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The Unity of the Sciences
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THE UNITY OF SCIENCE AND THE DUBIOUS CREDENTIALS OF POSITIVISM

by

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The aim of the unity of science is embedded in the very conception of knowledge. As soon as we think of knowledge as something other than is contained in dictionaries, i.e. particular information accumulation, we realise that we can distinguish between theories according to their explanatory power. The more a theory explains, the better its quality. By this we do not mean that good knowledge is the knowledge which enables us to "reduce" one piece of information to another. We mean instead, that the quality of knowledge depends on its universality, regardless of any possible reductions. Thus the more unified our science, the greater its explanatory power and therefore, tout court, the better it is. The unity of science is therefore not an idle aspiration or an aesthetic concern. It is an aim which is synonymous with knowledge itself.

One can detect that some of the real advantages in knowledge depend indeed on an increase in unity. When mathematics and the motion of bodies were brought together; when atomic theory and the periodic table of elements were brought together; when it was discovered that the functioning of the living cell was its molecular structure, or the possibility of uniting thermodynamics and mechanics through Boltzmann's statistical theories as envisaged by Planck in his Leyden lecture of 1908. (See J. Blackmore, Ernst Mach, Berkeley, 1972, p.221.) These are examples of genuine progress in knowledge and movements in the direction of the unity of science.

The unity of science is also a valuable and welcome weapon in the fight against relativism. If there is no unity, one will be led to think that all systems of knowledge, being isolated, are a paradigm unto themselves. Thus one is left with relativism; and if relativism is the last word of wisdom, one's respect for knowledge will be lessened. In this sense and for this reason, the idea of the unity of science performs a necessary function in our appreciation of the value of knowledge.

For approximately two centuries, the main philosophical support for the unity of science has come from positivism. Listing phenomenalism, nominalism and the rigid separation of values from knowledge as the distinguishing characteristics of positivism, Kolakowski (Positivist Philosophy, Harmondsworth, 1972, p.17) adds as the fourth hallmark "the unity of science". As a philosophy, positivism is not easy to define with precision and different positivists mean different things by the word "positivism". But speaking broadly, all positivists use the same model. They suppose that man the knower is capable of some sort of Olympian stance outside the world and from that stance he can look and watch the world. On the face of it, this model of knowledge seems plausible and sensible, for what better way to find out what the world is like than to look and watch and to eliminate all knowledge which is not derived from looking and watching. This summary description of positivism I have derived partly from my reading of people called "positivists" and partly from the impression I have gained from that famous textbook of positivism by Richard V. Mises (Kleines Lehrbuch des Positivismus, 1939; Positivism, Eng. transl., Cambridge, Mass., 1951). I know that Kolakowski's criteria for positivism as quoted above are more specific; but they are compatible with my summary of positivism as an Olympian stance. I also think one could argue with him about his second criterion, nominalism. Nominalism appears in positivism only in so far as particular observations do not easily lend themselves to the support of generalisations; the nominalism of positivists is therefore derivative from their sense-observation dogma, but is not an independent ingredient in positivism. Maurice Mandelbaum gives a slightly different description in Ch.I of his History, Man and Reason, (Baltimore, 1971). Mandelbaum states that positivism is first, the rejection of metaphysics; second, the assessment of the adequacy of knowledge according to its approximation to the achievements of the most advanced sciences; and third, the confinement of science to the description of correlations.

Mandelbaum observes that Kolakowski is wrong in omitting the second criterion, the approximation of all knowledge to the most advanced sciences and in including the value-knowledge separation instead. All in all, if a closer definition of positivism is required, I would go to J.S. Mill's The Positive Philosophy of Auguste Comte of 1865 in which he stresses at the beginning the phenomenalism of positivism; the rejection of the search for ultimate explanations; the insistence on descriptions of regularities; and the implied conviction that phenomenalism cannot mislead, provided we take its findings to be descriptions of appearances and not as revelations of essences. To my mind the proviso is really tautological and opens more problems than it solves.

As I said, there are many varieties in which this model was used and, depending on the variety, there are certain logical and philosophical difficulties in it which vary according to the variety one uses. But if one consults such an old fashioned standard text as the Kirchner-Michaelis dictionary of philosophy first published in Berlin in 1886 one will be told that positivism was not just one of many philosophies, but the philosophy which stood behind the whole enterprise of science. In this dictionary we are told that positivism states that all knowledge is scientific knowledge because it is based on observation, and that there can be no other knowledge. This description is very simple but not, in essence, different from the so called "Received View" in the philosophy of science. (The term was coined by H. Putnam, "What Theories are Not", in E. Nagel et al eds. Logic Methodology and Philosophy of Science, Stanford, 1962.) "Scientific theories" -- and this, we are told is the Received View -- "are axiomatic calculi which are given a partial observational interpretation by means of correspondence rules". (F. Suppe in his Introduction to his edition of The Structure of Scientific Theories, Urbana, 1977, p.3.)

Though the term "positivism" was not used by Locke and though he was by

no means the first philosopher to use the positivist model, Locke makes a good starting point for a historical inquiry into the rise and decline of positivism. For we must concern ourselves with the rise and decline of positivism. If positivism was the main support for the unity of science and if positivism has declined, ought we to conclude that the idea of the unity of science must decline with it? In surveying the rise and the decline of positivism, one will find out from the historian that, at the best of times, positivism had very peculiar and shaky foundations and that its eventual decline was to be expected because these shaky foundations had very little to do with philosophy and the nature of knowledge. The historian can show us, therefore, that the decline of positivism need not affect our understanding of knowledge and its in-built aim at unity; and that, on the contrary, the decline of positivism makes the way free for a more genuine conception of knowledge and the unity of knowledge.

At the centre of Locke's positivism there stood an explicit theory about the acquisition of knowledge. "I imagine that all knowledge", he wrote in the opening paragraph of Draft A of his Essay, "is founded and ultimately derives its self from sense." And in the very last edition of the Essay he writes in Book IV, Ch. XI, section i: "No particular man can know the existence of any other being, but only when, by actual operating upon him, it makes itself perceived by him". We get notice of the existence of things by an actual receiving of instructions. Locke, in other words, believed that we can account for knowledge by thinking of it as a sort of physical transfer from one thing to another. The world, in short, causes us to have knowledge of it.

