

The Milk of Paradise or the Conditions for Creativity

Many historians and others have noticed that from time to time there have been major shifts in the world view or 'spirit of the age'. These alter both the questions people ask and what answers they find acceptable. The Renaissance, the Enlightenment, the structuralist movement are examples. What has been much more difficult to explain is why such transformations have occurred. Both the nature of such shifts and the difficulty of understanding their roots are shown if we look at two famous analyses of the phenomenon of scientific and humanistic revolutions.

In his work on **The Structure of Scientific Revolutions**, Thomas Kuhn showed the relativity of science - that it was subject to fashion, that it was a matter of the replacement of world views. In other words, dealing mainly with revolutions in astronomy (Copernicus), chemistry (Boyle) and physics (Newton and Einstein), he shows how, rather than being overthrown by evidence and data of a new kind, in a sense there was an 'inner' revolution which saw the same data in a different light. The nature of the **questions** altered and the nature of what was **accepted** as a solution to old questions altered. He calls these world views 'paradigms'.

Kuhn defines 'paradigm' in several ways. At one time it looks like a model achievement: paradigms 'I take to be universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners.'¹ Kuhn asks the question 'Why do some succeed?' and answers that 'to be accepted as a paradigm, a theory must seem better than its competitors, but it need not, and in fact never does, explain all the facts with which it can be confronted.'² Such success is partial. 'Paradigms gain their status because they are more successful than their competitors in solving a few problems that the group of practitioners has come to recognize as acute. To be more successful is not, however, to be either completely successful with a single problem or notably successful with any large number. The success of a paradigm...is at the start largely a promise of success discoverable in selected and still incomplete examples...'³

One factor in a paradigm shift is the awareness of an anomaly which 'plays a role in the emergence of new sorts of phenomena.'⁴ Kuhn argues that 'crises are a necessary precondition for the emergence of novel theories.'⁵ Certainly it is not a matter of disproving theories by experiment - 'No process yet disclosed by the historical study of scientific development at all resembles the methodological stereotype

¹p.viii; OED 1. A pattern, exemplar, example (Caxton) 2. An example or pattern of the inflexion of a noun, verb, or other inflected part of speech.

²p.18

³p.23

⁴p.67

⁵p.77

of falsification by direct comparison with nature.⁶

A test case is the Galilean revolution. 'Why did that shift of vision occur? Through Galileo's individual genius, of course. But note that genius does not here manifest itself in more accurate or objective observation of the swinging body. Descriptively, the Aristotelian perception is just as accurate...Rather, what seems to have been involved was the exploitation by genius of perceptual possibilities made available by **a medieval paradigm shift**.'⁷

Kuhn argues that 'What occurs during a scientific revolution is not fully reducible to a reinterpretation of individual and stable data. Though the world does not change with a change of paradigm, the scientist afterward works in a different world.'⁸ We are told that 'Periods of 'normal science' or earlier paradigms 'are not corrigible by normal science at all...(there is a recognition of anomalies and crises)...these are terminated, not by deliberation and interpretation, but by a relatively sudden and unstructured event like the gesalt (sic) switch.'⁹ The effect works at a mysterious level on the individual. 'As a result of those crises and of other intellectual changes besides, Galileo saw the swinging stone quite differently.'

What Kuhn, in fact does, is to show that scientific explanations and paradigms **are fashions** - nearer to **myths** than many would have cared to believe. Speaking of Aristotelian dynamics, for example he says that 'if these out-of-date beliefs are to be called myths, then myths can be produced by the same sorts of methods and held for the same sorts of reasons that now lead to scientific knowledge.'¹⁰

Unfortunately Kuhn is unable to show in this work why these myths change. He has adequately shown that the old (nineteenth century) explanation of the reasons for the change, i.e. that the new one is self-evidently, 'better', 'more powerful', or emerges out of new 'facts' is wrong; But he has no explanation of why the revolutions occur - neither **why** they occur, why they occur **when** they do, why they take the **shape** they do. Hence, as a guide in our task of explaining the major shifts in theoretical systems, he only provides a start. As Ernest Gellner, for example, writes, 'it is difficult either to evaluate or to explain these fundamental shifts of vision...'¹¹

Indeed, in the preface to the work, Kuhn admits that he has really failed to explain the reasons for change. In other words he has failed to provide a theory of change or paradigm shifts which will account for changes in theories of change.

More important, except in occasional brief asides, I have said nothing about the role of technological advance or of external social, economic, and intellectual conditions in the development of the sciences.

⁶p.77

⁷p.119

⁸p.121

⁹p.122

¹⁰p.2

¹¹ Gellner, Legitimation, 178.

One need, however, look no further than Copernicus and the calendar to discover that external conditions may help to transform a mere anomaly into a source of acute crisis. The same example would illustrate the way in which conditions outside the man who seeks to end a crisis by proposing one or another revolutionary form. (XXX - footnote to other works by K. in which he claims to discuss some of these factors). Explicit consideration of effects like these would not, I think, modify the main theses developed in this essay, but it would surely add an analytic dimension of first-rate importance for the understanding of scientific advance.¹²

A second major attempt to consider major theoretical frameworks is that of Michel Foucault.¹³ Although he used the word 'episteme' rather than 'paradigm', and abandoned even that for 'discourse' towards the end, one can see clear resemblances to the work of Kuhn. His writing is contradictory, obscure and abstract, so let us try to simplify out of it answers to three simple questions.

