word "biology" and formulate its principles.³ Six years later, in 1815, the Histoire naturelle des animaux sans vertèbres began to appear, and finally in 1820 when he was 76 the Système analytique des connaissances positives de l'homme, a concluding epitome of his work, which Szyfman has called his chant de cigne.⁴ During his career Lamarck also published numerous articles in scientific journals.⁵ It is not clear how much influence Lamarck had on the science of his day. His works are notorious for the

² see Leslie J Burlingame, "Lamarck's theory of transformism in the context of his views of nature," PhD dissertation, Cornell Univ., 1973, for an exhaustive look at Lamarck's works showing how they conspire toward an evolutionary thinking. See also: Charles C Gillispie, "The formation of Lamarck's evolutionary theory," Archives internationales d'histoire des sciences, 9:323-338, 1956; Richard W Burkhardt, Jr., The spirit of system, Harvard, 1977.

³ see Brigitte Hoppe, "Le concept de biologie chez G R Treviranus," Colloque international "Lamarck", Joseph Schiller (ed.), Paris, 1971, p.199: "On sait depuis longtemps qu'à la même époque et la même année, 1802, Lamarck et Gottfried Reinhold Treviranus ont créé le terme Biologie. En 1935 Gunther Schmid fait remarquer que Karl Friedrich Burdach, médecin à Leipzig, qui a enseigné plus tard à Dorpat et à Königsberg, avait introduit ce concept deux ans auparavant."

⁴ Leon Szyfman, "Méthodologie de J-B Lamarck," in Colloque international "Lamarck", op. cit.

⁵ see for example Richard W Burkhardt, Jr., The spirit of system, op. cit., for a bibliography of Lamarck's publications.

silence with which they were received.⁶ This fact, however, detracts none from the insight his thinking offers the historian into the intellectual issues of the period.

It is striking and intriguing how important was the study of man in Lamarck's later works. While this could indicate merely a philosophical interest of Lamarck's, it could also indicate, as I had suspected, that man posed a particularly important or difficult problem for his formulation of biology. Actually both of these apply in this case. Bearing in mind the great expectations Lamarck had for the victories of scientific explanation--as did so many of his Enlightened contemporaries and predecessors--one may appreciate the appeal and the challenge of developing a science of man, for man was a whole solar system, as it were, whose secrets had not yet seen their Newton. Furthermore, man was nature's crowning production, and thus a highlight of any biology-to-be. Yet the path to a biology and a science of man was not straight and clear. A host of delicate and important problems lurked in the space between natural philosophy and philosophy proper where man was to be found.

In Lamarck's time of the French Enlightenment, one of the more serious and delicate issues was the strained and uncertain relation between a science trying to gain ground in society and the already well-established Church. Did science have the better claim to the truth about human nature, or did the Church? The understanding of the soul was a central and contested territory; it was populated with difficult and delicate problems for both scientists and theologians. The prevailing attitude among the philosophes was clear: truth lay in geometrical reasoning about matter and its properties, supported by observation. In this context Lamarck affords the opportunity for a case study of the way an active and imaginative naturaliste-philosophe resolved the problem of the soul, essence of the problem of man, as we shall see.

⁶ see Richard Burkhardt, "Lamarck, evolution, and the politics of science," J. hist. biol., 3:275-298, 1970, and The spirit of system, op. cit.

Since this is an historical study a constant effort is made to show the connections between Lamarck's thinking and the intellectual currents of his day. The scientific revolution (about 1300-1700) was revolutionary because it changed what was believed to be the nature of man and the nature of the world: and for this reason it was a religious--as well as scientific--revolution. A new physical but also conceptual universe was unveiled along new intellectual horizons. One of the central aspects of a religion is its account of the nature of man, and the nature of the world; another aspect is its account of how man should act and what his goals in life must be. Copernicus (1473-1543) upset the Christian view of the world in which God and earth were central by making the earth a mere planet, with the sun at the center of the universe. Giordano Bruno (1548-1600) went even further making the sun but one star in an infinite space. It was one thing to declare such convictions, but it was another to change one's whole life to reflect them, as the philosophes sought to do. The philosophes were religiously involved in science. During the Enlightenment in France they promulgated the new truths of a scientific view and strove to reformulate the goals of man, the nature of man, and the structure of society. They were not all scientists like scientists today, although some specialized in science more than others: what all philosophes shared in common was above all an interest in the advancement of science in every way...in education, politics, knowledge, ethics, and so on. It is no wonder they clashed with traditional Christian doctrine. Lamarck, specializing in natural history, called himself a naturaliste-philosophe; he sympathized with and participated in the philosophe movement. Historians of science have tended to concentrate on Lamarck as a specialist in natural history, owing in large part to his dramatic evolutionary theory: one does this, however, at the price of misunderstanding Lamarck by removing him from the totality of his historical context. Lamarck was not just a naturalist. A study of his approach to man exposes in its complexity the knot which tied the naturaliste to the philosophe.

Mechanistic biology, animistic biology, and philosophy converged at the end of the 18th century in the formulation of positivistic science of which Lamarck's Philosophie zoologique and his Système analytique des connaissances positives de l'homme aspired to be resonant expressions. Uniting these three confluent currents from the Enlightenment effort to advance science on all fronts was the problem and challenge of building a complete science of man. It is in this light that the present study focusses on the two just-mentioned works of Lamarck. Since man turned out under Enlightenment and positivistic examination to be no simple machine but rather something far more complex, we are faced with the task of trying to understand what they understood by man. This is an immense task, of course; I have therefore selected the soul as a central thread in the Enlightenment discussion of man and as a rallying point for the discourse of this dissertation.

Lamarck brought to a science of man an imaginative and broadly based contribution. His effort went in the direction of founding a science of man on a science of biology: one had to study all forms of life in order to better understand man, he insisted.⁷ His evolutionary theory sustained his position. Lamarck's treatment of the soul was based first of all on an analysis of animal organization; in particular it was both an evolutionary and physiological theory of the nervous system. His imaginative and sweeping way discovered a link between the nervous system and certain active forces of nature abundant in the environment, and put all this in the perspective of evolutionary time. Nature was a most essential idea in Lamarck's thinking. One finds oneself constantly returning in his writings to this central concept. Underlying and unifying his thought, this rich

⁷ "Le mérite essentiel de Lamarck est d'avoir posé dans son ensemble le problème de la vie en situant l'homme parmi les autres productions de la nature. La biologie de Lamarck est science de l'homme en même temps que science de la nature, l'homme se trouvant mis à sa place par une intelligence qui ne dédaigne aucun des êtres vivants." Georges Gusdorf, Introduction aux sciences humaines, Paris, 1960, p.312

concept tells that he was a great thinker of the Enlightenment. His approach to man is inseparable from and part of his approach to nature.

In Lamarck's Nature there are synthesized that admixture of Cartesian, Newtonian and Leibnizian elements which were characteristic of the French Enlightenment, hearkening back of course to classical Greek ideas reintroduced into the European conscience during the Renaissance.⁸ Lamarck appears to be both vitalist and mechanist. A devout mechanist, he carried mechanism to a limit in the understanding of man, whereupon his vitalism bloomed. His Nature is alive with active forces or subtle fluids which unite the living and the non-living, the spiritual and the material, and which give rise to creative organizing and also destructive processes. Through the relation he draws between nature and man--where mechanism yields to vitalism--one may glimpse the germination of that Romantic consciousness (expressed by Maine de Biran (1766-1824), for example) which was beginning to eclipse Enlightened Reason--but not materialistic science--by the start of the 19th century.⁹ Lamarck's man was ruled not by intelligence or a rational will but by an interiorized power of nature--the sentiment intérieur, which he claimed to have discovered. The nature of man was the nature in man...nature herself, spontaneous, active, creative, and destructive. Giordano Bruno's insight from the Renaissance may remind us how far the secularization (religious revolution) was substantiated to reach the expression Lamarck gave it:

⁸ an excellent study of this aspect of the Enlightenment may be found in Aram Vartanian, Descartes and Diderot, Princeton, 1953.

⁹ "Romanticism stood primarily for a religious interpretation of the universe, which would make man's interests central in the cosmos." The Romantics were "driven on to a fresh analysis of human experience and a new interpretation of the very nature of religion that would not identify it with a set of pseudo-scientific propositions that could not even maintain themselves in the light of scientific 'reason'." J H Randall, Jr., The career of philosophy, Columbia Univ. Press, New York and London, 1965, vol. II, p.332

God is not an external intelligence rolling around and leading around; it is more worthy for him to be the internal principle of motion, which is his own nature, his own appearance, his own soul than that as many entities as live in his bosom should have motion.¹⁰

Although Lamarck disclaimed the scientific merit of the âme or soul, it is evident, I have concluded, that the concept of an immortal, rational, and motive soul, far from being banished from his scientific theories was actually deeply embedded in them, especially in his concept of man, but also in his notions of nature and life, in a way that is reminiscent of the ancient physis and psyche.¹¹ The soul typically had this kind of fate in Enlightenment biological thinking. Lamarck, however, has taken that Greek play which was the Enlightenment to its climax by his firmly welding together the soul and nature: to a breaking point, indeed, begging as it does for a Romantic dénouement.

¹⁰ quoted by Ernst Cassirer, The philosophy of the Enlightenment, Fritz C A Koeblin and James P Pettegrove (trans.), Boston, 1955, p.41

¹¹ see William Ellis, The idea of the soul in western philosophy and science, London, 1940

II. LAMARCK'S ENLIGHTENED ORIENTATION

The only knowledge that it is possible for us to acquire is and always will be confined to what we have derived from a continued study of nature's laws; beyond nature all is bewilderment and delusion: such is my belief.--Lamarck, Zoological philosophy

Nature and Enlightenment

Nature--that rational order of things--was the world seen through the window of the Enlightenment, framed by Reason. One had to be Enlightened to conceive of such a nature, and in return, nature would be somehow reasonable, intelligible, and, of course, mechanistic. What more could one ask for than nature's congenial response to Newton's Enlightened overture? It was like a proof that nature was rational and mechanistic; as Gusdorf writes, "the Newtonian synthesis proposes in effect, to the admiration of contemporaries, the cosmological triumph of the mechanistic intelligibility."¹²

The Enlightenment idea of nature implied a mechanically operating world and demanded a mechanistic approach in science. This situation derived principally from achievements in physics and astronomy summed up in the Newtonian triumph. Yet life was still an enigma to a mechanistic world view, and man with his soul was the arch-riddle. Would living things follow the parade of mechanistic intelligibility? To say that life was still an enigma is something of a paradox of hindsight: one is roused to ask whether life was even conceivable under mechanistic intelligibility.¹³ Now Lamarck, at least, was one who brought his mechanistic thinking to bear on the problem of understanding life. Life as a concept definitely occurred to him in spite of his mechanistic thinking--yet it cost him that very mechanicism which was so dear.

¹² Georges Gusdorf, op. cit., p.105. Translations in the text are by the author unless otherwise noted.

¹³ Michel Foucault, in The order of things, New York, 1971, addresses this question.

Whether or not life was a current concept in the Enlightenment, it was undoubtedly a germinating concept at that time. The distinction between the inanimate and the animate kingdoms was an important one during the Enlightenment in competition against theories like the one of Charles Bonnet (1720-1793), who unified the two kingdoms (and even included angels) in one grand scala naturae.¹⁴ Lamarck early on made a clear distinction between the inanimate and animate; a radical difference between these ruled out the possibility that the inanimate could give rise to the animate. But later he perceived a relation between the two kingdoms--and it was that very possibility of the direct production of life from non-life which he had earlier denied.¹⁵ While such an idea of the origin of life logically entailed the idea of a series of species arranged according to their progressive transformation in order to account for the myriad of complex animals, it would be a mistake to think with Foucault that Lamarck was therein reverting to time-worn ways of thought which a new biology was superseding.¹⁶ While the scala naturae was indeed a beast of burdens from the past, Lamarck was nevertheless able to bend it to a new thinking. One must not be fooled by the mechanistic guise of Lamarck's later vitalism. Indeed, Lamarck's early position --far from being so avant-garde, as Foucault suggests--was no more than naive animism compared to the complex idea of life he later developed.

The distinction between the inanimate and animate kingdoms set the stage for the birth of biology as a science of living things distinct from physics and astronomy: it meant that biology was not

¹⁴ see Joseph Schiller, "Queries, answers and unsolved problems in 18th-century biology," Hist. sci., 12:184-199, 1974

¹⁵ see Richard Burkhardt, Spirit of system, chpt. II, for a discussion of the division of nature's productions into kingdoms; also Michel Foucault, op. cit., p.232

¹⁶ Michel Foucault, ibid., p.230-231. For a study of the scala naturae, see Arthur O Lovejoy, The great chain of being, Cambridge, Mass., 1936.

simply a physics of living bodies.¹⁷ At the same time, this distinction invited endless comparisons between physics and biology and suggested numerous leading questions, especially since physics had already proved itself in Newton's spectacular synthesis. Physics was therefore a source of inspiration and in many ways a paradigm for biology.¹⁸ Such questions as the following arose: What was the cause of motion in living things? Were living things made out of the same matter as non-living things? Was the gravitational force significant in living matter? Did life obey the same laws of physics that inanimate bodies obeyed? and so forth.

While scientists like Lamarck wished to further the success of (the Newtonian) mechanistic intelligibility by extending it into the biological world, yet at the same time they desired to define the difference between the living and the non-living, between biology and physics. Lamarck considered it his personal triumph that he characterized the nature of life in mechanistic terms (his Newtonian dream). As we shall see--testimony to the supremacy of historic preconceptions--his dream swayed him so strongly that it obscured from his vision the great distance he had in fact traversed from mechanistic physics toward a vitalistic biology.

Lamarck's Nature

As a naturalist Lamarck was interested in nature. Nature was more than just living things. For him nature was a structure, an order of all things, both living and non-living things. Nature was a power ordering matter according to laws, "matter being the unique

¹⁷ see: Joseph Schiller, loc. cit.; Jacques Roger, Les sciences de la vie dans la pensée française du xviii^e siècle, Paris, 1963

¹⁸ see Thomas S Hall, "Biological analogs of Newtonian paradigms," Philosophy of science, 35, 1968

and exclusive realm of nature."¹⁹ The world consisted of only matter and forces: that is, matter and the nature of matter. Nature's forces were absolute, blind, and relentless, bound to unchanging laws; nature "has been compelled to follow a constant order."²⁰ The soul of church doctrine ostensibly did not belong in nature, nor did final causes.

God might have created the world in the very beginning, but it was the laws of nature, not God, which carried out an orderly development of things. Man's only relation to extra- or super-natural things was that he could contemplate or imagine them. Man had the choice to use his intelligence for living either in harmony or else in discord with nature.²¹ Lamarck laments the price of ignorance and the misery of living in discord with nature.²² There is a strong moralistic and even religious flavor to his exhortation to study nature and learn how to live in harmony:

Now, if created matter is the exclusive domain of nature...if, finally, the human body is entirely subject to nature, like the other bodies, and if everything which belongs to the body as well as what derives from it is equally subject to nature, and subject in particular to those of nature's laws which rule the body's developments, its changes of state, the phenomena of its organization, its inner feeling, its penchants, the direction of the thoughts which it executes; of what importance for man must not be, therefore, the study or the knowledge of this same

¹⁹ J-B Lamarck, Système analytique des connaissances positives de l'homme, Paris, 1820, p.97--hereafter referred to as Système

²⁰ Système, p.98

²¹ As Bourdier pointed out (in "L'homme selon Lamarck," Colloque international "Lamarck", op. cit., p.137-159), according to Lamarck human judgment can err, "heureuse erreur qui prouve que la pensée n'est pas entièrement soumise aux lois de la nature, puisqu'elle peut les contredire." Among all living things man stood in a unique relation to nature. It is essential to press Lamarck for more precision. Did man have an extra-natural power? How does nature rule over man's will--his free will? Bourdier has jumped too fast to his conclusion. Clearly a thorough analysis is called for, and to this the present study is devoted.

²² see for example Système, p.154-155, in a footnote

nature on which he is so dependent!"²³

The study of nature has become for man, writes Lamarck, "an absolute necessity in his actual state of civilization."²⁴ The moralistes failed to elucidate the source of human actions because they did not study sufficiently the subject of nature; Lamarck claims that he himself can provide what they wanted, and, in a later chapter, we shall examine the account of human actions he offers. The point to bear in mind is that Lamarck definitely envisaged natural science as the key to a correct philosophy and ethics. The path to the future lay through the wide open field of biology.

When Lamarck turned to the subject of life he always had the notion of a nature greater than life in the background, that nature of the great puissances. There was the torrent of time, inexorable circumstance, and the great creativity of nature.²⁵ He had a lively sense of the forceful physical entities called electricity, magnetism, heat and attraction. The three great powers together with the forceful subtle fluids ruled the world--and ruled man. And behind his concept of biology as the study of life stood his concept of a physics of the earth, which should include, wrote Lamarck in 1802, "three essential parts, the first being a theory of the atmosphere, or meteorology, the second being a theory of the earth's external crust, or hydrogeology, and the third, a theory of living organisms, or biology."²⁶

For Lamarck, all things dead or living, organic or inorganic, were under the same law, all governed by a single nature. Through the agency of forces the law transforms its subjects according to

²³ Système, p.83. This passage raises a question: if man is so totally subjected to the power of nature how can man hope to exercise his will and modify his behavior? Just what and how much control does man have over himself? Lamarck resolves these apparent contradictions. As we shall see in a later chapter, the power man has in his will is none other than the very power of nature.

²⁴ ibid.

²⁵ see Jean-Paul Aron, "Les circonstances et le plan de la nature chez Lamarck," Revue générale des sciences pures et appliquées, 64: 243-250, 1957

²⁶ Lamarck, Hydrogeology, A V Carozzi (trans.), Urbana, Ill., 1964, p.18

their inner composition and their environment or conditions. The diversity of things in the world, therefore, is due not to the operation of diverse laws but to an original creation of manifold matter.²⁷

The animate (or organic) and the inanimate (or inorganic) kingdoms represented two basic different conditions under which the law operated, not two separate worlds each with its own law. He denied that the animate kingdom was ruled by a unique vital force:²⁸

"for my part," wrote Lamarck,

I see in both cases only a single force which is endlessly constructive (composant) in the one order of things and destructive (décomposant) in the other.²⁹

While complex or organic compounds are constantly decomposing "to give to their constituent principles the liberty and the natural qualities of which they were deprived in the state of combination," living things are constantly replenishing the supply by synthesizing organic compounds from simpler materials in the environment.

Lamarck maintained that his approach was new and that hitherto savants

had observed that the results of the laws of nature in living bodies were quite different from those produced in lifeless bodies, and they attributed the curious facts observed in the former to special laws, although in reality they are only due to the difference of the conditions between those bodies and in bodies destitute of life. They did not see that the nature of living bodies, that is, the state and order of things which produce life in them, give to the laws which regulate them a special direction, strength and properties that they cannot have in lifeless bodies; so that, by their omission to reflect that one and the same cause necessarily has varied effects when it acts upon objects of different nature and in different conditions, they have adopted for the explanation of the observed facts a

²⁷ J-B Lamarck, Zoological philosophy, Hugh Eliot (trans.), New York and London, 1963, p.249--hereafter referred to as PZ

²⁸ In contrast to Lamarck one may mention Marie Xavier Bichat (1771-1802) who characterized life as the sum of forces opposing death.

²⁹ PZ, p.251

route altogether opposite from what they ought to have followed.³⁰

Nature was thus a dynamic order of things:

there continually reigns throughout the whole of nature a mighty activity, a succession of movements and transformations of all kinds, which nothing could arrest or annihilate, unless it be the power which has made all things exist.³¹

The central unitary force behind all the activity was, according to Lamarck, a fire-like principle--the light of the Enlightenment as it were.³² All animal faculties take their origin in this light:

A celebrated scientist (Lavoisier, Chimie, tome I, p.202) has said with reason that God, in making light, spread over the earth the organizational principle of feeling and thought. Light, which is known to be the progenitor of heat, together with this heat, which has correctly been regarded as the mother of all generation, have spread there at least the principle of organization and feeling; and since the latter gives rise to thought, entailed by various impressions on the thinking organ, due to interior objects which, by means of the senses, engrave ideas, you will apprehend in these bases the origin of all animal faculties.³³

³⁰ PZ, p.249. Once again one may cite Richat to illustrate the opposite of Lamarck's approach: "When we consider, on one side, the phenomena which are the object of the physical sciences, and, on the other, those that are the object of the physiological, we see how immense is the space that separates their nature and their essence. But this difference arises from that which exists between the laws of the one and the other." (Quoted in Thomas S Hall, Ideas of life and matter, 2 vols, Chicago and London, 1969, vol. II, p.126)

³¹ PZ, p.183

³² This has inspired Gillispie to characterize Lamarck as the Heraclitos of the Enlightenment. See C C Gillispie, "The formation of Lamarck's evolutionary theory," Arch. int. hist. sci., 9:323-338, 1956. As for Heraclitos: "The pure cosmic fire was probably identified by Heraclitos with aither, the brilliant fiery stuff which fills the shining sky and surrounds the world: this aither was widely regarded both as divine and as a place of souls...Heraclitos' fire--the purest and brightest sort, that is, as of the aetherial and divine thunderbolt--has a directive capacity...Thus it is naturally conceived as the very constituent of things which actively determines their structure and behavior--which ensures not only the opposition of opposites, but also their unity through 'strife'." G S Kirk and J E Raven, The presocratic philosophers, Cambridge, 1957, p.22

³³ J-B Lamarck, Recherches sur l'organisation des corps vivans, Paris, 1802, p.102 --hereafter referred to as Corps vivans

Lamarck's mechanistic vision

If there is a dominant feeling which comes across the various and many pages Lamarck has written it is his sense of mechanical dynamism and vitality. One discovers in Lamarck's thinking a creative tension between his sense of mechanical dynamism on the one hand and vital dynamism on the other. At times these two seem happily to merge, at other times they seem incompatible. One does not have to see here a weakness in his thought, for this intellectual or conceptual dynamism was surely the mirror which held the image of that dynamic life in nature which Lamarck sought to define and express in words without killing.

Solids and moving fluids: these were the one and the other of dynamic existence, in the earth's crust as in living beings.

It is to the influence of the movements of various fluids in the more or less solid substances of our earth that we must attribute the formation, temporary preservation, and reproduction of all the transformations incessantly undergone by the remains of these bodies.³⁴

These various fluids included ponderable ones like water and imponderable ones like heat and electricity, the so-called subtle fluids. His idea of fluid was married to his idea of force, activity and transformation. The earth is in constant flux, owing to the running waters and the ocean, which by an

imperceptibly slow process...divides, destroys, and constantly invades one side of the continents...on the other side the ocean continuously descends, abandoning land areas after having elevated them into new continents to be destroyed one day by its return.³⁵

The simplest living things arise in gelatinous solids by the action of subtle fluids and water, one exciting the other into vital activity, causing to circulate fluids, air, nutrients, heat. "Life," writes Lamarck,

³⁴ PZ, p.249

³⁵ J-B Lamarck, Hydrogeology, op. cit., p.50

when studied in living bodies is exclusively due to the relations existing between the three following objects: the parts of the body adapted for containing liquids, the contained liquids moving in them, and the exciting cause of such movements and changes as are carried out.³⁶

For Lamarck the constructive and destructive activities proceeding in a living thing consisted of the movements of fluids and the reactions of supple parts. Drawing the comparison--mechanistic par excellence--between an organism and a clock, Lamarck says that the fluids and supple parts correspond to the cogs and wheels; and corresponding to the clock's spring, which keeps the cogs and wheels turning, is the exciting cause.³⁷ This exciting cause is in effect a vital force but only under certain material conditions; it is a destructive force ("which more or less rapidly destroys all existing compounds") under all other conditions.³⁸ In a clock the spring has to be wound up, but the spring of life is ever active; nature is a ceaseless activity.