Locke was nothing if not original. In all earlier attempts to account for knowledge, no matter what the precise nature of the mechanism of knowledge acquisition had been thought to be, philosophers had always assumed that there was some kind of link between the knower and the known. True, this link had not

been conceived in terms of an evolutionary adaptation between the knower and his environment. But a link there was believed to be. For Plato knowledge depended on "ideas" or "forms" which the soul had spotted before it was entombed in the body. Thus all human knowledge depended on the life-cycle of the soul which contained a period in which the soul, before its entombment in the body, had been part of the real world. In St. Thomas' Aristotelianism, knowledge depended to a large extent on the exercise of "right reason." Both "right reason" and the world to be known had been made by God and there existed, therefore, an ultimate link between knower and known, for both were the creations of God. For Descartes, to mention another example, knowledge proceeded from "clear ideas" which admitted of no doubt. True, here there seemed to be no initial link between "clarity" and what is known. But it so happens that for Descartes the primary clear idea from which everything followed was cogito, ergo sum: i.e. the awareness of a link between knower and known. For the famous formula asserts not only that I am because I think; but also that, in order to think, I have to be here. By contrast, Locke started a singularly novel line of thought. He not only argued that there is no link between the mind and the world; but alleged that the fact that there is no link made the contents of the mind (conceived as a sort of bucket) a genuine guide to the world. Knower and known are distinct and without link. And when we can discern a link, he said, we can be sure that the world has exerted a causal influence upon the knower and when that causal link has been detected, we can speak of having knowledge. The whole theory depended on the initial absence of a link.

We know today that this account of knowledge is completely false. To quote Donald Campbell: "Somewhere in the evolutionary hierarchy the available distal relationships come to be exploited, and with this comes a renunciation of rigid one-to-one reflexes at the proximal level." Proximal particulars (something

like Locke's directly derived ideas) are equivocal, Campbell says. This equivocality is corrected by a continuing process of pattern matching in which, for example, ideas in our mind are compared to the pattern of appearances as observed and gradually brought into line with each other. ("Pattern Matching as an Essential in Distal Knowing", in K.R. Hammond ed. The Psychology of Egon Brunswik, N.Y. 1966,p.85.) However, we can see that Locke, though wrong, was not completely at sea and that one could correct his theory if one took evolution into account. Our sense perceptions are adaptations to the environment in which we are living and while we cannot get ourselves to believe that our knowledge of any part of that environment is literally caused by those parts, we can see that the adaptiveness of our senses provides us with an opening into the world. Yet Locke persisted in his theory without any inkling of the evolutionary amendments one ought to make to his view of perception. This is hardly surprising. In the 17th century, ideas of evolution were not even in the air and Locke himself took great pains in the opening sentence of Book I of his Essay to stress that man is unique and totally different from all animals, i.e. to start from a totally non-evolutionary standpoint. If one were to amend Locke in the light of evolution, one would certainly be offending against the spirit and intention of Locke. And yet, there were people in the 17th century and earlier who had noticed, and Locke might have been one of them, that there was a certain adaptiveness between any animal and its surroundings. The explanations provided, however, were anti-evolutionary. God in his goodness, it was argued, seeing that camels liked heat and sun and sand and little water, had taken care to place them in the desert! (Cp. Keith Thomas, Man and the Natural World, London, 1983, p.19.)

Though the philosophy of observation would have been off to a flying start with the help of evolution, one can hardly blame Locke for failing to take advantage of the theory of evolution. But even so, had Locke been less concerned

with the uniqueness of man, he would have seen that men, like animals, do not learn entirely by observation and by receiving instructions from the outside world. In man the complexity of the manner in which the nervous system meshes with stimuli may not have been obvious. But an observation of animals would have helped. But here, evolution or not, there was a real barricade of dogma in the 17th century. No matter what observations even men like Bacon made, people were thrashing around for reasons to make sure that man kept on being seen as unique. Nakedness, it was alleged, is bestial. Men wear clothes. When somebody mentioned that animals are not naked either but have hair and fur people did not allow this observation to brighten their ignorance. They retorted instead that, in order to keep themselves unique, men had to cut off their hair because being covered by hair was a sign of bestiality. (Cp. K. Thomas, Man and the Natural World, London, 1983, p.39.) And yet, men more enlightened than Bacon or Locke started having their doubts. Lord Monboddo thought that animals might learn to be human if they could live longer and Pepys in 1661 wrote of a strange creature from Guinea, an ape so much like a man that one had to think of him as a hybrid between a man and a baboon. Sir Ashton Lever (1729-1788) had an orangoutang who had learnt to speak a few words. (Cp. K. Thomas, op.cit., p.132. For a fuller discussion see A.O.Lovejoy, The Great Chain of Being, N.Y., 1960, p.235f.) In spite of such observations, the idea that man was unique and that his humanity consisted in his absolute difference from animals held firm for another two hundred years and left its fateful imprint on the rise of positivism. And yet, as is well known, Locke showed fewer scruples in regard to other pieces of Christian dogma, and one must wonder what would have happened had Locke been able to read Gerhard Vollmer's Evolutionäre Erkenntnistheorie!

Or consider Locke's theory in relation to the greatest success story of his age, Newton's Principia. Locke admired Newton enormously. "Mr. Newton in his

never enough to be admired book," he wrote in Book IV, vii, 3, and stated that Newton, for one, never made use of a priori "maxims." Newton himself seems to have imagined that he had followed Locke's theory as to how one gains knowledge. First, he said, one reveals by analysis some simple results and then generalises them by induction. At least this is how I.B. Cohen (The Newtonian Revolution, Cambridge, 1980, p.13) summarises the scenario which Newton claimed to have followed. Going further into the matter, however, Cohen tells us that what Newton really did was totally different from this Lockean scenario. Newton's style, as Cohen calls it, is displayed in an alternation of two phases or stages of investigation. "In the first, the consequences of an imaginative construct are determined by applying mathematical techniques to the initial conditions concerning mathematical entities in a mathematical domain. In the second phase the physical counterpart of the initial conditions or of the consequences are compared and contrasted with observations of nature.... This usually gives rise to some alteration of the conditions of the initial construct, producing a new phase one, followed by a new phase two, and so on." (*ibid.*,p.99.) It takes very little discernment to see that in Cohen's view Newton did not follow Locke but, if one might say so, Donald Campbell.

The consequences of Locke's positivism and of his causal theory, devoid of an evolutionary corrective as they were, proved completely counter-productive. In Hume, they led to real scepticism and in Berkeley to a denial of the existence of the real world when it was not perceived. Hume thought that Newton had been a good practitioner of Locke and had proceeded by "admitting no principles but such as were founded on experiment...but resolute to adopt every such principle." Hume's eulogy of Newton in chapter LXXI of The History of England is well known and often quoted. But Hume's ironical scepticism about Newton in the same paragraph is not so frequently quoted: "While Newton seemed to draw off the veil

from some of the mysteries of nature, he showed at the same time the imperfections of the mechanical philosophy; and thereby restored her ultimate secrets to the obscurity in which they ever did and ever will remain." I take this to mean that Hume, certain that Newton had practised what Locke had preached, thought that Newton had very serious limitations. Our own assessment of Newton is quite different from Hume's. Thanks to Cohen we know that Newton did not follow Locke and that, for this reason, his discoveries, though they have important limitations, are not nearly as "obscure" as Hume thought.