The first is what does Foucault mean by an 'episteme'? There is no such word as 'episteme' in older dictionaries of the English language. 'Epistemology', combining the Greek words for 'knowing' and 'discourse' means, 'the theory or science of the method or grounds of knowledge.' Hence, presumably, 'episteme' means a specific set of ideas that science or theory has reached. Another hint is that Foucault used 'episteme' and 'configuration' interchangeably.¹⁴

One of the clearest exposition of what he means is in **Archaeology**.¹ Here he immediately **contradicts** the above. 'This **episteme** may be suspected of being something like a world view, a slice of history common to all branches of knowledge, which imposes on each one the same norms and postulates, a general stage of reason, a certain structure of thought that the man of a particular period cannot escape...' Elsewhere he points in a slightly different direction. 'The episteme is not a form of knowledge or *connaissance* which manifests the sovereign unity of a subject, a spirit, or a period, it is the totality of relations that can be discovered, for a given period, between the sciences when one analyses them at the level of discursive regularities.'¹⁵ So, it is the **relations** between sciences, as discursive regularities.

Since things are still fairly murky, let us approach this in another way. What, in practice, are the great epistemological breaks for Foucault? Foucault isolates 'two great discontinuities in the episteme of Western culture: the first inaugurates the Classical age (roughly half-way through the seventeenth century) and the second, at the beginning of the nineteenth century, marks the beginning of the modern age.'¹⁶

How then to explain the **causes** of these supposed shifts? Here Foucault is as unsatisfying as Kuhn.

¹²p.x

¹³in various books, *Archaeology of Knowledge*, *Order of Things*, *Madness and Civilization* etc.

¹⁴e.g. *Order*, p.30, xxiii

¹⁵cf also p.17 tree metaphor

¹⁶*Order*, xxii

He admits that he is not interested in continuity or continuous change, the 'history of ideas' or how systems evolve.¹⁷ Furthermore he admits that even the 'archaeological shifts' are not total; there is no single break.¹⁸

There are a few very half-hearted attempts to explain the supposed epistemic changes. He suggests that 'the fact that within the space of a few years a culture sometimes ceases to think as it had been thinking up till then and begins to think other things in a new way - probably begins with an erosion from outside...'¹⁹ But this lead is not pursued.

He admits that technological factors may be important, for example 'the discovery of printing was one of the great events in Western culture...the fundamental place accorded in the West to writing. Henceforth it is the primal nature of language to be written...'²⁰ Yet this is not pursued.

He plays with causes, ² he suggests some of the **symbolic** links between the birth of the clinic and political and other changes at the time, and some of the possible **causal** links - the political, economic changes in the early nineteenth century which might have given rise to it. But he quickly gives up, or rather says 'Archaeology situates its analysis at another level...' his aim is not 'to isolate mechanisms of causality.' Before a set of 'facts', 'archaeology does not ask what could have motivated them...'²¹ The clearest statement of his abrogation of the responsibility to **explain** is as follows. 'It is not always easy to determine what has caused a specific change in a science. What made such a discovery possible? Why did the new concept appear? Questions like these are often highly embarrassing because there are no definite methodological principles in which to base such an analysis...In this work, then, I left the problem of causes to one side, I chose instead to confine myself to describing the transformations themselves.'¹³

This is a **naive** division - to **describe** one must understand, and to **understand** one must think not only of effects but causes. In fact, Foucault is basically not interested in **history** i.e. change and reasons for change. As he revealingly puts it, (using 'Archaeology' to define his own science) 'Archaeology, however, seems to treat history only to freeze it.'²²

Thus, it is not surprising that we should gain no insight in his works as to what **caused** either of the supposed great epistemic breaks in the early seventeenth or early nineteenth centuries. Brian Morris points to the fact that in **The Order of Things** Foucault completely ignores the political, social and economic practices of the period, seeing the epistemic transformations as being unrelated to

¹⁷Archaeology, p.139

¹⁸Archaeology, p.175

¹⁹Order, p.50

²⁰Order, p.38

²¹p.162

²²Archaeology, p.166

non-discursive practices.²³ More generally, Abercrombie and his co-authors conclude that Foucault 'provides no recognizable historical or sociological analysis for the emergence of new epistemes; nor does he provide any suggestion on how we should analyse transitions and ruptures in discourses.'²⁴

While Kuhn and Foucault have helped to emphasize the way in which changes in theoretical systems arise from new ways of perceiving and linking the 'facts' in the external world, and Kuhn has noticed the way that external changes may be linked to internal ways of perceiving the world, they are unable to take us much further.

The psychology of creativity.

An alternative approach is to start from the other end, that is from the large literature on what we might call the 'psychology of creativity'. It has often been observed that the **gestalt** shift which Kuhn refers to happens very quickly, what one might call the 'eureka' syndrome. Just a few examples will illustrate the suddenness, unexpectedness and speed of the break-through.

From poetry we have the following example. 'For two years, as Goethe relates in **Dichtung and Wahrheit** the stuff of **Werther** occupied his mind without taking form. Then he tells us what happened. He received one day the startling news of his friend Jerusalem's suicide, and, as he says, "at that instant the plan of **Werther** was found; **the whole shot together from all directions, and became a solid mass, as the water in a vase, which is just at the freezing point, is changed by the slightest concussion into ice.**"²⁵

From economics an example would be that 'Malthus's conception of "effective demand" is brilliantly illustrated in this early pamphlet by "an idea which struck him so strongly as he rode on horseback from Hastings to Town" that he stopped two days in his "garret in town, sitting up till two o'clock to finish it that it might come out before the meeting of parliament."²⁶ From physics, we have Einstein on discovery..."the knowledge that the events which are simultaneous for one observer are not necessarily simultaneous for another", came to him early one morning just as he got out of bed.' From biology, 'Darwin had been accumulating masses of facts which pointed to a momentous conclusion. But they pointed through a maze of baffling inconsistencies. Then all at once the flash of vision came. "I can remember", he tells us in that precious fragment of an autobiography - "I can remember the very spot in the road, whilst in my carriage, when to my joy the solution came to me."²⁷ Numerous other examples could be cited.²⁸

As Koestler summarizes the experience, the art of discovery 'is signalled by the spontaneous flash of insight which shows a familiar situation or event in a new light, and elicits a new response to it. The

²³Morris, Western, 438.