As a mechanistically thinking scientist, making the comparison between clocks and organisms, Lamarck was aware that the exciting cause of vital movements must be separate from the parts that move, for according to mechanistic principles motion can be communicated but not created. An animal does not move itself, therefore; something stimulates it to move. Here, of course, Lamarck comes up against an old problem: what, then, stimulates it to move? Now Lamarck was quite unwilling to refer beyond nature for the exciting cause; it was the last thing he wanted to do. Indeed, he chides the ancient philosophers who

³⁶ PZ, p.201

³⁷ PZ, p.201-202

³⁸ PZ, p.253. Note that although Lamarck insists that there is only one force, he does characterize this force when it operates in living bodies as a vital force, as if to imply that there are actually two forces. But he decidedly does not mean a vital force as opposed to a physical force; he refers to the result of the force--i.e., vitality, synthetic activities, functions--not to its essence. For similar ideas of vital force see T S Hall, op. cit., vol.II, and also Everett Mendelsohn, "Physical models and physiological concepts in 19th-century biology," Brit. j. hist. sci., 2:203-219, 1965.

felt the necessity for a special exciting cause of organic movements; but not having sufficiently studied nature, they sought it beyond her; they imagined a vital principle, a perishable soul for animals, and even attributed the same to plants; thus in place of positive knowledge, which they could not attain from want of observation, they created mere words to which are attached only vague and unreal ideas.³⁹

As for Lamarck, his nature was full of various fluids which could play the role of exciting cause. The spring, that source of vital activity, has eluded researchers, he says; "I believe, however, that I shall be able to describe it."⁴⁰ He continues:

It would doubtless be impossible to ascertain the exciting cause of organic movement if the subtle, invisible, uncontainable, incessantly moving fluids which constitute it were not disclosed to us in a great variety of circumstances; if we had not proofs that the whole environment in which all living bodies dwell are permanently filled with them; lastly, if we did not know positively that these invisible fluids penetrate more or less easily the masses of all these bodies and stay in them for a longer or shorter time; and that some of them are in a constant state of agitation and expansion, from which they derive the faculty of distending the parts in which they are insinuated, of rarefying the special fluids of the the living bodies that they penetrate, and of communicating to the soft parts of these same bodies, an erethism or special tension which they retain so long as their condition is favorable to it.

But it is well known that the question at issue is not insoluble; for no part of the earth inhabited by living beings is destitute of caloric (even in the coldest regions), of electricity, of magnetic fluid, etc. These fluids, some of which are expansive and the others agitated in various ways, are incessantly undergoing more or less regular displacements, renewals or replacements and perhaps in the case of some of them there may be a genuine circulation.

We do not yet know how numerous may be these subtle invisible fluids which are distributed in constant agitation throughout the environment. But we do perceive in the clearest manner that these invisible fluids penetrate every organized body and there accumulate for a longer or shorter period. They thus stimulate movements and life, when they come in contact with an order of things permitting of such results.⁴¹

³⁹ PZ, p.211-212

⁴⁰ PZ, p.206

⁴¹ PZ, p.212-213

Perhaps one can now see more clearly the unifying principle in Lamarck's vision of the world. Fundamentally the world was a machine. To him this meant there was only one law--the law of machines. Wherever he looked he saw the solid parts of machines and the fluids which made them move. The many ponderable and subtle fluids were embodied forces which produced the various marvels of nature depending on which parts they moved and which conditions they performed their work under. Given water, air, and gelatinous parts, for example, the subtle fluids caloric and electricity could work to produce life.

Caloric is the first cause of life in that it produces and maintains orgasme; it is an "invisible, penetrating, expansive, ever active fluid that percolates slowly through the supple parts, distending them and making them irritable." As they heat up, the supple parts distend while the fluids become more active and motile. The electric substance is the second cause of life, also a subtle fluid. It arouses in the course of its movements through the body the nervous stimuli to the active part of life. Caloric prepares for activity, electricity stimulates it.⁴²

The preparedness for action, called orgasme, is the most primitive state of vitality. Since orgasme is maintained by a steady-state interaction of fluids and parts under the influence of caloric, any disruption causes movement, or a contraction, to be more specific.⁴³ This property of contracting is a general property of all living parts, according to Lamarck, and of simple living things since it requires no special organ--it is called irritability.

Albrecht von Haller (1708-1777) originally used the term irritability in a more restricted sense, referring uniquely to the power

⁴² PZ, p.216-217

⁴³ M J S Hodge, in "Lamarck's science of living bodies," Brit. j. hist. sci., 5:323-350, 1971, on p.346, assimilates Lamarck's scheme to Buffon's and sees in caloric a repulsive force; the contraction occurs therefore because of an attractive (i.e.gravitational) force. Lavoisier also regarded caloric as an effective force of repulsion, counterpart to attraction.

of muscle fibers to contract upon stimulation. Following von Haller's work there arose a debate over the primacy of sensibility versus irritability and the precise meaning of the terms.⁴⁴ Lamarck, although enlarging the scope of irritability, still distinguishes between sensibility and irritability. He objects to Cabanis' (1757-1808) confusing them under the single term sensibility.⁴⁵ To attribute sensibility to all living parts would surely have meant to Lamarck admitting a vital soul. By reserving sensibility for the nervous system alone, Lamarck circumvents the soul and gives himself a whole system of parts and fluids with which to explain sensibility mechanistically. We have yet to examine how successful he was.

If we adopt Schiller's scheme with its two main streams of vitalism in 18th-century France, then Lamarck falls into the "vitalism of the naturalists" which took a materialistic turn by its identification with Haller's irritability.⁴⁶ The other stream of vitalism was associated with the Montpellier school of medicine. The "modified metaphysical entity" by which Schiller characterizes the latter we may identify with that soul-like amalgamation of irritability and sensibility which Lamarck disclaimed.

⁴⁴ see T S Hall, op. cit., vol. I, p.398

⁴⁵ PZ, p.228. Raymond Lenoir, in "Lamarck," Monist, 34:187-235, 1924, points out that Cabanis, Condillac, and Destutt de Tracy (prominent figures in idéologie at the turn of the century--more of them in a later chapter) all three contended, "that to live and to feel is all one, and that feeling is a fact common to all animals. They have maintained this theory, acquired from physiologists like le Gallois and Richerand, only through neglecting any consideration of organization, and the final studies of Haller which set up a distinction between sensibility and irritability."

⁴⁶ J Schiller, "Queries, answers and unsolved problems in 18th-century biology," Hist. sci., 12:184-199, 1974

III. GENESIS OF BIOLOGY: FROM ANIMISM AND MECHANISM TO VITALISM

We regard all knowledge as beautiful and valuable, but one kind more so than another, either in virtue of its accuracy, or because it relates to higher and more wonderful things. On both these counts it is reasonable to regard the inquiry concerning the soul as of the first importance. Moreover this investigation seems likely to make a substantial contribution to the whole body of truth, and particularly to the study of nature; for the soul is in a sense the principle of animal life.

--Aristotle, On the soul

The philosophes address the living/non-living dichotomy

A useful perspective for this study is to view the 18th-century Enlightenment as a large-scale attempt to apply to nature and man the principles and methods emerging triumphantly from the 16th and 17th centuries' scientific revolution in mathematical physics and astronomy.⁴⁷ The term "Enlightenment" derives from the light of a newly discovered truth which lit up the world--the truth revealed through observation and mathematical reason: grossly, the scientific truth. Isaac Newton (1642-1727) had brought to a head the revolution in physics and astronomy, but no one had yet done the equivalent for the life sciences. It was many a man's dream to be the Newton of biology. Were the laws which governed life different from Newton's laws which governed the cosmos? Was nature one, her laws universal? What were the laws of nature which governed man, asked doctors, scientists, and philosophes, and what ought to be the governing laws of society? Biology and the human sciences were born from such questions

⁴⁷ Many scholars have emphasized this aspect of the Enlightenment. See for example, Ernst Cassirer, op. cit.; Georges Gusdorf, op. cit.

in the Enlightenment.⁴⁸

The sophisticated specialization and compartmentalization of science which we witness today had hardly begun in the 18th century; but during the first half of the 19th century this process developed in a spectacular way. As we use the term today, a "scientist" is someone who has chosen a particular "field" of study, be it botany, paleobotany, protein chemistry, or what have you. The scientist in this sense was not typical of the 18th century. The term "natural philosophy" was commonly used instead of science, and the French philosophes, who practised it, were men of culture usually well versed in several of a broad spectrum of subjects including mathematics, physics, natural history, ethics, and letters, among others. All philosophes did not have exactly the same interests, of course; they were a diverse group, and some were more "scientific" than others. The philosophes were the flesh and blood of the Enlightenment...bridges

⁴⁸ Michel Foucault maintains (op. cit.) that at the end of the Enlightenment there was an episteme shift: the episteme of the Classical Age went out (it reigned from about 1650 to 1800) and the modern era began. According to Foucault, biology and the human sciences were not possible under the Classical Age episteme. Their birth was laborious, to be sure, and not sudden. His archaeology seems to have become cloudy from all the dust he has blown off to reveal the depths ...but then he does not pretend to have done a complete excavation. Since he provides no transition--no mechanism of episteme change--we shall proceed to study in the transitional figure of Lamarck the birth of biology and a science of man despite his warning, viz.: "Historians want to write histories of biology in the 18th century; but they do not realize that biology did not exist then, and that the pattern of knowledge which has been familiar to us for a hundred and fifty years is not valid for a previous period. And that, if biology was unknown, there was a very simple reason for it: that life itself did not exist. All that existed was living beings, which were viewed through a grid of knowledge constituted by natural history." (Ibid., p.127). One may contend that the episteme actually has its existence in the surface phenomena, although it appears to exist below them. The surface phenomena--the events of recorded history--constitute the means by which an episteme must change. The episteme does not supplant the surface phenomena...nor is it more important than them: it is an entity only to help explain them. Here, we shall let the surface phenomena speak for themselves.

between science and society, between physics and a science of life and man. They were in a position to evaluate--and exhort or stave--the invasion or cross-fertilization of one subject by another. What could theology offer to science? they demanded. What could mechanics offer a study of living processes--and what would then happen to the soul?

According to Schiller, "vitalism emerged as a doctrine in the second half of the 18th century as a reaction against mechanism."⁴⁹ This reaction stemmed from a persuasion that the laws of mechanics were not sufficient for an explanation of the phenomena of life. As the philosophe, Pierre Louis Moreau de Maupertuis (1698-1759), influenced by Leibniz (1646-1716), wrote ominously one year after Lamarck's birth,

Never shall the formation of any organized body be explained by only the physical properties of matter; and since Epicurus until Descartes one has only to read the writings of all the philosophers who attempted it in order to be convinced.⁵⁰

It was the awareness of a dichotomy between living and inert phenomena which underlay the need for a distinct science of life.⁵¹ Thus matter which was organized became the subject of a new science of organization, or biology. The major problem for the new science was to uncover the character of the difference between organized and unorganized matter. What was organization, after all? What caused it? How was it maintained? These are questions Lamarck addressed increasingly during his career.

⁴⁹ Joseph Schiller, loc. cit., p.193. See also, Th M Brown, "From mechanism to vitalism in 18th-century English physiology," J. hist. biol., 7:179-216, 1974.

⁵⁰ quoted by Georges Gusdorf, op. cit., p.244

⁵¹ Even behind Charles Bonnet's (1720-1793) great chain of being (scala naturae)--which encompassed everything from inert matter to angels--lay this awareness. One should note that the very purpose of his chain was to span a recognized and glaring gap by resolving it into many tiny gaps across which bridges were much more feasible. The schism, however, did not disappear...or did it? (here is a paradox for Xeno).

In his earlier thinking Lamarck drew a distinct line between the living and the non-living, maintaining that life could never be produced from non-life; but later, around 1800, as he wrestled with the major problem, he found a thread of continuity between them. The subtle fluids, he believed, could generate organization in certain inert materials under certain conditions.⁵² While Lamarck recognized that spontaneous generation required a matter specific to life--gelatinous or mucilaginous starting substances--he emphasized the conditions necessary for life. He was not so much concerned about the differences and similarities between organic and inorganic matter (a subject soon to be elaborated in organic and inorganic chemistry) as he was intrigued by the laws and forces creating and maintaining organization and the related vital functions. He always held that, in the process of becoming organized, bodies developed very different properties from the brute matter of which they consisted. What were these unique properties? he asked of his biology.

The intermingling of animism and mechanism

René Descartes (1596-1650) had dogmatically and decisively avoided this problem involving the two organized and inert matters. His world consisted of only one (inert) matter and motion. The soul was something else apart. He belonged to a different era. It was in part the legacy of his decisive--divisive--position (his mechanistic, dualistic philosophy) against which the philosophes reacted. "Reaction," however, rarely amounts to a clearcut rejection, but more often involves constructive acceptance with criticism: in an important way Descartes in fact provided basic elements which the philosophes would incorporate into the formulation of a science of organization

⁵² see Richard Burkhardt, Spirit of system, pp.53,59,99-103. For Foucault this later phase of Lamarck's thinking was a reversion from an avant-garde modernistic attitude to the Classical one. I cannot see that this is true.

and a science of man.⁵³ His rationalist, geometrical method, his staunch materialism, the spell of his daring hypotheses, and his synthetic, imaginative approach invigorated the thinking to come.

For Descartes the essence of scientific--or rational--explanation was a mechanistic world view: all phenomena happen as a result only of material particles hitting each other--there was no other reasonable way to explain things. His magnificent insistence on common sense is not hard to appreciate. But Newton's dramatic success with esoteric mathematical philosophy posed a serious challenge on top of the problems Descartes ran into. The simplicity and beauty of Newton's mathematical laws were as fascinating as Descartes' logical, common sense.

Descartes' position, that if one wanted to explain the universe rationally one had to start with the hypothesis that all things are machines, met head-on the insoluble problem of explaining man's soul. The problem was mechanistically insoluble, he admitted, for he concluded that the realm of the mind and sensation (realm of the soul) belonged to the realm of God. In that realm things were not made out of material particles...spiritual things occupied no space, they consisted of no matter. For Descartes the universe was not split between organized and unorganized things, but rather between material things (res extensa) and spiritual things (res cogitans).

The idea that animals and man could be treated like machines for the purposes of experimental research was immensely profitable... this was a boon to Cartesian philosophy. Along similar lines William Harvey (1578-1657) likened the heart to a pump--which is generally regarded as a landmark in the history of physiology. Hermann Boerhaave (1668-1738) and Albrecht von Haller (1708-1777), among others, propelled this mechanistic tradition into prosperity. Boerhaave's work on organic fibers and Haller's work on irritability and sensibility provided a cornerstone to 18th-century biological thinking.

⁵³ see Aram Vartanian, op. cit., p.55: "It was, moreover, Cartesian tradition which, by its dominant influence in France up until the 1730's, actually furnished the ingredients essential to the philosophes' scientific naturalism."

But the idea of Descartes' that man had a soul which could not be fathomed by science--a soul descended from God--was hard to swallow for many of the philosophes, such as Lamarck. Not even the soul would withstand the Enlightened sword of reason; it was an obstacle to the progress of science.⁵⁴ Yet, for other philosophes it was hard to swallow the idea that animals were machines with no soul: it was an hypothesis, after all, which had to stand up to observed reality (scientifically speaking); and there was something about living phenomena to which mechanistic science did not do justice.

And here English natural philosophy, Newtonian and Lockeian especially, had much to offer the French philosophes. English philosophe John Locke (1632-1704) had suggested that brute matter itself might think, in contrast to Descartes' contention that thought was the property of a unique soul-substance.⁵⁵ Matter might then contain the soul within it...as a property of matter. More important than Locke's suggestion, Newton's philosophy of attractive forces opened a way to compromise the traditional (and Cartesian) soul with a mechanistic materialism. The relation between gravity and matter bore a tantalizing analogy to the relation between reason and man. It was too easy a step to ignore Newton's warning that the power of attraction was only apparently resident in matter: an actually resident power offered the path to a reinterpretation of the soul, and suggested an alternative to a totalitarian mechanism.⁵⁶ Maupertuis (1698-

⁵⁴ see Aram Vartanian, op. cit., p.28: "the import of scientific naturalism among the philosophes was to consist, not so much in the elaboration and defence of a dogma or doctrine, as in the removal of obstacles to a progressively closer scrutiny of the physical universe of which, generally speaking, man was held to be an intimate, uniform part."

⁵⁵ see J H Brumfitt, The French Enlightenment, Cambridge, Mass., 1973, p.42

⁵⁶ Newton's warning is in a letter to Bentley in 1693: "You sometimes speak of gravity as essential and inherent to matter. Pray do not ascribe that notion to me, for the cause of gravity is what I do not pretend to know and therefore would take more time to consider of it." See The Leibniz-Clarke correspondence, H G Alexander (ed.), Manchester, 1956, p.xix

1759), turning to Leibniz (1646-1716) for inspiration, went so far as to say, "We must enlarge the concept of matter in such a way that it does not exclude the basic facts of consciousness."⁵⁷ A whole dimension for vital forces opened up; they were invited to enter hand in hand with the force of gravity: they entered into matter itself.

Forces and nature: the ensouling of matter

It was precisely this idea of an intrinsically powerful material nature which lay at the core of the thinking of the philosophes (and the case of Lamarck is a prime example). By ensouling matter and dropping Newton's as well as Descartes' accommodations of the Divine (relics of a past era) a new kind of materialism was forged on top of a new concept of nature.⁵⁸ This materialism ought properly be called naturalism. It was of this naturalism that mid 18th-century vitalism arose as an integral part.

Essential to 18th-century biological developments, then, there were the evolving concepts of nature, matter and forces. The idea of force merged with the old concept of matter: matter would now have powers, have soul. While one could not know all the countless influences shaping this evolution, intellectuals still would ask themselves, Is this the most fruitful, most truthful way to go? Perspicacious Leibniz decried Newton's force of attraction as an occult quality, "'tis a chimerical thing, a scholastic occult quality;

⁵⁷ quoted by Ernst Cassirer, op. cit., p.88

⁵⁸ Take the case of Bernard le Boyer de Fontenelle (1657-1757), for example, a most important popularizer of Descartes' philosophy: "From Descartes to Fontenelle, a decisive change has taken place in the evolution of Cartesianism. In Descartes' system considered in its explicit meaning, physics had been subordinated logically to metaphysics and the laws of motion had been deduced, or so it was claimed, from the definition of God. Fontenelle's popularization emancipated itself from both metaphysics and theology. The laws of motion were conceived as properties of matter and made per se the starting point of natural philosophy, without being further related to a cause outside and above nature." Aram Vartanian, op. cit., p.62

but then what does he mean, when he will have the sun to attract the globe of the earth through empty space? Is it God himself who serves as means? But this would be a miracle if ever there was any.⁵⁹

Newton vigorously denied that the gravitational force and other forces were occult qualities; "and their causes only are occult," he insisted.⁶⁰ Notwithstanding Newton's denial, in all appearance forces were indeed occult qualities as long as their causes were not yet discovered. And notwithstanding Leibniz's critique the philosophes embraced the idea of force in order to vitalize matter and create a biology.⁶¹ The properties which Descartes had so clearly perceived to be the distinct, inalienable attributes of the soul were thus taken in the way Newton's attractive force was taken and impregnated in matter. That is not saying it was a simple thing to do. First of all, the soul was no simple entity with well defined attributes, and there was plenty of room for debating which aspects of the soul were truly fundamental and could be actually ascribed to matter.

Matter thus came to possess the power to create organization, and nature thus became a process--the creating of order according to

⁵⁹ in Alexander, loc. cit., p.94

⁶⁰ Newton expressed some anxiety about the reception of his idea of forces because they resembled so closely the occult qualities "the rejection of which had been one of the basic premises of 17th-century natural philosophy." Richard S Westfall, Force in Newton's physics, New York, 1971, p.386. See also E J Dijksterhuis, The mechanization of the world picture, Oxford, 1969, p.489

⁶¹ "It is interesting to see how soon notions, which at one time had been rejected by the greatest physicists as essentially unmechanistic, came to be considered as essential elements of mechanistic science... From the moment Newton's way of thinking began to set its mark on physics, no concept had become more indissolubly bound up with the mechanistic view of nature than that of the force acting at a distance and causing motion. For 18th- and 19th-century materialism it was no longer, as in the 17th century, matter and motion, but matter and force which were the inseparably associated categories considered capable of explaining things." E J Dijksterhuis, ibid., p.490. Lamarck's subtle fluids were, in this context, typical of 18th-century materialism.

rational laws and certain forces. As Diderot (1713-1784) saw and Lamarck described, organized matter becomes disorganized, and from disorganized matter nature again creates organization: "But how should it be that all matter is not one, all living or all dead?" asked Diderot; "Is living matter always living? Is dead matter always and really dead? Does not living matter die? Does not dead matter come to life?"⁶² In naturalism "there intervened between God and the realm of phenomena the notion of a demiurgical Nature, having creative, self-determining powers."⁶³ And what were these powers if they did not constitute the concept of life and soul which the new science of biology was called upon to harbor? As Gusdorf writes; in the Enlightenment,

physical mechanicism does not suffice to account for the reality of life. The biological order puts into action its own specificity, as attests physiological and medical research. Life takes an immanent orientation, a regulation which transcends the purely mathematical interaction of physical forces. But life thus recognized as an intrinsic activity appears armed with certain of the prerogatives reserved until then for the soul or the mind. The materialism of the 18th century is therefore no longer that of the 17th; it is monist, that is to say it stands on the affirmation of a vital unity, in relation to which must be explained the characteristic phenomena of human or animal existence.⁶⁴

The animist-mechanist debate: barrier to a unified science

Before the threshold of the new biology preeminently stood two diverse approaches to understanding life--a Scylla and Charybdis to a unified science. The 18th century is frequently epitomized as a contest between these two rival schools...that is, between animism and mechanism. The term vitalism is unfortunately often confused with animism, so one often sees the animist-mechanist debate

⁶² quoted by T S Hall, op. cit., vol.I, p.57

⁶³ Aram Vartanian, op. cit., p.107

⁶⁴ Georges Gusdorf, op. cit., p.243

referred to as the vitalist-mechanist debate.⁶⁵ Actually the emerging biology in the second half of the 18th century was a *mêlée* of doctrines combining animism and mechanism in many and various proportions, all combinations being vitalistic.