Given the fact that Locke's prescriptions for and explanations of knowledge are not nearly as marvellous as he and Newton and Hume thought, how are we to explain that Lockean positivism or something very similarly based on it, came to be one of the reigning philosophies of knowledge for over two centuries? I would like to put forward the theory that Locke's success and enormous influence is not to be explained by the inherent plausibility of his philosophical reasoning, let alone by the successes of their application; but by a peculiar view of human history and of the development of mankind. Locke simply reasoned, though he never spelt this out in so many words, that exclusive reliance on sense perception is the last and most modern method for getting knowledge. Every other method had been tried. People had believed in revelation and in tradition. They had paid heed to authority and had relied on innate ideas. Whenever they had done so, they had not achieved much knowledge. The whole past history of mankind, he knew, is full of superstition and ignorance and he ascribed such superstition and ignorance to the reliance on faulty methods of getting knowledge. In his own age, by contrast, knowledge had made real progress. Since everything had been tried and had been found wanting, there was only one other method left. That method, he thought, was the causal theory of perception.

Ultimately, then, the real motive power in Locke was not philosophical

reasoning, though he tried hard. The real motive power for his view of knowledge was the conviction that in the past men had tried faulty methods and that in his own age, men were at long last capable of using the correct method. The causal theory of perception was right, he thought, because it is the hallmark of the modern enlightenment. There is a sort of developmental law of history, he would have argued had he been pressed, which makes mankind advance from wrong methods for gaining knowledge to right methods. The causal theory of perception was right in virtue of a purely eliminative process. It was the one method which had never been tried before and since its discovery coincided with the first genuine growth of knowledge it had to be considered a valid account of that growth. Locke, in short, was something of a historicist: the main backing for his theory of perception did not come from philosophy at all; but from the historicist view that there was a law of development which had brought man finally to the stage at which exclusive reliance on causally produced knowledge, on knowledge as the causal interaction between knower and known, was the final stage of development.

In order to understand the full significance of Locke's non-philosophical motives, one has to look at the way in which he saw his position in the history of thought. Locke saw himself as a sort of revolutionary intellectual Hercules who had cleared out the Augean Stables. There are three pieces of explicit evidence to this effect. In the beginning, Locke wrote, all people were like the people who are living in America now, i.e. savages. ("In the beginning all the world was America," Two Treatises of Government, Peter Laslett ed., New York, 1965, p.343.) We are enlightened and civilised; and they are not. Locke started his Treatises on Government by devoting the whole of the first Treatise to the demolition of a traditional view of the origin and character of government, i.e. the views of Robert Filmer. Filmer was no great intellect; but if one were to make a comparison between Locke's own theory and that of Filmer, one would have to admit that

Filmer's theory though illiberal was much closer to the historical truth than Locke's. Finally, Locke's Essay Concerning Human Understanding begins with a lengthy attack on the theory of innate ideas. In all respects, one can see that Locke had no mean view of his own role in the history of mankind and in particular of his contribution to human enlightenment. Had Filmer and the theory of innate ideas been allowed to prevail, he seemed to be saying, there would be little difference between savage America and civilised England!

This assessment of himself was enthusiastically and unreservedly supported by no less a person than Voltaire. Writing to Walpole he called Locke "another Hercules" and in his The Age of Louis XIV he uses the example of Locke to prove that the 17th century was superior to the golden age of Greece. (Cp. Ira O. Wade, The Intellectual Development of Voltaire, Princeton, 1969, p.620.) Such an evaluation of the significance of Locke in human history is all the more remarkable because it is not borne out by 17th century historians like Sprat and Glanville, who saw progress in knowledge as very gradual and continuous. It had started with the Greeks and worked up to the culmination in the Royal Society whose hallmark was experimentation. Strange as it may seem, Locke's view of himself as some kind of sudden fulguration was more in line with the thought of the Fifth Monarchy Men and other Puritan fanatics of the 17th century who believed that the millennium, intellectual or other, was at long last at hand. Here again we can notice how deeply embedded the sudden illumination of positivism was in the darkest traditions of Christian phantasy. In his view of history, Locke seems to have belonged with the real obscurantists; and not with Sprat and Glanville! However this may be, we must concentrate on Locke's view of his position in history in order to understand how he could be so convinced of the liberating effect of his philosophy of observation and of the mind as a sort of bucket (to use Karl Popper's phrase) into which the world was being poured in order to produce knowledge. Philosophically

Locke's theory could not stand on its own feet, but found great support in his view of history and of his place in that history.

Two centuries before Locke, at the time of the Renaissance, scholars and scientists had often looked back upon the past. But when they were looking back, they had only seen the Greeks and the Romans to whom they felt, on the whole, inferior. They had therefore formed the idea that knowledge and civilisation were what the Greeks and Romans had achieved and that the future of mankind must depend on attempts to recover the knowledge of the Greeks and Romans. This peculiar, though understandable vision of the past came to be punctured and eventually discarded by the awareness that with Galileo and Kepler and Copernicus knowledge had outstripped the Greeks and the Romans and that what came to be known as "The Enlightenment" had to be explained in some other way. How had the enlightenment been possible? What was its place in the history of mankind?

One of the first men to address himself specifically to this question was Voltaire. The answer he came up with was very strange and to us, totally unconvincing. But to appreciate its significance we have to consider that in the 16th and 17th century men had begun to see the past in a new perspective. Where the men of the Renaissance had identified the past as the Greeks and the Romans, observers in the 16th and 17th century, not to mention the 18th century, had come across the inhabitants of Africa and America whom they thought much less civilised than the Greeks and Romans. Hobbes wrote in his Leviathan (Everyman ed. pp.64-5) that the natural condition of man was a state of war of everybody against everybody, i.e. the state of the savage people in many places of America. Fontenelle (Oeuvres, Paris, 1752, Vol. III, p.271) declared in his work on the Origin of Oracles of 1686 that in the first ages of the world, men must have been as ignorant and barbarous as Kaffirs, Lapps and Iroquois are today. When Locke coined his phrase "in the beginning the whole world was America" he was not

merely echoing Hobbes and Fontenelle but could have invoked the support of countless 16th and 17th century ethnographers and travellers who had come back from Africa with reports of the crudest and most savage and most conditions which they alleged to prevail on that continent. (See e.g. Katherine George, "The Civilised West Looks at Primitive Africa: 1400-1800", *Isis*, 49, 1958, pp. 62-72.) With such information, people in the 17th century were beginning to tumble to the idea that the original condition of all mankind had been like the conditions that were prevailing in Africa and North America and that when one is looking at the past, one has to consider that the past, even for people living in Europe, had been full of people who were ignorant and supersitious. In the Renaissance perspective of the past there could be no room for progress; but in the modern perspcetive of the past, there was ample room for progress. This progress, they reasoned, had at long last taken place.