²⁴Abercrombie et al., Sovereign, 173

²⁵Loves, Xanadu, p. 136

²⁶Keynes, Essays, pp.103-4

²⁷Loves, Xanadu, p.395

²⁸e.g. Knowlson, Originality, pp.87/88 note 2 gives some.

bisociative act connects previously unconnected matrices of experiences...! Yet all of these accounts merely describe the end result, the sudden re-aligning of the pattern. As Koestler notes, 'The moment of truth, the sudden emergence of a new insight, is an act of intuition. Such intuitions give the appearance of miraculous flashes, or short-circuits of reasoning. In fact they may be likened to an immersed chain, of which only the beginning and the end are visible above the surface of consciousness.'²⁹ The difficulty of understanding the concealed parts of the chain are shown by Darwin's puzzlement. "I have been speculating last night," he said to Horace Darwin, "what makes a man a discoverer of undiscovered things; and a most perplexing problem it is. Many men who are very clever - much cleverer than the discoverers - never originate anything. As far as I can conjecture the art consists in habitually searching the causes and meaning of everything that occurs."⁴ This is obviously only partially correct.

There have been a number of attempts to picture what goes on in the invisible reaches of the minds and in particular the ways in which ideas are transmitted and linked in new ways. How do we think we are working in these moments of inspiration? A few classic accounts are worth citing. One is by the geneticist Galton. 'There seems to be a presence-chamber in my mind where full consciousness holds court, and where two or three sides are at the same time in audience, and an ante-chamber full of more or less allied ideas, which is situated just beyond the full ken of consciousness. Out of this ante-chamber the ideas most allied to those in the presence-chamber appear to be summoned in a mechanically logical way, and to have their turn of audience.'³⁰ This is one of the most powerful metaphors for that groping on the edges of consciousness which seems always to be present in great science and great art.

Another hint with a similar idea of a core and margins, is given by the psychologist William James. 'The great field for new discoveries is always the unclassified residuum. Round about the accredited and orderly facts of every science there ever flows a sort of dust-cloud of exceptional observations, of occurrences minute and irregular and seldom met with, which it always proves more easy to ignore than to attend to.'³¹ These are similar to, but not identical to Kuhn's anomalies.

The new creative combinations occur from shaking and juxtaposing. "It is obvious", says Hadamard, "that invention or discovery, be it in mathematics or anywhere else, takes place by combining ideas...the Latin verb 'cogito' for 'to think' etymologically means 'to shake together'. St. Augustine had already noticed that and also observed that 'intelligo' means 'to select among'.³²

One of the most interesting accounts of the antechambers of subterranean regions, is given by Lowes in his study of Coleridge's creative thought, **The Road to Xanadu**. In Coleridge's notebooks he found Galton's 'antechamber of consciousness was rapidly peopled with strange shapes.'³³ 'The term, then, as I shall employ it, assumes the existence of what Coleridge called "the twilight realms of consciousness"; it assumes that "in that shadowy half-being" (as he once put it), "that state of nascent existence in the twilight of imagination and just on the vestibule of consciousness", ideas and images exist; it assumes

²⁹Koestler, *Creation*, p.211

³⁰Quoted in Koestler, *Creation*, p.160

³¹Quoted in Koestler, *Creation*, p.191

³²Quoted in Koestler, *Creation*, p.12

³³Lowes, *Xanadu*, p.14

(and again I am quoting Coleridge) a "confluence of our recollections", through which "we establish a centre, as it were, a sort of nucleus in (this) reservoirs of the soul."³⁴

Lowes suggests as his central image of Coleridge's mind is of a deep well or hole into which sensations are dropped and form new shapes. 'One after another vivid bits from what he read dropped into that deep well. And there, below the level of conscious mental processes, they set up their obscure and powerful reactions. Up above, on the stream of consciousness (which is all that we commonly take into account) they had floated separate and remote; here in the well they lived a strangely intimate and simultaneous life. But the inscrutable energy of genius which we call creative owes its secret virtue at least in part to the enhanced and almost incredible facility with which in the wonder-working depths of the unconscious the fragments which sink incessantly below the surface fuse and assimilate and coalesce.'³⁵

Or in another summary of the process we are asked to, 'Suppose a subliminal reservoir thronged, as Coleridge's was thronged, with images which had flashed on the inner eye from the pages of innumerable books. Suppose these images to be fitted, as it were, with links which render possible indefinite combination. Suppose some powerful suggestion in the field of consciousness strikes down into this mass of images thus capable of all manner of conjunctions. And suppose that this time, when in response to the summons the sleeping images flock up, with their potential associations, from the deeps - **suppose that this time all conscious imaginative control is for some reason in abeyance**.; What, if all this were so, would happen?' What might happen is the writing of Kubla Khan, where Coleridge 'gives us the very quintessence of perception, the clearly crystallized precipitation of all that is most precious in the ferment of impression after the impertinent and obtrusive particulars have evaporated from the memory. It is the pure visual ecstasy disengaged from the confused and confusing material that gave it birth.'³⁶

One of Lowes' central ideas is the way in which data, when it drops into the 'well' becomes hooked, linked or connected to other data, previously held apart by conscious thought. Lowes noted that Coleridge himself saw the process as one of hooks and eyes. 'Coleridge speaks, in **The Friend**, of what he calls "**the hooks and eyes** of the memory."³⁷ What happens is that things become linked or associated in the creative moment: **by the images of memory flowing in on the impulses of immediate impression**."³⁸ This occurred out of the chaos and diversity of what was in the 'well'. Indeed, 'the more multifarious, even the more incongruous and chaotic the welter, the freer play it offers to those darting and prehensile filaments of association which reach out in all directions through the mass.'³⁹ One example, given by Coleridge, of the process is as follows. "Seeing a mackerel...it may