Coming a century earlier, Descartes was, *par excellence*, not a vitalist: instead of combining animism and mechanism he carefully, clearly separated the mechanistic from the animistic portions of his natural philosophy. This dramatic separation between res cogitans and res extensa is for us a stepping stone to understanding the mentality behind the 18th-century debate and Lamarck's position. The philosophes knew very well what Descartes was talking about (clear and logical arguments are persuasive). But the philosophes were also well aware that the soul-body dichotomy begged to be bridged. Descartes, of course, did not create the schism out of the blue... he did not invent those incongruous concepts of soul and machine. But he did express them with an unmatched perspicuity. From the darker parts of the European mind he had brought forth into the bright light of reason certain deeply rooted prejudices. And both Descartes and the philosophes--despite the significant gap of a generation or two--arose from the same cultural background. The germs of mechanism had already been reborn in the Renaissance, and one must not overlook the fact that Christianity was essentially animistic and dualistic. An extended Christian influence lasting over a millennium underlay the fundamental notions Descartes vented and the philosophes bandied. Apparently Descartes had actually tried to break away toward a monistic philosophy but could not carry it off.⁶⁶ He failed so well, however, by stating so clearly the basis of the mediaeval-Christian position which he had tried to transcend, that the philosophes who heard him could not help but be enlightened and

⁶⁵ see for example Storia delle scienze, Nicola Abbagnano (ed.), Torino, 1952, vol.VIII, p.319. T S Hall, op. cit., distinguishes quite carefully between animism and vitalism.

⁶⁶ see Sergio Moravia, Il pensiero degli Idéologues, Firenze, 1974, p.46--henceforth referred to as Pensiero

proceed.

The destructive scope of Descartes' natural philosophy was to banish all extra- or super-natural entities from science.⁶⁷ Although he maintained the soul in its place of prominence which was in keeping with Christian teachings, it is not at all clear how sincerely he meant it. In any case, a sore spot of mechanism was thus laid bare. The médecin-philosophe, Julien Offray de la Mettrie (1709-1751), thought Descartes' intent was obvious: Descartes was actually a rigorous mechanist and his doctrine of the soul was only meant to appease the repressive church, "a ruse of style to make the theologians swallow a poison."⁶⁸

Sergio Moravia has shown that Descartes had sought to achieve a unified science of cosmos, life and man, but could not, however he tried, part with his extreme mechanistic conception of the body that logically entailed an extremely non-mechanical soul to inhabit it and allow it to think.⁶⁹ Those who wanted to carry out Descartes' dream had to materialize and internalize the soul and at the same time mitigate Descartes' mechanistic rigor--in short, they had to vitalize the machine (as Lamarck tried to do). What was involved was that new notion of nature and matter: materializing the soul was tantamount to ensouling matter under such terms as forces, faculties, and powers, while nature became an order of creation and destruction.

It may be somewhat fanciful to speak of "Descartes' dream". One may instead speak of that goal characteristic of science, namely generalization and unity. One did not, after all, have to be a Cartesian to desire a unified science--although Descartes was an important inspiration to French science. On the other hand, all

⁶⁷ "Each of Descartes' explanations (of physiological processes) borrows something from traditionalist physiological theories, but in each case Descartes wields Ockham's razor to strip away excess souls, faculties, forces, innate heats from the corpuscular core of explanation." Th M Brown, "Descartes: physiology," Dictionnaire of scientific biography, C C Gillispie (ed.), New York, 1972.

⁶⁸ quoted by T S Hall, op. cit., vol.II, p.50

⁶⁹ Sergio Moravia, Pensiero, p.46

scientists did not necessarily cherish so highly the goal of a universal science. Those who, like Hermann Boerhaave (1668-1738), kept the soul in its (Cartesian) exile from science, concentrated on the mechanical structures and functions of the body. And there were those who, like Georg Ernst Stahl (1660-1734), contemporary and rival of Boerhaave, underlined the desirability of dualism; a unique soul was indeed responsible for the radical difference between living and non-living machines. Well into the 18th century the medical school at Paris was dominated by the theories of Boerhaave, whereas at Montpellier reigned both Boerhaave and Stahl encouraging there the growth of vitalist thinking and the development of a unified science. The philosophes strove typically in the direction of Descartes' dream. And it is against this background that Lamarck sought above all a general theory for a unified science, in the context of which his biology would naturally take its place.

IV. VITALISM AND THE SOUL

Thought and extension are two properties very distinct one from the other. But could they or could they not be located in the same subject? It is for the examination of the phenomena of nature to teach us what we should think about this.

--Maupertuis, Système de la nature

Beyond dualism toward a unitary concept of man

Man was the central issue in the 18th-century movement to heal the Cartesian wound. This is clear since the question was whether the soul and the body were one or two: and even if the other animals did not, at least man was the creature who did have a soul.⁷⁰ Doctors and physiologists play a most conspicuous role in the 18th-century effervescence of ideas. The stellar rise of French medicine culminating eventually in the 19th-century figure of Claude Bernard (1813-1878) is a sign of an important intellectual growth where man was the center of attention.

In a more general sense as well, man was central in the Enlightenment. The Renaissance is often taken to be the time when man --or a concept of nature with man as its crowning production--became the focal point of minds at the expense of a preoccupation with God (in the mediaeval world view). In this respect the Enlightenment was historically and intellectually continuous with the Renaissance.⁷¹ There was a consuming interest in man as a worldly creature--as a machine--with wondrous flaws and capabilities. Secularism and

⁷⁰ Descartes claimed that only man had a soul; the animals were bête-machines. The question became not so much, what had a soul? as, what was the soul?...with all sorts of answers. The notion of an irrational soul dominated Enlightenment biological thinking and led in due course to that vast and unlightened inner world of the unconscious.

⁷¹ Michel Foucault (op. cit.) contends that at the archaeological level there is a distinct discontinuity between the Renaissance and the Enlightenment. There is beyond a doubt (at some level) some kind of continuity between the Renaissance and the Enlightenment; either Foucault has not found it, or else has neglected to describe it.

materialism were characteristic. As the Baron d'Holbach (1723-1789) wrote, "Our most general goal is to live in a way conforming to Nature and to our own nature."⁷² The concern for happiness in life on earth was paramount, and was, assuredly, a main driving force of science, technology, and the industrial revolution.⁷³

If man was the focus, he was also a point of departure for the greater thinkers. Even if Diderot's thoughts wander over a varied landscape, one would blunder not to recognize that the bedrock was always the meaning and being of man. The French Revolution is testimony to the potent--even volcanic--nature of this deeper stratum. One would miss an essential aspect of the Enlightenment by thinking that the concern for man, for society and for progress was not a preoccupation of the French scientific world. The reorganization of human society was meant to follow rational and scientific lines;

as the moral guide and benefactor of society, the investigator of nature took over a large part of the duties and prerogatives --admittedly with some inconvenience--that had belonged perennially to religion. The deeds of saints, past and present, were relegated to the ignorance and misguided endeavor of an "unenlightened" era.⁷⁴

According to Georges Gusdorf, the core of the thinking of the philosophes-encyclopédistes was their conception of a science of man.⁷⁵ Toward the end of the 18th century the younger generation of philosophes carried on this thinking in what they called idéologie. The idéologues distinguished themselves by going beyond the conceptualization of a science of man to the enactment of a reorganization ushering in the French Revolution and the 19th-century compartmentalization of science.⁷⁶ The French Revolution may be regarded as the

⁷² Paul d'Holbach, Système de la nature, Yvon Belaval (ed.), Hildesheim, 1966, p.xviii

⁷³ see Paul Hazard, European thought in the 18th century, J Lewis May (trans.), London, 1954

⁷⁴ Aram Vartanian, op. cit., p.19

⁷⁵ see Gusdorf, op. cit., chpt. VI

⁷⁶ see Sergio Moravia, Il tramonto dell'illuminismo, Bari, 1968; and La scienza dell'uomo nel settecento, Bari, 1970

culmination of the Enlightenment. Some of the idéologues lost their lives (such as Marie Jean Condorcet (1743-1794) and Antoine Laurent de Lavoisier (1734-1794)); Lamarck played an important role in the reorganization of the Jardin du roi into the Muséum; and the Institut was set up for the diffusion of the Enlightened--and now revolutionized--understanding. Napoleon eventually turned against the idéologues (free thinkers are a threat to a totalitarian policy), nevertheless this Enlightened current survived on into the 19th century rising above the surface here and there as in the physiology of Claude Bernard (1813-1878), pupil of the idéologue François Magendie (1783-1855), and in the Positive Sociology of Auguste Comte (1798-1857).

Behind the developing conception of a new science of man lay experimental and observational discoveries and the idea that man was a great and irreducible reality. The notion that medicine, as a science of man, was a great science--independent of physics--had proponents like Théophile de Bordeu (1722-1776) and Paul Joseph Barthez (1734-1806) at Montpellier, Heironymus Gaub (1705-1780) at Leyden, Pierre Jean Georges Cabanis (1757-1808) at Paris. The widespread sympathy for vitalist thinking amongst philosophes and idéologues points out a common belief that an understanding of life demanded a unique approach beyond mechanism and the confines of Cartesian dualism.

But it was no easy matter to know--in the face of such a great unknown--what would be the most reliable and profitable approach. And so the philosophes endeavored to be open-minded; they threw off their prejudices and they cast away their blinders: they were admirable in their pursuit of truth. Swearing allegiance to no -ism, the vitalists wanted to know life the way life really was...⁷⁷ which meant, in effect, that they relied on observation and reason.

⁷⁷ Take for example Claude Adrien Helvétius (1715-1771), who claimed in De l'esprit (1758) that from the standpoint of natural philosophy the immateriality of the soul was an hypothesis that could not be confirmed or disconfirmed, and the function of the student of natural man was to describe natural processes in natural terms. Alan Charles Kors, d'Holbach's coterie, Princeton, 1976, p.71. See also Georges Gusdorf, op. cit., p.293

But it also meant that the conditions were right for the flourishing of an integrated approach.⁷⁸ Not only was man to be understood in terms of a science of man but man was also to be regarded in the totality of his spiritual and material (they questioned whether these were truly separate) realities. It so happened that a reliance on reason entailed analytic methods along with observational ones; in this Etienne Bonnot de Condillac (1714-1780) led the way with his famed analyse. But analysis is by nature not predisposed to producing integrated approaches although it may indeed aid in scientific understanding; and a falling apart in due course occurred. The flower of the philosophes' integrated approach was short-lived.

Soon after Lamarck's time, natural philosophy, which embodied the Enlightenment union of man and science, would lead to pure science. The light of science would eclipse even the light of reason.

The idea of a science of man yields thus its place to the hope of a science without man, of a science which has no need of man and drops him along the wayside, drowned in the mass of the real in which nothing distinguishes him anymore. Such is, in sum, the path which leads from the positivism of Lamarck and Auguste Comte to the scientism which we have just mentioned.⁷⁹

Scientisme, as Gusdorf describes it, involves a divorce of the philosophical from (what we now call) the scientific component of (what used to be called) "natural philosophy". Gusdorf points out that the term "natural philosophy" drops out of usage by the mid 19th century, and he calls the rise of scientisme at the expense of positivism the "decisive event" of the intellectual history of the 19th century.⁸⁰ Essential to positivism was a balanced integration of philosophy and science: thus Comte collected his thoughts under the term Cours de

⁷⁸ "et la biologie lamarckienne réconcile la science de la nature et la science de l'homme, traditionnellement opposées; elle les unit dans la perspective d'un même accomplissement hiérarchique." Gusdorf, op. cit., p.319. Paul Hazard, op. cit., p.378-385, points out that Denis Diderot (1713-1784) typifies the precarious and temporary coalition of two forces which were soon to part company and pursue their separate ways. A materialist, Diderot firmly believed in the supremacy of the mind, the spirit; a determinist, yet he believed in personal choice.

⁷⁹ Georges Gusdorf, op. cit., p.363

⁸⁰ ibid., pp.344,350

philosophie positive (1830-1842), Lamarck entitled his biological work Philosophie zoologique (1809), Fourcroy called his book Philosophie chimique (1792). Lamarck's life span may be seen therefore to enclose a period in French history marked by a serious integrated approach to man's inner and outer worlds. But the ideal of a rigorous, positivist science would eventually lead some of its advocates (such as the idéologue and Romantic, Pierre Maine de Biran (1766-1824)) to a realization that that same integrated approach which was thought to be the very key for unlocking the ideals of positivism and idéologie was actually--and ironically--another barrier to a complete and honest understanding.

The fate of the soul in the Enlightenment

As soon as one begins to examine the 18th-century *mêlée* of attempts to step beyond dualism to a new biology, one confronts the almost unimaginable richness of that ancient idea of the soul. How could anyone step beyond it? one might ask. From the earliest times the science or philosophy of life has been all about the soul. Science, far from being steadfastly attached to a material, demonstrable world, is and has been steeped in the intangible, the invisible, and the idealistic: gods, numbers, harmonies, forces, subtle fluids, vital principles, entelechies, energies...The scientist or natural philosopher has always typically sought an idealistic or conceptual unity through the visible diversity, seeking an expression of that which connects things. What does connect things? What connects living things to the stars? What connects the warmth of one's body to the warmth of the sun? What connects man to the other animals and to the plants? And, of course, what connects the body to the mind?

The soul is an ancient concept of connection. It was probably already ancient when the Greeks inherited it from their ancestors whose myths were gardens exuding the very aroma of soul. Classic Greek culture produced a fertile discourse on the soul which was no longer in the mythical idiom. The many and sundry cosmologies and philosophies of nature, each with its own interpretation of soul, are

relevant not only as an old foundation of subsequent European culture but also as a continuing source of inspiration to succeeding generations of natural philosophers. The Enlightenment was still very much a renaissance of such ancient doctrines.

The materialistic system called Epicureanism was particularly (but by no means alone) important in Enlightenment France; T S Hall calls Epicurus (342?-270 BC) an indirect founder of modern biology.⁸¹ The Epicurean cosmos consisted of atoms and the void. It can be characterized as materialistic monism since the existence of immaterial things was ruled out. There did exist, however, a soul or subtle substance or pneuma consisting of the most mobile atoms, which could be found as a tenuous net through the living body. While all atoms were insensible (devoid of soul), sensibility was explained in animals by certain configurations (organizations) of atoms. The underlying goal of this system was to free man from fear of death and from primitive religions, in particular by way of a knowledge of nature. This was also a goal of many philosophes. Pierre Gassendi (1592-1655) overtly introduced Epicureanism into the Enlightenment with his De vita, moribus et doctrina Epicuri (1647); similar ideas run through the thinking of Descartes, La Mettrie, Lamarck, and others. One of the reasons for calling Epicurus a founder of biology is that he seemed to successfully account for living phenomena in purely materialistic terms...without involving an immaterial, spiritual soul. If one were to discard the res cogitans from Cartesian natural philosophy (which many philosophes tried to do), something very similar to Epicureanism would result.⁸²

Rich concepts like the soul are always difficult to understand, they lend themselves to many uses and interpretations. But what especially complicates the issue is that such concepts outgrow

⁸¹ T S Hall, op. cit., vol.I, p.120-136

⁸² It is noteworthy that Gassendi--Descartes' contemporary--although he introduced Epicureanism he nevertheless personally rejected Epicurus's negation of an immaterial, rational, free and spontaneous soul. The Enlightenment philosophes in the next century embraced Epicureanism much more whole-heartedly.

the words by which they are designated. The historian will notice that beguiling games are played between simple words and rich concepts --a kind of hide-and-go-seek. One must be on the look-out for concepts which remain through--and despite--verbal juggles.

For a large number of Enlightened philosophes the soul was definitely something undesirable, something to be rid of. In an Age of Reason there was no place for such a rich and (necessarily) ambiguous idea. As La Mettrie summed up in 1747, "the soul is therefore but an empty word (qu'un vain terme) of which no one has any idea, and which an enlightened man should use only to signify the part in us that thinks."⁸³ By virtue of its richness and its great undesirability, the soul had a fate which, though particular, mirrored that of the Enlightenment as a whole. At the climax of its reduction (seduction by reason) it revealed itself still filled with complexity, as we shall see with Lamarck.

While it is not feasible to give here a complete picture of the vicissitudes of the soul in the 18th century, it is essential to present at least a sketch of the attempts to define, analyze, replace, materialize, or admit it. If there was a discernible trend in the thinking about the soul one would identify it as a tendency to split it up, to divide the loot, as it were. The theologians kept the immortal part, the material part fell to the growing appetite of the laboratory scientists, and the active part, slippery and intangible, went up for grabs. The active part had at least three facets (which were not necessarily articulated this way): a thinking rational one, a feeling sensible one, and a spontaneous motile one.

Barthez (1734-1806) lumped together the sensible and motile facets into his principe vital or irrational soul.⁸⁴ While he could not say whether this irrational soul was an incorporeal entity distinct from or else part of the body, he nevertheless separated himself from the materialists (the Solidistes, as he calls them) by emphasizing

⁸³ Julien Offray de la Mettrie, Man a machine, Chicago, 1912, p.128

⁸⁴ Paul Joseph Barthez, Nouveaux éléments de la science de l'homme, Paris, 1858 (first published 1778)

the immateriality and uniqueness of the rational and irrational souls; and he separated himself from the animists by making a clear distinction between the âme pensante (rational soul) and the principe vital (irrational soul). The animists, like Stahl (1660-1734), ignoring any distinction between an irrational and a rational soul, maintained that a rational soul guided sensibility and all actions; thus they gave expression to the apparent directedness of vital functions (which was no small problem to solve). The materialists, like Lamarck, insisted that all facets of the soul had an explanation in terms of matter and forces.⁸⁵ There were, within these categories, many variant positions, of course. Was there one soul per animal? Did each organ have its own rational soul, its own sensations, a sense of its own function in the organism? Did all animals have a rational soul? Did plants have an irrational soul? and so forth.

As the structure of the body became increasingly unravelled, the various aspects of the soul found their way into various tissues, organs or molecules. Where was the soul? How did it act? The brain and the nervous system were implicated almost universally in the thinking function. There was much less consensus over sensibility and motility. Denis Diderot (1713-1784) makes sentience a property of matter; Maupertuis (1698-1759) endows the elements with both sentience and intelligence; La Mettrie (1709-1751) associates an Hippocratean enormon (impetuous force) with a tissue he calls parenchyma; Gaub (1705-1780) posits a vis vitalis animating the fibers and tissues; von Haller (1708-1777) finds irritability (vis insita) in muscles and sensibility (vis nervosa) in nerves; Bordeu (1722-1776), following van Helmont (1577-1644), gives to each organ a life of its own, postulating a conspiracy of the organs to maintain the life of the whole. Through the myriad of theories one apperceives that a whole new inner cosmos of living bodies was opening up. Instead of stars and planets and comets there were organs and fluids and diseases: there was

⁸⁵ In Lamarck's earlier writings prior to his Mémoires de physique et d'histoire naturelle of 1797, he inclined more toward the idea of a principe vital. See Richard Burkhardt, Spirit of system, p.99-103

âme, there were esprits, defined and undefined vital principles.

Soul and spirits in the Enlightenment

The article âme in the Encyclopédie defines the soul as "a principle endowed with knowledge and feeling." The soul, it says, can be envisaged either as a quality or as a substance. Most of the ancients supposed the soul to be an incorporeal substance which moved itself, and partook of a universal soul. According to the article, the ancient notion of incorporeal was not the same as immaterial, however; incorporeal meant "composed of very subtle parts." Whether or not this is a correct interpretation of classical sources, it shows an important 18th-century bias toward the materialization of the soul based on certain classic philosophies (like Epicureanism). The idea that material souls or spirits existed was very widespread, and was even a key element in the foundation of science. Already Francis Bacon (1561-1626), herald of the dawning age of science, claimed that his more recent predecessors had misrepresented the nature of a spirit; a spirit is "nothing else but a Natural Body rarefied to a proportion, and included in the Tangible Parts of Bodies, as in an Itegument," and also, "spirits are the agents and workmen that produce all the effects in the body."⁸⁶ In the Enlightenment, the idea that, if not all matter, as Maupertuis maintained, then at least some kinds of matter possessed active, often verging on intelligent properties seemed to be indispensable for a complete explanation: conversely, one could say, it was indispensable that spirits and other causal agents were material.

There was some confusion over the difference between animal spirits (which were rarefied bodies as Bacon said) and soul, which was commonly thought to be immaterial (mistakenly so, according to the Encyclopédie article). The more extreme materialists dropped the immaterial connotation from the word soul altogether and used it in the

⁸⁶ see T S Hall, op. cit., vol.I, p.231-234

sense of spirit. Descartes (1596-1650) had distinguished carefully between the soul and the animal spirits, as he had distinguished between material and immaterial things (which created, in fact, a major problem for explaining the communication or harmony between the soul and the body). For Descartes the animal spirits (esprits-animaux) were the smallest and most agitated particles which alone could reach the inner part of the brain from the blood and burn there as a flame:

As concerns the particles of the blood which penetrate all the way to the brain, they serve not only to nourish and maintain the brain but principally also to produce there a certain very subtle wind, or rather a flame, very active and very pure, which is called the animal-spirits.⁸⁷

Many of Descartes' successors, being more consistently materialistic, glossed over the differences between soul and spirit. Lamy, for example, in his Explication mécanique et physique des fonctions de l'âme sensitive (Paris, 1678), fused together the notions of esprits-animaux and of âme, saying:

Throughout this little work I have used indiscriminately the terms 'soul' and 'spirits', which ought not to cause any confusion, for they are the same thing. I have frequently employed the word 'animal spirits' to signify that portion of the soul which is contained in the nerves; and the word 'soul' to designate the animal spirits contained in the brain.⁸⁸

The spirits of the early Enlightenment became the subtle fluids of the later 18th century. The subtle fluids (including light, heat, electricity, magnetism) were like Bacon's spirits, "agents and workmen." They were above all active, and so readily assumed the role of motor for the fortune of machines the Enlightened intellectual saw all around him. Vital and animal spirits were active particles in the blood or nerves, implicated, like the Epicurean pneuma, in the causation of vital movements and sensations. The fusion of the soul with the animal spirits as carried out by Lamy reflected a popular and

⁸⁷ René Descartes, "Traité de l'homme," in Oeuvres, Victor Cousin (ed.), Paris, 1824, vol. IV, p.345

⁸⁸ quoted by Aram Vartanian, op. cit., p.222

important Enlightenment idea which was also expressed in the article âme of the Encyclopédie.

While the spirits were said to be material, it is interesting to note how often they were associated with a special material, not just a rarefied one; and also, to note how special were their properties: Spirits and subtle fluids had unique powers and materiality. For Thomas Willis (1621-1675) spirits were "highly subtil, and aether-eal particles of a more Divine Breathing."⁸⁹ For William Harvey (1578-1657) "the blood 'acts above the forces of the elements,' and what Aristotle said about the soul is true of the blood, namely that it 'seems to have a connection with a matter different from and more divine than the so-called elements...'"⁹⁰ The Aristotelian pneuma, which had its seat in the heart, was a physical substance of the finest corporeality--an aither--which hailed from the stars and was endowed with generative power.⁹¹ Vicq d'Azir (1748-1794), anatomist and contemporary of Lamarck, speaks of "l'esprit éthéré dont les nerfs paraissent être les conducteurs" (an ethereal spirit in the nerves).⁹² To emphasize the importance of such spirits, one may cite Isaac Newton (1642-1727), who speculated about

a most subtle spirit which pervades and lies hid in all gross bodies; by the force and action of which the particles of bodies attract one another at near distances, and cohere, if contiguous; and electric bodies operate to greater distances, as well repelling as attracting the neighboring corpuscles; and light is emitted, reflected, refracted, inflected, and heats bodies; and all sensation is excited, and the members of animal bodies move at the command of the will.⁹³

⁸⁹ see T S Hall, op. cit., vol. I, p.313

⁹⁰ see Walter Pagel, William Harvey's biological ideas, New York, 1967, p.253

⁹¹ ibid.