When Voltaire began to consider the matter, he came up with a theory of history which is very similar to the theory of 18th century geologists. They explained the mountains and oceans and valley and rock formations on earth as the result of gigantic, sudden, unpredictable and inexplicable catastrophes. Voltaire applied the same kind of reasoning to the Enlightenment. Looking back he saw that he was living in an age of enlightenment and admitted that there had been comparable ages in the past. He identified four such ages: the Athens of Pericles, the Rome of Augustus, the Florence of the Medici and his own age, the Age of Louis XIV. Unpredictably and catastrophically, we might say, cultural volcanic eruptions of enlightenment had pushed their way up and created temporary islands of civilisation and knowledge. As unpredictably as they had arisen, they had subsided again. He sometimes was a little bit more optimistic about the future of the enlightened age in which he himself was living and hoped that the star of Newton had come to stay.

To historians such a theory of the enlightenment was not satisfactory. It left more questions open than it was able to answer. Why the sudden eruptions? How were they related to surrounding periods of history? Why had they subsided? And last not least, what was to be the future of the present "catastrophe" which had been presided over by Locke and Newton?

Voltaire's "catastrophist" explanation of the liberating effect of Locke and Newton was inspired by the reasoning which had presided over the famous quarrel between the "ancients" and the "moderns". This quarrel had broken out when the first doubts had arisen in the 17th century about the unsurpassed excellence of the Greeks and Romans. Some had argued that the excellence was final, even when compared with the achievements of Galileo and Harvey and Newton; and others had argued that the achievements proved that that excellence had not been final. Either way, the argument was "catastrophist" in that it concentrated merely on the relative merits of two "catastrophes", one ancient and one modern. The participants in the debate were not arguing about history or comparing competing views of history but kept arguing about the relative merits of two different catastrophes.

Though Voltaire's catastrophist explanation of the enlightenment was by far the most readable work of historical literature on the subject and was to have far-reaching effects on the study of social and cultural history in the 19th century, Voltaire remained alone. During the 18th century, there came a whole crop of more genuinely historical explanations. These explanations employed a very different model of history. They worked on the assumption that there was a law of development which had propelled mankind from an original state of savagery and superstition to his present state of knowledge and civilisation. In its most specific form this law of development stated that society had grown naturally and progressed normally over time through four more or less distinct consecutive phases.

The stages were originally defined in terms of different modes of subsistence: Hunting, pasturage, agriculture and commerce. It requires little exercise of the imagination to see that once the law of the four stages was fixed, in terms of the mode of subsistence, one could easily elaborate it and assign to each mode its prevalent type of ignorance. Starting with Locke himself, in whom the law was not elaborated at all, we can trace its growth and hold in Bossuet and Fontenelle and Turgot right down to the end of the 18th century where it dominated the great work on the history of America by William Robertson who actually spelt out that once the mode of subsistence in every stage is known, one can find out how it affected, in every stage, laws and policy. The law of the four stages was a developmental law and, as such, historicist. It asserted that there was an iron necessity which compelled progress through these four stages and that the sequence was a unique succession of events. There was no need for further inquiry.

One must ask, however, where Turgot and his fellow historians got this idea from. Ronald Meek (Social Science and the Ignoble Savage, Cambridge, 1976) points out that the idea that there had been different stages in the history of mankind was a very old idea and can be traced back to the ancients. He says it had been dormant for two millennia when it was eventually taken up in the 17th century by Grotius and Pufendorf. The ancient writers, however, had been in two minds about the direction of the sequence of these stages. Hesiod had seen a decline and deterioration from a golden age to an iron age and others, from Plato to Machiavelli, had seen merely repetitive cycles. (For the enormous hold the cycles had on the human mind see G. Trompf, The Idea of Historical Recurrence in Western Thought, Berkeley, 1979.) It was only from Bodin and Bacon onwards that the idea that the sequence of stages was taking place in an upward direction and linked to progress through enlightenment gained a firm foothold. This notion of progress came to be very firmly established by the early 18th century and is

apparent even in so theology- minded a work as Bossuet's Discourse of Universal History of 1681, which was otherwise completely out of step with the Enlightenment and a target for both Voltaire and Turgot (R. Meek, op.cit., p.23 and R. Nisbet, The History of the Idea of Progress, London, 1969, p.143.)

The derivation established, we are still left with the inherently unreasonable character of this law of the four stages. It was unreasonable because it could not explain why there had been a singular succession of those stages and why that succession should be a developmental law which explained what had happened and why modern Europeans were not like the inhabitants of Africa or America in the 17th and 18th centuries. All the same, compared with the traditional theology-dominated histories which had been extrapolated from the Bible, the historicism of Turgot was yet another mark of enlightenment. It seemed indeed more "enlightened" to assert that there were four stages in the development of mankind than to say that God had providentially guided the evolution of mankind from the Garden of Eden to the liberalism of the commercial culture of 18th century Britain and France. Whatever the faults of historicism, it was a net gain over theology-inspired history.

The net gain did not just consist in the fact that it was non-theological and did not invoke God and providence and, therefore, had a certain explanatory power. It also looked "scientific" because if one makes the assumption that there are given wholes, phases, styles, stages or systems one can make the observation that the sequences of these wholes reveal laws of development. This method of arriving at such laws of development is not really scientific, because it is entirely based on the assumption that there are such wholes. But it looks scientific and certainly more scientific than the view that there are divinely ordained sequences, which had preceded it. A.F.V. Hayek has therefore, rightly, called this kind of history "scientistic" history. And this is what we mean by historicism. (The

Counter-Revolution of Science, Glencoe, 1952, p.73).

The historicist law of the four stages was also an improvement on the simple Renaissance view that excellence had been present in Greece and Rome and had to be recovered in the 14th century. In this view the middle ages were simply the "age in between" the two great cultural peaks of mankind. With the law of the four stages this view of the middle ages changed. The middle ages ceased to be a period of Gothic depravity. Turgot saw the middle ages instead as the stage of agriculture and therefore as an improvement on hunting and pastoralism. Eventually Comte adopted an even more positive attitude to the middle ages. He recognised that the democracy which had prevailed in the personnel of the church had helped to lay the foundations for a more liberal order of society and had detracted even then from the authority of magic and religion which had been linked to a hierarchical order of society or a patriarchal order which had sustained magic and religion.