³⁴Lowes, Xanadu, p.51

³⁵Lowes, Xanadu, pp.54/55

³⁶Lowes, Xanadu, p.128

³⁷Lowes, Xanadu, p.41

³⁸Lowes, Xanadu, 163

³⁹Lowes, Xanadu, p.56

happen, that I immediately think of gooseberries, because I at the same time ate mackerel with gooseberries as the sauce. The first syllable of the latter word, being that which had coexisted with image of the bird so called, I may then think of a goose. In the next moment the image of a swan may arise before me, though I had never seen the two birds together."⁴⁰ This happens many thousands of times. "Through a flash of association by way of a common phrase, two objects have telescoped into a third. And at moments of high imaginative tension associations, not merely in pairs but in battalions, are apt in similar fashion to stream together and coalesce."⁴¹

Lowes drew his inspiration for his analysis partly from Galton's 'antechamber' idea, but equally from the famous account of the intuitive process by the nineteenth century mathematician Poincare. Writing of Coleridge, Lowes describes how 'Once more there was the long, slow storing of the Well; once more the flash of amazing vision through a fortuitous suggestion; once more the exacting task of translating the vision into actuality. And those are essentially the stages which Poincare observed and graphically recorded in his "Mathematical Discovery". And that chapter reads, as we saw long ago, like an exposition of the creative process through which "The Ancient Mariner" came to be."⁴²

[This account is scrappy; I need to look at his original writing and re-work: these are just a few pieces from Lowes/Koestler.] The need to connect is further described by the great French mathematician Poincare in a famous analysis. 'Among chosen combinations the most fertile will often be those formed of elements drawn from domains which are far apart...Most combinations so formed would be entirely sterile; but certain among them, very rare, are the most fruitful of all.'⁴³ This passage looks similar to, but is not identical to, another valuable piece by Poincare in Nadel⁴⁴, which is also worth quoting. 'The experimental method is intended to "reveal unsuspected relations between...facts, long since known, but wrongly believed to be unrelated to each other. Among the combinations we choose, the most fruitful are often those which are formed of elements borrowed from widely separated domains.'"

[See also long passage in Koestler, pp. 115-16, which he rightly describes as 'one of the most lucid accounts of the Eureka acts by a great scientist.']

Here are three unconnected pieces of his writing to indicate their value. 'Perhaps we must look for the explanation in that period of preliminary conscious work which always precedes all fruitful unconscious work. If I may be permitted a crude comparison, let us represent the future elements of our combinations as **something resembling Epicurus's hooked atoms (atomes crochus)**. When the mind is in complete repose these atoms are immovable; they are, so to speak, attached to the wall. This complete repose may continue indefinitely without the atoms meeting, and, consequently, without the

⁴⁰Lowes, Xanadu, p.84

⁴¹Lowes, Xanadu, P.??

⁴²Lowes, Xanadu, xxx

⁴³Koestler, Creation, p.164

⁴⁴Nadel, Foundations, p.243

possibility of the formation of any combination.⁴⁵

'All that we can hope from these inspirations, which are the fruits of unconscious work, is to obtain points of departure for (our) calculations. As for the calculations themselves, **they must be made in the second period of conscious work which follows the inspiration...They demand discipline, attention, will, and consequently consciousness.** In the subliminal ego, on the contrary, there reigns what I would call liberty, if one could give this name to the mere absence of discipline and to disorder born of chance. **Only this very disorder permits of unexpected couplings.**⁴⁶

'On the other hand, during a period of apparent repose, but of unconscious work, some of them are detached from the wall and set in motion. **They plough through space in all directions, like a swarm of gnats, for instance, or, if we prefer a more learned comparison, like the gaseous molecules in the kinetic theory of gases. Their mutual collisions may then produce new combinations ...**⁴⁷

'It is certain that the combinations which present themselves to the mind in a kind of sudden illumination after a somewhat prolonged period of unconscious work are generally useful and fruitful combinations, which appear to be the result of a preliminary sifting...This, too, is more mysterious. How can we explain the fact that, of the thousand products of our unconscious activity, some are invited to cross the threshold, while others remain outside? Is it mere chance that gives them this privilege? Evidently not..⁴⁸

Out of these and other accounts, those who write overviews of 'Creativity' have tried to erect some general theories. One of the earliest of these, Knowlson, particularly stresses the role of analogy, metaphorical thinking and forging new associations. He quotes William James on the process. 'According to our view, there are two stages in reasoned thought, one where similarity merely "operates" to call up cognate thoughts, and another further stage when the bond of identity between the cognate thoughts is "noticed"; so minds of genius, for, said he, it implies an intuitive perception of similarity in dissimilars. All the great thinkers have been masters of metaphor because all vivid thinking must be in images and the philosopher whose metaphors are blurred and diluted is one whose thinking is blurred and diluted. Thus it comes about that the thinkers who survive are the thinkers who wrote well and are most nearly poets. All great thinkers are great masters of metaphor because all thinking of any kind must be by analogy.'⁴⁹ Knowlson himself believes that "The fact is, analogy is a necessary mode of all our thinking, and genius is often another name for the power to see similarities in phenomena, natural or mental, that have hitherto been undetected."⁵⁰

⁴⁵Loves, Xanadu, p.58

⁴⁶Loves, Xanadu, p.58

⁴⁷Loves, Xanadu, p.58

⁴⁸Loves, Xanadu, p.58

⁴⁹Knowlson, Originality, p.111

⁵⁰Knowlson, Originality, p.110

This process 'does not create something out of nothing; it uncovers, selects, re-shuffles, combines, synthesizes already existing facts, ideas, faculties, skills.'⁵¹ There is a 'sudden interlocking of two previously unrelated skills, or matrices of thought.'⁵² Or, to put it another way, 'All decisive advances in the history of scientific thought can be described in terms of mental cross-fertilization between different disciplines.'⁵³ We begin to see similarities where before there was only difference. 'The most important feature of original experimental thinking is the discovery of overlap and agreement where formerly only isolation and difference were recognized.'⁵⁴