⁹² see M H de Blainville, Histoire des sciences de l'organisation et de leurs progrès comme base de la philosophie, Paris, 1847, vol. III, p.67

⁹³ quoted by E J Dijksterhuis, op. cit., p.484

Here Newton unambiguously suggested that "a most subtle spirit" stimulates sensation and motion, an idea developed by Lamarck. For Lamarck, not only is the whole world filled with "subtle, invisible, uncontainable, incessantly moving fluids,"⁹⁴ but also

the speed of the displacements of the subtle fluid which moves as it likes in the medullary substance of its brain and nerves ...finally the speed of the contractions and relaxations of those muscles which act, is--of all the marvels that nature can produce--the one which seems to me the most admirable. It is veritably the master-piece of her operations. Besides, all the marvel I have been mentioning stems entirely from the nature and the particular faculties of the aetherial fire, which is spread everywhere over our globe, and of which the nervous fluid, the electric matter, and even the magnetic matter, are apparently only simple modifications.⁹⁵

Suffice it here to say that the historic literature concerning the vital and animal spirits, the subtle fluids, the blood, the source of the body's heat, the nervous fluid, is very picturesque. The Enlightened world was surrounded and enveloped in an aura of active, invisible spirits. The images of pure flames, gentle winds, of airs, and intangible potent fluids were common. These imaginations were not medieval or alchemical aberrations in the minds of scientists not having yet reached the light of reason; on the contrary they described the most reasonable account these scientists could express of the mystery of nature and life. Developments in chemistry, like van Helmont's (1579-1644) discovery of ferments and gasses, provided strong support to the idea that brute matter was a gross over-simplification of the truth. Matter existed in a variety of forms, each with its own properties and powers. Typically in the guise of a luminous spirit, the soul remained at the heart of scientific thinking.⁹⁶ It was a "flood of light," writes Lamarck, "which disclosed to me the principal cause which maintains movements and the life of organized

⁹⁴ PZ, p.212

⁹⁵ J-B Lamarck, Recherches sur l'organisation des corps vivans, Paris, 1801, p.183-184

⁹⁶ The concept of energy--as a metamorphosed form of matter--is a modern example.

bodies, and to which animals owe all that animates them."⁹⁷

The special material of which fire consisted had been given the name of phlogiston by Georg Ernst Stahl (1660-1734). Lavoisier (1734-1794), Lamarck's contemporary, in words sounding like Lamarck's, defined the matter of fire as "a very subtle and very elastic fluid which surrounds all parts of the planet we inhabit, penetrates more or less easily the bodies that compose it, and tends when free to become equally distributed."⁹⁸ The name caloric for matter of fire was introduced in 1787 in the Méthode de nomenclature chimique published by Guyton de Morveau (1737-1816) in association with Lavoisier, Claude Louis Bertholet (1748-1822), and Antoine Fourcroy (1757-1809). When Gustav Magnus (1802-1870) was writing, 40 years after Lavoisier's Traité de chimie (1789), heat was still generally regarded to be caloric, the weightless fluid.⁹⁹

A new rigor in ideas about the soul

In the trend to materialism, then, the soul was resolved to be partly inherent in some kind of matter and partly emergent (as a property of organized matter). The soul was materialized, and the matter which was thus ensouled, obeying the laws of nature, was self-organizing, and self-moving--spontaneous and alive. The parallel between these vitalist theories and Newton's theory of the cosmos is striking. Newton's cosmos was kept in order by laws of nature guiding a matter apparently endowed through a subtle spirit with a force of attraction. Newton had, in effect, injected a certain life into pure (and traditional) mechanism; he gave it a meaning from a "concealed

⁹⁷ PZ, p.6

⁹⁸ see T S Hall, op. cit., vol. II, p.161

⁹⁹ W A Smeaton, "New light on Lavoisier: the research of the last 10 years," Hist. sci., 2:51-69, 1963. See also Marie Boas, "Structure of matter and chemical theory in the 17th and 18th centuries," in M Claggett, Critical problems in the history of science, Madison, 1959, p.499-514.

depth of animistic connotation."¹⁰⁰ Newton used the term force, but he might have used the term soul had he intended to keep to an old tradition: in any case, underneath the change of terminology an important thread of conceptual continuity remained.¹⁰¹ In both vitalist explanations of life and Newton's explanation of gravitation, the forces attributed to matter are of unknown origin, and their existence is inferred from observed effects. They are conceptual lines at the horizon of scientific knowledge.

Behind the birth of biology stood the achievement of physics; but also, biology and Newtonian physics were in a significant way historic twins. The philosophes took what they learned from Newton and used it to disengage a biology from physics by giving strictly vital properties to a unique organic matter. And Newton, drawing from animistic sources, gave vital, soul-like properties to the cosmos (it became a Divine universe), and revolutionized mechanist physics. So we can easily discern that Newtonian physics and the new biology were two strings tied in a knot, two facets of an Enlightenment way of thinking. This intricacy of biology and physics, holding in its fabric the notion of a living--at least ensouled--cosmos, was noted by the vitalist Richat:

If physiology had been cultivated by men before physics, as the latter was actually done before the former, I am convinced that men would have made numerous applications of the first to the second, that they would have seen rivers flowing due to the tonic excitation of their banks, crystals combining by the excitation which they exert on their mutual sensibility, the planets moving themselves because they are reciprocally irritated over large distances, etc...To say that physiology is the physics of animals is to give a very inexact picture; I would as much like to say that astronomy is the physiology of the stars...¹⁰²

¹⁰⁰ Richard S Westfall, Force in Newton's physics, op. cit., p.391

¹⁰¹ "Aristotle reminds us...that Thales said that the magnet had a soul because it attracts iron." Frederick Woodbridge, Aristotle's vision of nature, New York, 1965, p.31. The question of why Newton chose the terminology he did introduces a vast and interesting inquiry which cannot be broached here, involving political, theological, scientific, and personal factors among many others. See Westfall, op. cit.

¹⁰² quoted by Georges Gusdorf, op. cit., p.303

Vartanian has stressed the role of speculation and hypothesis in the Cartesian tradition including Diderot (1713-1784), Buffon (1707-1788), d'Holbach (1732-1782), and la Mettrie (1709-1751); science had to be more than just accumulation of facts and even more than just theories arrived at by induction (like Newton's). Like Descartes they strove to put the universe in a nutshell. This is not to say someone like Diderot was blind to the shortcomings of speculative science and the systems it produced. He reproached Descartes for not having put his speculations to test.¹⁰³ But then, nor did Diderot test them. It was precisely at this moment that the idéologues enter the scene bolstered up by Condillac's (1714-1780) philosophy. The new spirit was definitely positivistic in that every idea had to be tested and firmly grounded either in fact or else in an ascertained probability of fact. Diderot's reproach was taken seriously by his younger colleagues. It needs yet to be definitively established whether Lamarck, as an intellectual child of Buffon, followed him in the path of speculation, as Cuvier (1769-1832) would believe...or did Lamarck succeed as he thought in rising to the positivist challenge of his time? Or was Lamarck a straddler, pulled in one direction by the allure of the positivism of the future and in the other by the sugar of the systems of the past?¹⁰⁴

An integral part of the positivist reaction--an obvious consequence of an analytic way of thinking à la Condillac--was the compartmentalization of science. For the positivist, it was far too risky to assume physical laws to explain living things...for it meant of realms a confusion which belonged to the dreams of the grandiose system-builders--and one paid for that the price of rigor. To learn about man one must study man not the cosmos, not clocks; as Canalis insisted,

¹⁰³ Aram Vartanian, op. cit., p.165, quotes Diderot: "I pardon Descartes for having imagined his laws of motion, but what I do not excuse him for is his failure to verify by experiment whether or not the they were in nature as he had supposed them to be."

¹⁰⁴ Richard Burkhardt has since forcibly argued (Spirit of system) that Lamarck was indeed a system-builder at a time when contemporaries were stressing hard facts.

When one seeks to explain the animal economy by the laws of mechanics, of physics, of chemistry, or by some philosophical hypothesis rooted elsewhere than in the very observation of the living body, one finds oneself arrested, so to speak, at each step: the exceptions to the rule soon become more numerous than the facts which conform to it: and not only is one compelled to recognize how much these hypotheses are insufficient to weave together the fragments of science, but one readily notices that they entail innumerable mistakes in practice.¹⁰⁵

Idéologie brought a new rigor to Enlightenment thinking about the soul...but also a certain irony which was propelled by the incoming tide of Romanticism. The new rigor was destined to find not only the strong points in the notion of a materialized soul but also the weak ones. The intellectual scrutiny born of the Enlightenment's faith in reason and science was bound to turn upon itself--when reason turned to explain itself. Could human understanding understand what understanding was? The Romantic reaction, appearing in Maine de Biran (1776-1824) among others, was ironically as much a product of the Enlightenment as a reaction against it. The light of reason found corners too dark to be lit up.

¹⁰⁵ quoted by Moravia, Pensiero, p.16

V. TOWARD A SCIENCE OF MAN

Though so much interested in acquiring a thorough knowledge of ourselves, yet I could say almost certainly that man is less acquainted with the human, than with any other existence.

--Buffon, De l'homme

Idéologie

Idéologie has both a broad sense and a specific sense. In the broad sense it refers to the thinking of the generations of philosophes who bridged the 18th and 19th centuries, and thus includes Lamarck.¹⁰⁶ In a specific sense it is the science of ideas defined by Destutt de Tracy (1754-1836), begun by Condillac (1714-1780), and studied originally by a circle of idéologues who met first at the salon of Rue St-Anne and then at Auteuil chez Mme. Helvétius. The continuity between philosophes-encyclopédistes and idéologues was guaranteed in a personal way since Diderot (1713-1784), d'Alembert (1717-1783), Buffon (1707-1788), Condorcet (1743-1794), Condillac (1714-1780), and others representing the encyclopédistes were among the idéologues who originally gathered together. Moravia emphasizes that the passing of the so-called great lights of the Enlightenment (Helvétius died in 1771, Voltaire and Rousseau in 1778, Condillac in 1780, Turgot in 1781, d'Alembert in 1783, Diderot in 1784, Buffon in 1788, d'Holbach in 1789) signifies neither the disappearance of the whole generation of philosophes nor the disappearance of philosophy, of science, of political theory and practice inspired by reason: the Enlightenment was yet to experience an ultimate and flourishing season

¹⁰⁶ Gusdorf calls Lamarck the "disciple et l'ami" of the idéologues. (op. cit., p.282)

with the idéologues.¹⁰⁷ This was also the season of Lamarck.

The idéologues, like their intellectual forebears, held as their underlying goal a science of man. Included in the goal of a science of man would be the knowledge of how the mind works. Knowing this one could more positively organize all sciences and all knowledge (toward a more perfect encyclopedia). A universal language would be the clue to a universal science: this was the hope beneath the encyclopédie and nurtured by the idéologues. It was the hope of Reason.¹⁰⁸

In idéologie the biological-medical and the philosophical enterprises of the Enlightenment converged. In order to understand the nature of knowledge, in order to philosophically ground a rational, scientific way of knowing, it became necessary first to scientifically know man. It was this total scrutiny of man for which idéologie called. What was reason and observation? What were the senses? and how did they relate information to the rational mind? How did the sense organs work, and were they to be trusted? How did the mind alter sensations? In short: What was the soul? "From the very conditions on which science succeeds, therefore it unexpectedly appears that the proper study of mankind is man."¹⁰⁹ As Cassirer says:

¹⁰⁷ see Moravia, Tramonto (op. cit.), p.14. Besides Moravia's other works on the idéologues (Il pensiero degli idéologues (op. cit.), and Scienze dell'uomo nel settecento (op. cit.)) there is the work by François Picavet, Les idéologues, Paris, 1891

¹⁰⁸ "Nous n'existons," wrote Destutt de Tracy according to Picavet, ibid., p.305, "que par nos sensations et nos idées; tous les êtres n'existent pour nous que par les idées que nous en avons. Ainsi la connaissance de la manière dont nous formons nos idées est la base de toutes les sciences. C'est l'analyse des idées qui a fait faire aux chimistes français, à l'illustre Lavoisier et à ses collaborateurs, tant de progrès dans l'analyse des corps. Cette analyse est surtout nécessaire pour traiter méthodiquement les sciences morales et politiques, grammaire, logique, science de l'éducation et de l'instruction, morale et politique, et pour les établir sur des fondements stables."

¹⁰⁹ C C Gillispie, The edge of objectivity, Princeton, 1967, p.162

The essence of nature as a whole was understood to be accessible only by taking the nature of man as a starting point; accordingly, the physiology of man became the point of departure and the key for the study of nature; mathematics and mathematical physics were banished from their central position and superseded, in the works of the founders of materialistic doctrine, by biology and general physiology.¹¹⁰

The term idéologie was first used as an alternative to psychologie by Destutt de Tracy, according to Moravia, in a series of four articles presented beginning in 1796 to the Institut entitled "Sur la faculté de penser."¹¹¹ Coining the new term manifested a rebellion against Condillac. The word psychologie was used by Condillac, but this term seemed to Tracy to presuppose a knowledge of the psyche or soul--and no one could so delude himself to have that, maintained Tracy. The new term had a positivist ring to it...a death knell to "recherche vague" of the first causes, "for the goal of all our works is the knowledge of effects and their practical consequences."¹¹² It was in the essence of positivism not to transgress beyond observable phenomena. Religious and alchemical overtones seemed to be passing by the wayside (the positivists thought so anyway) as the idéologues chose an admission of ignorance over a quest for the first causes. As Diderot had said:

If nature offers us a difficult knot to untie, let us leave it for what it is, and let us not in order to untie it, use the hand of a being who will then become himself a new knot for us, more irresoluble than the first.¹¹³

The rebellion of Tracy against Condillac may remind us of the rebellion of the earlier philosophes against Descartes. Neither Descartes nor Condillac were rejected outrightly, rather they were critically accepted and reworked. Moravia remarks that all the

¹¹⁰ Ernst Cassirer, op. cit., p.66

¹¹¹ see Moravia, Tramonto, p.15-17

¹¹² ibid.

¹¹³ quoted by Marx W Wartofsky, "Diderot and the development of materialistic monism," Diderot studies, O E Fellows and N L Torrey (eds.), Syracuse, vol.II, p.281

idéologues were heirs to Condillac.¹¹⁴ Tracy wrote that Condillac's works

opened my eyes and showed me of what it consisted that which I was looking for. The Traité des systèmes especially was for me a flood of light, and finding the one on sensation neither complete nor exempt from errors, I made for myself starting right then a succinct exposition of the principle truths which accrue from an analysis of thought.¹¹⁵

Condillac had taken valuable first steps toward grounding a philosophy of scientific knowledge in a physiological understanding of man. He sought to elucidate the operations which the soul carries out on sensory data. For this he formulated an analytic method. All ideas in the mind were reducible to primitive sensations, and all operations of the mind to combinations of sensations. The great contribution of Condillac was this analytic method for handling ideas and concepts, a method for organizing scientific knowledge, and hence for mapping out fields of new knowledge. The idéologues avidly plucked up and used this method; "It is the method and not the decisions of Condillac which we make a great deal of," wrote Destutt de Tracy.¹¹⁶ It assured them of positive results, in contrast to the uncertain speculative knowledge characteristic of Descartes and later of Buffon for example. René Leclercq mentions how Lamarck, as a pioneer, suffered great difficulties including a fight against his own previous beliefs; Lamarck considered method a safe way to reach the truth and a kind of moral support when he was alone against his contemporaries.¹¹⁷ For

¹¹⁴ Sergio Moravia, Pensiero.

¹¹⁵ ibid., p.292

¹¹⁶ Picavet, op. cit., p.22

¹¹⁷ René Leclercq, "Review of Colloque international 'Lamarck'," in Ann. sci. (GB), 29:42, 1972.

sure, Lamarck made obvious use of Condillac's analyse; ¹¹⁸ and Lavoisier (1734-1794) and Fourcroy (1757-1809) reorganized the old and founded the new science of chemistry by revamping terminology, heeding Condillac's advice--"a science well handled is only a language well made."¹¹⁹ The correspondence between Lamarck's evolutionary approach and the analytic method (décomposant-récomposant) bears out what Gusdorf says for idéologie:

There is an undeniable continuity between the cosmology of Laplace, the philosophy of history of Condorcet, and the genetic epistemology of the theoreticians of ideology. The organization of the structures of the understanding goes hand in hand with a rational reordering of the world picture. A single jurisdiction applies to thought and reality.¹²⁰

But we would misunderstand the situation were we to ignore distinguishing between the rather theoretical method of Condillac and the very practical, experimental method of science. Indeed Lamarck held dearly to Condillac's method, thinking it assured his theories scientific validity. History would not sustain him on this however. As Richard Burkhardt has clearly pointed out, it was Lamarck's failure to fall back on an impeccable experimental method (he strayed from the 'facts') which brought him that dark silence for recognition.¹²¹ The

¹¹⁸ We saw above (p.15) that the great force of nature for Lamarck was composant in living things and décomposant in non-living. Compare this with Condillac's definition of analyse: "Il est nécessaire de décomposer pour connaître chaque qualité séparément; et il est nécessaire de récomposer pour connaître le tout que résulte de la réunion des qualités connues. Cette décomposition et cette récomposition est ce que je nomme analyse." (Quoted by Gusdorf, op. cit., p.178). In other words, Lamarck has found an identity between the analyse of thought and an analyse in nature. Man is an image of nature--"a single jurisdiction applies to thought and reality" (ibid., p.288).

¹¹⁹ see Gusdorf, op. cit., p.177

¹²⁰ ibid., p.288

¹²¹ Richard Burkhardt, Spirit of system

foundations of his thought were not proven to be as positive as he claimed.¹²²

The idéologues inherited more than a method from Condillac. They also inherited an attitude to the importance of studying the mind...of integrating science with philosophy. Of course Condillac was not the sole bequeathor of this tradition. John Locke (1632-1704) in his Essay concerning human understanding (1690) ushered into the 18th century this central theme. Carefully omitting the word "soul" from the title, yet renouncing a physical and physiological analysis of the mind, he pursued an examination by introspection of ideas and the mind's operations. The Aristotelian notion--namely, all that enters the mind passes by way of sensation--was made a cornerstone of this early science of man called sensationalism.

David Hume (1711-1776) and Condillac (1714-1780) both developed Locke's ideas trying to bring them in line with Newtonian science. Thus Condillac's Traité des sensations proposed to reduce all phenomena of the mind to a single principle. Hume's envisioned science of human nature was meant as a counterpart to that science of physical nature which Newton had crowned.¹²³ But for a naturaliste-philosophe like Lamarck the proper counterpart of physics was not a science of man...it was a biologie which would subsume that science of man. With his broad background Lamarck was, as it were, the Buffon of the idéologues--in contrast to a biological idéologue like Georges Cuvier (1769-1832) who inveighed against Lamarck's expansive and speculative

¹²² I do not wish to imply that science is all naive facts--the history of science bears out the contrary. But at this particular period in French history speculative science was a bane to a growing interest in experiment. How could one talk scientifically about the --unobservable--evolution of life and past geologic ages? Lamarck also failed to persuade his contemporaries to follow his train of thought. As Richard Burkhardt says (Spirit of system), by his great leaps he lost them--assuming they would have followed if they could ...which is not certain.

¹²³ see Gusdorf, op. cit., p.170

tendencies.

One of the raison-d'êtres of idéologie was precisely the lack of both a broader and a firmer foundation in physiology and natural history for a science of man. As I mentioned, Locke had expressly avoided that aspect: it was historically too early, perhaps, as Gusdorf says,

Locke and Hume did not bother themselves to effect a union between their exploration of the understanding and the new facts of biology and the natural sciences which were, furthermore, in the midst of effervescence. Others would follow to attempt the synthesis.¹²⁴

The idéologues, especially those of the second generation, including Lamarck among others, would attempt the synthesis. Clearly it would be a theoretical synthesis, a philosophical enterprise however based on scientific data and observation. In this context Lamarck quite perceptibly called himself a naturaliste-philosophe. His biology filled an historic need, even if it did not cater to a new mode in science.

Destutt de Tracy (1754-1836) declared that idéologie was a branch of zoology, although he did not carry the pronouncement into a reality (it was a formidable task).¹²⁵ Cabanis had the same idea:

physiology, the analysis of ideas and moral philosophy are simply three branches of one and the same science, which may appropriately be designated the science of man.¹²⁶

¹²⁴ Gusdorf, op. cit., p.174

¹²⁵ Destutt de Tracy writes in Elémens d'idéologie, Paris, 1827, p.xviii: "One has only an incomplete knowledge of an animal if one does not know its intellectual faculties. Idéologie is a part of zoology, and it is above all in man that this part is important, and merits to be fathomed: besides, the eloquent interpreter of nature, Buffon, would not have thought to have completed his history of man without at least trying to describe his faculty of thought."

¹²⁶ Cabanis adds in a note that the Germans call it Anthropologie. Quoted by George Rosen, "The philosophy of ideology and the emergence of modern medicine in France," Bull. hist. med., 20:328-339, 1946

The title of Cabanis' main work, Rapports du physique et du moral de l'homme (1802), is a limpid statement of the attempted synthesis. And Lamarck, in the introduction of Part II of his Philosophie zoologique (1809), expresses his sympathy for Cabanis' efforts:

Mr Cabanis unquestionably established a very great truth by a series of unexceptionable facts, when he said that the moral and the physical both spring from a common origin; and when he showed that the operations called moral are directly due, like those called physical, to the activity either of certain organs, or of the living system as a whole; and finally that all the phenomena of intelligence and of will take their origin from the congenital or fortuitous state of the organization.

At the same time, Lamarck complains that Cabanis' approach is too limited. What was needed, Lamarck claimed, of course, was exactly what Lamarck had to offer:

But in order to see more clearly how firmly this great truth is based, we must not confine ourselves to seeking the proofs of it by an examination of the highly complicated organization of man and the more perfect animals; proof will be obtained more easily by studying the diverse progress in complexity of organization from the most imperfect animals up to those whose organization is the most complex; for this progress will then exhibit in turn the origin of every animal faculty and the causes and developments of these faculties. We shall then acquire a renewed conviction that those two great branches of our existence called the physical and the moral, which exhibit two orders of phenomena apparently so distinct, have a common basis of organization.¹²⁷

The foregoing tells explicitly that Lamarck meant his biology to supply a basic ingredient for building a science of man and bridging the Cartesian schism. The fact that such a passage introduces the second part of his Zoological philosophy underscores the importance he attached to this aspect of his biology.

¹²⁷ PZ, p.185

VI. TOWARD A UNION OF MIND AND BODY

"You are trembling, carcass," the great Turenne said to himself at his first battle. "If you knew where I must lead you one day, you would be trembling even more." Which is this I that Turenne speaks of? Is it the body, sensibility, or animal contractility?

--Maine de Biran, Nouvelles considérations sur les rapports du physique et du moral de l'homme.

Idéologie physiologique

Picavet distinguishes three generations of idéologues.¹²⁸ The first includes those who died or reached their peak of celebrity before the end of the 18th century; at their head he places Marie Jean Condorcet (1743-1794). The core of idéologie was made up by the second generation, "the most flourishing and the most original," led by Pierre Jean Georges Cabanis (1757-1808) and Destutt de Tracy (1754-1836). Pierre Laromiguière (1756-1837) and Joseph dégérando (1772-1842) were the outstanding figures of the third generation, according to Picavet. The second generation Picavet characterizes as "l'idéologie physiologique,"¹²⁹ and it is this one which is of especial interest here.