The historicist law of the four stages was also a great improvement on the catastrophist theory of Voltaire even though according to our own understanding, it explained nothing at all. What, one might ask, should have compelled this particular sequence? Why was there compulsion at all? Could it be the other way round? There was, however, to be no improvement of this kind of historicism until the model of constructing historical sequences of Lyell came to be known. Lyell eventually explained that one can explain past events by the operation of the causes which are acting in the present. With this methodology he drew away from historicism and showed the way to a proper understanding of historical development. In the meantime, however, historicism was accepted and served as an explanation of the Enlightenment. Such an explanation was indeed necessary, for, as we have seen, the philosophical reasoning which had recommended sense observation as the royal road to success was extremely wanting as a theory and was not practised by

those men who had actually advanced knowledge and brought about the enlightenment. Without the historicist explanation that sense observation was "enlightened" because it was the philosophy of the fourth stage of development, the philosophy of sense observation or any other form of positivism could not have won approval. With historicism, it was firmly established in the face of arguments and evidence to the contrary. Thus there began one of the unholy alliances in the history of thought: the alliance between positivism and historicism. Positivists paraded their philosophy on the ground that it pertained to the most recent stage of development; and historicists paraded their developmental law on the grounds of positivism. A careful and disinterested study of history -- absence of authority and hear-say, avoidance of wishful thinking and mere legend; all analogues to the positivistic study of nature -- had led to the discovery of the developmental law of the four stages. It took a very long time, incidentally, to remove this kind of positivism from historical study. It dominated the historical researches of Karl Marx and Leopold von Ranke and showed up in the very title of Arnold Toynbee's great work A Study of History. And through Ranke, it came to be academic orthodoxy in our universities and presided over the establishment of the first Chair of modern history in the University of Oxford in 1850 when the University Authorities, seeking a substitute for the theology-dominated curriculum which had led to nothing but controversy, hit upon the study of history as the most uncontroversial because most positivistic kind of study available at that time.

It was believed that the study of history was based on documents and that, provided one did not stray from the documents, one could not make mistakes. Such "documentary positivism" as the method of historical research was the precise parallel to Locke's positivism of perception. The process by which one gains historical knowledge through documents was a little more complicated because one cannot describe the relation between the historian and the documents in the causal

terms in which Locke had described the relation between man and nature. But historians tried hard: source criticism was the answer intended to nullify bias and thus assimilate the relation between historian and sources to a causal relation. In an impassioned moment, the great French historian Fustel de Coulanges leant forward towards his students and stated: "It is not I who is speaking, but history itself." And if there are doubts about such positivism in historical knowledge, I will quote a passage in which Richard v. Mises (Positivism, Engl. transl. Cambridge, Mass., 1951, p.222) summed up positivism in historical knowledge: "The criterion of truth of an historical assertion lies in the testability of the still observable aftereffects of the alleged fact and of its indirect consequences (sources)..." Less sophisticated historians (and practising historians often are very unsophisticated) cut this process of testability short. They imagined that in writing history they are simply copying from History, i.e. they are transcribing events into words. They thus imagine the causal process to take place between what happened and what is being written so that historical narratives are 'caused' by events. R.v. Mises is a little more circumspect and relates that the causal relation is between the aftereffects, among which he includes the sources and documents, and the composition of the narrative. With views like these there was established the positive science of history. History itself came to be seen as part of positive knowledge. Positivists, it is to be admitted, looked askance at historians like Hegel and Spengler in whom theorising had outstripped the study of the sources. But barring such extremes, historical knowledge positively told of the continuing progress of mankind from savagery to enlightenment. This had been the burden of Turgot's story. It was explained by Herder in his Ideas on the Philosophy of the History of Mankind and found its greatest exponent in H.T. Buckle's widely acclaimed History of Civilisation in England which Mises called "a model of positivistic writing of history" (ibid., p.223). Buckle, he seems to have meant, used

the positivistic method for writing history and thus produced a history which explained that positivism was the correct philosophy of knowledge because it provided historical evidence that theology and metaphysics had been superseded by the positive reign of reason (R.v. Mises, loc.cit.).

I have dwelt on this alliance between positivism and historicism at some length because it is crucial. Positivism by itself was poor philosophy and could not have gained much of a hearing. Thanks to Karl Popper we know that historicism by itself was poverty stricken. But when positivism could invoke a historicist theory to say that the reign of positivism had to come; and when historicism could invoke the method of positivism and look like science to support the contention of positivism, these two philosophies became indispensable to each other.

The alliance between positivism and historicism found its grandest exposition in the work of Auguste Comte in the early 19th century. Comte, moving away from subsistence as the definition of each stage, fastened upon the mode of knowledge as the characteristic which presided at every stage. Thus he reduced the stages from four to three and taught that mankind had progressed from magic to religion and from religion to positivism, by which he meant modern science. If one peruses the voluminous writings of Comte who did more than any other philosopher to give the word "positivism" its status and currency, one will find next to no philosophical argument in favour of it. When he did try to provide a philosophical argument, it led from muddle to muddle. "The question to which it is exceedingly difficult to find an answer in Comte's work," A.F.v. Hayek writes (The Counter-Revolution of Science, Glencoe, 1952, p.171) "is what precisely is meant by the 'phenomena' which are all subject to invariable laws, or what he regards as 'facts'". Comte, instead of dispelling such and similar doubts, based his advocacy of positivism entirely upon the fact that it was the mode of knowledge of the third and final stage of the development of mankind. We can see the interdependence of

history and philosophy, i.e. of historicism and positivism very clearly in Comte. In the scientific stage of knowledge, when metaphysics and theology have been superseded, scientists rule out questions about the hidden nature of things. They cease to ask: why? and ask, instead: how? This was the philosophy of positivism. How could it be recommended or legitimised? Comte legitimised it by an appeal to history. The iron law of development decrees, he argued, that theology and metaphysics are superseded by science and in the last stage of development, when enlightenment has arrived, the intellectual world is dominated by "scientists", i.e. by people who know the relation between the external world and man and this knowledge enables them to present a "system of positive knowledge" in which every hypothesis must be capable of positive verification. (The Positive Philosophy, Engl. translation and condensation by Harriet Martineau, London, 1853, p.200.) This was the historicist view of history. How could it be justified? By the contention that a positivistic treatment of the sources would reveal that the course of history was from theology to metaphysics and from metaphysics to science. Rarely in the history of thought has there been a finer example of how thoughtful and highly respected people were pulling themselves up by the straps of their own boots.