The problem is, of course, that most of the interesting activity occurs at a level which we cannot observe, and happens over a long time period. What goes into the 'well', or hovers in the ante-chamber, may have been there for many years. As he writes of XXX 'The story of this discovery shows that an idea may sleep for decades in the unconscious mind and then suddenly return. Einstein saw the solution at a flash, but that moment had been preceded 'by ten years of contemplation, of considering a paradox which had struck one at the age of sixteen.'⁵⁵ Or again 'Most striking at first is this appearance of sudden illumination, a manifest sign of long, unconscious prior work. The role of this unconscious work in mathematical invention appears to me incontestable...'⁵⁶ Thus 'the most important part of mental action, the essential process on which thinking depends, is unconscious mental activity.'⁵⁷

The puzzle is made more difficult when we recognize that many of our stereotypes of how major transformations in thought occur are wrong or misleading. One of the most common, still half implied by Kuhn's idea of anomalous facts somehow 'overwhelming' or undermining a paradigm, is the common sense notion that ideas change in response to new 'facts'. Of course there is a half-truth here; extra data is needed and often tips the balance, but such data in itself is unlikely to create a new pattern. This can be seen if we notice that most of the great theoretical break-throughs occurred first as a new theory - which was later substantiated by data.

As T.H. Huxley wrote, 'Those who refuse to go beyond fact rarely get as far as fact; and anyone who has studied the history of science knows that almost every step therein has been made by...the invention of a hypothesis which, though verifiable, often had little foundation to start with...'⁵⁸ Scientists sometimes present it otherwise, as if the facts came first and then the theory, as Darwin did. But as Koestler comments on this case, 'For, contrary to the pious assertions in the preface, the bridge had come first

⁵¹Koestler, *Creation*, p.120

⁵²Koestler, *Creation*, p.121

⁵³Koestler, *Creation*, p.230

⁵⁴Koestler, *Creation*, p.232

⁵⁵Koestler, *Creation*, p.183

⁵⁶Koestler, *Creation*, p.116

⁵⁷Koestler, *Creation*, p.152

⁵⁸Koestler, *Creation*, p.233

and the pillars afterwards - as was nearly always the case in the history of scientific thought.⁵⁹ Darwin became committed to the evolutionary theory - and then set out to collect facts to prove it.⁶⁰ Putting it in another way, from mathematics, Polya remarks: "When you have satisfied yourself that the theorem is true, you start proving it."⁶¹ Or Poincare writes 'guessing before demonstrating! Do I need to remind you that was how all important discoveries are made?'⁶² Or as Poulton puts it 'Powers of observation, however acute, could never make a scientific discovery; for discovery requires the relative effort of the imagination... Fertility of imagination is essential for that step from the less to the more perfectly known, which we call discovery.'⁶³

More aphoristically, as Richardson puts it, 'it is a certain maxim, no man sees what things are, that knows not what they ought to be.'⁶⁴ Thus 'Max Planck, the father of quantum theory, wrote in his autobiography that the pioneer scientist must have a "vivid intuitive imagination for new ideas not generated by deduction, but by artistically creative imagination."⁶⁵ Surprisingly, we are told, 'The telescope is, of course, the supreme eye-opener and fact-finder in astronomy; but it is rarely appreciated that the Copernican revolution came before the invention of the telescope - and so did Kepler's "New Astronomy".'⁶⁶ A living example of all of this was Faraday. Untrained in mathematics 'It is in the highest degree astonishing to see what a large number of general theorems, the methodical deduction of which requires the highest powers of mathematical analysis, he found by a kind of intuition, with the security of instinct, without the help of a single mathematical formula.'⁶⁷

How are we to explain the changing intuition? One clue lies in changing the questions one asks. As Koestler notes, 'The greatness of the philosophers of the scientific revolution consisted not so much in finding the right answers but in asking the right questions, in seeing a problem where nobody saw one before; in substituting a "why" for a "how".'⁶⁸ A delightful example is given by Einstein's account of his late development of the 'why' questions. 'The normal adult never bothers his head about space-time problems. Everything there is to be thought about, in his opinion, has already been done in early childhood. I, on the contrary, developed so slowly that I only began to wonder about space and time when I was already grown up. In consequence I probed deeper into the problem than an ordinary child would have done.'⁶⁹

It is easy enough to say, 'change the question', but how and in what direction should we move? Another clue lies in various discussions about the need for ignorance, the breaking of assumptions, the

⁵⁹Koestler, *Creation*, p.137

⁶⁰Koestler, *Creation*, p.135

⁶¹Koestler, *Creation*, p.118

⁶²Koestler, *Creation*, p.83

⁶³Knowlson, *Originality*, p.83

⁶⁴Quoted in Koestler, *Creation*, p.381

⁶⁵Koestler, *Creation*, p.147

⁶⁶Koestler, *Creation*, p.234

⁶⁷Koestler, *Creation*, p.170

⁶⁸Koestler, *Creation*, p.126

⁶⁹Koestler, *Creation*, p.175

overthrow of common sense. Koestler gives three examples of the overthrow of 'common sense'. 'Newton, to his horror, had to go against the obvious experience that action is only possible by contact: Rutherford had to commit the contradiction in terms of asserting the divisibility of the atom, which in Greek means "indivisible". Einstein destroyed our belief that clocks move at the same rate anywhere in the universe; quantum physics has made the traditional meaning of words like matter, energy, cause and effect, evaporate into thin air.⁷⁰ Put more generally, 'Each of the major break-throughs in scientific thought had to be achieved not only in the teeth of Aristotelian, Platonic and Christian dogma, but also in the teeth of what appeared to be self-evident and commonsensical - the implied rules of the code.'⁷¹