In attempting to synthesize a science of the mind (i.e. idéologie) with a science of the body (i.e. physiology) Cabanis drew heavily from the animistic tradition as well as from the mechanistic tradition.¹³⁰ According to Moravia, "his most intimate intellectual and scientific sympathy lay in actuality with the scholars of a vitalistic leaning."¹³¹ Cabanis was a doctor, after all, and this is an important factor in his predilection for the Montpellier school, the highlight of which was a new concept of medicine and a new look at man.

¹²⁸ Picavet, op. cit., p.101

¹²⁹ ibid., p.176

¹³⁰ For a thorough discussion of Cabanis in English see Martin S Staum, "Cabanis and the science of man," PhD dissertation, Cornell Univ., 1970

¹³¹ Moravia, Pensiero, p.18

At Montpellier medicine was raised to the stature of an independent science from its former position as a practical art with eclectic theoretical underpinnings. Behind Barthez's (1734-1806) principe vital--with its unique, if somewhat metaphysical, properties--one must not overlook the motive of creating a theoretical bulwark which was distinctive, autonomous and strong enough for bearing up the new science. The objective of medicine, wrote Bordeu in 1775, is not only to cure but also to analyze systematically the entire human organism, to attain "the knowledge of both the physical and spiritual (moral) man."¹³²

While the tendency of the Cartesians was to vitalize their machines, the tendency of the animists or vitalists was to materialize and mechanize their vital principles.¹³³ These two tendencies were bound to meet at some point or in some people. Cabanis stands at a point of convergence; so does Lamarck. The challenge was to confront the idea of organisme--a self-regulating body of organes--with the idea that matter is moved according to mechanist laws.¹³⁴ In other

¹³² Moravia, Pensiero, p.20

¹³³ Lamarck of course is an excellent example of the vitalist's tendency...he materialized the vital principle of his earlier thinking into the subtle fluid of his later theory. See Burkhardt, op. cit.

¹³⁴ Cabanis recognized his indebtedness to Stahl (1660-1734) and van Helmont (1579-1644) for their ideas of organic unity, which ideas were circulating at Montpellier (Moravia, Pensiero, p.18). Gusdorf attributes to Bordeu (1722-1776) the genesis of the concept of organisme, a word not to be found in the encyclopédie. He writes: "Dans l'ordre proprement médical, l'organisme de Bordeu (ou plutôt son organicisme, comme nous dirions aujourd'hui, le glissement de sens ayant suscité l'apparition d'un vocable nouveau) sera bientôt relayé par le vitalisme de Barthez, le plus grand nom de l'école de Montpellier, et lui aussi familier des encyclopédistes." (op. cit., p.130). The word organisme points up the existence of an internal immanent finality in living phenomena. For Barthez, "le simple automatisme de l'homme machine ne permet pas d'expliquer cette finalité immanente de la vie biologique, sans cesse capable de modifier son activité, en fonction d'une situation mouvante, pour la réalisation d'une même fin." (ibid., p. 131). Lamarck, while keeping central the immanent finality in living things--so they can respond to needs and evolve--nevertheless subjugates it to a fixed law of nature (the plan of nature): the animal is not really modifying its own activity, he contended: nature is forcing it to change. This of course alerts us to investigate Lamarck's notion of nature with circumspection, which we shall try to do.

words, the challenge was to construct a viable vitalism. For Cabanis --as for Lamarck--vital principles (or faculties, as Lamarck calls them) were an obvious reality, but they both insisted that vital principles must operate like the material parts of a machine (which excludes something like Barthez's principe vital). The vital principles would have to be entirely natural--not in any way supernatural. Here the idea of organisation with its emergent faculties propitiously moved ahead between the Scylla of animism and the Charybdis of mechanism.

Between animism and mechanism: organisation

The idea of organisation meant that in the act of being organized matter thereby transcended its limited brute-matter properties. Organization was effectively nature's way to give new properties to matter...and nature did this by creating organs. An organ was not a mere lump of matter: it was a lump of matter which moved, functioned --which carried out some activity brute matter could not. Brute matter itself is not life, said Cabanis, but it can produce life.¹³⁵

The idea of organization was a way to surmount the need for metaphysical entities in the explanation of living functions. The apparent supernatural origin of faculties like sensibility (Descartes' soul) was in this view a simple misinterpretation of the facts...an illusion. Actually, it was argued, faculties are properties of organized wholes. They emerge in the process of organizing, they are not present to start with as immanent qualities of matter. Maupertuis' idea of intelligent particles was ruled out. In as much as nature transcends brute matter through organization in the production of life, so her higher productions (like intelligence) appear--but only appear--transcendent or supernatural. The process of organization was understood to follow strictly the laws of nature according to the fundamental properties of matter. Nonetheless, one should note, Cabanis

¹³⁵ Moravia, Pensiero, p.122-124

did not refrain from stretching the definition of these fundamental properties and giving them a distinct vitalistic or biological cast:

thus inspite of his denial of a distinction between inanimate and living matter, Cabanis, to all practical purposes, reintroduced vitalistic ideas. And on top of this he raised the question as to whether the tendency of all matter towards some center of attraction (gravitational, chemical, &c.) was not itself a kind of "universal instinct," still vague in mere gravitation, but attaining its highest form in human intelligence.¹³⁶

Maupertuis' idea of intelligent particles was not so far-fetched after all. The fact is that, in the attempt to unify mind and body, the mind had to go somewhere, and it was bound to go into matter in one form or another. As Wartofsky comments, "it is also at this point that mechanical materialism begins to negate its mechanistic character."¹³⁷ Precisely: mechanical materialism--in order to be valid and applicable to life--had to become non-mechanical. It went shopping for vitalism. Vitalism there was...and in many different forms, to be sure. Differentiating the various blends of Newtonian, Leibnizian and Cartesian philosophies was a matter of nuance; uniting them into the new vitalistic biological thinking were such basic concepts as an intelligent Creation, an organizing and disorganizing Nature, forces and ensouled matter.

The idea of organisation comes to a brilliant expression in Lamarck's thinking. He provided a veritable natural history of organization. The organizing power of nature was forcefully evinced by his evolutionary theory and his account of spontaneous generation. He described the different levels of organization in order of their creation and with each one the new properties which emerged; he classified animals and plants accordingly. He proposed mechanisms for this organizing activity, always premising a powerful nature acting of necessity according to fixed laws. Nature did not design her productions, she only followed the rules. He saw the marvelous adaptations of

¹³⁶ O Temkin, "The philosophical background of Magendie's physiology," Bull. hist. med., 20:10-35, 1946

¹³⁷ M W Wartofsky, op. cit., p.288

living structures to their functions as the necessary result of living things--not struggling--but striving to survive by responding to needs. It was not a question of struggle, adapt or die, as Darwin saw it. Nor was it a case where some (divine, caring) power foresaw the needs of living things and molded them accordingly. For Lamarck, living things had something called life within them which caused them blindly (but how blindly?--we shall see) and necessarily to feel and respond to needs and forces in the environment. Living things could not fail to adapt: the very essence of being alive for Lamarck was the active exercise of a power to adapt...to grow new habits and structures and thus evolve a progressively more complex organization. The Sublime Author designed matter and the rules nature followed--but, from that original creation thence forward, no supernatural interference was conceivable. If there was interference in the progress of nature's productivity it came from geologic activities, a rebellious climate, or an uncooperative cosmos. And if there was an apparent, ordered progression in the path nature has followed from infusoria to the progressively more complex productions...well then, that was a real marvel! there was no further explanation for it: such was nature's plan.¹³⁸

Man stood out conspicuously in Lamarck's order of things. He was the most highly organized production of nature, produced by the relentless activity of matter under unrelenting laws in all different circumstances and conditions. The production of man with the emergence of intelligence was in a sense therefore the ultimate phenomenon to be explained by biology, and so to this subject Lamarck devoted a major part of his Philosophie zoologique.

He was well aware of the significance of his biologically general approach, coming as he did through natural history and evolutionary thought to the problem of man: Lamarck's broad approach stood in contrast to the straiter one of Cabanis', who sought through only

¹³⁸ see Richard Burkhardt, Spirit of system, for a good discussion of the plan of nature in Lamarck's theories.

human physiological studies the elucidation of human organization (naturally enough, for he was a doctor of medicine). Lamarck believed that his own approach afforded a more convincing proof of the material basis of sensibility and intelligence.

Lamarck must have also known that the problem of the material basis of the soul was much more than a biological problem, that it captivated the imagination of all the philosophes before him...and knowing this there was a farther-reaching reason for man's being an ultimate phenomenon. Lamarck was responding to an intellectual demand of his time which was addressed to thinkers in all disciplines. It is essential in understanding Lamarck to realize the significance of this philosophe he attached to his identity as naturaliste. It cut him off from that new trend in science which leant toward scientism and experimentalism disparaging the philosophical and humanistic orientation; it put him at a climax of natural philosophy.

Between mind and body: the nervous system

The nervous system was of especial interest to both Lamarck and Cabanis as the link between the physique and the moral. In a typical positivist, ideological concern for language and terminology, Cabanis used the pair of words physique-moral to replace corps-âme. The change in words was meant to obviate the associations and overtones of the old âme-corps: it was precisely the old dualism which the new words were intended to supersede. For Cabanis, physique and moral were just two different ways of looking at the one and same phenomenon--namely, human organization.¹³⁹

That Cabanis bridged Cartesian dualism is borne out by his confirmed conviction that man was a unitary phenomenon: not ruled by a soul, not just a machine--but a vital machine. Cabanis was undoubtedly a devoted materialist, yet matter for him could be organized and so give rise to phenomena traditionally relegated to a spiritual realm. The big problem of sensibility and intelligence would be solved

¹³⁹ Moravia, Pensiero, p.171

through a thorough, all-out investigation of man's physiological processes. One imagines that he dreamt of the day which would witness the work of a man like Claude Bernard (1813-1878).

The central role which the nervous system began to play in Enlightenment thinking about man is outstanding.¹⁴⁰ One is led to suspect that it became a crux to a consistent materialism or vitalism. As we have been discussing, a crucial problem in biological thinking was the origin and nature of sensibility and spontaneity in animals. Now sensibility and spontaneity make up in large measure the old (dualistic) notion of the soul, and it was just this notion which had to be accommodated to a monistic, vitalistic way of thought. Since sensibility and spontaneity were identified by the proponents of organisation as the faculties of the organ called the nervous system, they thereby caught the soul in a net of nerves.

Not only were sensibility and spontaneity important problems to vitalism, but so too was the integration of all the organs to form an organic whole. The idea of organisation went hand in hand with the idea of organisme. The idea of organisme, however, as it was developed by Bordeu (1722-1776) and Barthez (1734-1806), involved ideas unacceptable to materialists such as Cabanis and Lamarck. Bordeu gave to each organ a life (and sensibility) of its own, unacceptable to Lamarck who knew that only nerves possessed the faculty of sensibility. Barthez's principe vital smelled of the soul, as nebulous and detached from any particular organ as it was and bearing a faculty of active sensibility. How then could Cabanis or Lamarck successfully use the idea of organisme and organisation without some such (to them, unacceptable) animating and integrating principle?

Here one finds that the nervous system is given extraordinary powers by both Cabanis and Lamarck, powers for uniting the physique and the moral. But, one must inquire, did they succeed in this way to forge a materialistic vitalism? Or did they slip some soul or noisome vital principle under the carpet of materialism? Before turning

¹⁴⁰ Moravia, Pensiero, p.167

to a closer look at Lamarck's theory it is instructive to first see how Cabanis dealt with the issue at hand.

Cabanis and the nervous system

For Cabanis the brain sits in a paradoxical situation. It is a part of the body, subject to the same laws as the other parts, yet at the same time it appears to animate and guide all the others (like a principe vital):

in effect the cerebral system goes by its extremities to animate all the points of the body. It is present everywhere; it governs everything; it feels, it commands actions and modifies living parts; it even regenerates them sometimes. The nervous system is the trunk and the common branch of all parts, the reservoir and the dispenser of general sensibility; but in addition it is also responsible for certain functions so much more important that it is the life-guard and the guide of the individual.¹⁴¹

While the original source of vitality is unknown to Cabanis, he describes the brain as a reservoir or fountain of the animal-spirits:

the brain is not only the principle and like the root of all the nerves and all the muscles, but even the principle of all their functions, being as it were the fountain and the spring (la fontaine et la source) of the animal-spirits.¹⁴²

Lamarck too speaks of a fountain, or spring, when describing the brain. This image in itself is most interesting: on one hand it conjures up a simple mechanical process; and on the other hand it conjures up some unseen, subterranean source of bubbling water.¹⁴³ But

¹⁴¹ Pierre Jean Georges Cabanis, Rapports du physique et du moral de l'homme, Paris, 1844, p.584

¹⁴² quoted by Picavet, op. cit., p.183

¹⁴³ The idea of a source of living spirit is very old, although it has not always been located in the brain or nervous system. Aristotle upheld the heart as the origin and supreme part of the organism, its principle, its arche; Harvey saw in the blood the fountain from which the organs and tissues are continually refreshed indeed built up both in embryonic and in later life (see Walter Pagel, op. cit., p.43).

Lamarck will go further than Cabanis in this direction by "grasping that thread to the truth which nature has left," namely the subtle fluids. Lamarck is thus able to name the source of vitality as the subtle fluids in the environment, heated and kept active by the sun. His theory opens a whole new dimension through an expressed continuity between man's inner feeling and the subtle fluids as a power of nature.¹⁴⁴ Where Cabanis was more cautious, by admitting as unknown the original source of vitality, Lamarck boldly stepped into that darkness with the light of his evolutionary thesis in search of the spring of life.¹⁴⁵

Cabanis tended to identify sensibility with vitality, betraying a sympathy for the ideas of Bordeu and Barthez.¹⁴⁶ The question was whether sensibility was a fundamental property of all living tissues (or organs) or whether it was the faculty of only one particular organ. Now Albrecht von Haller (1708-1777) maintained that sensibility (vis nervosa) was the peculiar faculty of the nerves. In the thinking of Bordeu and Barthez every organ was understood to have its own sensibility and an ability to react in certain ways to various stimuli; therefore organs were totally different from parts of a machine. For Lamarck, however, sensibility was clearly and definitely

¹⁴⁴ In history, words such as "modern" and "new" are ambiguous because usually relative to context. One could also say here that Lamarck appears to be trying to keep open--in evolutionary doctrine--a dimension which was strongly present in the Renaissance at least, and expressed in the microcosm/macrocosm notion of which Paracelsus (1493-1541) was a master spokesman.

¹⁴⁵ This audacity of course made Lamarck's positivism suspect and elicited that recurrent theme of his concern for positive knowledge which he repeated throughout the Système analytique with an exaggerated frequency. He was testing and demonstrating the positivism in his work. He must have realized that somehow and somewhere in his intellectual life he had trespassed beyond the boundary of positivism; but he could not find where. If everything was positive in his theory, he seems to have concluded, why would it not be embraced by all? This is a thorny question now for historians to answer.

¹⁴⁶ see note 134, p.57 above

the property of the nervous system alone. Thus where Bordeu conceived of a conspiracy of the organs, Lamarck conceived of a dominion by the nervous system. For Lamarck the organs were alive...but to be alive did not mean to be sensible; he characterized the basic state of vitality in organs by the term orgasme, which essentially described a tension or preparedness for action set up by the subtle fluids. Cabanis also placed far more emphasis on the rule of the nervous system than did Bordeu or Barthez; unlike Lamarck, however, he tended (more in the direction of Bordeu and Barthez) to think of the brain as a general "source de vie."¹⁴⁷

Contradictions and paradoxes have a way of bonding unions if they can be tolerated (or not perceived as illogical). Cabanis seems to have achieved his synthesis of physique and moral by placing the brain in the paradoxical position of both slave and master of the organisme. The idéologue Maine de Biran (1766-1824), Lamarck's contemporary, was a student of physiological idéologie. He accused the idéologues of having buried the soul in--not under--their theories, and his efforts to bring to light this weakness of idéologie led in due course to the disengagement of a new science of psychology. The Cartesian wound would again gape open. "Vainly, therefore," wrote Maine de Biran,

does one flatter oneself by eliminating this unknown factor, cause or force which always subsists in the intimacy of thought under whatever conventional term it is designated by, or not even named at all.¹⁴⁸

Maine de Biran insisted that man lived two lives: one was material and organic, the other was psychic.¹⁴⁹ Inheriting the idea that new properties emerge with higher levels of organization, he was led to conclude that there was consequently a higher--hyperorganic--

¹⁴⁷ Cabanis, Rapports, p.585

¹⁴⁸ Pierre Maine de Biran, "Nouvelles considérations sur les rapports du physique et du moral de l'homme," Oeuvres, vol. XIII, Paris, 1949, p.17

¹⁴⁹ see Moravia, Pensiero, p.508. These are the vie organique and the vie intellectuelle.

world:

we have concluded that it is necessary to admit a hyperorganic force, which the imagination can easily localize in a point of the brain different from that from which depart the automatic and instinctive determinations, but which, due to the manner in which it is conceived or felt, must escape all representation.¹⁵⁰

His rebellion against idéologie was in this light a logical extension of it. According to Maine de Biran the intellect could not, therefore, be explained only in terms of organic function at a material level (as Cabanis desired), but rather an explanation must also be in subjective terms of the psyche. And so in his Mémoire sur la décomposition de la pensée (1805) he calls for a positivist science of the inner motors of the psycho-affective life of man:

considered then as an essential branch or even as the main body of the philosophy of experience, if it is still further distinct from pure physics, it is for this reason only: that the subject of observation perceived in the one as exterior to the thinking being is seen in the other as interior or intimate to this very being.¹⁵¹

Biran's revolt against the materialistic idéologie physiologique may serve to tell us how fragile was the union of physique and moral. Certain conditions and attitudes, however, present toward the end of the 18th century led certain thinkers in the philosophe tradition not only to achieve this union (admittedly with disputable success) but in addition (and perhaps more significantly) to rate it as one of the more urgent goals of their day. The scientists in a developing, stricter scientific tradition (Georges Cuvier (1769-1832) is an example), increasingly enamored by experimentally-derived facts, saw no place for such delicate "philosophical" syntheses. Therefore natural philosophy was forced to split...into a psychic stream and a physical stream. Scientism embarked on its quest for experimental

¹⁵⁰ Moravia, Pensiero, p.528. This passage may be read as an epitaph to the Enlightenment, or to Foucault's "Classical Age". For indeed, Foucault makes representation the essence of the Classical episteme and it is precisely the loss of the conducibility to representation which is alluded to by Maine de Biran.

¹⁵¹ ibid., p.510

results leaving man behind the scenes (unperturbed that scientists were men), and the human sciences, newly born, went behind those scenes to observe that man who was being left out.¹⁵² Clearly this made a bleak future for Lamarck's approach to an understanding of man and nature in his philosophical zoology. A flower of the philosophe movement, he bloomed in the winter.

¹⁵² see Gusdorf, op. cit.

VII. LAMARCK AND THE NERVOUS SYSTEM

Is psychology a branch of physiology, or a department of metaphysics? To call it a science is ambiguous. If by science we mean a natural science, what then is the meaning of nature?
 --Lotze¹⁵³

According to the science of living organization--or biology, as Lamarck called it--man and other organisms consisted fundamentally of physical (material) organs and fluids, to which were attributed without exception their faculties and movements. Man was an obvious challenge to such an explanatory project. I will focus on the way Lamarck approached man through the organization of the nervous system. The nervous system was not only the distinguishing feature of man, but also, as we saw with Cabanis, an organ of capital importance. Particular interest is devoted here to what happened to the soul in Lamarck's theory. To start with one should know that he rejected outright--as scientifically useless--the traditional concept of a supernatural soul and a spiritual order of phenomena in nature.¹⁵⁴ But we must inquire more deeply to see how far he actually went in banning such concepts from his science.

The approach through comparative anatomy

It should be emphasized that it was Lamarck's characteristic way in biological explanations to constantly refer to that apparent progression of complexity in animal organization which he observed by way of the methods of comparative anatomy, pride of the Muséum. While the methods of comparative anatomy opened new vistas to scientists, it is not true that everyone necessarily saw the same sight or

¹⁵³ Rudolf Hermann Lotze (1817-1881), German philosopher, citation from Die medicinische Psychologie, 1852.

¹⁵⁴ PZ, p.286; Corps vivans, p.70; Mémoires de physique et d'histoire naturelle, Paris, 1797, p.254

had the same view as Lamarck. Georges Cuvier (1769-1832), for one, a leader in the field and Lamarck's colleague, decidedly did not see the same great evolutionary progression Lamarck saw.¹⁵⁵ As professor of invertebrate zoology at the Muséum, Lamarck had the benefit of being able to draw from his accruing experience and knowledge of this vast realm of the animal kingdom...which was undoubtedly indispensable to him for so clearly apprehending the evolutionary law of nature: indeed, invertebrate diversity is virtually a diagram of progressive complexity in animal organization.¹⁵⁶ And it was this virtual diagram which functioned as Lamarck's frame of reference; it was a skeleton supporting and uniting the body of his biological theory.

Lamarck's analysis of the human nervous system therefore consisted in delineating the progressive development of organizational complexity from the simplest animal up to man, or conversely, the increasing simplicity of organization from man to the infusoria. The human nervous system was seen to contain, as it were, at least all of those simpler than it. Since function and structure were inseparably linked together in Lamarck's conception of organization, he had to do no more than identify the degree of anatomical complexity of the nervous system in any species in order to determine the degree to which that species could feel or be intelligent; it was not necessary to carry out behavioral studies. On the basis of anatomy alone, man was clearly the most perfect of creatures.

The progression of complexity was broken down into three main stages:¹⁵⁷

1) Animaux apathiques, where the nervous system is in its greatest simplicity and "confers on the animals which possess it the one faculty of muscular movement," including infusoria, polyps, radiarians, worms, ascidians. These animals have no feeling, no instincts; they possess habits which are caused by subtle fluids from

¹⁵⁵ Richard Burkhardt discusses this in Spirit of system.

¹⁵⁶ see PZ, p.345

¹⁵⁷ PZ, p.291-292; Histoire naturelle, I, p.220-223. See also Philippe Decourt, "Rôle du système nerveux dans les conceptions de Lamarck," Colloque international "Lamarck", op. cit.

the environment forming ruts and channels as they pass through the material organization. (This together with chemical affinities constitutes their primitive physiology.)

2) Animaux sensibles, which include all other invertebrates, where the nervous system includes a brain, and with the brain the faculty of inner feeling (sentiment intérieur), but no intelligence is present. These animals feel, have instinct, and a penchant to conserve one's existence. I will deal in detail with these faculties later. Suffice it here to say that instinct is the power of the brain (or inner feeling) to release a surge of nervous fluid. The penchant to conserve one's existence is the power of the inner feeling to decide which actions to take. This penchant leads these animals according to need to flee from a sensation of ill-being, to search for food, to reproduce, to seek out favorable environments.¹⁵⁸

3) Animaux intelligents, including all the vertebrates, where the nervous system, on reaching completion (perfection),

confers on the animals which possess it the faculties of muscular movement, of experiencing sensations, and of forming ideas, comparing them together, and producing judgments; in short, of having an intellect whose development is proportional to the perfection of organization.

The ability of intelligent animals to vary their actions sets them apart from the merely sensible ones. They have a unique sense of their own well-being and seek it, they have a love of themselves which is distinct from the desire to preserve their existence, and they have a tendency to dominate others. Among the intelligent animals, man has a unique awareness of and aversion to death.