If we are to believe John Stuart Mill, positivism's view of science "became the general property of the age" (August Comte and Positivism, Boston, 1867, pp. 9-10). But we have to be careful. The great purveyors and advocates of positivism from Bacon to Locke and Comte and Mill, with the one important exception of Mach, were not practising scientists themselves and the methods which they recommended to scientists were not "always necessarily those," F.A.v. Hayek writes, "which the scientists in fact followed in their own field, but rather those which they believed they employed." (The Counter-Revolution of Science, Glencoe, 1952, p.14.) We have already noticed the gap between Newton's professed method and his actual style. We will find similar doubts and discrepancies between

profession and style in the 19th century. Maxwell frequently expressed himself as a positivist (Cp. L. Campbell and W. Garnet, The Life of James Clerk Maxwell, London, 1884, p.436) but was also capable of a different frame of mind as is apparent from his essay "Molecules" of 1873 where he sought to derive a proof for the existence of God from an examination of molecular structure. (Scientific Papers, Cambridge, 1890, Vol. II, pp. 361-78.) God or no God, with or without molecules, it is impossible to imagine that his famous equations could have been inductively derived from observations. It is much more likely that he employed a style of investigation similar to the one Cohen says Newton employed. Faraday was never at his best with pure theory and he struggled violently with the demands of positivism because, as is well known, "lines of force" are not easily susceptible to positivism. (Cp. J. Agassi, Faraday as a Natural Philosopher, Chicago, 1971, pp. 152ff.) If we consult L. Pearce Williams' biography of Faraday (London, 1965) we do not get the impression of a man too preoccupied with the philosophy of his pursuits; but Williams described Faraday's philosophical education in some detail in chapter 2. He seems to have been anything but a positivist. For instance, in 1812 "when he first made Davy's acquaintance, he was a confessed and ardent believer in the real existence of imponderable fluids. Davy, in the first lecture Faraday attended, soon shook this belief" (p.84). Davy was no positivist himself and had been close to Coleridge who had introduced Kant into England. "The result was that Faraday found himself in an intellectual muddle," Williams concludes (op. cit. p.85). Helmholtz, to cite another example, wrote that "the appointed task of physics is thus to refer natural phenomena to unchangeable attractive and repulsive forces, whose intensity depends upon distance." (Über die Erhaltung der Kraft, Leipzig, 1889, pp. 6f.) With this view one can hardly call him a positivist. Kirchhoff seems betwixt and between. He declared that the mechanistic view could not explain phenomena -- only describe them. This was a good piece of positivist

thinking. But when he went on that his goal was the complete description of the motions occurring in nature and excluded other phenomena from such description, he seems to have gone beyond the limits set by positivism, at least in the sense in which Mach understood them. (Vorlesungen über mathematische Physik, 2nd ed., Leipzig, 1977, I, p.1). With Hertz one remains equally unsure. He argued that no objective content need be sought in the system of Maxwell's differential equations over and above that already expressed there. We can, he continued, deduce consequences from Maxwell's theory and find them verified by experiment. This is all the proof of the theory's validity we can get and no more is possible. (Untersuchungen über die Ausbreitung der elektrischen Kraft, Leipzig, 1892, p.23) "Experience," he wrote, (op. cit., p.53) "remains wholly foreign to the considerations" of time, space and mass. "They rest on the laws of an inner intuition and forms of the inner logic of the person stating them and have no connection with his external experience other than these intuitions and forms may have with it." This way of thinking was Kantian and certainly not part of positivism. Poincare, as is well known, was not a positivist but a conventionalist. The case of Darwin is specially interesting. The Origin of Species, i.e. the way he set out his theory, is often described as a classic of inductive logic and could thus be considered a work informed by positivism (Cp. e.g. E. Cassirer, The Problem of Knowledge, New Haven, 1950, p.160). However, we know from Darwin's note-books as well as from his letter to Haeckel, October 8, 1864, that his method of discovery owed nothing to positivism. In his observations on his journey on the Beagle he was struck by three classes of phenomena -- i.e. he singled out three specific classes and chose to omit others. These selected observations led him to concentrate back home on domestic animals and cultivated plants and thus there occurred to him a general theory about man's power of selection. And the theory and the selected classes of phenomena all fell into place when he read Malthus. If

we are to believe him, we can hardly think of him as a "positivist" (Cp. E. Mayr, The Growth of Biological Thought, Cambridge, Mass., 1982, p.29). Planck was not exactly a positivist either (Cp. John Blackmore, Ernst Mach, Berkeley, 1972, p.221 and E. Cassirer, The Problem of Knowledge, New Haven, 1950, pp. 84-85, 89).

Boltzmann seems to have wavered at times, at least this is the impression one gets in reading pp. 214-16 of John Blackmore's Ernst Mach; and Einstein, at the very beginning of his career, sometimes flirted with positivism of the Machian kind, or was believed to have done so. This is not an exhaustive list but these examples show that positivism did not exactly enjoy wide support among practising scientists, i.e. among people who provided the knowledge we have. Given the dubious credentials of positivism without historicism, this is hardly surprising. The only thing that is surprising is that in spite of so much evidence to the contrary, positivism came to be given a new lease of life by the Vienna Circle during the early part of the 20th century. The logical positivism of the Vienna Circle relied heavily on the emancipation and enlightenment historicism of earlier positivists (Cp. G. Radnitzky, Contemporary Schools of Metascience, 3rd ed., Chicago, 1973, p.81). In reiterating that science is the knowledge producing enterprise (Ibid., p.69) the Vienna Circle was on very shaky ground, for one glance at the practice of 19th century physicists would have sufficed to prove the contrary. The Vienna Circle, however, provided a new twist. They thought one could consolidate the "unity of science" ideal of positivism by the production of a unified language. (Cp. G. Radnitzky, op. cit., p.75). This hope depended on the presumption that all knowledge can be derived from or is caused by observation. With this presumption, observation statements provide, together with the appropriate reduction and derivation rules, the unified language. All knowledge, if it is to count as such, can be translated into observation statements. To my mind such hopes of methodological unity are trivial and should be distinguished clearly from genuine,

non-trivial efforts based on content and substance of theories as in the examples on p.1, above. Although the Vienna Circle enjoyed a certain support and although one can see that the language twist the Circle had given to positivism was to be one of the contributory inspirations for all sorts of linguistic analysis philosophy in the middle of this century, natural scientists kept their distance.

Social scientists, on the other hand, were much more explicit about their positivism and their historicism. They failed to distinguish historicism as scientific and took it to be scientific. It is in the writings of men like Maine, Tylor and Fraser that we can study the link between positivism and historicism best.

Fraser was a historicist. He believed that there was a developmental law which had determined man's intellectual evolution from magic to religion and from religion to science. When questioned about the reasons for believing that this law was true, he replied that a study of history taught that it was right. In other words, he was a positivist who believed that simply by looking at history one could determine the law it was governed or directed by. His historicism was founded upon positivism. Had one taken it the other way round and asked him why he was a positivist, he would have replied that positivism was the philosophy and methodology of every intelligent man living in the 19th century and that the course of history had been directed towards the evolution of positivism. His positivism, in turn, was founded upon his historicism.

The 19th century alliance between historicism and positivism has been obscured by a careless way of looking at the history of ideas, recently reinforced by the writings of Michel Foucault. Both Fraser and Darwin and countless other people used the term "evolution". Many books have been written about the use of the idea of evolution in the 19th century and in all those books Fraser and Tylor, Comte and Darwin and Wallace and Lyell are seen as exponents of "evolution", be it of the earth, society or species. There was, however, a world of difference

between the uniformitarian evolutionism of Lyell and Darwin and the historicist evolutionism of Comte and Fraser. Lyell and Darwin was evolution as the result of the operations of general laws. Comte and Fraser believed that there was a law of evolution which had determined the progress of mankind. The authors of books on the intellectual history of the 19th century rarely make this distinction and find it therefore very difficult to explain why the evolutionism of Darwin has survived and shown progressive problem shifts; while the evolutionism of Comte and Fraser is dead, though not necessarily because it showed degenerative problem shifts.