Like nationalism, which Renan described as 'the art of forgetting', so discovery could also be described as 'the art of forgetting'. 'To undo wrong connections, faulty integrations, is half the game. To acquire a new habit is easy, because one main function of the nervous system is to act as a habit-forming machine; to break out of the habit is an almost heroic feat of mind or character. The prerequisite of originality is the art of forgetting, at the proper moment, what we know.'⁷² Again, two examples are given by Koestler. 'To Faraday, his ignorance of mathematics was an asset; Edison benefited from his shocking ignorance of science.'⁷³

Furthermore we know that major discoveries occur when new data intersects with 'the right mind'. As Pasteur famously put it 'Chance only favours invention for minds which are prepared for discoveries by patient study and persevering efforts.'⁷⁴ Or, as Van Gogh put it, 'Art demands persistent work, work in spite of everything, and a continuous observation.'⁷⁵ But many people work very hard and achieve little; why Mozart and not Salieri?

So we come back, in Koestler's anticipation of Kuhn, to a mysterious change both within the individual and the context. 'At the decisive turning points in the history of science, all the data in the field, unchanged in themselves, may fall into a new pattern, and be given a new interpretation, a new theoretical frame.'⁷⁶ The same point is put in another way thus. Creative discovery is '...the art of handling the same bundle of data as before, but placing them in a new system of relations with one another by giving them a different framework, all of which virtually means putting on a different kind of thinking-cap for the moment.'⁷⁷ Koestler also anticipates Kuhn in suggesting that there are pendulum swings between 'normal science' and periods of scientific revolution, triggered by 'discontent'. 'In both fields there are periods of crisis, of "creative anarchy", leading to a break-through to new frontiers - followed by decades, or centuries of consolidation, orthodoxy, stagnation, and decadence - until a new crisis arises, a holy discontent, which starts the cycle again.'⁷⁸

⁷⁰Koestler, *Creation*, p.177

⁷¹Koestler, *Creation*, p.176

⁷²Koestler, *Creation*, p.190

⁷³Koestler, *Creation*, p.190

⁷⁴Koestler, *Creation*, p.145

⁷⁵Van Gogh, *Letters*, p.156

⁷⁶Koestler, *Creation*, p.233

⁷⁷Koestler, *Creation*, p.235

⁷⁸Koestler, *Creation*, p.335

There is of course, plenty of anecdotal evidence on some of the ways in which this creative process is encouraged. One way of achieving it is to force ourselves into new challenges. 'But to recapture the erstwhile magic in all its freshness, he must turn to something new; experimental theatre, avant-garde films, or Japanese Kabuki, perhaps; novel experiences which compel him to strain his imagination, in order to make sense of the seemingly absurd - to participate, and re-create.'⁷⁹ Another is to vary effort and relaxation. Darwin had his 'thinking path' along which he would stride, trying to sort out his ideas. In this he was demonstrating Max Weber's view that: 'Both, enthusiasm and work, and above all both of them jointly, can entice the idea. Ideas occur to us when they please, not when it pleases us. The best ideas do indeed occur to one's mind in the way in which Ihering describes it: when smoking a cigar on the sofa; or as Helmholtz states of himself with scientific exactitude: when taking a walk on a slowly ascending street; or in a similar way. In any case, ideas come when we do not expect them, and not when we are brooding and searching at our desks. Yet ideas would certainly not come to mind had we not brooded at our desks and searched for answers with passionate devotion.'⁸⁰

It may even be that some dulling of the conscious brain is needed, as the poet Houseman described.⁸¹ 'Having drink a pint of beer at luncheon - beer is a sedative to the brain, and my afternoons are the least intellectual portion of my life - I would go out for a walk of two or three hours.' The writer then becomes 'possessed', Einstein's 'rape of the mind', or as Kipling described it 'My Daemon was with me in the Jungle Books, Kim, and both Puck books, and good care I took to walk delicately, lest he should withdraw. I know that he did not, because when those books were finished they said so themselves with, almost, the water-hammer click of a tap turned off...Note here. When your Daemon is in charge, do not try to think consciously. Drift, wait, and obey.'⁸²

The earlier work of Knowlson, Koestler, Lowes and others has been supplemented and made more sophisticated by recent explorations of creativity theory. For example, Maggie Boden has shown that we can understand a good deal about the re-arrangements of 'conceptual space' through the study of children's art and computer programming. David Perkins has analysed some of the difficulties of creative thought through his metaphor of a 'klondyke' landscape [EXPAND] where there are numerous obstacles to major break-throughs, various intellectual traps.

What becomes increasingly obvious, however, is that in order to proceed we need somehow to bridge the gap between the meta level of 'paradigm shift' and the manifestation of the break-throughs at the level of the individual. In approaching this, one of the most helpful approaches is that developed by Csikszentmihalyi. His major thesis is that 'we cannot study creativity by isolating individuals and their works from the social and historical milieu in which their actions are carried out.'⁸³ But how do we do

⁷⁹ p.336

⁸⁰ From Max Weber, p.136

⁸¹ See whole section in Koestler, p.318

⁸² Autobiography, p.210

⁸³ Csikszentmihalyi, Systems, p.325

this? Csikszentmihalyi proposes that we separate out three 'shaping forces' namely social institutions or **field**, a stable cultural **domain** and the individual. All three are necessary 'Without a culturally defined domain of action in which innovation is possible, the person cannot even get started. And without a group of peers to evaluate and confirm the adaptiveness of the innovation, it is impossible to differentiate what is creative from what is simply statistically improbable or bizarre.'⁸⁴ All of this concentrates on the evaluation of creativity. Csikszentmihalyi also touches on the problem of the inputs, that is to say in a diagram⁸⁵ he suggests something termed 'Culture', which affects the 'Domain' (Symbol System) which then 'transmits structural information and action' to the person. The 'Domain' has also been influenced by the social system, and the 'Person' is also influenced by the 'Genetic Pool and Personal Experiences'.