¹⁵⁸ This penchant is a remarkable power and clearly absorbs certain qualities of the soul. It is a driving force of evolution since it pushes animals on to find new environments, new habits, new ways to survive. Habits are not mere patterns of behavior to Lamarck: because--as was mentioned--the physique and the moral were unified in Lamarck's thinking, habits are therefore also patterns of organization or body structure. And structural patterns, how ever altered by changed habits, are passed on to the next generation, thus giving rise to evolutionary change in the population.

Functions of the nervous system

Since living substance according to Lamarck consists of fluids and organs maintained in a state of irritability by subtle fluids, then, with increasing complexity of organization

there soon arrives a time when irritability and the exciting cause are no longer sufficient by themselves for the acceleration needed in the movements of the fluids.¹⁵⁹

At this point nature makes use of the nervous system to increase fluid movement by activating certain (involuntary) muscles, such as those of the heart.¹⁶⁰ This animating function of the nervous system is not to be confused with the sensational function, Lamarck emphasizes, to correct certain misconceptions (he refers to Cabanis, but it points also to Barthez): "when we walk or perform any action we never feel the movement of the muscles nor the impulse which drives them."¹⁶¹ Furthermore Lamarck supports his position--in his characteristic, positivist way--with a simple and basic observation, in this case the fact that in the activation of muscles and other organs the impulse of nervous fluid flows away from the brain, whereas in sensation the fluid flows to the brain, and it is thus felt.¹⁶²

Sensation, Lamarck, insists, is not the property of brute matter; it is the result of an organic act..."the special system of organs for producing such an effect is known under the name of the nervous system." Since Lamarck claims that the nervous system does all the feeling, he has to explain why in common experience one has feelings in different parts of the body, why a finger or some other

¹⁵⁹ PZ, p.207

¹⁶⁰ Notice here the lucidity of Lamarck's idea of organization. It was not a single organ, the heart, which was such a great invention by nature (William Harvey (1578-1657), for one, sang its marvels); rather it was a whole new order of organization, in which the heart featured only as an integral part. At the same time, one should note the emphasis Lamarck still places on the nervous system.

¹⁶¹ PZ, p.208

¹⁶² PZ, p.302

part feels cold, for example. Surely, one might object to Lamarck, the finger itself is cold not the brain. It is an illusion, he says, that various parts of the body seem themselves to produce sensations. He writes,

none of our humors, and none of our organs, not even our nerves have the faculty of feeling. It is only by an illusion that we attribute the singular effect, which we call sensation or feeling, to a definite part of our body; none of the substances composing this part does or can really feel.¹⁶³

In this passage he means that it is not the finger which does the feeling--of cold, for example--rather it is the nervous system which reacts in such a way to the stimulus that an impulse is transmitted to the brain where the appropriate feeling occurs.

The complexity of sensation for Lamarck springs from his notion that feeling is as much a physical phenomenon as a moral one. Feeling has two correlates: one in the physique--namely, the transmission of nervous juice to the brain in reaction to a stimulus--and one in the moral--namely, the feeling of the appropriate sensation to the stimulus. They are two faces of a single phenomenon.

The organ of sensation is specifically identified as the brain, the sensorium commune, or main medullary mass; feeling is not a general property of nerves. Lamarck says that

the faculty of feeling in any animal can only arise when the medullary mass contains a single nucleus or center of communication, to which the nerves of the sensitive system travel from all parts of the body.¹⁶⁴

Intelligence depends upon the hypocephalon, yet another organ of the nervous system. All organs of the nervous system can communicate with each other, and this communication is, as we shall see, a key to understanding its physiology.

¹⁶³ PZ, p.273. Again, this is a criticism of the more extreme vitalists like Barthez whose principe vital endowed each organ with an active sensibility. Where Barthez tended to see the organism as a federation of equally sensible and active parts, Lamarck emphasized the division of labor among the organs. Organs for Lamarck were more like the parts of a machine. Each organ participates as part of an organism in feeling, but does not itself feel.

¹⁶⁴ PZ, p.293

Intelligence "may be regarded as the high-water mark of what nature can achieve by means of organization." It is distinct from sensation; for, an animal may have sensation without being intelligent. Acts of intelligence are carried out by "a special organ," a "part added to the brain;" "in vertebrates it is confused with the medullary mass under the name of brain, although it only consists of the two wrinkled hemispheres which cover it over."¹⁶⁵

The hypocephalon, according to Lamarck, is so soft that it can only passively react to subtle fluid, to receive, that is, impressions of sensations (an impression is an idea), or else serve as a mold and render up the impressions to the nervous fluid when it passes over (remembering). The hypocephalon is a passive organ but the subtle fluid which runs through it is active. This organ is unique in that it "does no more than provide the means for the nervous fluid to carry out its various phenomena."¹⁶⁶ All other organs react actively to the subtle fluids. In sum, intelligence is a sensitivity to and expression of the subtle fluid; ideas are felt.¹⁶⁷

Like Cabanis he envisaged the brain as a reservoir of nervous fluid from which the active fluid is dispatched according to both conscious (i.e. willed) and unconscious (i.e. felt) requirements (called needs). Lamarck distinguishes four different uses of the subtle fluid, explicitly criticising Cabanis for having confused them:

- 1) particular sensations felt to be in specific parts;
- 2) general sensations felt to be emotions of the inner feeling;
- 3) organ coordination, and muscle activation;
- 4) production and recall of ideas (imprinted sensations).¹⁶⁸

¹⁶⁵ PZ, p.279

¹⁶⁶ PZ, p.366

¹⁶⁷ PZ, p.303. Here Lamarck incorporates the dictum of sensationalism and idéologie, viz.: "penser c'est sentir."

¹⁶⁸ PZ, p.302

The origin of the nervous system

Lamarck's analysis of organization led him to an elementary unit of life, which was so simple, he saw, that it required no special (divine) Creation. Given a gelatinous substance, under certain favorable conditions of warmth and moisture, it was bound spontaneously to become alive owing to subtle fluids entering it and there causing orgasme and irritability. The basics of organization were gelatinous parts and fluids interacting and, due to chemical affinities, growing and reproducing. The subtle fluids played a crucial excitatory role in spontaneous generation. This primitive excitatory role may be seen as the prototype of nervous function. In fact, the environment with its subtle fluids was understood by Lamarck as the virtual nervous system of those simple living things which lack one of their own (infusoria, polyps and all plants).

In the simplest organizations, according to Lamarck, life can exist without special organs;¹⁶⁹ here life was reduced to the bare essentials. The essential functions of life were feeding, building up the body, developing and growing to a certain limit (which varies according to the species), and reproducing.¹⁷⁰ Now Lamarck tells us that these essential faculties arise from "a general force which animates the organs;" this must be, as we have seen, the subtle fluids in the environment.¹⁷¹ But in complex organizations a special organ is necessary to promote the penetration of subtle fluid.¹⁷² This organ is, of course, the nervous system. What this means is that evolution has led, according to Lamarck, to the gradual interiorization of the excitatory power of the environmental subtle fluid, entailing the serial appearance of a network of nerves (in the simpler organizations), then brain, and finally hypocephalon.

¹⁶⁹ PZ, p.259

¹⁷⁰ PZ, p.260

¹⁷¹ PZ, p.261

¹⁷² PZ, p.207

Lamarck cannot explain why evolution has gone in such a direction. He can only say that such is the path observation leads him to believe that nature has taken:

If nature had confined herself to her original method, that is, to a force entirely external and foreign to the animal, her work would have remained very imperfect; animals would have been simply passive machines, and nature never would have produced in such organisms the wonderful phenomena of sensibility, the intimate feeling of existence, the power of acting, and lastly, ideas, by means of which she has created the most astonishing of all, viz. thought or intelligence.¹⁷³

This passage reveals the interesting way in which Lamarck has incorporated the bête-machine idea into his vitalistic thinking. The very simplest creatures, which arise spontaneously, are in fact no more than passive machines--veritable bête-machines! But the passive machine is nature's lowliest, most imperfect creation; indeed, the bête-machine is only the point of departure for nature's creativity ...a rudimentary master-plan, as it were. In this context, the thrust of nature's enterprise has been to activate or vitalize the machine, and to this end nature has put herself inside of animal organization.¹⁷⁴ But how can nature put herself inside an animal? Here one must recognize the tremendous powers attributed to the subtle fluids. They created and create life, and take charge of governing the actions of living things--and they govern, one hastens to ask, according to whose laws?

For Lamarck, the fact that animals with a brain and a nervous system contain within them the power of nature meant that they were bound from the depths of their organization to conform in their action to the laws of nature, not necessarily that they had responsibility, choice, or spontaneity to act as they pleased. This brings us to an important issue: What is the will? Can a man decide for

¹⁷³ PZ, p.346

¹⁷⁴ It is not insignificant--for an understanding of history--that the vitalist (on the stage of intellectual history) appears to have played the role of nature: thus he sought to vitalize the machine, ensoul matter, and, as we are soon to see in the case of Lamarck, to put himself inside each man (an inner man or soul) and take the name, power of nature.

himself how he is going to act, or does the nature within him--that power of the interiorized subtle fluid--decide for him? To frame the question another way: is that self or soul which seems to constitute the life of a man in fact distinct from the powerful subtle fluid within him? Or, is each man nothing other than nature herself, a veritable microcosm?¹⁷⁵

Before I turn to consider how Lamarck treats this problem let me repeat that he does not pretend that man is a mere machine, nor that man has a soul distinct from the matter he is made of. The challenge he faced was essentially to be as positive and scientific as possible without slipping into either mechanism or animism. Man

¹⁷⁵ M J S Hodge, op. cit., seems to have missed the implications of Lamarck's placing man at the top of nature's productions, and consequently distinguishes Lamarck from the Naturphilosophes ("German Romantics"). Because of the interiorization of the power of nature, and since man represents its greatest perfection, so man is in a sense nature grown up, nature becoming conscious. It would be a mistake to consider that Lamarck's thoughts are contained only in the literal and explicit meanings of his words. There is no doubt that Lamarck considered himself a mechanist and presented himself as a deist: but while Hodge says that Lamarck's biologie has the great merit of allowing him a consistent mechanistic and deistic position, one cannot thereupon conclude that Lamarck was in fact either consistent or even a mechanist. Were Lamarck's thoughts really in sympathy with his words and his audience? By distinguishing clearly between what Lamarck said and what Lamarck meant, we enable ourselves to better understand Lamarck's position in history. George Sidney Brett (in his History of psychology, R S Peters (ed.), London/New York, 1962), where he discusses the sources of "will psychology" (p.574-575), mentions Lamarck and Cabanis as counterweights to the Romantic tendency to introduce a cosmic life-principle. "Schelling," he writes, "made this spontaneous life-principle cosmic, a development greatly assisted by the discovery of electrical phenomena." In contrast, he says, Lamarck's evolutionism "made the development of the organism dependent of psychic impulses." Brett has flagrantly overlooked the connection between the psyche and the cosmic subtle fluids ...which is the key to Lamarckian theory--as Lamarck says himself. I bring up these examples of Hodge and Brett to underline the existence of an intellectual conflict in Lamarck's thinking which is all too easily over-simplified or even missed completely.

was to be described along positivist lines so to do justice to the entirety of his observed complexity.

As Lamarck takes the position that man has a will (*volonté*) together with an inner power of nature which he calls the sentiment intérieur (inner feeling), so he must explain how these two powers function organically, how they interact, how they control the actions of man. Unable to deny a certain degree of spontaneity to the will, he nevertheless curtails its freedom as much as possible under the restraints of the inner feeling.

But even the inner feeling, as we shall see, seems to have undeniable--but perhaps reluctantly admitted--powers of spontaneity. On the surface Lamarck's exposition seems to be clear, logical and consistent: yet analysis reveals the evanescence of the consistency and the clarity. This is not to say that he failed: maybe the riddles of the sphinx are indeed divine. They are certainly problematic.

Where he might have made Descartes' analysis of man--into a spiritual, divine soul and a physical, mundane body--instead, Lamarck proffers in the Système analytique an analysis of man into the distinct organism and the indistinct organism. The distinct one consists of those organs--such as muscles, the liver, heart, stomach, and so on--which are massive and easily determinable in shape and which contain liquid, ponderable fluids. The indistinct organism consists of very delicate organs, with an indistinct morphology, and which contain subtle fluids. The indistinct organism corresponds to the nervous system which--in words that conjure up a soul--"reaches all parts, embraces the whole body, and seems to become confused with it."¹⁷⁶ We shall see that a traditional soul has become materialized in Lamarck's nervous system. Of course a material soul was certainly no (traditional) soul to Lamarck...and this is what made his analysis so different from Descartes' (who would have cringed at the confusion of terms in "material soul"): nevertheless it is striking how immaterial Lamarck's soul actually was, and how even the terminology--grey matter, subtle, indistinct--connote the occult.

¹⁷⁶ Système, p.172

VIII. THE NATURE OF MAN

You could not discover the limits of the soul even if you traveled every road to do so; such is the depth of its meaning.--Heraclitos¹⁷⁷

The feature of Lamarck's evolutionary thought which I have so far emphasized is the "transference of the force which produces movements into the interior of animals"...the transposition, that is, of the universal subtle fluid from the environment into the inner feeling or sentiment intérieur. According to Lamarck's biological principles, this transference occurred simultaneously with correlative increments in complexity of organization, so the inner feeling exists only in sensible and intelligent animals (i.e. those with at least a nervous net and a brain). The inner feeling is to be understood as the faculty which the brain brings to the nervous system.

In Lamarck's theory the inner feeling assumes an extraordinary role in the determination of human actions, notwithstanding the influence of the will and reason (faculties of the hypocephalon). From Lamarck's descriptions of the interactions between the inner feeling, intelligence, and needs, man emerges like a raft on an ocean of heavy currents. Enlightened as he was, Lamarck sought to illuminate even the dark forces in their obscurity. Was the light bright enough?

The interpretation of his theory is no easy matter; this ought to be issued as an advance warning. His language labors under the difficulty of expressing the unity behind complicated organic interactions. His terminology is constantly begging to be explained. Here he uses the word "force," for example, there the word "subtle fluid," or there again "nervous fluid." In spite of these difficulties --and perhaps because of them--one is invited to explore the web of connections he has spun. At least one major source of confusion may lie in the admitted speculative basis of his knowledge about the nature of man; as he says,

¹⁷⁷ quoted by Philip Wheelwright, Heraclitus, Princeton, 1959, p.58

all is a product of imagination; limited however by the necessity for admitting nothing but physical causes compatible with the known properties of matter, nothing, in short, but causes which may be and probably are correct.¹⁷⁷

As for the acts of the mind, "none of them can be witnessed and none therefore can be proved."¹⁷⁸ The purpose of the present analysis is to probe the nature of his concepts and delineate the structure of his understanding of man.

The sentiment intérieur: its sentiment intime, penchants, instinct

According to Lamarck, the inner feeling is both the sensitive and the active power of man (and of any other sensible animal). That makes it very important. As a sensitive power it is a genuine feeling, of course; but as an active power the word feeling is not appropriate, although the word inner definitely is. What exactly does Lamarck mean by inner feeling? Obviously the inner feeling is no simple entity in his thinking, since it is responsible for both sensation and action: one would correctly expect it to be something complex. What kind of something is it then? Is it a power? an organ? the product of certain organic motions? Let us see of what the inner feeling consisted for Lamarck, and how he meant it to explain the origin of all human actions.

From his writings there appear to be three aspects of the complex inner feeling: the sentiment intime (intimate feeling), the penchants, and instinct.¹⁷⁹ Lamarck speaks of these powers as faculties of the inner feeling...which is confusing since we are also told that the inner feeling is not an organ but a faculty of the brain--and how can we talk about faculties of the faculty of the brain?¹⁸⁰ Lamarck's tendency to treat the inner feeling as an organ

¹⁷⁸ PZ, p.371

¹⁷⁹ Judgment, we shall conclude later, is a fourth aspect (or faculty) of the inner feeling. But Lamarck does not unambiguously present it as such. Lamarck saw that judgment--restricted to intelligent animals--depended on the hypocephalon, and was thus a candidate for consideration as an independent power. Our analysis shall reveal that the hypocephalon was however no more than a satellite organ of the brain at the disposition of the inner feeling.

¹⁸⁰ This confusion exists also in the very word sentiment in French, which means both a felt sensation and a capacity for feeling.

instead of as a faculty is not just confusing; from another point of view, it betrays a deep-seated and more tacit notion: here is the autonomous soul...a subtle fluid which is both organ and faculty, which is sensitive, rational, and active--essence of the nature of man.

As the passive, sensitive power, the inner feeling is the very obscure, unconscious--but felt--sense of existence (sentiment intime d'existence), which can be brought to consciousness through the attention of intelligence in man;¹⁸¹ it then becomes an idea (which we can talk about). The sense of existence has been well known, Lamarck says, but no one before him has recognized that it is only one facet of the entity he calls the inner feeling. "This intimate sense of existence," writes Lamarck,

in one word, this I in question, has been well known to us, as I have just said; but the inner feeling which gives rise to it, constituting a power on the one hand susceptible of being moved by all felt needs, and on the other hand capable of causing immediate actions, seems to me to have been recognized by no one before me.¹⁸²

This obscure sense of existence is the result of murmuring inner sensations which are constantly arising in the nerves from all parts of the body owing to vital activity;¹⁸³ "the sum-total of these impressions constitutes a very obscure but real inner feeling that has been called the feeling of existence."¹⁸⁴ The sense of

¹⁸¹ Système, p.192

¹⁸² Système, p.229. This passage tells how strongly ruled a materialistic organicism in his thinking. For how else could he have been so blind to the similarity between this power and the traditional soul, recognized by so many before him? Was giving it a name like sentiment intérieur enough to make it an original notion? At least one thesis presents itself: what was original was his vitalistic frame of mind in all its historic moment: old ideas subjected to historical time may become new again.

¹⁸³ Système, p.187

¹⁸⁴ PZ, p.334

existence resides in the brain, where the incessant, obscure sensations all converge (to be felt). So this faculty of the brain is a true inner feeling.

By some unexplained way this state of obscure bodily awareness, according to Lamarck, "confers upon animals the power of producing movements and actions for themselves."¹⁸⁵ In other words, the inner feeling--or brain, as Lamarck could have said--by virtue of constant impulses and murmurs in the nerves develops first the passive faculty of being generally aware of the body and its environment. Then, somehow from this fundamental, passive faculty the capacity for spontaneous--and appropriate--action arises (this capacity is called instinct). As for describing the biological basis of actions it is important to have this "somehow" explained.

To be more precise, Lamarck indicates that the inner feeling "gives rise to a force which causes action," rather than, one may suppose, giving rise directly to action.¹⁸⁶ But, as we have already seen, the exciting force which causes muscular activity (and hence actions) is an impulse of the subtle nervous fluid. Therefore, the inner feeling--as a source of action--must have the power to give rise to impulses of subtle fluid. This power is essential to the function of the inner feeling. We may read that the inner feeling, "regarded as a very active, motive power (moteur), works simply by dispatching to the required muscles the nervous fluid which is to excite them."¹⁸⁷

Still more precisely, he says, "we may regard the inner feeling as the fountain (source) from which the force that produces actions derives its energy (puise ses moyens)."¹⁸⁸ This suggested image of the spring or fountain helps to clarify both the nature of

¹⁸⁵ PZ, p.334

¹⁸⁶ ibid.

¹⁸⁷ PZ, p.333

¹⁸⁸ PZ, p.334. Hugh Eliot's translation is not apt here. "Energy" is too liberal for the historian. "Moyens" has the literal equivalent "means"; the idea to be conveyed is "means of action."

his conception and its meaning. There are three fundamental stages to any action. It seems that the subtle fluid is 1) stirred up, 2) given a direction, and 3) sent on its way.¹⁸⁹ The inner feeling has three faculties for doing this: the sentiment intime is a passive faculty disposing the fluid to be stirred up by stimuli; the penchants direct the aroused fluid, and instinct impels it.

The stirring up or upwelling of the subtle fluid in the fountain is called an emotion, according to Lamarck. An emotion is the subtle fluid in an excited or powerful state; in such a state it is amenable to being directed and channeled. When Lamarck writes, "the emotions of the inner feeling constitute the power which drives the exciting fluid to the muscles," he is alluding to the fact that an emotion is the first of a series of three steps necessary to produce an action.¹⁹⁰ Emotion is a precondition to action, and therefore appears to be a primal power. While this explanation helps, it still does not completely elucidate the source of human actions. We are left asking, But what causes an emotion, that upwelling in the fountain?

Lamarck tells us that the cause of an emotion is a certain "exciting cause" called a need. He envisages the need as a force which, according to its intensity--in Newtonian fashion--causes a proportionate reaction in the subtle fluid of the nervous system (inner feeling).¹⁹¹ In the same way that the force of gravity excites the motions of attraction in another body, so the force of need excites the motions of sensation (emotion) in the nerves. Such motions of sensation take the form of impulses of nervous fluid originating anywhere in the body and flowing to the brain. In intelligent animals there is a special category of sensations called willed

¹⁸⁹ While such a break-down of action looks very mechanistic, the actual agencies or faculties which operate to allow such action involve other--organic--dimensions, which we shall explore further.

¹⁹⁰ PZ, p.344

¹⁹¹ PZ, p.380

needs; it refers to sensations originating in the hypocephalon. We can see that, for sensations in general, Lamarck had a materialistic and mechanistic view of their origin and nature: it was essentially a question of the communication of motion between material bodies. As for the special category of willed needs we shall inquire later whether motions in the nervous fluid were in this case created spontaneously.

Lamarck is able to explain in detail how sensation occurs... how a current of subtle fluid leaves the affected part of the body, reaches the brain, spreads from there throughout the body along the nerves, rebounds at the extremities of the nerves, returning to the brain and channeling down the one nerve which is open--namely, the one leading back to the affected part. Sensation is thus ingeniously accounted for in terms of an involvement of the entire nervous system focussed on a particular, affected region.¹⁹²

Although the mechanics of sensation is in this way described, Lamarck offers no further explanation for the subsequent response of the organism. Somehow certain muscles, for example, must be activated to carry the animal away from the stimulus. All Lamarck can say is that, yes, certain muscles are activated; this is the responsibility of the nervous system by its power of inner feeling. The inner feeling has, as we have mentionned, besides its faculty of sensitivity (sentiment intime), the power to guide and to act; it appears intelligent or rational not because it thinks or reasons (which it does not), but because it knows.¹⁹³ This knowledge of the inner feeling's has the form of guidelines called penchants. The penchants constitute the inner feeling's power to guide. And the inner feeling's

¹⁹² Système, p.177

¹⁹³ Now Lamarck, of course, in a positivist way, was content to call the inner feeling a power or faculty and go no further than describe its effects. Such a power or faculty was an understandable and acceptable entity. For Lamarck, the identification itself of this power was a discovery; it solved the mystery of the source of human actions. (see Système, p.324). Certainly Lamarck did not call this power intelligent or wise, as I am doing: my intention in seeking to describe it is historical--to understand a late 18th-century idea.

power to act is called instinct. In certain places Lamarck argues that also intellect has a power to act, but I will show later that this is not rigorously correct according to the rest of his theory. The first power which rules man is not the intellect: it is the inner feeling.