Michel Foucault has now increased this confusion by the peculiar theory of cognitive relativism he professes. According to Foucault the intellectual climate changes approximately once a century. Since he does not relate these changes to anything at all, one can only presume that he believes in some kind of number magic in which the figure "100" casts an intellectual spell over intelligent people. However this may be, Foucault diagnoses that in the 19th century intelligent people were given to explaining everything in terms of evolution. Thus he throws Darwin and Fraser together and obliterates the fact that Darwin's theory of evolution was uniformitarian and Fraser's, historicist, and that that historicism was based on positivism. Broadly speaking, Foucault is right. Evolution was very pervasive in the 19th century. But his writings show how important it is to make the right distinctions and not to throw things together that merely look alike. Using Foucault's method, one would end up by likening flies to aeroplanes. No doubt, they have similarities. But are these similarities significant or accidental?

Leaving Foucault aside, let us now turn to the last great exponent of positivism in science, Ernst Mach. Mach was a towering figure who exercised a great influence on some of the finest minds of the 20th century. Mach was an arch-positivist. He firmly believed that only those statements are true which are directly produced by sense observation. In this way he came to question the

existence of Newton's absolute space as well as the existence of atoms. In the first case he was working in the right direction, though for the wrong reasons and in the second case, he was on the wrong track altogether. However this may be, I have not been able to find any clear indication either in John Blackmore's book or any other work on Mach I have consulted, why Mach believed that only sense-observation afforded access to the truth. Given the fact that this doctrine of the absolute veracity of sense-observation is so peculiar and given the fact that it has had such a chequered career ever since Locke, it is really very astonishing that a man of Mach's intellectual power should have placed so much reliance on it.

The only conceivable answer is that Mach simply took it for granted that exclusive reliance on what our senses tell us is more "enlightened" than deference to any other source of information. There can, indeed, be no other explanation. By any critical standard, if one has sense-observations one has knowledge about one's self. When my skin is stung or my eyes stimulated, I can be fairly certain that there are events on my skin and on my retina. Sensa, so called, no matter how one twists and turns, are sensa, i.e. events in our nervous system and, possibly, in our mind. One has to make an act of faith in order to persuade oneself that they present something else, e.g. something that is happening outside one's nervous system. I cannot get myself to believe that Mach was the sort of man who would make such an act of faith. We are thus left with the only possible explanation. Like all other positivists, Mach was a historicist. He believed that sense-observations are the most advanced and enlightened form of information. The developmental law had forced Mach's ancestors to jettison, first magic and then religion and had left him with the truly enlightening and rational method of getting knowledge -- reliance on sense-observations. Mach is yet another example of my contention that without historicism, positivism is untenable.

Philosophically, Mach's contention that basic sentences are denotations of

direct sensations such as "I see blue" (R.v. Mises, Positivism, Engl. transl. Cambridge, Mass., 1951, p.81) is not different from Locke's causal theory of perception. In the two centuries between Locke and Mach, to the best of my knowledge, nobody had ever come up with a sensible argument in favour of this kind of positivism, though it had been formulated in many slightly different ways. One way or another, everybody had fallen back upon historicism: positivism, the ultimate argument was, is more enlightened than theology and metaphysics. Mach was no exception and Richard v. Mises, a positivist himself, says that Mach was the second stage in the "emancipation and humanisation of knowledge" (op. cit., p.86; the first stage had been Hume). Mach insisted, and thus he emancipated knowledge, that correct knowledge is an extension of man's practical activity in man's relation with the world. Neither religion nor theology nor metaphysics were so related and could not be seen as an extension of man's practical activity. The way Mach fell back upon historicism is neatly illustrated by the Introduction he wrote to the German translation (Leipzig, 1911) of J.B. Stallo's The Concepts and Theories of Modern Physics of 1881. Mach (op. cit., p.xii) praised Stallo because he had recognised and definitely removed the scholastic and metaphysical elements that still clung to the older physics.

There was a subsidiary motive in Mach. Mach wanted to promote the unity of science. His conception of "elementary statements" about simple elements enabled him to connect physics with psychology. "Elements", he said, is what we experience and what the world consists of: "The material world rests upon established connexions between elements, and relations between human impressions are only particular instances of such connexions" (quoted in L. Kolakowski, op. cit., p.146). By looking at knowledge in this way, Mach was able to advance the unity of science by linking psychology with physics. His positivism was designed to be an emancipation and such emancipation led to an increase in unity. The view that

positivism is an emancipation rests squarely on the developmental law which states that mankind moves from the bondage of magic and metaphysics to emancipation. Without this kind of historicism, there can be no reason why one should think that positivism, not even the positivism in Mach's version, should be an emancipation.

The history of the unholy alliance between positivism and historicism had an ironical epilogue through the work of Wittgenstein. Whatever one thinks of the Tractatus, one must give it credit for being an attempt at positivism which did not invoke the idea that sense-observation was more enlightened than other sources of information. Wittgenstein made a genuine effort to show that there is a real and intelligible relationship between the sum total of all facts and the sum total of all true and meaningful sentences. This was precisely what all positivists had assumed. Wittgenstein, however, sought to demonstrate that this was so by making quite non-positivistic assumptions. He assumed, for example, that there are what he called "atomic facts." In view of my analysis of the rise of positivism, it cannot come as a surprise that he had to base his positivism on such a non-positivistic view. Other positivists before him had also had to rely on an auxiliary hypothesis, i.e. the hypothesis that there was a historicist developmental law which had made men enlightened enough to rely on observation as a source of knowledge. Wittgenstein simply changed the auxiliary hypothesis. For the rest, he proclaimed to have achieved what all positivists had hoped for. Positivism, it had always been alleged, supersedes all philosophical attempts to explain knowledge and makes philosophy superfluous. If one is a positivist, one knows that everything one knows is known "scientifically" by observation and that science thus takes the place not only of magic and religion but also of philosophy. Every reader of the Preface to the Tractatus knows that this is precisely what Wittgenstein claimed. The irony consists in the fact that in order to achieve his aim, he had to replace the historicist crutch by the "atomic facts" crutch.