This is clearly all true, as are Csikszentmihalyi's warnings that elapsed time is very important in creative activity, as is wealth. Discoveries may occur in a second, but there is usually a long preparation period, and the leisure to pursue many often unsuccessful leads may be essential. But when we come to the question of what, exactly, the changes which will lead to personal creativity are, the guidance becomes thinner. In relation to the Renaissance we are sensibly told that it is unlikely that 'individual personalities' suddenly changed, but the 'changes that produced the Renaissance took place in the social system, the field of art, and, to a lesser extent, the culture and the domain.'⁸⁶ But what, precisely, were these changes, and why did they change? Csikszentmihalyi refers to new work by Perkins and others on 'domain' creativity concerning how information is stored and transmitted. At the level of the person, he draws attention to the importance of memory and experience and laments the absence of studies of creative individuals. With the field 'less is known about the effects of the social system on creativity than about the other two phases of the cycle'⁸⁷ and that is saying something. In other words Csikszentmihalyi has thrown down a challenge, rightly seeing the problem at the level of interactions between individual, culture and social institutions. This is important for it is obvious that individuals do not think in a vacuum. Their ability to see a new pattern arises out of the inter-section of their individual personality, their life experiences, and the wider changes at all levels in the society in which they live.

This fact has long been known. To take just one example, the philosopher and historian Burckhardt in his **Reflections** asking why Athens and Florence were so creative intellectually and artistically. He put forward a number of reasons, all of them at a level above that of the individual. One reason for creativity was self-confidence. 'And finally we shall deal with the great centres of intellectual exchange, such as Athens, Florence etc. Such places give birth to a strong local prejudice, namely, that there was nothing they could not do, and that the best society, and the greatest, or even the sole stimulation of and respect for culture was to be found there.'⁸⁸ Another was the effects of a network of communications, particularly if the social hierarchy was not too rigid. 'Social intercourse, however, even where the castes are preserved, brings all the elements of culture more or less into touch, from the highest to the meanest

⁸⁴Csikszentmihalyi, *Systems*, p. 326

⁸⁵p.329

⁸⁶p.335

⁸⁷p.337

⁸⁸Burckhardt, *Reflections*, p.60

mechanical activity. Thus they form a great chain, a thousandfold entwined, which is more or less affected at all its parts by one electric shock. One important innovation in the domain of mind and spirit may implant even in men who seem to have little share in it a new conception of their ordinary, every day doings.⁸⁹

Among other reasons for the creativity of Athens were: 'the value of such a situation in such an archipelago, of the particularly happy, unforced fusion of races, into which freshly immigrated elements brought primarily fresh stimulus, of the high talent and versatility of the Ionian race, of the significance of the conservative control of the Eupatridae, and then again the breach with their overlordship, and of the rise of a body of citizens with equal rights, in which men were citizens and only citizens.'⁹⁰ Finally, there was an appropriate 'climate', an audience, a style. 'Thus a general understanding was created. Orators and dramatists could reckon with an audience such as had never before existed. People had time and taste for the highest and best because mind was not drowned in money-making, social distinctions and false decencies. There was comprehension for the sublime, sensitiveness for the subtlest allusions and appreciation of the crassest wit.'⁹¹ None of this is to deny the importance of the individual genius, but it balances the psychologistic interpretations. We only have to think for a moment what Coleridge would have achieved without his network of friends, particularly Wordsworth, or without the vast flow of wealth and new data created by the early industrial and imperial expansion of Britain.

In other words we need to study both the individual and the context, and to watch in detail as new paradigms are formed in order to see what happens. We are studying what Aldous Huxley called 'the gates of perception', gates which are shaped both at the individual level of character and experience, but also at much wider levels. As Koestler puts it 'The codes which govern the matrices of perception are hidden persuaders; their influence permeates the whole personality, shapes his pattern of vision, determines which aspects of reality should be considered significant, while others are ignored, like the ticking of one's watch.'⁹² These 'hidden persuaders' are themselves formed out of the life and experiences of the individual. This book is an attempt to examine in a little more depth the inter-action between individual and context, between life and work, which can lie behind creative discovery.

How, then, can we proceed to tease out the nature and causes of paradigm shifts? What is needed is a case where we can study the links between the wider context within which individuals work and the evolving thoughts of such individuals. In particular we need to analyse the links between Csikszentmihaly's three levels, the social institutions or 'field', the cultural 'domain' and the individual. As Csikszentmihaly concludes, 'Careful studies of complex interactions among persons, field, and domain are especially needed and in scarce supply.'⁹³ The only historical case he cites is Gruber's study of Darwin, though it

⁸⁹Burckhardt, Reflections, p.61

⁹⁰Burckhardt, Reflections, p.105

⁹¹Burckhardt, Reflections, p.109

⁹²Koestler, Creation, p.334

⁹³Creativity, p.337

would be possible to think of others of works by historians (e.g. Burrow, Liberal Tradition, Evolution), poets (Lowes, Xanadu), sociologists (Lukes, Durkheim) which while explicitly not directed to this problem have some bearing on this need.

In other words, instead of looking at paradigm shifts at the level of isolated incidents, literally the tip of the explosion of creativity, we need to go inside the individuals to see how over their whole lives their personality interacts with a changing world. Preferably we should choose several individuals who are all involved in the same paradigm shift in order to see if there are any patterns in common. In order to do this we need to choose a really major change and some major figures within it who have left extensive clues as to their lives and thought patterns.

The paradigm shift I have chosen is 'The Enlightenment'. Although primarily located in France and Scotland, it was a pan-European movement, and even, as we shall see, reached Japan. Thus it was geographically wide. It was historically lengthy, supposedly commencing in the scientific and political innovations of the later seventeenth century, reaching a peak in the second half of the eighteenth century, but reverberating through to the later nineteenth and even later twentieth century.