While the sensitivity of the inner feeling--its faculty of sentiment intime--is the organic mechanism to alert the individual to needs, the penchants seem to give the inner feeling its inner sense of what to do in case of need: they let it know how to react to sensations of all kinds. Let us look carefully at the penchants: are they laws of nature, permanent and unchanging? Or are they the changing decrees or whims of a cryptic intelligence?

Moral agent in the inner feeling: the penchants

There are two kinds of penchants: 1) general or natural ones; and 2) special ones. The special ones are acquired by an individual during his own experience and he can learn to modify them; they are not necessarily permanent. The general penchants he calls "natural"

because it is effectively nature which has instituted them and because they exist at the same time as instinct, at the same time even as the inner feeling. And, in effect, as soon as an individual has the intimate feeling (sentiment intime) of his own existence, whether or not he realizes it, he possesses simultaneously a penchant to conserve his being, and this penchant is the source of all the others.¹⁹⁴

There is, as he says, one main penchant rooted in the nature of organization, namely the penchant to conserve one's existence. The six penchants which arise from it (the first is actually identical to the main one) guide the inner feeling respectively to: 1) conservation of one's existence; 2) independence (love for one's liberty); 3) self-interest; 4) domination; 5) seeking out well-being (both mental and physical); 6) horror of one's destruction.

¹⁹⁴ Système, p.249

These six penchants "are the unique sources from which all the actions of man take their activity (puisent leur mobile)."¹⁹⁵ Yet the first penchant--the one to conserve one's existence--may be considered alone as the source of all actions, Lamarck says, since it gives rise to the other penchants.

While on one hand presenting the penchants as the source of all action, on the other hand Lamarck also describes each penchant as a constant tendency (tendance constante) of the individual's inner feeling towards a particular goal; a tendency which always manifests itself whenever this inner feeling has some action to execute, and when the circumstance in which the individual finds himself favor its development.¹⁹⁶

"Penchant" literally means a leaning or a tendency. But can tendencies be immediate products of the inner feeling ("véritables produits de son sentiment intérieur")? we ask, for the inner feeling produces actions and sensations.¹⁹⁷ Does the inner feeling, then, produce actions, sensations, and tendencies? Lamarck seems to confuse the penchant proper with the actions that just manifest the penchant. According to Lamarck, the six general penchants begin to direct--as soon as the inner feeling begins to excite--an action;¹⁹⁸ in consequence, the resulting actions will surely look as much like the direct products of the penchants as the direct products of the inner feeling... which explains the confusion. In any case, it is clear that there are certain goals toward which the inner feeling tends to orient its actions.

Let us say, therefore, that a penchant is not, strictly-speaking, a source of action. Lamarck means it as a source of guidance. It guides the individual in accordance with the laws of nature. To call a penchant a tendance (tendency) is to call it after the observed pattern of actions which are really the result of a penchant,

¹⁹⁵ Systeme, p.212

¹⁹⁶ ibid.

¹⁹⁷ Systeme, p.227

¹⁹⁸ Systeme, p.212

not the essence of one. The essence of a penchant has more to do with laws and forces. Consider the following passage:

What I notice here that is most positive is that, in as much as he is a physical being, man is entirely subject to the laws of nature, that, ruled by the penchants he has received, he acts always in conformity with these laws and by them, in such a way that, in perfectly identical circumstances, his actions are constantly the same.¹⁹⁹

What kind of entity could it be which leads a man to act in accordance with the laws of nature? Since the penchants were unlikely meant to be the laws themselves, then they must be forces of some kind. Are they active forces, knowing forces, or blind forces? As forces, the penchants must act on the subtle fluid (in the nerves) and thus indirectly cause actions in man: they act on the inner feeling; but at the same time they comprise, according to Lamarck, a faculty or force of the inner feeling. The inner feeling, therefore, must act on itself through its penchants. We are dealing with no ordinary force.

The penchants constitute a force only in the sense that conscience is a kind of force, a force which acts upon itself as well as on other things. Moreover a conscience implies the presence of both law and force: it is an entity with the power to enforce the law. In Lamarck's depiction, the penchants appear to possess precisely this power.

To call conscience a force is perhaps to push a reductio ad absurdum. Lamarck in fact does not go this far. The complexity and ambiguity in his description of the inner feeling and its faculties reveal rather the conceptual intricacy with which he is beset by admitting the unique powers of the inner feeling. Would we be wrong to recognize here that rich conceptual substratum which historically has been known as the soul?

As a conscience, a penchant is some power that can decide or know what action to command given any need. But first a sensation must be recognized as a need before a decision and command can be made. Between the recognition and the decision a connection between the

¹⁹⁹ Système, p.156

intimate feeling of existence (sentiment intime) and the penchant to conserve one's existence may be unravelled: one does the physical part of feeling need, the other does the moral part. The sentiment intime (the passive, sensitive faculty of the inner feeling) can feel two kinds of sensation: well-being and ill-being. A sense of well-being is a joy; a sense of ill-being is a need.²⁰⁰ But as far as the sentiment intime is concerned--since it is passive--a sensation is just a sensation--a flux of nervous juice. It must be the role of the penchant, I conclude, to recognize that sense of well-being as well--it makes it desireable--and the sense of ill-being as ill--it makes it a need and creates desire.²⁰¹ In effect, the penchant identifies sensations, evaluates them. It is therefore meaningful for Lamarck to say that the penchant "gives birth" to needs,²⁰² for the penchant generates a veritable moral universe, a universe of values, in which stimuli are no longer just stimuli, blind and senseless events--but--and this is the key point--events with sense...needs and joys. The penchant makes an animal sensible.

More light is shed on the concept of penchant when Lamarck says that a penchant which becomes overwhelming is a passion.²⁰³ Now, if a passion is an extreme form of a penchant, we can see that a penchant normally must be a strong, innate desire; a special penchant must be an acquired desire, which may be changed by an effort of the will or by new environment and habits. One infers that desire is something fundamental and inexplicable in Lamarck's theory. Desire is a basic element which entails also the idea of goal--for there is only desire as long as there is something to be desired. Here are two essential ingredients in Lamarck's vitalism. As for man, to live is to desire to live.

A natural penchant, as a desire, is no willed desire but a

²⁰⁰ Système, pp.201.226

²⁰¹ see PZ, p.380: "desire is only a need or the consequence of need that is felt..."

²⁰² Système, p.214

²⁰³ Système, p.206

desire in the inner feeling, an inherent desire created by nature in a certain level of living organization. It arises from a sense of self-love which nature inspires in an individual as soon as the inner feeling is experienced.²⁰⁴ A penchant is not merely desire--but desire, conscience, knowledge or wisdom, and goal or purpose, are all facets of this vital power. Here we arrive at the cross-roads of Enlightenment vitalism and the Romantic consciousness: where the idea of finality in nature meets the immense sense of deep desire: where reason meets the unconscious. It is essential to remember that for Lamarck the inner feeling has arisen over the aeons of evolutionary time by a process of interiorizing the power of nature. The nature of man is nature herself--a torrent within. Probing the various concepts of need, penchant, instinct, and so on, we are merely touching the depths of that ocean which is the notion of nature; it came in like a tide at the Renaissance.

The instinct of the inner feeling

Lamarck tells us that the inner feeling is the one and only "motor of all actions which man and the sensible animals execute, no matter where the needs which make them act come from."²⁰⁵ The inner feeling channels emotional activity into actions, as we saw. And it dispatches emotional nervous fluid down the correct nerves by obeying its penchants. In this way all actions promote the survival and well-being of the individual. The conversion of emotional activity into motor activity is carried out in particular by the power of instinct, a faculty of the inner feeling.

Compared to the penchant with its apparent foresight, instinct is blind and mechanical:

²⁰⁴ Système, p.211

²⁰⁵ Système, p.194

It is a mechanical power of sorts, and which itself does not vary in degrees but the effects of which are always proportional to the causes which make it act.²⁰⁶

Unlike a penchant it is clearly assimilated to a Newtonian force (with the important difference, however, that although it remains constant it produces varied reactions). In effect, instinct is merely an agent intermediating the Newtonian relationship between needs and actions. We already saw that, as the source of actions, needs constitute a force which can vary in intensity and causes proportionate disturbances or emotions in the nerves--in a decidedly Newtonian way. Instinct really serves to transmit the force of need from wherever it occurs through the nerves to the target muscle (as determined by the penchants). Instinct is only an agent-force...which is undoubtedly why Lamarck qualified it as a mechanical power "of sorts" (une puissance, en quelque sorte, mécanique).

Moreover, instinct--although it is a mere agent to needs--also serves as ambassador to the inner conscience: it induces action only under the control of the penchants. It cannot exist without its penchants (as a mere agent it must be guided to act toward the preservation of the individual's existence) nor can it exist without its sentiment intime (there first must be a sensation before it can be transmitted). The penchants, the instinct, and the sentiment intime complement one another: one feels, one guides, one acts. Together these form something which begins to look very much like a living soul: together they form the inner feeling of the brain and its nervous net. And it is significant that Lamarck put them together: that was his discovery, he said. While we have analyzed the inner feeling into its components, we must put them back together as Lamarck conceived. Do we not obtain an intricate vital entity that thinks, feels, and acts all in one? a vital entity which constitutes an animal within the animal--a man within the man?

²⁰⁶ Système, p.245

Will and judgment

One must not necessarily conclude that the inner feeling has the power of spontaneously causing actions. The inner feeling must be forced to cause actions by stimuli: yet the inner feeling, and it alone, does have the power to recognize stimuli and satisfy the ones which are needs, which means to activate the correct muscles or organs by its instinct and penchants. Stimuli make up the outer world for the inner feeling; they are the world in which it lives, the world it encounters and to which it responds. For the inner feeling, it is important to realize, the intellect exists in this outer domain; the intellect is a source of certain needs--willed needs. The willed need and the felt need are the two sources of human actions.²⁰⁷

So Lamarck leads us in places to think of the will as a fundamental, emotive force like a need. This suggests that the will is a source of spontaneity. But we learn more specifically that the will is only a result of certain judgments.²⁰⁸ And judgments, Lamarck assures us, are not spontaneous and free; so too the will is only "free in appearance."²⁰⁹ He writes,

the fact that our judgments depend on so many inappreciable elements has given rise to the belief that our determinations are free, although in reality they are not so, seeing that the judgments which produce them are not free in themselves.²¹⁰

Lamarck's concept of the will must incorporate at least two ideas: the idea that actions can be intelligently determined; and the idea that intelligence is not really free. He calls the will a need because it appears to cause intelligent actions, in the same way that felt needs cause instinctive actions.²¹¹ I would suggest that Lamarck

²⁰⁷ Système, pp.244,157; PZ, p.356

²⁰⁸ PZ, p.380; Système, p.246

²⁰⁹ PZ, p.359

²¹⁰ PZ, p.360

²¹¹ Système, p.275

--to express more clearly what he meant--should have likened the will to a faculty like instinct, rather than to a force like need. For the will, as Lamarck describes it, only processes emotions sent to the hypocephalon by the inner feeling (instinct processes needs affecting the nerves); it does not actually create emotions (nor does instinct) although it certainly does alter them (in effect, it combines them with ideas). Both instinct and the will operate between needs on the one hand (which limits their freedom) and actions on the other (which makes them agents of influence).

Lamarck says that the essential function of intelligence is to vary the individual's actions...so that the individual can act intelligently--not just by instinct.²¹² The intellect or hypocephalon does this by producing willed needs, which is a general term intended to include all impulses of nervous fluid sent from the intelligent organ to the inner feeling. A willed need is an emotion of the nervous fluid which is communicated to the inner feeling from the hypocephalon; it combines with and thus changes emotions present in the inner feeling, and thereby leads the inner feeling to (intelligently) alter its course of action.²¹³ An example my help to clarify the situation. Suppose an intelligent animal feels cold, and thus feels a need to move since it has a penchant to conserve its existence. Through an act of intelligence it can will a need to remain still (knowing that if it moves it will be easily seen by a predator). Presumably the felt need to move and the willed need to stay cancel each other in the inner feeling and as a result no action is taken. In animals with no intelligence, and often in intelligent animals, the need to move will lead directly to an action or movement with no thinking or willing in between--this is action by instinct.

²¹² PZ, p.358

²¹³ Système, p.199

The problem is that while Lamarck tells us that the intellect can act of its own will to produce a willed need,²¹⁴ he also says that the intellect cannot act for itself, since (and this is an indestructible principle of his) the inner feeling is the only motor of all acts including the acts of intelligence (including the will).²¹⁵ The hypocephalon is so soft, we remember, that it is a uniquely passive organ. It is the seat--not the actor--of the four faculties of intelligence. The inner feeling sends nervous fluid to it for: 1) commanding the attention of the mind (attention is the first step in any act of intelligence; effectively, the individual is attentive when the inner feeling is in communication with the hypocephalon); 2) storing an idea; 3) recalling any idea at will; 4) combining ideas to make a judgment or will a need.²¹⁶

Lamarck is far from clear about the autonomy of the intellect and the spontaneity of the will. If the will is really a source of action then one would expect the intellect to have some kind of inner feeling of its own, or at least a power to command the inner feeling of the brain. On the other hand, if the inner feeling of the brain is really the one and only director of actions then the willed need is really not a need at all but a determination of action by the inner feeling through the agency of the hypocephalon; the will would be virtually a sophistication of the penchants. And along with such a functional sophistication, in accordance with Lamarck's biological principles, there must be an organizational sophistication--which is precisely the hypocephalon.

It is more consistent with Lamarck's thinking that the hypocephalon and intelligence actually be controlled by the inner feeling. Lamarck does speak of an esprit (spirit, mind), which carries out "the determinations that constitute the will," and has its seat in the hypocephalon apart from the brain where the inner feeling resides.²¹⁷

²¹⁴ PZ, p.357

²¹⁵ Système, p.266

²¹⁶ Système, p.255

²¹⁷ Système, p.271-272

But since it is the inner feeling which brings ideas to mind (présent à l'esprit), how can the esprit be any other than the inner feeling when it is attentive?²¹⁸ In other words, the attentive mind (présence d'esprit) is a state of the inner feeling:

therefore what is presence of mind if it is not the free execution of acts of thought, joined with the communication--equally free--of these acts to the inner feeling, a communication which takes place completely only when the latter is calm?²¹⁹

Dreams are disordered not because the intellect is at rest but rather because the inner feeling is at rest--because the inner feeling has not ordered the recall of the dream images.²²⁰ And when the inner feeling is violently moved (as by a great fear) one's presence of mind is eclipsed by that emotion and the inner feeling then rules unswayed by judgments yet guided only by its own inner sense (namely, the penchants).²²¹ Even when not violently moved, the inner feeling is, Lamarck says,

the activator (le mobile) of all the movements which are at its disposition, and if this individual possesses the organ of intelligence, it is still the inner feeling which directs all its acts.²²²

The organ of intelligence, or hypocephalon, thus appears to be a library of ideas which only the inner feeling from the brain (donning the name esprit) knows how to use. The inner feeling is the head librarian.

The passivity of the hypocephalon corroborates this interpretation of its essential subservience. Lamarck explicitly says that the hypocephalon

never exerts any action itself in any of the acts or phenomena to which it gives rise, and that it does nothing more than receive and preserve for a longer or shorter period the images transmitted to it and the impressions graven upon it.²²³

²¹⁸ Système, p.267

²¹⁹ Système, p.275

²²⁰ Système, p.269

²²¹ Système, p.274

²²² Système, p.191

²²³ PZ, p.366-367

But the brain too is passive: the hypocephalon

together with the brain and nerves, differs from all the other organs of the animal body in that it is not active, and does no more than provide the means for the nervous fluid to carry out its various phenomena.²²⁴

To be sure, all the solid parts of the nervous system are but the servant to the subtle, fluid part--be it called esprit, inner feeling, or simply nervous fluid. Lamarck leaves us little doubt that the inner feeling is a remarkable, active and powerful subtle fluid.

Are we not bound to ask, then, the question he foresaw:

I may be asked how it is possible to conceive that any fluid, however subtle and varied its movements, can by itself give rise to that astonishing variety of acts and phenomena characteristic of the intellectual faculties. To this I reply that the entire marvel is in the composition of the hypocephalon itself.²²⁵

Indeed, the composition of the hypocephalon must be marvelous. But is it not even more marvelous how expertly the subtle fluid finds its way among the channels of engraved ideas, how it knowingly responds to stimuli, how it gives birth to needs? Let us not underrate Lamarck's notion that the subtle fluid and the supple parts together and inseparably constitute the entirety of the phenomenon, one being functionless without the other. Still, there is one of them which, without the other, is forever active: and this self-moving, self-asserting, subtle fluid uses the brain and the hypocephalon like a glove in its encounter with a restless earth and changing circumstances. Even if all the marvel were in the composition of the hypocephalon, yet has not that same marvelous organization in fact been molded by the subtle fluid as exciting cause of life and driving force of evolution? Decidedly we do find Lamarck sharing this very thought when he says that, of all the marvels which nature has been able to produce, the rapidity and agility of the subtle fluid in the nervous system is the most admirable, "it is veritably the master-piece of her operations."²²⁶

²²⁴ ibid.

²²⁵ ibid.

²²⁶ see above, p.43, note 95

IX. PHYSIS AND PSYCHE IN LAMARCK'S VITALISM

All things are full of gods -- Thales

At the limits of mechanism

Analysis of Lamarck's theory of man reveals the central importance of that complex entity called the sentiment intérieur or inner feeling. As Lamarck himself said, "the inner feeling is the most important thing to consider in the study of the products of the organization of man."²²⁷ One cannot regard the inner feeling simply as a faculty of the brain; rather it is a faculty of the passive brain together with the active subtle fluid within it and within the entire nervous system. The inner feeling carries out both physical and spiritual (by which is meant mental and emotional) functions, a combination which gives the inner feeling its central importance and its unique role of uniting in a single unit of organization "two orders of phenomena apparently so distinct,"²²⁸ the physique and the moral.

Reigning over Lamarck's physiological thinking was the idea that all organic activity could be explained in terms of the interaction between two basic parts, between more-or-less solid organs and moving fluids.²²⁹ This, of course, was a mechanistic conception par excellence. The great challenge for Lamarck was to answer the demands of such an explanatory program while fitting in that order of

²²⁷ Système, p.191

²²⁸ see above, p.55

²²⁹ see PZ, p.288: "We have therefore to deal only with the relations existing between the concrete supple and containing parts of an animal, and the moving fluids (containable or uncontainable) which act on these parts. This well-known fact has been for me as a beam of light; it guided me in the research that I have sketched out, and I soon perceived that the intelligent acts of animals are, like their other acts, phenomena of animals organization, and that they take their origin from the relations existing between certain moving fluids and the organs which produce these wonderful acts."

phenomena called the moral. It was not a new challenge, but an inflamed one since the expansion of mechanistic science in the Renaissance. It was the problem of the soul, impeccably formulated by René Descartes (1596-1650), who declared that the moral and the physique were clearly and distinctly two different orders of reality.

Lamarck, following his mechanistic vision, which was the "beam of light" that guided him in his researches, discovered that the key to explaining the production of the moral from the physique lay in the fact that the body's fluids and solids were not necessarily visible, distinct and ponderable in all organs. In fact, the nerves and cerebral organs, he realized, calling them the organisme indistinct, are passive and the fluids in them invisible, subtle and very active. This solution to the problem of the soul was very attractive since the basic pattern consisting of organs and fluids interacting--a cornerstone of his science of organization or biology--could be preserved. Indeed, this solution may have been the only one open to him in a world illumined by his beam of light. It behooves the historian of science to inquire after the context, motives and implications of Lamarck's solution. Although he could not see either these fluids or the fine structure of the brain to confirm the solution, yet in the interest of a complete theory or system--pushing mechanistic thinking as far as he could--he used his imagination to the best of a French, Newtonian and Cartesian tradition (coming by way of the naturalism of the philosophes such as d'Holbach (1723-1787) and Buffon (1707-1788)) to argue from phenomena and spin theory on hypothesis--to reach what he called, in a good positivistic idiom, certitude morale.²³⁰ "What matters it," he wrote,

that these fluids whose extreme tenuity prevents us from seeing them or even keeping them in a vessel for making experiments with, only manifest their existence by their effects? These effects constitute a cogent proof that no other cause could have produced them.²³¹

²³⁰ see Aram Vartanian, op. cit., for a lucid discussion of the intriguing interrelationship of Newtonian and Cartesian traditions in Enlightenment France.

²³¹ PZ, p.288-289

And,

with regard to the traces impressed on the brain by ideas and thoughts, what matters it that these traces cannot be perceived by our senses, if, as is agreed, observations exist which leave us no doubt as to their presence and their seat: do we see any more clearly how the nerves set the muscles in action? Yet we cannot doubt that nervous influence is indispensable for the performance of muscular movements.²³²

These words fall like an echo of Newton defending his forces. No force could ever be seen or touched, forces themselves were strictly occult: but their existence was certain, inferred from observable effects. We hear echos because Lamarck and Newton stood at the same brink of mechanistic thinking. They both faced a great empty space between the cause and the effect. For Newton it was the space between the sun and the earth, the void between all bodies; how could the sun attract the earth across empty space? For Lamarck it was the space between the physique and the moral; how could the interaction of solid parts and fluids produce that "order of phenomena apparently so distinct," that order of feeling and thoughts?

Far from abnegating the unobservable, the occult, Lamarck, like the hero Newton, actually wooed it. For both Newton and Lamarck the notion of a subtle fluid was very important, but where Newton used the idea of force, Lamarck used the idea of faculty. Lamarck believed that the sentiment intérieur was that faculty which gave rise the the moral from the physique, just as Newton believed that it was the force of gravity in one body which gave rise across space to motion in another. But not everyone would find it so easy to believe. Was this really mechanistic thinking? The Romantics saw this great space as a great hollowness in Reason, a great darkness inside the Enlightenment. "What is this power," asked Maine de Biran (1766-1824),

capable of modifying all the laws of animal sensibility and contractility, which struggles against instinct, alters all its determinations, suspends this movement, constrains the body to stay still or to move ahead when an opposing force makes it flee or tremble? I stop here in the belief that it is not necessary to develop further the premises of a distinction which anyway is self-evident, and which would not

232 PZ, p.286

need any proofs had not modern physiology sought to invade even the realm of the soul and to submit to its divisions and hypothetical explanations even the events of the sens intime. The hollowness of these explanations of the moral by the physique is I hope now demonstrated by all that precedes. But still, is there not some connection or relation other than causality between the two thinking and living natures?²³³

While mechanism was very dear to Lamarck, it did not, however, dominate his thinking to the extent of forcing him into a dualistic position of the Cartesian type. On the contrary, his own attachment to mechanism was combined with an attachment to materialism and steered him away from the allure of dualism in the understanding of life and man. The last thing Lamarck meant to allow in his system was an animistic or supernatural soul as Descartes had done. What is outstanding about Lamarck's notion of the sentiment intérieur (with its penchants, sentiment intime, and instinct) is surely the materialistic amalgamation I have described of mechanistic and animistic properties. In effect, Lamarck used a material subtle fluid to combine the properties of the soul with a material and mechanical nature. He thus intended to bridge that great gap Descartes had faced between the soul and the body; for how can soul influence the body or the body the soul if they are utterly distinct? How can thoughts cause actions? Descartes himself had definitely adumbrated Lamarck's solution. In a witty cataloguing of prevalent materialist ideas, the abbé Coyer said that Descartes had employed subtle matter, like Empedocles his fire, to restore vitality, consciousness, and reason to the organs of the body. Coyer concluded: "Either there is no materialism, or that is it. And the public, who takes everything literally, reads all this."²³⁴ If Lamarck had been a little less stubbornly mechanistic and materialistic, his sentiment intérieur might well have become the Principe vital of a Barthez. As mechanistic as he remained, Lamarck was, however, a true vitalist.