But there was more irony to come. Wittgenstein was an honest thinker and soon realised that the claim he had made in the Preface to the Tractatus was not justified. Positivism can no more be legitimised by the "atomic facts" view than it could be by historicism. And so, in his effort to establish knowledge on a secure basis, i.e. on as secure a basis as the positivists had believed they had established it, he ended up by making nonsense of knowledge. He dropped the Tractatus and suggested instead that "the harmony of thought and reality is to be found in the grammar of our language" (Zettel 320). By this he meant that when we are saying that we know A to be true because we have observed it, we do not mean that we have observed it (i.e. that there is a relation between knower and known) but that we are following the rules of language which prescribe that the word "observe" be used in this and no other manner. With this doctrine, the entire positivist enterprise has reduced itself ad absurdum. Starting off in the 17th century as a philosophy to establish knowledge on a secure and unshakable basis, it ended up in the 20th century by making nonsense of the notion of knowledge. Wittgenstein, it often seems to me, had learnt more from G.E. Moore than he cared to admit. Where Moore had persuaded himself that "goodness" was a "state of mind of goodness," Wittgenstein persuaded himself that the meaning of sentences does not depend on extra-linguistic events, as had been maintained in all versions of positivism, but is a state of mind which follows upon an assurance that the sentence in question was formed in obedience to the prevailing speech rules. He supplemented Moore's non-relational ethics by a non-relational epistemology.

Curiously, he had been proceeded in this strategy by the anthropologist Bronislaw Malinowski. I do not know whether Wittgenstein ever considered the historicist back-up to positivism and rejected it because he found it wanting. I do not even know whether he knew that positivism had depended so strongly on historicist backing. Malinowski, on the other hand, considered historicism very

seriously. He had studied Fraser and was very alive to the implications of Fraser's historicism and rejected it explicitly. The idea that there is a developmental law which compels mankind to evolve from magic to science via religion is absurd, he argued. He too, however, did not want to let go of positivism in anthropology. He therefore anticipated Wittgenstein's strategy of positivism without historicism. Malinowski reasoned that one could get correct information about the way societies functioned by doing field-work in the society one is studying. Such field-work would make the anthropologist become an insider in the society and thus the anthropologist would understand the society he was studying as it was being understood by its own members. Field-work, to Malinowski, became what sense-observation had been to Locke and what source criticism had been the the positivist historians of the 19th century. When one understands a society from the inside, Malinowski argued, one sees that the meanings of rituals and laws and beliefs are to be understood in terms of their actual use in that particular society; and need not be interpreted in any other terms. Where Fraser and other positivists had explained such meanings in terms of what had been before and of what was to come after (using the evolutionary law of development as a guide), Malinowski dispensed with historicism and showed that one can determine meaning by not looking to the before and after. The analogy to Wittgenstein's strategy is obvious and striking. However, one has to admit that where Wittgenstein in applying this strategy to knowledge, made nonsense of knowledge, Malinowski, in applying it to the study of primitive societies, was able to produce a remarkable number of progressive problem shifts. The reason for the difference is not far to seek. Wittgenstein referred people to "rules" -- but could never explain how these rules had come to apply and who the members of a certain rule-obeying group were. Malinowski, working as an anthropologist among primitive people, never came up against this difficulty. The members of the groups he studied and the rules to

which he referred the meanings of their actions and beliefs were defined by geography. The societies were societies of islanders surrounded by water or by other tangible boundaries. The problem as to who was in and who was out could therefore not arise. Wittgenstein was not so lucky. Working with the problem of knowledge, his speech communities whose epistemic authority governed meaning, were arbitrarily thrown together and can be considered at best, as voluntary associations of people willing to believe that what Wittgenstein said was right -- which fact leaves the whole problem, in Wittgenstein's case, wide open and completely unsolved.

With the possible exception of Malinowski, therefore, positivists have had a bad time. Positivism has always been established on shaky foundations and its eventual demise was to be expected. Where does this leave us in regard to the question of the unity of science? The unity of science is an intimate and integral part of positivism. Does the failure of positivism prove that there is no unity of science? My answer would be an emphatic No. Considering the dubious credentials of positivism and its chequered career, one should not throw out the baby with the bath-water and seek instead to disentangle the unity of science from positivism. The idea of the unity of science is not only valuable because it holds up the notion that an increase in unity is an increase in explanatory power; but also a rational part of our knowledge that homo sapiens has evolved because the world is the sort of world it is and that homo sapiens would not be here if that world were fundamentally different. It is therefore both legitimate and imperative that we embark upon a search for the unity of knowledge now that we have jettisoned the easy and conventional idea that the unity of science is a consequence of positivism.

Throwing out the baby with the bath-water has in fact been the most common reaction to the demise of positivism. From Wittgenstein's later philosophy on we can see a retreat not only from positivism as such but a retreat from the

unity of science. Following upon Wittgenstein's philosophy of language games we witness one retreat to the relativism of frame-works after another. Wittgenstein set the stage by his argument that every language game is an end in itself and provides the only frame-work in terms of which one can judge the viability of any statement. "Whether a thing is a blunder or not -- it is a blunder in a particular system. Just as something is a blunder in a particular game and not in another" (quoted by L. Kolakowski, Religion, Fontana Paperbacks, 1982, p.61). Here, in a nutshell, we have Kuhn's philosophy of paradigms and Feyerabend's philosophical anarchism based on the denial of meaning invariance and Michel Foucault's theory that all knowledge is relative to a prevailing episteme and Richard Rorty's proclamation that all knowledge is relative and therefore of little value. Throwing out the baby with the bath-water has led not only to the denial of the unity of science but to the opposite view that all knowledge is relative to a frame-work and therefore ultimately meaningless. For this reason, if for no other, we ought to make a new start with the unity of science without positivism. The best starting point, I would argue, lies in the philosophy of Karl Popper. Popper's rejection of positivism, and Popper is alone in this stand, has not led to a retreat to frame-works and relativism. His fallibilism points the way to a philosophy of knowledge which is not based on the causal theory of perception and on induction and yet avoids a retreat to frame-works and to the relativity of paradigms. It links the growth of knowledge to a Neo-Darwinian theory of evolution in general. According to this evolution theory, evolution as a whole is a growth of knowledge brought about by making mistakes. Instead of thinking of the growth of knowledge as a process based on the avoidance of error, Darwin and Popper think of the growth of knowledge as a process in which errors are made and subject to elimination. Errors which are less fitting than others are eliminated; and the less erroneous conjectures which are a better fit to the environment are selected for retention. This way of

seeing the growth of knowledge as a product of errors rather than as an accumulation of correct observations, is entirely novel. It is also entirely plausible; for the attempt to seek knowledge by avoiding error is like a contradiction in terms. It seems to presuppose that one knows before one seeks to know: for how could one avoid errors unless one knew what sort of observation would be an erroneous observation? To avoid errors one would have to know what would be an error. The search for knowledge, on the other hand, by making errors is a new conception. It is the opposite of positivism and, being so novel, I keep wondering whether one might not christen it "negativism" in opposition to "positivism". Negativism or not, I am convinced that here lies a plausible alternative to the retreat to frame-works with their relativism, their disunity of science and their devaluation of knowledge.