It was a change at the deepest level. It fundamentally altered ideas about the relations between man, God, reason, nature. Man was increasingly viewed as no longer essentially depraved, but could, if his mind was freed from ignorance and superstition, come to understand and control his world, and free from arbitrary government could pursue progress and even perfection. All things were interconnected and formed part of the grand scheme of a shadowy Providence. Thus worldly action and happiness was the goal.

Its theoretical impact was immense, inaugurating revolutionary developments in philosophy, art and politics. Its methodological impact was enormous, laying the foundations of all the social sciences as we know them - sociology, anthropology, economics, psychology, history, particularly in its framework of different 'stages' of man's evolution, as well as in many of the sciences, such as geology, zoology and archaeology.

Its effects on the way questions were posed and where answers were sought was vast. Its central core was a new dedication to reason, a belief in intellectual and social progress, a confidence in nature as a source of inspiration. It set new goals for mankind, the search of knowledge, freedom and happiness. It advocated a new morality based on humanity, political freedom based on a strong civil society and the separation of religion and politics, and the basic equality of all.

Finally its practical results were multifarious, from inspiring the French and American revolutions to providing the underpinning for the British Empire. It is worthy of our attention as, along with the Renaissance and Scientific Revolutions it is arguably the largest theoretical movement of the last thousand years.

There were, of course, many outstanding figures in many countries in such a movement, but I will restrict myself to the analysis of just four of them. Montesquieu (1689-1755) was one of the major early

figures, a representative of the early French Enlightenment, 'founding father' of sociology, anthropology and parts of political philosophy. Then there is Adam Smith (1723-1790), one of the central figures of that other great Enlightenment, the Scottish, founder of modern economics. Finally on the European side all the different strands find a powerful expression at the end of the French Enlightenment in Tocqueville (1805-1859). In order to expand these Euro-centric analyses we need to find another Enlightenment. In Japan, the **keimo** or Enlightenment of the 1870s was expounded by another group, of whom Fukuzawa (1835-1902) was 'undoubtedly the most comprehensive exponent of the doctrines of Enlightenment.'⁹⁴ Like the others chosen, there is ample material on his life and working materials.

The theory I shall be exploring then is that cosmological systems, of which theoretical paradigms are a part, change because of wider shifts occurring within and between the societies in which individual thinkers are located. Although, of course, the relationships are complex and dialectical, we would expect that the Enlightenment as expressed in individual thinkers would reflect the huge changes at every level from the later seventeenth century onwards. The Enlightenment covers the period of the industrial and urban revolutions, the scientific revolution, the spread of European power over all quarters of the globe, the re-alignment of nations within and outside Europe. In a way the Enlightenment can thus be seen as an attempt to grapple with various contradictions, between Europe and Asia, between a basically **ancien regime** past and a new, more egalitarian and individualistic future, between a God-based and a science based cosmology.

That the power of its analysis comes out of the fact that there is a **balanced** confrontation of forces is well put by Nisbet, summarizing an idea of Troeltsch. 'What is ultimately and crucially required...is a spark that is ignited during that brief period when the two social orders are of almost equal power in the loyalties they inspire and the incentives they arouse in reflective minds...it is not the transition as such that is precipitative; it is the confrontation, so to speak, of the two orders; the old one moribund, and the new one not yet wholly grown. Out of such confrontations comes friction - to be seen in the problems, often agonizing, that become transmitted into the moral philosophy, the art, and the science of the age - and out of the friction comes the flame or creativity manifest in new insights, and new ideas.'⁹⁵

Nisbet describes the development of sociology in the nineteenth century as emerging out of such a balanced contradiction. 'Its contextual frame was the conflict between two social orders: the feudal-traditional and the democratic-capitalist. Plainly, the conflict, the friction, between these two orders produced a spark of creativity - not only among social scientists, but among philosophers, theologians, and artists.'⁹⁶ Nisbet starts with Tocqueville in his analysis, and I end with him within my European examples - we are dealing with two halves of the same great movement and his words apply equally to the earlier half. The theme of conflict and contradiction is also noted by Gellner when he wrote 'Sociology came into being because men were struck by the contrast between an old aristocratic-agrarian-military social order and a commercial-industrial bourgeois one which seemed to

⁹⁴Blacker, Fukuzawa, p.xii

⁹⁵Nisbet, *Sociological Tradition*, p.315, summarizing Troeltsch.

⁹⁶Nisbet, *Sociological*, p.316

be replacing it, and they sought the meaning of this transition and its place in human history at large.⁹⁷ In fact, it was more than sociology - much of the theoretical framework upon which knowledge is based was developed out of this clash. Furthermore it was not only a clash within Europe over time and space, but between Europe and in particular Asia. The creativity emerged out of trying to incorporate and reconcile vast differences and vast new sets of data, as a growingly self-confident, technologically sophisticated civilization started to overwhelm older and until recently more powerful civilizations in India, China and Japan. Time and space were expanding, so to speak, and theories had to expand too.

We may easily assent to the proposition that individual creativity is heavily influenced by context, but it is difficult to examine the process of how this happens over a lifetime. We can often see what comes out of the process - the creative works. But what goes into the individual and how it is re-arranged over a lifetime in a creative way has been less fully explored. This book will try to examine the inter-action between four deeply thoughtful individuals and the world they lived in over the whole of their lives to see how their ideas and their shifting experiences, their methods of work and theoretical tools evolved and inter-acted. We will try to see how they actually helped shape the new Enlightenment paradigm, following a vision of something new emerging out of the contradictions of their experience. They were both creatures of their age, yet different, standing out as people whose life and work took what was available to many and developed it into a unique and new synthesis.

1. Archaeology, p.19

2. E.g. Archaeology, pp.162-3

3. Order, p.xiii

4. Knowlson, Originality, pp.82/3

⁹⁷Gellner, Evans-Pritchard, Preface, p.xvii