²³³ Pierre Maine de Biran, op. cit., p.56

²³⁴ quoted by Aram Vartanian, op. cit., p.234

Although Lamarck explained the soul in terms of material organs, subtle fluids, and faculties, it is still difficult to say exactly at what point in the interaction between subtle fluids and organs the moral arises from the physique. In fact, the moral appears to arise from no ordinary interaction of fluids and organs: rather it appears to arise by some kind of transformation carried out by the faculty of the sentiment intérieur. The great space between a physical ébranlement in the nerves and its moral evaluation as a need or a pleasure is densely packed into the faculty of the inner feeling. The very essence of the faculty of the inner feeling is its power to simultaneously feel (a phenomenon of the moral) and act (a phenomenon of the physique): the moral and the physique are indeed inseparable in Lamarck's theory, thanks to the remarkable properties of the sentiment intérieur. It is this entity in its context of organisation which marks the leap beyond dualism and demands, because it is no ordinary force, a unique (vitalist) science of man and life. The problem of the soul did not demand a leap beyond science, insisted Lamarck; intelligence and feeling, he maintained, are entirely natural products, not at all "marvels foreign to the realm of nature."²³⁵ What the problem of the soul did demand was a new biology.

The soul in Lamarck's vitalism

Lamarck's vitalism is characterized by a soul which is all but conceptually absent, a material soul of nature however divine its properties might appear. In his imaginative and sweeping attempt to explain life in terms of faculties, organs, and fluids, the soul persistently shows through, as what we could summarily and perhaps advantageously call a creative power. If one were to use the term "Lamarckian" one should mean to refer to a concept of nature where the environment is a demand and life a creative (vital) response. This persistent soul in his idea of life surely constitutes the

²³⁵ Système, p.266

fundamental strength as well as the hallmark of his vitalism. Moreover, Lamarck's natural philosophy stands upon concepts of soul and nature, developing relations between these, which are reminiscent of and rival to ancient Greek ideas. This is testimony both to a significant 18th-century expansion of the idea of nature to include properties previously kept divine in a stricter Christian world view, and also to the thoroughness and durability of those ancient philosophies.

Under the scrutiny of Enlightenment reason, as we saw, the traditional soul was broken down into components. The immortal part went to the theologians, the material part fell to the growing appetite of the laboratory scientists, and the active part went up for grabs, as slippery as it was, and became the center of an 18th-century debate over the fundamental properties of living things, where irritability and sensibility were essential points of concern. I identified three facets of this active part, all present in man: a thinking rational facet, a feeling sensible facet, and a spontaneous motive one. Animism was an important ingredient and source of inspiration in the later part of the Enlightenment but it was at that time a waning theoretical competitor. The prevailing trend among the philosophes was to resolve the material basis of the soul. Lamarck's sentiment intérieur with its attendant biologie was a particular response to that situation.

In Lamarck's theory the material basis of the active soul was identified as the nervous system.²³⁶ The material basis of the rational soul was the hypocephalon, the material basis of the sensitive soul was the brain and nerves. Now since Lamarck emphatically

²³⁶ Muscles, according to Lamarck, were activated by a nervous system. In simpler animals which appeared to have no nervous system motion was due to irritability. Irritability was a phenomenon caused by free subtle fluid in the environment penetrating the living body and there stimulating a tension (orgasme) between fluids and solid parts thus making them irritable to any disturbance of the tension. This free subtle fluid, however, in the light of Lamarck's comprehensive evolutionary vision, was the nervous system in its most primitive form.

declared that the brain and hypocephalon were passive organs, one concludes that it was the subtle nervous fluid which carried out all the active functions, as long as it had cerebral organs with which to do this.

Since the brain was essentially a "centre de rapport ou foyer commun" of the nerves,²³⁷ a fountain or reservoir of subtle nervous fluid, it was the unique place where all acts of the body could be controlled, integrated and coordinated. It is important to note that here it was a case of self-control and self-coordination, because the divine hand of a supernatural soul was absent. The brain-organ was passive (yet instrumental) in this self-control; the subtle fluid was, as it were, the master-mind, the decision-maker. Yet the subtle fluid was not only a mind, we saw. It could also feel. And it could act. Here in the sentiment intérieur, the motor of all actions, were three kinds of soul working together: the penchants as rational soul, the sentiment intime as sensitive soul, and instinct as motive soul. Lamarck has put the parts of the soul back together again; united in the sentiment intérieur they renew an older, traditional concept of the human soul. Such a synthesis of powers is typically Lamarckian, reflecting as it does his cherished view that diversity arises from a unitary force acting under a variety of different conditions. It is therefore consistent in his thinking that the sentiment intérieur alone should have such great power and produce through the various organs all the phenomena of sensibility, intelligence, and muscular activity. The organized body was, in effect, the organ (tool) of the soul.

Was the sentiment intérieur really a motor, then? Was the motor, as Lamarck called it, actually a machine or a soul? As a mechanist Lamarck saw the motor as a machine. Something in his thought, however, was obviously unwilling to reduce man to a (mere) machine; something insisted on a soul and made Lamarck a vitalist. Whether his thinking thus foundered on the soul or drew strength from it is a matter of opinion.

²³⁷ Système, p.193

The soul in nature

The proof that intelligence and feeling were entirely natural products was provided by his evolutionary theory. This theory was intended to demonstrate step by step how nature interiorized the subtle fluids, how

nature, although obliged at first to borrow from the environment the excitatory power for vital movements and the actions of imperfect animals, was able by a further elaboration of the animal organization to convey that power right into the interior of these beings, and that finally she reached the point of placing that same power at the disposal of the individual.²³⁸

Finally she reached the point of placing the sentiment intérieur at the disposal of man. What does this mean? Did man have, other than his inner nature, some faculty for disposing that inner power? Which man--the inner or the outer--possessed the intelligence for wielding that power of nature?

As we saw, all acts of the intelligence are begun and carried out by the subtle fluid of the inner feeling. The hypocephalon is passive; it serves as a template to the subtle fluid, rendering up or storing ideas as the case may be. What is important to note is that before a judgment is consciously felt by the brain, that judgment has already been made by the subtle fluid. The subtle fluid somehow knows which ideas to search out in the hypocephalon, it knows which ones to combine for making the judgment. The subtle fluid is therefore a clear case of an unconscious active intelligence, in contrast to the conscious but passive intelligence of the brain.²³⁹ If one were pushed to identify more specifically the part which initiates an act of intelligence, one would name the faculty called the penchants. This faculty of the subtle nervous fluid is an active intelligence which knows or decides which are the desired ideas for making any conscious judgment. As we saw earlier, the penchants do not merely initiate acts of intelligence, they also create desire,

²³⁸ PZ, p.6

²³⁹ This is an insecure distinction, however, since the sentiment intérieur really unifies both active and passive functions. One must remember that analysis breaks up wholes at a risk: the risk of maiming the original idea but also the risk of understanding it.

and desire was the most fundamental activator of life, as Lamarck said:

and we know that desire includes and leads to the performance both of those actions which set up muscular movement, and of those which give rise to our thoughts, judgments, reasonings, philosophical analyses, and to the operations of our imagination.²⁴⁰

When Lamarck said that nature placed its excitatory power at the disposal of the individual he apparently meant simply that the ubiquitous subtle fluid had condensed, as it were, into centers of self-controlling activity (individuals). One may liken it to the formation of the solar system by condensation into planets from an original gas. The inner power was not placed at the disposal of an autonomous and independent human consciousness: the inner power was placed at its own disposal in the material confines of an individual man. This makes it look like man had no free choice over his actions. Lamarck referred in places to free will as an illusion, and he meant to emphasize the subordination of man to nature. From man's point of view, man's will appeared to be free, but from nature's point of view, it was determined. Man's free will was not really his: it was primarily nature's free will which man carried around in himself. This meant that man could attain freedom in that degree to which he identified himself with--or actually became one with--nature.²⁴¹

The traditional image of the soul as an inner man seems to

²⁴⁰ PZ, p.397. Like Aristotle, Lamarck made appetite (desire, needs) the source of all movement (see Aristotle, On the soul, Book III, Chpt. 10), but unlike Aristotle, he did not admit a distinct autonomous mind. For Lamarck there was indeed an autonomous mind but such a mind was definitely conjoined with the sensitive and active souls. The sentiment intérieur was an autonomous soul--man's feeling, thinking, acting soul--and it was certainly an undivided soul. Like the Aristotelian mind, Lamarck's soul was eternal since it took the form of free subtle fluid upon the death of the individual.

²⁴¹ Here is a golden thought the philosophes kept close to their hearts.

fit Lamarck's thinking.²⁴² The distinguishing characteristic of the inner man is of course its active intelligence--above all its ability to employ the knowledge it has of what is desireable. And what is desireable? Is it not undoubtedly a certain direction in life toward a certain goal?--namely, the fulfilment of life according to a supposed --or, in Lamarck's case, an observed--plan of nature? Here is vitalist thinking par excellence. The apparent directedness in nature (acts taken to preserve one's existence, creation of organs to fill needs, evolving complexity of organization) implied that nature had a goal or telos, a design, or some reason behind it: nature was alive and going somewhere.²⁴³ Nature as a whole reflected, as a macrocosm reflects a microcosm, nature as an individual--there was a common soul and a harmony of goals. Nature (in the sense of living nature, or life) clearly was not following a routine trajectory like the planets around the sun. "What leads nature on her creative path?," one can hear Lamarck asking between the lines. The ever-active subtle fluids kept nature moving, that much was mechanistically explicable. But with no such mechanistic explanation for the directedness, Lamarck was obliged to add a moral power on to the physical power of the subtle fluids. This new and bigger power thus united the moral and the physique, and took on the properties of that soul or unconscious intelligence in man, source of actions, ideas, desires.

²⁴² Lest one think that this image belongs to an antiquated science, one may refer to Gunther Stent, "Limits to the scientific understanding of man: human sciences face an impasse since their central concept of the self is transcendental," Science, 21 March, 1975, pp.1052-1057. This article is a kind of modern intellectual rehearsal of the play of ideas discussed in this dissertation. It may also serve to remind us that the intellectual progress of science is not straight forward. The story of science and the soul is not without analogy to the story of Winnie the Pooh following those mysterious yet intimate tracks round and round the bush.

²⁴³ In an era when Reason was the sun both day and night, and when progress was the beacon of the future, is it surprising that science would discover this same reason and progress to be essential qualities of nature?

Lamarck's account of the natural production of feeling and thinking relied heavily on his notion of the subtle fluids. He attributed remarkable powers to these fluids--and yet none was too remarkable to be considered by him as supernatural. Lamarck's evolutionary account of the natural production of feeling and thought is, therefore, only half the story: we must also ask, what did he mean by natural? If Descartes had found it necessary to attribute the production of feeling and thought to a soul descended from God, how did Lamarck manage to attribute it to nature? Exactly what powers did the nature of Lamarck's possess?

Lamarck seems to have simply materialized Descartes's soul, taking it from God and giving it to nature. For Lamarck, as for many thinkers of his time, it was only sensible to give to nature qualities which once were reserved for the Divine. God's role was thus reduced to the role of an original creator--a Supreme Author, as Lamarck liked to say--and nature became the source of active, creative powers in the world. Matter and subtle matter were seen to embody forces which obeyed nature's laws. That spiritual (i.e. mental and emotional) phenomena in living things had a uniquely material basis was a foregone conclusion, for which, Lamarck, like many other philosophes, sought to provide proof. The idea of a powerful nature was the foundation upon which the vault of the Enlightenment rested.

Lamarck the naturaliste-philosophe

One must not think that Lamarck went so far as to deny the existence of spiritual phenomena in nature. Thoughts and feelings were in a different category from stars and stones, but there was a connection. In fact the belief that both spiritual and material phenomena had a common basis in the natural world was essential to Lamarck's thinking and typical of many philosophes. In the light of this study it appears that Lamarck was so convinced--even in the manner of a religious conviction--of the natural origin of the moral that he was utterly blind to that great hollowness in his theory

(the gap between matter and spirit) which the Romantics saw so clearly. It is not a question of who was right or who was wrong. People believe different things, see different things, say different things: in sum, people are subject to history.

It appears that Lamarck himself did not fully appreciate the nature and implications of his own theories: he did not realize what a vitalist he was. Always insisting that he was a mechanistic thinker, always presenting the sentiment intérieur as a mechanically acting organic motor, insisting that the subtle fluids were truly physical things whose existence was assured, he unwittingly confused his audience and invited misinterpretations. The fact is that Lamarck was primarily interested in the nature of life, in the causes of life; and of this he had a definite intimation since he called himself a naturaliste philosophe. But at the turn of the 18th century French science was trying to elaborate an experimental method to study only effects, and theories would have to stand on the results obtained. Richard Burkhardt has rightly emphasized this situation for a proper understanding of Lamarck's poor acceptance by the scientific community.²⁴⁴ Yet this also tells us that if we want to understand Lamarck, it may be a mistake to consider him primarily in the context of natural history (which Burkhardt has done very well). Understanding Lamarck as a Parisian scientist does not necessarily equal understanding Lamarck for what he was. I have tried to present another side of the picture by considering Lamarck in the context of a general Enlightenment movement to create a science of man and a science of life, a movement in which the philosophes were very prominent.

Quite apart from the question of Lamarck's influence or success as scientist or philosopher, a study of Lamarck can reveal historical insight into the dynamics of important currents shaping Europe, such as the reformulation of the soul in scientific terms, the growth of Romanticism from Enlightenment, the recognition of the unconscious when reason turned to explain itself, and the birth of

²⁴⁴ Richard Burkhardt, Jr., Spirit of system, Harvard, 1977

the human sciences such as psychology from the natural and physical ones. Standing squarely in the midst of these events was the intractable soul, which the philosophes had early set out to bring down to earth. The case of Lamarck, who thought he had succeeded so well in this enterprise but who actually ended up espousing a complex and traditional idea of soul, illustrates especially clearly how a faith in reason was not just a "beam of light" but equally a cloud of darkness: what was a failure of reason could be construed as a success according to his way of thinking, and the irrational could be dressed in the guise of its opposite. The historian cannot blindly accept what scientists like Lamarck profess--that they are objective: science is deeply involved in a beguiling and complex interrelationship of human motives and endeavors, thoughts and passions, hopes and illusions. From the Enlightenment intricacy of faith and reason, which is salient in a study of Lamarck, one can especially see unfolding the inexorable Romantic appeal and the recoil of scientists into the shell of experimentalism. Science had put out long and curious and hungry feelers in the Enlightenment--Lamarck was one of them--to discover new territories: The enthusiasm of the Newtonian triumph, however, met many barriers and difficulties in the biological realm. As Aristotle had warned, "To attain any assured knowledge about the soul is one of the most difficult things in the world."²⁴⁵

Lamarck was by no means alone in his attempt to materialize the soul. Spirits and subtle fluids were very common ideas, not to mention the popularity of forces acting invisibly and at a distance. Subtle fluids were material substances of a most fine corporeality with very active properties, mysterious, elusive, intangible, invisible; in many ways they resembled the traditional soul. The challenge for science, and vitalism in particular, was not to throw out spiritual or soul-like phenomena, it was rather to integrate them into a rational understanding of nature. But how were they to be integrated? that was the question. How does one explain the perpetual motion of the planets or the coordinated motions of a man? While Lamarck's subtle fluids

²⁴⁵ Aristotle, On the soul, Book I, Chpt. 1.

were nothing original, the connection he made between subtle fluids, nature and man--his sentiment intérieur as the product of an evolution of organization--was a brilliant (however ill-received by scientists) response to the intellectual challenge of his day.

There was in France an important stigma to the materialization of the soul which must be mentioned, for the authority of the Church was threatened. A problem in the Enlightenment for a biology struggling to be born and for its enthusiastic supporters among the philosophes was that the religion of the Church was also all about the soul and had, as it were, a monopoly over the soul. A confrontation was inevitable. Indeed, the Enlightenment may be seen as a hundred years' war between science and the Church to establish a recognized boundary between them. The philosophes and scientists wanted to create a new image of man free from the soul of Christian doctrine. They wanted to create an institution of science in society free from the Church. They wanted freedom of reason. They wanted to redefine the boundary between the realms of the natural and the supernatural. Science would rule the realm of nature, theology would rule the realm beyond. And what happened to the soul in this contest? It was caught on the line; it was not clear what should be done with it, but it was bound to be partitioned. In an approximate way the immortal, incorporeal and conscience-laden part went to the Church; the soul as a principle of motion and of life lost the name soul and became absorbed in various scientific terms such as forces and subtle fluids. Typically the natural philosophers employed soul-like concepts dressed in new terminology while at the same time vigorously disclaiming the scientific validity of the traditional soul concept.²⁴⁶

Such a contradictory position is readily understood in view of philosophical and political motives for the promotion of science and the growth of its authority. The goal of the philosophes was not necessarily to do away with the traditional soul but rather to give it a materialistic interpretation and a scientific cast. Their point was

²⁴⁶ In the case of Lamarck see Système, p.11

that science and reason had more to say about the soul than the Church did. But when it comes down to basic concepts, did they indeed have more to say? We have seen that Lamarck, in the mainstream of the naturalistic philosophic movement, tried to lay down the principles for a science of life, of man, and of the soul, but embedded into the heart of his thinking a traditional soul. In trying to explain phenomena formerly explained by reference to the soul, he actually ended up with many of the old explanations put, however, in new words. This is not to imply that there was no import of these new words for fashioning a new future, but--did the concepts change with the words? The materialization of the soul, as Lamarck carried it out, was actually an admission of a spiritual order of phenomena in nature which the Greeks had long before recognized, and which the Christians, with Eastern influence, had elaborately developed.

By placing man definitively in the realm of nature's productions, Lamarck felt the need of his time to extend the horizon of nature's powers: nature would have also the capacity to produce the moral, thoughts and feelings. Nature was not just that order of things as he defined it, for he did not define it completely: nature was alive, creating, desiring. Through his theory of the interiorization of the subtle fluid, man and nature were joined as by an umbilical cord. From this scheme issues the idea that intelligence and the will are the reins by which nature rules man. Man is only a fetus with latent freedom; the better he knows nature, the more will he tend to be free; biology was a new salvation. The Baron d'Holbach wrote in a similar vein that "in man, free agency is nothing more than necessity contained within himself."²⁴⁷ Yet at the same time man has the capacity to wield this tremendous power within him, wield it the way nature wields it. Man can create marvels and destroy them. Man is caught in the torrent of nature; he can either ride the current or be drowned under it.

²⁴⁷ Paul Henri d'Holbach, The system of nature, J P Mendum, Boston, 1868, p.163

Nature was not alive nor intelligent, Lamarck said, despite his vitalism. The subtle fluids did not manifest in the environment the same powers as the animal spirits, as the subtle fluids were called when they circulated inside living organization and had organs at their disposal for the production of living activity. They did possess, however, Lamarck said, a fundamental dynamism, "une puissance toujours active."²⁴⁸ One is here faced with a picture of the world in which the soul of man or psyche is connected in fundamental continuity with what is undoubtedly a soul of nature or physis as the Ionian philosophers might have called them in the 6th century B.C.²⁴⁹ The immortality of the soul is assured in Lamarck's scheme for at death the interiorized subtle fluids, losing their faculties of intelligence, and feeling, but preserving their incessant activity, depart to rejoin that universal pool of spirits. And in spontaneous or direct generation some of this universal spirit may again find its way into living

²⁴⁸ Système, p.48

²⁴⁹ see William Ellis, op. cit. The Ionians peered past appearances for a more basic reality or identity of things. "This identity, that which persists through the changing manifold, that which is real is denoted in early Greek thought by a technical term physis, which may be translated primary substance." (p.42). For the Ionians, the psyche was in general a subsidiary of the physis contained in the living organism. Ellis considers that a radical change to animism occurred with Socrates and Plato; still, Plato carried on many of the old themes, and I cite the following passage to suggest how such themes were also carried on by Lamarck. "The Platonic psyche is not a part of a material continuum, but of a spiritual Real. Like the Socratic psyche, the Platonic psyche is the spiritual source of all action and passion in living things, but, like the Ionian psyche it is also the source of all activity in the inorganic world. It is a matter of common experience that only living things have the power to move themselves, and it is of course this power of self-movement that Socrates and Plato ascribed to the soul. Now, individual objects in the inorganic world have no such intrinsic power of motion; they move only when impelled extrinsically. Therefore it is not to the individual objects in Nature that we must attribute a psyche but to nature as a whole. That is to say, there is a universal psyche, a world soul which moves the whole of nature as the individual psyche moves the whole organic being. The universe is a "living organism"...All that Plato seems to regard as certain is that the force which moves the universe, which causes the motions of the heavenly bodies, of the winds and the tides, and all the ceaseless interplay of natural phenomena, is akin to the spiritual force which moves in us, and in virtue of which we are living beings." (p.90).

organization. In this way the puissance of nature and the sentiment intérieur are caught together in a circle of endless activity.

When Lamarck says "the nature of man" he means it in a literal sense, and in an old Ionian sense: for nature has in the course of evolution not just produced man, but has actually become man. If one considers the convictions and ideals of the philosophes of the French Enlightenment, this is not a startling conclusion although the biological argument is original and dramatic. One of the deepest sentiments of the age was that man was related by an intimate bond to nature rather than to God. From across the Rhine, Goethe could be heard,

Nature! We are surrounded and embraced by her: powerless to separate ourselves from her, and powerless to penetrate beyond her.²⁵⁰

With Lamarck, then, man is depicted in his great superiority with a potential to conquer the world, to destroy other forms of life. Here too he is depicted in bondage to the will of the Supreme Author. Lamarck intended no place for a divine soul, neither in man nor in nature; man and nature were both too lowly for that, the Supreme Author having securely confined them to his law. But here in their confinement do man and nature not appear really demoniacal--agents of a material ever-active and powerful soul, as destructive as creative? One hears beneath Lamarck's ingenious account of how light, mother of caloric, produces in organization all the marvels of human reason the rumblings of a storm from the unconscious dark.

²⁵⁰ Johann Wolfgang von Goethe (1749-1832), "Goethe's aphorisms," Nature, 1:9, 1869

EPILOGUE

"...but what you said about the soul leaves the average person with grave misgivings that when it is released from the body it may no longer exist anywhere, but may be dispersed and destroyed on the very day that the man himself dies, as soon as it is freed from the body; that as it emerges it may be dissipated like breath or smoke, and vanish away, so that nothing is left of it anywhere. Of course if it still existed as an independent unity, released from all the evils which you have just described, there would be a strong and glorious hope, Socrates, that what you say is true. But I fancy that it requires no little faith and assurance to believe that the soul exists after death and retains some active force and intelligence."

"Quite true, Cebes," said Socrates, "But what are we to do about it? Is it your wish that we should go on speculating about the subject, to see whether this view is likely to be true or not?"

"For my part, " said Cebes, "I should be very glad to hear what you think about it."

"At any rate," said Socrates, "I hardly think that any one who heard us now--even a comic poet--would say that I am wasting time and discoursing on subjects which do not concern men. Let us approach it from this point of view: do the souls of the departed exist in another world or not?"

"There is an old legend, which we still remember..."

--Plato, Phaedo

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